

# Methodological Practices in On-the-Job Learning Research

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**ABSTRACT** *This paper compares and discusses aspects of methodological practices in on-the-job learning research. The focus is on contemporary research into on-the-job learning processes. Methodological practices refer to decisions of researchers in their research projects, to how they carry out the research, and how they report. This overview of methodological practices presents research instruments, on-the-job learning perspectives, paradigms, goals, researcher roles and quality and rigour considerations. The results show that, even though research in human resource development stems from different kinds of disciplines with their own data collection tools, there is nevertheless a rather limited variety in the instruments (questionnaires and interviews only) used for mapping the process of on-the-job learning. This is probably due to the implicit nature of most on-the-job learning processes. The paper proposes to apply research instruments from related research fields that could provide opportunities for future research. Combining instruments seems to offer fruitful opportunities for obtaining a more profound understanding of the process of on-the-job learning. The paper ends with a set of tentative guidelines for sound methodological practices in future research.*

**KEY WORDS:** Methodological practices, methodological issues, on-the-job learning, paradigms, research instruments

## Introduction

Key challenges in the mapping of on-the-job learning arise from the nature of such learning, which is frequently tacit. On-the-job learning is often not highly conscious, not intentional and not well planned, because it is opportunistic and closely integrated with work activities. Therefore, it is difficult to determine how learning processes take place (Marsick, 2003). Yet, good methodological practices, which are the decisions researchers take in their research projects as reflected in their design and report, are central to the success of published research (Rocco, 2003). Instrument design and other data collection tools are especially important in relatively new research fields such as on-the-job learning, which interests an increasing number of researchers as well as practitioners (Smith, 2003; D'abate *et al.*, 2003; Rainbird *et al.*, 2004). The aim of this study is to provide an overview of the variety of methodological

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practices in on-the-job learning research in order to identify tentative guidelines for future research addressing the process of on-the-job learning.

On-the-job learning, also referred to in the literature with terms such as workplace learning, work-based learning, work-related learning, informal learning and non-formal learning, plays a major role in initial and ongoing competence development. It implies human change or growth that occurs primarily in activities and contexts of work (Fenwick, 2001). Marsick and Watkins (1990) describe it as a situation where people go about their daily activities at work or in other spheres of life. This on-the-job learning can be very effective and necessary to develop professional and vocational knowledge and skills. Employees themselves believe that they have acquired most of their productive competence through their work – not through the educational system – and employers share this view. The basic idea of on-the-job learning is that it occurs outside the context of educational goals, and does not follow a formally organized learning programme or event. It happens within the context of day-to-day learning and development, and is therefore often spontaneous and integrated with work activities (Eraut, 2000; Marsick and Watkins, 1990). *On-the-job learning is viewed as implicit or explicit mental and/or overt activities and processes, embedded in working and work-related performance, leading to relatively permanent changes in knowledge, attitudes or skills* (adapted from Bolhuis and Simons, 1999, p. 16). Learning outcomes may vary from change to reinforcement, refinement or extension to learning something new. What people learn may be of immediate value to them: for example, how to do the job in a less stressful or exhausting way. At other times, what they learn could be related to the nature of the work itself (Billett, 2002). On-the-job learning concerns, for example, learning by routine, from direct or indirect experience, and in interaction with other people. It is the implicit or spontaneous character of the learning process that makes it difficult to examine, because workers may not be aware of their learning processes. In these cases, learning can be studied only retrospectively, by looking back from learning outcomes realized to the processes that must have taken place unconsciously and situations that have contributed to the learning outcome. Doornbos *et al.* (2004) differentiate between spontaneous and deliberate learning, based on the worker's intention to learn. They argue that spontaneous learning can occur when activities are performed with a goal other than learning in mind. The learning outcomes may refer to changes in knowledge, skills or attitudes as a result of such activities. They are typically unexpected and may therefore be described as by-products, discoveries, coincidences or (sudden) realizations. The learner may also remain unaware of certain changes when, for example, reflection does not occur (Marsick and Watkins, 1992). Deliberate learning, in contrast, refers to those activities performed with the goal of learning in mind. The resulting changes in behaviour, skills and attitudes are planned, sought and sometimes even premeditated.

There is still much to explore about the modes and processes of individual on-the-job learning. We know little about the kinds of learning employees make use of, especially those that are spontaneous. Current themes and research directions address the social and situational aspects of learning through the on-the-job learning cultures, texts and discourses, identities and differences, equity and ethics in work and workplaces (Fenwick, 2001). Given the emergent interest in on-the-job learning, researchers put their efforts into collecting data on its processes to contribute to theoretical notions regarding this construct. Research instruments address different

kinds of on-the-job learning, such as explicit and planned learning, emergent learning, self-directed learning, experiential learning, learning strategies, team learning, innovative learning, distance learning, etc. Some instruments are also used in intervention practices, for example when human resource developers apply instruments for diagnostic purposes and take into account individuals' different ways of learning in their daily practices, to improve the process of learning and consequently enhance performance. Examples of these instruments may be questionnaires, interviews, observations, documents (portfolios), visual methods (such as concept maps and diagrams) or personal narratives (e.g. logs and diaries) (Denzin and Lincoln, 2000).

With this growing body of research instruments and accompanying practices, the importance of accumulating the variety of instruments is increasing. Moreover, it seems important to formulate generic standards for methodological practices to be used in on-the-job learning research, since the current literature does not provide a systematic description of standards or guidelines for research. In this study, we will first propose and describe aspects of methodological practice. Then, we will provide an overview of the variety of instruments used to measure individual on-the-job learning processes and the accompanying methodological practices. The overview provides an insight into the contemporary state of research, and can serve as a starting point for further development. Next, to study what other instruments provide possibly useful opportunities for future research on individual on-the-job learning, we have examined literature covering a broader definition of on-the-job learning processes and literature on on-the-job learning outcomes. Based on our conclusions, we will formulate a set of guidelines of methodological practice, which is helpful in terms of quality improvement and for comparability reasons.

### **Research Questions**

In this paper, methodological practices in on-the-job learning research are explored to gain an insight into their variety and qualities. These methodological practices may stem from different research paradigms. In line with Lincoln and Guba we choose not to follow one specific research paradigm, but rather to follow how various paradigms 'interbreed' and inform one another's argument (2000, p. 164). The aim is to provide an overview of this variety in order to identify tentative guidelines for future research addressing the process of on-the-job learning.

Therefore, the main research question of this study is twofold:

1. What is the variety of methodological practices in contemporary research on on-the-job learning?
2. What instruments not used in current research on on-the-job learning provide possibly useful opportunities for its future research?

