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Advantages of an educational micro perspective

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**Workplace changes and workplace learning:
Advantages of an educational micro perspective**

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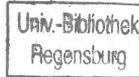


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Abstract

This paper analyses two perspectives, a macro and a micro perspective, on changes in the workplace in relation to workplace learning. It critically evaluates what kind of phenomena both perspectives can account for. Research from a macro perspective focuses on changes in economy or on organisational change. It helps to explore the role of lifelong learning and workplace learning in society as well as to define which competences are required in different professions. Research from a micro perspective focuses on individual reactions to changes in one's own workplace. It helps to explain how changes in daily work affect knowledge and skills on individual or group level. It is argued that the micro perspectives is advantageous if educational goals are pursued which aim at fostering workplace learning and competence development. Examples for empirical investigations are provided which illustrate the potential of a micro perspective on workplace changes and workplace learning.

Keywords: workplace learning, professional development, competence



Zusammenfassung

Der Beitrag analysiert zwei Perspektiven auf Veränderungen am Arbeitsplatz in ihrer Relation zum Lernen am Arbeitsplatz. Es wird zwischen einer Makro- und einer Mikroperspektive unterschieden. Beide Perspektiven werden kritisch daraufhin befragt, welche Phänomene des Lernens am Arbeitsplatz mit ihnen erfasst werden können. Forschung von einer Makroperspektive nimmt Veränderungen auf gesamtökonomischer und auf organisationaler Ebene in den Blick.. Sie hilft die gesellschaftliche Bedeutung lebenslangen Lernens zu eruieren und Kompetenzen für unterschiedliche Professionen zu identifizieren. Forschung aus einer Mikroperspektive fokussiert individuelle Reaktionen auf Veränderungen am Arbeitsplatz. Sie hilft zu klären, wie Veränderungen in der täglichen Arbeit Wissen und Fertigkeiten auf individueller Ebene beeinflussen. Es wird argumentiert, dass die Mikroperspektive von Vorteil ist, wenn pädagogische Ziele, die auf Lernen am Arbeitsplatz und Kompetenzentwicklung zielen, verfolgt werden. An Beispielen empirischer Forschung wird das Potential einer Mikroperspektive für die Erfassung von Veränderungen am Arbeitsplatz in ihrem Zusammenhang mit Lernen am Arbeitsplatz illustriert.

Stichworte: Lernen am Arbeitsplatz, berufliche Entwicklung, Kompetenz

Introduction

Theorising on workplace learning has been undertaken from various perspectives and disciplines. This theoretical pluralism is commonly appreciated because competing theories are generally beneficial for scientific progress, and because theories with different scope can account for a diversity of phenomena (Boud & Garrick, 1999; Hager, 1999). This, however, requires that theories are compared and judged by their explanative and predictive power. The goal of this paper is to analyse two perspectives on changes in the workplace in relation to workplace learning, and to evaluate what kind of phenomena they can account for. Changes in the workplace and workplace learning are narrowly intertwined, because changes are supposed to be both starting point for and medium of workplace learning.

To be concrete, we compare a macro perspective and a micro perspective. We argue that both have their merits in explaining different facets of workplace changes and workplace learning. The macro perspective often incorporates theories from business administration, organisational theory, and human capital theory. It focuses on changes in society, economy, or on organisational change. A typical statement from a macro perspective about workplace changes is that under the conditions of rapidly changing markets and the developments of a highly technologised knowledge society, employees face the challenge of adapting to such changes and thus to learn continually. We argue that such a perspective is useful for analysing why concepts of lifelong learning and workplace learning are important, which competences are required in different professions, and what kind of context variables should be considered.

On the other hand, the micro perspective focuses on how individuals perceive and react on changes in their immediate workplace environment. A typical micro perspective statement about workplaces changes is that changes in daily working tasks and routines constitute novel situations which require subjects to engage in problem-solving activities und thus to modify and extend their prior knowledge. This perspective can explain how local changes at work in form of changing tasks and routines lead to learning processes, how such learning

contributes to professional development, the acquisition of expertise, and different kinds of knowledge, and to which degree context variables affect these processes.