### **Variety of Paradigms**

A paradigm can be defined as a philosophical template or framework that guides the production of knowledge (Kuhn, 1962). It concerns beliefs about what can be known about the world and how we can come to know it. Within each paradigm, several research methodologies are possible, each drawing on a number of methods or

techniques for data collection and interpretation (Lincoln and Guba, 2000). The explicit or implicit paradigm and strategy are related to the applied methodological practices. A useful categorization of paradigms could be based on a combination of Melles's (1999) and Lincoln and Guba's (2000) categorizations, and includes the (post-)positivistic, interpretative, critical and participatory approach. In our description of the variety of methodological practices in on-the-job learning research, we will often follow Lincoln and Guba (2000) in a more rough division of social scientists: classical researchers and new-paradigm inquirers. Classical researchers are scientists from the (post-)positivistic paradigm and new-paradigm inquirers from the other paradigms mentioned above. Classical researchers have foundational ideas that are discovered and imply certain final, ultimate criteria for testing the truth. New-paradigm researchers have non-foundational ideas, and argue that there are no such criteria, only those that we can agree upon at a certain time and under certain conditions; criteria that are negotiated (Lincoln and Guba, 2000).

### **Aspects of Methodological Practice**

Methodological practice can be used as a concept to describe *decisions researchers take in their research projects, how they carry them out and report on them*. Therefore, in our view, methodological practice goes beyond the researcher's decisions to use a particular research method or instrument and refers to the operationalization of research concepts, research goals, researcher roles and how to maintain rigour and quality (inspired by Lincoln and Guba, 2000). These decisions are dependent on the underlying paradigm. Furthermore, methodological practice does not include only the decisions researchers take, but also how these decisions are reflected in their design and report.

The next section describes the aspects of methodological practice distinguished above.

### *Operationalization of the Research Concept*

Researchers investigating on-the-job learning processes have different perspectives in their operationalization of the research concept. Some focus on deliberate learning only; some focus on spontaneous learning, too. They focus on, for example, styles, activities, strategies, tactics, behaviours, orientations and approaches. According to Berings and Poell (2005), an on-the-job learning *style* is the tendency to use a certain combination of implicit and explicit learning activities that a person is able and likes to engage in on the job. The person may use a different combination of learning *activities* in each different situation. This particular combination is called the actualized learning *strategy*. Dalton (1999) describes learning *tactics* as the *behaviours* that individuals have reported using when engaged in the task of learning. Learning *orientations* refer to how people think about learning. These indicate a cross-situational consistency in approach to learning (Entwistle, 1988). A learning *approach* can be described as learning processes that stem from a learner's perception of a particular learning situation, and as being influenced by their personal characteristics (cf. Biggs, 1988). All the above perspectives describe a rich variety of on-the-job learning processes and can focus on both mental and overt, and both spontaneous and deliberate, learning activities.

### *Research Goals*

The goals of research can be to predict, explain, explore, describe or perform action (Dane, 1990). New-paradigm inquirers are increasingly concerned with singular experiences. Classical researchers generalize their findings towards their particular research population (Lincoln and Guba, 2000).

Classical researchers are mostly focused on *prediction or explanation*. Predictive research identifies relationships that enable us to speculate about one thing by knowing about other things. Explanatory research involves examining a cause-effect relationship between two or more phenomena. It is used to determine whether or not an explanation (a cause-effect relationship) is valid or which of two or more competing explanations is the more valid.

New-paradigm researchers have other research goals. Critical theorists and interpretativists are mostly directed towards *explorations and descriptions*. Exploratory research involves an attempt to determine whether or not a phenomenon exists. Descriptive research involves examining a phenomenon to define it more fully or to differentiate it from other phenomena. The goal of participatory researchers is *action*. Action research refers to research conducted to solve a social problem. Marsick and Watkins (1990) describe it as a cyclical process by which a group of people jointly identify a problem, experiment with a solution, monitor the results, reflect on the process and use the resultant information to reformulate the problem, which may lead to another cycle of research.

### *Researcher's Role*

The researcher's role can be described in terms of interaction with others involved in the research project (Lincoln and Guba, 2000). The inquirer posture of a classical researcher is that of an *informant* of decision-makers, policy-makers and change agents. Classical researchers merely control their research and deny their own influence. In contrast, new-paradigm inquirers admit their influence and report about this (Lincoln and Guba, 2000). They share control with the participants. Interpretativists are *passionate participants*, who are facilitators of multi-voice reconstruction, share their control of the research and are involved with the participants. A third role that can be distinguished is the role of an *activist*, where the participating researcher's primary voice is manifest through conscious self-reflective action, and his or her secondary voice is manifest in illuminating theory through which shared control of the research becomes salient in varying degrees. Lincoln and Guba (2000) do not describe the role of critical researchers. In our view, critical researchers can be described as *reflexivists*, who continuously elucidate the means by which their own *and* respondents' value suppositions guide the framing of theory and fact. Critical researchers do not take for granted and reproduce, but reflect on dominant institutions and ideologies as a way to emancipate from frozen social and ideational patterns (Alvesson and Sköldberg, 2000).

### *Maintaining Rigour and Quality*

Classical researchers perform mainly quantitative research, and new-paradigm inquirers perform mainly qualitative research (Lincoln and Guba, 2000). However,

within each paradigm, mixed methodologies may make perfectly good sense (Guba and Lincoln, 1981; Lincoln and Guba, 2000). Instruments that can be used are, for example, questionnaires, interviews, observations, documents (portfolios), visual methods (such as concept maps and diagrams) or personal narratives (e.g. logs and diaries) (Denzin and Lincoln, 2000). The underlying paradigm may have a major impact on how researchers maintain the quality and rigour of their research, that is, what effort they put into achieving credibility in design, analysis and report. Significant aspects will be briefly mentioned here.

Classical researchers can use conventional benchmarks of rigour (validity, reliability and objectivity). In our review, we used the definitions of Messick (1980) and Allen and Yen (1979). We will discern: *content*, *construct* and *criterion validity*. Furthermore, we distinguish *test-retest reliability*, *alternate form reliability* and *internal consistency*. *Objectivity* refers to procedures for minimizing investigator bias.

New-paradigm researchers can maintain rigour and quality by validity, generalizability (Maxwell, 2002), rigorous methods and authenticity (Patton, 2002; Lincoln and Guba, 2000). Maxwell (2002) provides a typology of understanding and validity in qualitative research including *descriptive validity* (factual accuracy of participants' accounts), *interpretative validity* (inferences drawn from participants' actions and words; the participants' perspectives in terms of intention, cognition, belief, affect and evaluation), *theoretical validity* (a theory that the researcher brings to, or develops during the study of some phenomenon in terms of concepts or categories and the relationships thought to exist between these concepts) and *evaluative validity* (application of an evaluative framework to the objects of study). Yin (1994) offers a very straightforward protocol approach for case-study research, emphasizing field procedures, case-study questions and a guide for reporting. Yin claims such steps are a major tactic for increasing the reliability of the research endeavour. *Generalizability* refers to the extent to which one can extend the account of a particular situation or population to other persons, times or settings than those directly studied. *Rigorous methods* yield high-quality data that are systematically analysed with attention to issues of credibility such as searching for rival explanations, explaining negative cases and triangulation. *Authenticity* is the 'reflexive consciousness about one's own perspective, appreciation for the perspective of others, and fairness in depicting constructions in the values that triggered them' (Patton, 2002, p. 546). In our view, this refers to the consideration of investigator effects, such as training, experience, status and also representation of self.

In the next section of the paper, we describe how we reviewed the variety of all above mentioned aspects of methodological practice in contemporary research on on-the-job learning. Finally, we will discuss what can be learned from this for future research.

## Procedure

### *Variety of Methodological Practices*

To identify the variety of methodological practices in contemporary research on on-the-job learning, a four-step procedure was used to select instruments to be included in our overview. First, the instruments, gathered unsystematically in our research

projects during the last two years, served as a starting point for the exploration. Second, we thought about descriptions under which on-the-job learning instruments could be categorized, such as on-the-job learning, workplace learning, work-based learning, work-related learning, informal learning, non-formal learning, vocational or occupational learning, skill development, growth or acquiring know-how, competence, ability, mastery and expertise in combination with descriptions of instruments, such as diary, journal, log, narrative, diagram, picture, chart, questionnaire, inventory, interview, critical incident, portfolio and concept maps. These descriptions were used in searching ERIC, PsychINFO and ABI/Inform. Third, we conducted a hand search of each issue (1998–2004) of six major journals on this topic: *Adult Education Quarterly*, *Human Resource Development International*, *Human Resource Development Quarterly*, *Journal of Workplace Learning*, *Lifelong Learning in Europe* and *Studies in Continuing Education*. Fourth, we examined reference lists of articles to identify additional, relevant sources. The studies of on-the-job learning processes and the accompanying methodological practices that will be included in the overview had to meet six selection criteria, to review a congruent set of studies sharing similar features. The studies should:

1. measure the *process*, and not the product, of on-the-job learning;
2. be applied in *employee learning*, that is learning confined to the context of an occupation;
3. measure *individual* employee learning (in a social context), and not group or organizational learning;
4. include *empirical* data collection and analysis;
5. be *clearly described* in published material;
6. contribute to the *variety* of instruments and accompanying methodological practices, and not to the quantity of instruments.

Studies needed to fulfil all of the criteria above to be selected for the overview.

In line with the above discussion, we describe the methodological practices of the studies included in the overview in terms of the specific instruments used, their perspective on on-the-job learning, the research goals, the researcher's role, the subjects examined and how rigour and quality were maintained. This latter characteristic is further divided into method description, validity, reliability and objectivity for quantitative studies, and method description, validity, evaluation of the instrument and authenticity for qualitative studies. Furthermore, we included instrument samples and descriptions of the subjects.

This description of methodological practice follows the AHRD Standards on ethics and integrity (Russ-Eft *et al.*, 1999). These standards suggest that 'HRD professionals who develop and conduct research with tests and other assessment techniques use research procedures and current professional knowledge for test and research design, standardization, validation, reduction or elimination of bias, and recommendations for use' (*ibid.*, p. 8).

The tables present information explicitly described by the authors in normal print. Information we were able to infer only indirectly appears in italics. When the information is absent, the table cell remains blank.

### *Other Instruments*

To study which other instruments provide possibly useful opportunities for future research on on-the-job learning processes, we extended the first and second items of our selection criteria. The first criterion was extended to include learning outcomes as a result of on-the-job learning processes, descriptions of work activities and experiences in which employees learn. The second criterion was extended to include student learning in apprenticeships and employee learning which is not job related. Our third, fourth, fifth and sixth criteria were kept unchanged.

## **Findings**

### *Variety of Methodological Practices*

The variety of methodological practices in contemporary research on on-the-job learning is listed in the overviews of Table 1 and 2. The overview shows variety (examples in all categories found), and is not meant to be all-embracing or representative. In general, many studies did not report on all aspects of methodological practice. Especially, information as to quality and rigour was often incomplete. Appendices 1 and 2 present instrument samples and descriptions of the subjects examined.

We found only questionnaires and interviews meeting the initial selection criteria, no other kinds of instruments. Researchers report the qualities of the instruments differently according to the kind of instrument.

The perspective on on-the-job learning applied in research conducted with *questionnaires* addresses deliberate learning in terms of strategies, behaviours and approaches, as can be seen in Table 1. Deliberate learning is studied in specific learning events or as a relative stable set of activities that employees apply in all kinds of situations. Only the questionnaire of Megginson (1996) covers spontaneous learning (as well as deliberate learning). Research goals in the questionnaires vary from exploration to explanation. In five out of six surveys, the researcher performs the role of an informant, whereas in one case (learning tactics inventory) a passionate participant role was identified. As far as reporting on quality and rigour is concerned, most authors inform the reader on internal consistency of the different scales or on the intercorrelations between items within one scale.

Perspectives on on-the-job learning in the *interview studies* vary from directed and self-initiated learning (projects) to ubiquitous activity in work that is sometimes inseparable from learning. Thus, spontaneous learning is addressed more often in interview studies than in surveys. Interview goals are to describe and/or to explain, with the exception of one interview that was also pursued to help people to take care of their own development. The researcher's role is mostly that of a passionate participant, but informant, reflexivist and activist roles were also found. Interviews are sometimes pilot-tested, and are either semi-structured or follow a critical incident approach, as can be seen in Table 2. Remarks about interpretative and theoretical validity and generalizability were often reported. In contrast, evaluating the method or the authenticity of the study was less frequently found.



**Table 1.** Overview of variety of methodological practices of questionnaires in contemporary research in on-the-job learning

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Instrument description	Quality and rigour		
					Validity	Reliability	Objectivity
1 Critical reflective work behaviour (CRWB) (van Woerkom, 2003)	CRWB is a set of connected activities, carried out individually or in interaction with others aimed at optimizing individual and collective practices, or critically analysing and trying to change organizational or individual values.	Validate the construct of CRWB and examine the relationships specified in the conceptual model ( <i>describe and predict</i> ).	<i>Informant:</i> constructs conceptual model and collects anonymous information via mail questionnaire	Based on case study, 47 items developed by researcher herself	<i>Construct validity</i> is illustrated with results of factor analysis.	Internal consistency measure alpha between .67 and .83.	Overcome subjectivity of self-report method by formulating items as much as possible in terms of concrete behaviour
2 Learning strategies (Holman <i>et al.</i> , 2001)	Learning strategies can be defined as the practices that people use to aid the acquisition and development of knowledge in any context.	Examine learning strategies in a non-educational organizational setting ( <i>explore</i> ).	<i>Informant:</i> adapts learning strategies that others gathered from literature, and collects data via mail questionnaire	Based on measures developed by Warr and Downing (2000) and in educational setting examined	<i>Construct validity</i> is illustrated with results of exploratory and confirmatory factor analysis (cross-validation).	Internal consistency measure alpha between .70 and .82.	Comments about possibility that individuals are not entirely cognizant of the particular strategies they use.

(continued)

Table 1. (Continued)

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Instrument description	Quality and rigour		
					Validity	Reliability	Objectivity
3 Learning strategies (Megginson, 1996)	Learning strategies are defined as an approach to all experiences, and are not observable or amenable to regulation by others.	Measure planned and emergent learning strategies as independent dimensions ( <i>explore</i> ).	<i>Informant</i> : constructs conceptual model and anonymous mailing	From 25 original items, 9 were allotted to planned, and 8 to emergent learning. Finally, the best 12 items were kept.	<i>Construct</i> validity is illustrated with intercorrelations between items in each scale and between the two scales.	x	
4 Learning tactics (Dalton, 1999)	Learning is approached as a set of behavioural tactics that an individual employs to engage in learning from experience.	Measure four kinds of learning tactics in challenging and unfamiliar work assignments in order to increase self-awareness of personal development ( <i>action</i> ).	<i>Passionate participant</i> : uses inventory as educational tool	Based on conversations with experts, journal entries, and literature.	<i>Construct</i> validity is illustrated with self-report data of comparative self-report and boss report instrument	x	

(continued)

Table 1. (Continued)

Instrument	Operationalization of on-the-job learning	Quality and rigour					
		Research goal	Researcher's role	Instrument description	Validity	Reliability	Objectivity
5 Learning at work inventory (Hoeksema, 1995; Hoeksema <i>et al.</i> , 1997)	A learning strategy is a combination of related tactics aimed at a change in knowledge and/or behaviour within a specific situation	Examine career success of individual managers as a complex positive or negative function of individual learning strategy and organizational structure (1997) ( <i>explain</i> ).	<i>Informant:</i> constructs hypothetical conceptual model and anonymous mailing	Based on measures by Selmes (1987) of school graduate learning behaviour and tested among 135 students	<i>Construct</i> validity is questioned, and suggestions for alternatives are given	Internal consistency measures were .60 and .72 and test-retest correlations were .61 and .85.	x
6 Motivated self-directed learning in schools and companies (Straka, 2003)	Learning strategies are part of the behavioural dimension in a learning event.	Test assumption of more dimensionality of self-directed learning based on interest strategies, control and emotion ( <i>describe</i> ).	<i>Informant:</i> constructs conceptual model and anonymous mailing	Based on a questionnaire originally developed for educational settings by Nennerger (1999) and his research group.	<i>Construct</i> validity is illustrated with results of means of principal components analysis and references to validation studies	Coefficients between indicators and main constructs vary from .60 to .84	x

**Table 2.** Overview of variety of methodological practice of interviews in contemporary research in on-the-job learning

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Method description	Quality and rigour		
					Validity	Evaluation	Authenticity
1 Semi-structured interviews (Eraut, 1998)	Working and learning cannot be separated from each other; a large part of learning is a tacit process, some is explicit. Focused on learning rather than knowledge use.	Study what is being learned at work, how it is taking place and what other factors affect the amount and direction of learning in the workplace ( <i>describe and explain</i> ).	<i>Passionate participants</i> , trying to gather data by interpreting the different voices of the participants, without being distracted by any preconceptions.	Relation to theory, pilot test expert or peer review	Interview helped to develop and extend previous research and construct comprehensive picture of learning at work: To reveal tacit knowledge a few weeks of field research or an ethnographical study	Focus on a wider range of learning experiences than those captured by the projects approach.	

(continued)

Table 2. (Continued)

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Quality and rigour			
				Method description	Validity	Evaluation	Authenticity
2 Semi-structured interviews about self-directed learning projects (SDLP) (Clardy, 2000)	SDLP operationalized based on Tough (1971), a self-initiated or directed set of activities with the primary purpose of learning about job, vocational or occupational subjects (≥7 hours).	Explore types and occurrence of SDLP ( <i>describe</i> ).	<i>Passionate participant</i> in naturalistic research. Inductive, articulate, emergent categories through iterative process of constant comparison. Conceptual categories are grounded in a multi-voice reconstruction.	Relation to theory by Tough (1971). Interview was pilot tested and revised. After each interview the researcher would evaluate the interview and make appropriate adjustments for future interviews.	<i>Descriptive and interpretative</i> validity is illustrated by experiences of researcher with interviewing. <i>Theoretical validity</i> is shown by a speculative model that integrates the processes affecting the occurrence of the types of SDLP. <i>Generalizability</i> of the conclusions is restricted due to the convenience sample	Author mentions several problems with the research such as that self-report accounts of learning projects are suspect	The author explicitly mentions that interviewer training and skill are crucial.

(continued)

**Table 2.** (Continued)

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Method description	Quality and rigour		
					Validity	Evaluation	Authenticity
3 Semi-structured interviews combined with observations (Collin, 2002)	Learning is understood as a ubiquitous, ongoing activity, though often unrecognized as such (Lave, 1993). It is informal, experiential, context bound participation.	Explore conceptions of learning in a work context from a process-oriented perspective ( <i>describe</i> ).	<i>Reflexivist</i> who continuously elucidates the means by which her own and respondents' value suppositions guide the framing of theory and fact	According to phenomenological principles, too many questions or details were not formulated in advance. The point is to establish the phenomenon as experienced and to explore the different aspects of the experience jointly as fully as possible.	<i>Interpretative validity</i> was accounted for based on interviewee checks that are extensively reported. <i>Theoretical validity</i> is tentative in hierarchically ordering the conceptions. <i>Generalizability</i> : since learning is assumed to relate to aims, tasks and context of work, it would be premature to draw conclusions for other contexts.	Remarks about the value of integrating interviews and observations are stated. Ethnographic case studies will provide insight into participative and collective learning.	Explicitly takes point of workers themselves as starting point and explains how researchers can never escape from own interpretations in the research process.

(continued)

Table 2. (Continued)

Instrument	Operationalization of on-the-job learning	Quality and rigour					
		Research goal	Researcher's role	Method description	Validity	Evaluation	Authenticity
4 Critical incident interviews (Billett, 2000)	Learning is engagement in everyday activities in the workplace that provide ongoing access to goal-directed activities and support, which are instrumental in assisting individuals constructing or learning new work-related knowledge as well as the strengthening of that learning.	Determine whether guided workplace learning can assist the development of skills and knowledge required for workplace performance and understand how that learning can be maximized ( <i>explain</i> )	<i>Activist</i> who trials strategies and reflects on their effectiveness through interviews with participants	The interview approach focused on three kinds of actual workplace incidents, namely 'high moments', 'problem-situations' and 'low moments'. The approach was modelled on an earlier investigation, which used similar procedures to elicit data grounded in actual workplace problem-solving incidents. Relation to theory, expert or peer review.	<i>Descriptive validity</i> of verbal data is held through actual events and changes in behaviour. <i>Interpretative validity</i> was accounted for by additional data gathering in observations, visits, open questions about the perceptions of the participants, and questioning the mentors. <i>Theoretical validity</i> is accounted for by grounding the interview questions in relevant literature using selected criteria. <i>Generalizability:</i> differences in functions, products/ services and organizational structures comprised the scope.	x	x

(continued)

Table 2. (Continued)

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Method description	Validity	Quality and rigour	Authenticity
5 Stimulated recall interview (Poskiparta et al., 1999)	Self-reflection in improving communication skills in the areas of listening, interviewing methods, motivation, giving advice and feedback. Self-reflection is seen as a way of learning by doing in normal working processes and consists of 7 levels of which 4 are seen as conscious levels and three as critical conscious levels of reflectivity.	Describe nurses' opinions of their communication skills in health counselling situations and analyse the levels of reflectivity in their evaluations according to Mezirow (1981) ( <i>describe</i> )	<i>Passionate participant</i> Besides classification in levels of reflection, the author refers to the nurses' benefit from this method of data-gathering.	Stimulated recall interviews based on videotaped counselling and appended written evaluations.	<i>Interpretative:</i> nurses' written evaluations and the video data supported the interpretation of counselling. Before and after analysing the data, the principles of analyses and basis of differences and agreement were discussed with the parallel recorder. <i>Theoretical:</i> the levels of reflectivity in nurses' evaluations of their counselling skills were analysed by Mezirow's typology of reflection. Six out of seven levels could be used. The results correspond with earlier studies. <i>Generalizability:</i> x	Nurses found it difficult to evaluate their counselling immediately after watching it on video. The videoing disturbed the interaction between nurse and patient only slightly.	x

(continued)



Table 2. (Continued)

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Method description	Validity	Evaluation	Authenticity
6 In-depth interviews (Fenwick, 2004)	Learning in general is practice based and participative. Innovative learning is an interplay of local choice-making and design within social relations constituted by material interests, cultural histories, and conflicting discourses.	Understand how portfolio workers learn for innovative work and in innovative work ( <i>describe</i> )	<i>Reflexivist</i> who continuously elucidates the means by which her own and respondents' value suppositions guide the framing of theory and fact	Three main topics of the interviews were: work histories, strategies and challenges, and skills and knowledge required. These were fully explored based on narratives of critical incidents and periods of lived experiences.	<i>Interpretative:</i> a narrative was created based on the experiences and validated with the participants. The steps and decisions taken in the analysis process remain rather implicit. <i>Theoretical:</i> categorizing data at increasing levels of abstraction resulted in themes. <i>Generalizability:</i> x	Author mentions that the perspective of the individual worker is well captured, but that ethnographic methods involving the analysis of daily interactions and observations of changing practices over time throughout a system may reveal other perspectives on innovative learning.	x

(continued)

**Table 2. (Continued)**

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Method description	Validity	Quality and rigour	Evaluation	Authenticity
7 Informal learning project (ILP) interview (Gear et al., 1994)	Informal learning is learning that professional people may undertake, in and through their normal work and practice, intentionally or spontaneously. <i>The method section shows focus on deliberate learning.</i> ILP means spending at least one working day at developing some aspect of professional knowledge, skills and competence to the point where some of it could be passed on to a colleague	Explore the pattern of learning in an ILP, the nature of the process, and influences ( <i>describe and explain</i> )	<i>Informant:</i> The researchers gather information about informal learning	Semi-structured interviews that ensured that all topics were covered in most cases, to minimize interviewer differences, and to provide enough freedom to pursue themes and topics that arose during the interview, in a relatively flexible manner.	<i>Interpretative:</i> one fifth of the interviews was analysed by researchers as a group <i>Theoretical:</i> x <i>Generalizability:</i> no representativeness of the sample for the population (professions in the United Kingdom). However, no obvious influences affecting selection (there is an element of chance)	x	x	x

(continued)

Table 2. (Continued)

Instrument	Operationalization of on-the-job learning	Research goal	Researcher's role	Quality and rigour			
				Method description	Validity	Evaluation	
8 Narrative (life and work-history) interviews (Valkevaar, 2002)	Development of professional expertise is viewed as experienced performance and developed as an interactive constructive process based on the interpretation of experience and narratives in a variety of everyday situations at work as well as in other fields of life.	Explore the construction of professional expertise through interpretations of experience in the practice of HRD-professionals ( <i>describe</i> )	<i>Passionate participant</i> Regards the interviews as beneficial for the interviewees: it offers space and time for reflection.	Narrative (life and work history) interviews to supplement an earlier held survey about the HRD professionals' experiences and conceptions in order to examine the quality and development of their expertise in HRD work.	<i>Interpretative: x</i> <i>Theoretical:</i> the similarities in career stories found are related to findings in earlier studies <i>Generalizability:</i> more interviews of the whole group of 20 HRD professionals should be analysed.	The framework should be offered to HR developers themselves to see whether it helps in analysing and making sense of experiences.	x

The four paradigms described above, one classical and three new, could not be unambiguously inferred from the reports. It appeared that paradigms do indeed interbreed on a methodological level (Lincoln and Guba, 2000). Moreover, in most cases, scholars were not explicit about the underlying paradigm. Thus, no data are reported on this issue in the tables.

Most of the information in the tables comes from the researchers themselves, some could be indirectly inferred from the reports (reported here in italics) and some is just lacking. The researchers' roles, in particular, could only be inferred indirectly, and information on quality and rigour was often lacking and could not be inferred from the reports. Researchers using questionnaires do mostly report about the validity and reliability of the instrument afterwards, whereas researchers using interview instruments mainly focus on rigour and quality beforehand.

### *Instruments for Future Research*

Instruments from related literature provide possibly useful opportunities for on-the-job learning research in the future. Literature focusing on the (re)design of work, changing environmental conditions or employee competencies or pursuing improvement of work outcomes is relevant, especially for research goals that relate to the innovative efforts of human resource departments in stimulating on-the-job learning.

Research instruments addressing on-the-job learning in relation to the various work-related activities employees carry out, are, for example, *observations* of managers' work activities (Mintzberg, 1970), *structured diaries* of bank apprentices activities (Noß, 2000), *concept maps* of adult learners' activities (Stevens, 1997) or *photographs* and *drawings* (Daniels, 2003). Faurfelt and Wichmann-Hanssen (1999) combined observations and diaries with interviews in a study of learning in apprenticeships to identify encouraging and inhibiting factors for learning processes in junior doctors' continuing education at a surgical ward. Observations focused on the interaction between the task, the junior doctor, the teacher and the work environment. In the diaries, the junior doctors recorded what they believed they had learned and how they had experienced the learning situation. Carson and Longhini (2002) reported on a study in which diaries and discussions were combined. She used a learning diary, containing narratives of learning Spanish during an exchange in a Spanish-language country. The analyses of these narratives followed a pre-formatted structure of language-learning strategies, and a second researcher read the diary, discussed issues and questioned the diary-writer. However, diaries may also be used in isolation, for example, when Reimers (1971) analysed his own learning diary, in which he mapped his progress in a work-related course. Diary studies seem to be useful in understanding how people learn in interaction with their social context, and in relation to what they have learned, whether this is being analysed in a pre-structured manner or not, by the writers themselves or a researcher, or in combination with other data-collection tools. Alternatives to diaries are photographs and drawings, such as Daniels (2003) used to strengthen her inquiry into women's capacity for leadership and community building in South Africa with interviews and observations. She gave her participants a disposable camera to take pictures of their home environment, family and life. Through the photographs the researcher gained

a better understanding of the participants' visibility, strengths and potentials in community building. With this data-collecting method, the decision-making power shifted away from the researcher and more to the participants. They served as elaborators of verbal dialogue and became rich sources of data on the participants' feelings about the topic of interest 'community' and encouraged collaborative inquiry.

Studies of learning products are another research track that provides potentially useful instruments for future research on on-the-job learning. For example, Brown (2002) reports on portfolios of what adult students (re-) entering college have learned from their work experiences. Portfolios provide an insight not only into what people have learned, but also into how they have learned, through substantial descriptions of the experiences and the learning processes.

### **Conclusions and Discussion**

The main conclusion concerning the first research question is that in contemporary research into on-the-job learning, the research instruments used to map on-the-job learning processes are questionnaires and interview guides only. Inspired by Lincoln and Guba (2000), we investigated the rather limited variety of methodological practices in terms of the underlying paradigms, the operationalization of the research concept of on-the-job learning, the research goals, the researcher's role and how to maintain rigour and quality. The main conclusions concerning the variety in these aspects of methodological practices can be formulated as follows.

From the publications, the research paradigms adhered to could not be unambiguously inferred. It appeared that paradigms interbreed on a methodological level (Lincoln and Guba, 2000). In research into on-the-job learning many different operationalizations of the research concept are used. Further, the range of width across which the concept is investigated is large. However, it is currently recognized by many scholars that learning at work is best understood by taking different perspectives into account: terms of the nature of the task itself, the cultural and social relations that characterize the workplace and the experiences and social world of the participants (Illeris, 2002; Billett, 2002). The publications we investigated use questionnaires and interview guides for a detailed investigation of specific aspects of learning processes for the goals of describing, explaining or exploring. Further, one questionnaire study was aimed at predicting and one questionnaire study was aimed at action. The researchers' roles could be inferred only indirectly from the publications. In the studies using questionnaires, the researchers are mostly informants. Only Dalton (1999) has the role of a passionate participant in her study on learning tactics, in which she uses the questionnaire as an educational tool. The variety of researcher's roles in the studies using interview guides is higher: we found an informant, passionate participants, reflexivists and an activist.

Information on quality and rigour is often lacking, especially in the interview studies. Billett (2000), for example, used the same (modelled) interview strategy on several occasions, but does not report on the reason for or type of adjustments. Reliability can be achieved by using detailed protocols and by checking for generalization. We do not want to suggest that the absent information is due to

inadequate thinking on these aspects of methodological practice. It may result from incomplete reporting (in books) or limited space in articles. Maxwell's (2002) typology of validity seems a usable approach to get more information on validity. It stands out that researchers using questionnaires in most cases do afterwards report on the validity and reliability of the instrument, whereas researchers using interviews mainly focus beforehand on controlling rigour and quality. Sometimes, triangulation is used (see, e.g., Faurfelt and Wichmann-Hanssen, 1999). We believe that validity and reliability should become a more important concern for new-paradigm researchers. On the other hand, triangulation may be a good option for researchers using questionnaires too, especially in the case of investigating implicit on-the-job learning that seems difficult to catch. It can then be checked if different instruments agree with each other or, at least, do not contradict one another (Miles and Huberman, 1994). Van Woerkom advised as follows: 'Further research could focus on inter-rater reliability, and on the possibilities that the 360-degree feedback method offers to increase the validity of the instrument, contrasting self-ratings with ratings of colleagues and immediate managers' (2003, p. 170). Further, Holman *et al.* concluded: 'Research needs to be conducted in a wider range of learning strategies and such studies would benefit from being multi-method and not relying on self-report questionnaire-based measures as it is possible that individuals are not entirely cognizant of the particular strategies they use' (2001, p. 680). Observing what people actually do in addition to inquiring what they say they did may therefore raise rigour and quality of the data in terms of validity.

A reason for the observed preference of researchers into on-the-job learning for the use of questionnaires and interview guides may be that these instruments are commonly applied in scientific research, often standardized and easier to report on compared to instruments that are less common. On-the-job learning is a relatively new field of study that benefits from available instruments. Furthermore, so far on-the-job learning has been studied in the field with its practical time constraints as opposed to in laboratory settings. Researchers probably use only interviews and questionnaires due to the implicit nature of most on-the-job learning processes. These implicit processes can be identified only when reflection on these processes is stimulated. In observations, diagrams, personal narratives, etc., probably only the explicit learning processes would become visible.

The advantage of using questionnaires is that large groups of employees can be reached. The disadvantage is that on-the-job learning is measured restrictedly in terms of approaches, activities, and strategies and questionnaires do not provide insight into learning histories and meaning making in experiences or spontaneous learning. We can conclude that in questionnaires deliberate learning, whether it is mental or overt, is satisfyingly measured, but that it is more difficult to measure spontaneous learning using questionnaires, since one cannot ask individual follow-up questions in questionnaires. The advantage of using interview guides is that they can better provide insight into tacit processes and interpretations of experiences. This means, in our view, that employees are better recognized in their personal learning stories. The disadvantage is that it is difficult to reach a large group of people.

To answer the second research question, other instruments not used in current research on on-the-job learning that provide potentially useful opportunities for

future research on on-the-job learning processes are observations, diagrams, personal narratives and documents, often utilized in combination with interviews and/or questionnaires. In mapping learning outcomes and work experiences, these instruments are useful as a trigger for making explicit the learning processes embedded in these experiences, in interviews and/or questionnaires. This indirect questioning of the process may solve some practical problems related to researching on-the-job learning, such as the difficulty of talking about learning processes at work, often an unusual topic to share experiences about. Other difficulties are the willingness to disclose sensitive experiences in which mistakes were made or the employees' feelings of insecurity about what experiences are relevant or interesting to the research. Furthermore, the instruments themselves may create a 'need' to talk about on-the-job learning since they direct the employees' attention to it when putting down their experiences in narratives or diagrams. It is expected that this should contribute to a better understanding on the part of both participants and the researcher into experiences relevant to on-the-job learning processes.

We found examples of studies that used observation techniques to investigate communication patterns in workplace situations (e.g. Wheelan *et al.*, 1994; Kubo *et al.*, 2001). Observation techniques might offer opportunities for measuring interpersonal learning processes, even though communication patterns are a specific way of learning in which only knowledge sharing is being studied. These overt activities can be more easily observed than mental learning activities.

A final possibility for future research is inspired by research on collective learning. As noted earlier, there is a growing interest in how individual learning contributes to the larger collective of the organization. Barker and Neaily (1999) examined how collective learning (innovation) could be facilitated by starting with the individual awareness of what had been learned by explicating this in learning logs and later discussing this with fellow automotive manufacturing employees. For example, collective learning through knowledge sharing is studied through observations of communication patterns at a bank (Kubo *et al.*, 2001) or conference session documents of professionals from a variety of fields (Wheelan *et al.*, 1994).

This study does not have the ambition to review the methodological practices of the entire body of contemporary research on on-the-job learning. Instead, we have systematically searched the available literature, and selected cases representative of certain kinds of practice. Similar reports were not selected. The database, therefore, is not a representative overview of all the research available, but of the kinds of research instruments in use. It should be noted that this might have influenced the findings of this study.

With the growing body of research instruments and accompanying practices, the importance increases of listing the variety of instruments. Moreover, it seems important to formulate generic standards for methodological practices in on-the-job learning research, since the current literature does not provide research standards or guidelines.

### **Guidelines for Future Research**

In this final section, we formulate a tentative set of guidelines for future research on methodological practices in on-the-job learning research. One might object that

identifying general guidelines for rigour and quality in methodological practice is in contradiction with our attempts to connect paradigms and methodological practice. Yet, some important general guidelines can be identified whether researchers have a classical or a new-paradigm approach. The main underlying idea behind most of our guidelines is that researchers should be explicit about all aspects of methodological practice as conceptualized above.

Based on the overview of methodological practices found and in line with the ideas of Lincoln and Guba (2000), we recommend that future on-the-job learning researchers:

1. pay attention to on-the-job learning in terms of the nature of the task itself, the cultural and social relations that characterize the workplace and the experiences and social world of the participants;
2. explicitly account for the relationships between the underlying paradigm and all aspects of the methodological practice used;
3. try to triangulate by using different kinds of data-collection methods that provide different perspectives on on-the-job learning (e.g. observations provide insight in current activities and interviews provide insight in stories of the past and in people's intentions);
4. in addition, use other instruments, such as observations, diagrams, personal narratives and documents, besides questionnaires and interviews to study the complex interplay of the learner's deliberate and spontaneous internal process and the social environment;
5. be explicit about the role they themselves play in the research (informant, passionate participant, activist, reflexivist);
6. describe how they maintain rigour and quality, before, during and after data gathering.
  - a. For questionnaires, we propose that future researchers describe not only the internal consistency (coefficients alpha) of the questionnaires, but also: a) the process of item construction and selection, including the use they make of pre-existing instruments; b) example items for each subscale; c) how the data gathered with the questionnaire were analysed, d) pilot research they did to test the reliability and validity of the instrument and e) indications of validity (e.g. content validity, construct validity and criterion validity).
  - b. For interviews, we propose that future researchers describe not only the interview questions used, but also: a) whether and how they were used flexibly depending on the answers received; b) how the questions were constructed and pre-tested and with whom; c) how the interview data were analysed, d) what selections of interview data were made and how, and e) indications of validity (descriptive, interpretative, theoretical and/or evaluative validity and generalizability, cf. Maxwell, 2002).

One final guideline we would like to propose, not directly following from our findings, but from new-paradigm researchers' literature (e.g. Alvesson and Sköldbberg, 2000), is to use the opinions of subjects more explicitly. Respondents could, besides answering, also evaluate the questionnaires and interviews.



With this paper, we hope to contribute to the quality of future on-the-job learning research, by stimulating researchers in this field to take different perspectives on on-the-job learning into account: terms of the nature of the task itself, the cultural and social relations that characterize the workplace and the experiences and social world of the participants. Further, we hope to encourage them to be more explicit on their use of methodological practice and to use a larger variety of instruments.

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**Appendix 1.** Descriptive information and item samples of questionnaires

Instrument	Research subjects	Description + instrument samples
1 Critical reflective work behaviour (CRWB) (van Woerkom, 2003)	742 Dutch employees in several sectors	<p>Critical reflective work behaviour consists of seven dimensions. Reflection (9 items, e.g. 'I reflect on the way I do my work'), career awareness (8 items, e.g. 'I am continually occupied with my career development'), experimentation (6 items, e.g. 'I do not like to deviate from the prescribed working method'), critical opinion-sharing (7 items, e.g. 'I come up with ideas how things could be organised differently here'), asking for feedback (10 items, e.g. 'I discuss with colleagues how I have developed'), challenging group think (5 items, e.g. 'When I do not agree with the way a colleague does his work, I keep quiet'), sharing knowledge (6 items, e.g. 'I think I have the right to keep my knowledge to myself') and learning from mistakes (7 items, e.g. 'I get embarrassed if I make a mistake'). Responses on 6-point scale (1 = totally disagree, 6 = totally agree).</p>
2 Learning strategies (Holman <i>et al.</i> , 2001)	628 UK call centre employees	<p>Three cognitive and three behavioural strategies were measured with 22 items. Reproduction (4 items, e.g. 'I do my work without really questioning it'), extrinsic work reflection (3 items, e.g. 'I often think about how my work fits into the 'bigger picture' at X'), intrinsic work reflection (5 items, e.g. 'I generally try to understand how new information fits into how I do my work'), interpersonal help seeking (3 items, e.g. 'I ask others questions when I am uncertain about something'), seeking help from written material (3 items, e.g. 'I fill in the gaps in my knowledge by getting hold of the appropriate material') and practical application (3 items, e.g. 'I try out new things by applying them in practice'). Responses on a 5-point scale from 'not at all', through 'quite often' to 'a great deal'.</p>
3 Learning strategies (Meggison, 1996)	168 UK managers	<p>The questionnaire contains 12 (2 × 6) items measuring two learning strategies. Planned learning: e.g. 'I set targets for my development' and 'I use learning contracts regularly to focus on my progress in developing'; emergent learning: e.g. 'It is important to be open to experience, then learning will come' and 'most of my learning emerges unexpectedly from things that happen'. Responses on a 7-point scale from 0 = never true/you never agree to 6 = always true/you totally agree.</p>

*(continued)*

Appendix 1. (Continued)

Instrument	Research subjects	Description + instrument samples
4 Learning tactics (Dalton, 1999)	274 military officers and 36 individuals from civilian population in the US	The questionnaire contains 32 (4 × 8) items measuring four learning tactics. 'When faced with an unfamiliar task I... Action (e.g. 'briefly outline what needs to be done and do it'), thinking (e.g. 'ask myself how this is similar to other things I know'), feeling (e.g. 'confront myself if I am avoiding the challenge') and accessing (e.g. 'get on-the-job tutoring from another person'). Responses on 5-point scale (1 = I have almost never used this approach, 5 = I have almost always used this approach).
5 Learning at work inventory (Hoeksema, 1995; Hoeksema <i>et al.</i> , 1997)	127 Dutch managers in government-related organizations	The questionnaire contains 12 items measuring two learning strategies. Deep learning, 5 items, e.g. 'I think about the consequences of my work for others' and 'try to understand the reasons of things that happen around me', and surface learning, 7 items, e.g. 'I especially remember facts and data' and 'I like to be told exactly what is expected of me'. The 5-point response scale ranges from 1 = never or only rarely true of me to 5 = always or almost always true of me.
6 Motivated self-directed learning in schools and companies (Straka, 2003)	295 German employees	The questionnaire contains 18 (3 × 6) items measuring learning strategies. Organizing: e.g. 'When I discover that I lack information I know where to get it'; sequencing: e.g. 'Before tackling a task I think about the order in which to carry it out'; acquiring: e.g. 'I write short summaries of the subject I have to learn'. The 4-point response scale ranges from 1 = absolutely through 4 = not at all.

**Appendix 2.** Descriptive information and question samples of interviews

Instrument	Research subjects	Description interview strategy
1 Semi-structured interviews (Eraut, 1998)	120 independent professionals in three occupational areas: engineering, health care, and business; 80 were interviewed twice.	1) Questions about the nature of their jobs, recent tasks, duties and problems. 2) The nature of expertise required to do it was discussed. 3) How was the expertise acquired and to what extent is it changing. 4) Questions about sources of learning. Respondents were encouraged to elaborate on salient learning episodes, or to exemplify general statements about learning.
2 Semi-structured interviews about self-directed learning projects (SDLP) (Clardy, 2000)	Intentional sampling of 56 adults working in 6 non-exempt positions (technical, clerical, administrative, labourer, inside sales – hourly employees) in a mix of organizations in the mid-Atlantic	Interview guide: 1) identify without prompts a self-directed learning project based on the description provided by the researcher in the last year; 2) identify with specific prompts, such as duty change, new equipment, new procedure, special work assignments more SDLP; 3) estimate how much time was spent on planning, organizing, learning and evaluating; 4) detailed report describing the learning project; 5) HR policies and practices played a role in encouraging or discouraging? 6) other workplace conditions? 7) biographical data.
3 Semi-structured interviews (Collin, 2002)	18 Finnish product designers and engineers	Observations were carried out after the interviews to describe the work setting and the context, the situations in which learning was assumed to take place, and how the people involved see their actions and those of others. Everyday practices and situations, and ways of dealing with them, become more visible through observations. The meaning attached to experiences in working contexts can be obtained from the interviews. Employees were asked questions such as: tell me about your current job, what kinds of competencies are needed in order to meet the challenges of your everyday job? Describe a challenging or problematic situation at work. How did you solve the problem? What did you learn from it?

*(continued)*

Appendix 2. (Continued)

Instrument	Research subjects	Description interview strategy
4 Critical incident interviews (Billett, 2000)	15 Australian employees in mining and 24 employees in food manufacturing	Interviews were conducted with the mentees throughout the programme (in all 4 interviews over a period of six months). Critical incidents were used to help the mentees recall and consider three kinds of workplace incidents, namely 'high moments', 'problem situations' and 'low moments'. These focus the data on problem-solving tasks that were likely to be generative of new knowledge.
5 Stimulated recall interview (Poskiparta <i>et al.</i> , 1999)	19 female nurses from seven hospital wards in Finland	After videotaping, nurses read educational materials, watched their counselling on video and then immediately gave verbal feedback in an interview. The nurses also provided written evaluations. The nurses replied to two open questions: 'What communication skills do you know well?' and 'How would you improve your communication skills?' Separate interviews were held both with nurses and patients. The patients' answers were used to support the interpretation of counselling.
6 In depth interviews (Fenwick, 2004)	28 portfolio workers (nurses and educators from Canada)	Interviews were semi-structured, informal and conversational. Three main topics were explored through participants' narratives of critical incidents and periods of lived experience: 1) individual's work histories, focusing on their vocational aspirations and transitional experiences in entering portfolio work; 2) challenges, strategies and benefits of negotiating portfolio work; and 3) skills and knowledge required to negotiate portfolio work and their approaches to generating this knowledge.
7 Informal learning project interview (Gear <i>et al.</i> , 1994)	130 professionals of six different sectors in urban locations in the United Kingdom	The interviews are divided into five stages. The first part is meant to gather background information, the second to identify a person's informal learning projects carried out in the past three years, the third to analyse one of such projects in detail, the fourth to explore the contextual factors which might affect the person's informal learning process in general, and the last part is about the relationship between formal and informal learning and general issues related to the topic.
8 Narrative (life and work-history) interviews (Valkevaara, 2002)	Narratives of 4 managers of HRD departments with different work histories are analysed, selected out of interviews with 20 HRD professionals in Finland	Life and work-history: interviewees were encouraged to talk about their everyday working experiences and educational careers.