Both perspectives have their own explanative power. However, we argue that it is misleading to analyse individual or group learning at workplaces from a macro perspective. Since workplace learning concepts aim at explaining the acquisition of professional competence and expertise through the engagement in work tasks and related social interactions (Billett, 2001b, 2004), we advocate that taking a micro perspective has theoretical and empirical advantages. Explaining our argument in more detail, we start out with a discussion of professional competence. Theorising on the relationship between workplace changes and workplace learning cannot be effective without taking into account what kind of knowledge or competence results from such learning. Next we discuss both the macro perspective and the micro perspective. We elaborate the micro perspective by suggesting two ways for the analysis of changes in daily work, (1) the establishment and modification of scripts and routines, and (2) the reflection of experiences in daily work. While the first notion provides a cognitive explanation of how workplace learning leads to knowledge and competence, the latter provides a model of workplace learning as engagement in learning activities. In this discussion we add the notion that errors which occur in the daily work practice are important triggers for workplace learning, next to changes in tasks. Finally, we exemplify the application of the micro perspective in empirical research by some sketches of current research projects.

Professional competence

The question how changes at the workplace are related to learning and competence development cannot be analysed without having a model of professional competence in mind. The discussion of learning is pointless, if it contains no notion of what is being learnt and what kind of behaviour it enables. While a process perspective on learning has epistemological, conceptual, and also empirical

advantages over a product view (Hager, 2004b), still any conception of a learning process contains at least an implicit notion of resulting in personal knowledge in various forms. Extreme positions of situated cognition denying the notion of personally represented knowledge at all (Clancey, 1997) have proven to be theoretically inconsistent.

Models of professional competence can be obtained from research on expertise and professional development (Boshuizen, Bromme, & Gruber, 2004). Stark, Mandl, Gruber, and Renkl (1998) proposed a model which consists of (1) the competence to adequately accomplish recurring tasks, (2) the competence to deal with novel situations, and (3) the competence to acquire and recall well-founded domain-specific declarative knowledge. Recurring tasks are accomplished via routines, whereas the quality of mental models is crucial for succeeding in novel situations. They allow the selection of actions by processing mental trials. Domain-specific knowledge serves as base for deep understanding of problems and for effective problem-solving. One advantage of this model is that it covers a broad range of workplace activities, from routine tasks which may be highly automated, to tasks which are novel and thus require creativity and problem-solving. It also states that these processes are based in necessary domain-specific declarative and procedural knowledge. On the other hand, these components are distinct enough to operationalise them for empirical investigation.

However, this model merely focuses on individual cognitive functioning and neglects that acting in a workplace is largely shaped by the socio-cultural development of a practice and its situational manifestation at a specific workplace (Billett, 2001a). Following Lave and Wenger (1991), more recent conceptions of expertise and professional development emphasised that the participation in a community of experts and its shared knowledge and actions is a central element of expertise that goes beyond individual cognitive capacity (Billett, 2001a; Engeström, 2004; Palonen, 2003; Simons & Ruijters, 2004).

This component of expertise is unfortunately much more difficult to operationalise for empirical research, because it involves analysing the position, the

activity, and the power of an individual within a social community which itself is difficult to locate and define. One possibility is the analysis of building professional networks as part of professional competence (Hakkarainen, Palonen, Paavola, & Lehtinen, 2004; Palonen, 2003). First steps have recently been made through the use of social network analysis (SNA) methodology. SNA allows for the empirical investigation of the social component of learning through the analysis of social relations (e. g. trust, responsibility, knowledge exchange, team work) and, as a consequence, the social position of individuals within professional networks. Evidence exists that such a social position substantially predicts work performance (Mehra, Kilduff, & Brass, 2001). Recent studies relate the social components of learning, which are focused in socio-cultural research, with personal attributes (knowledge, memory, problem-solving capacities), which are focused in cognitive psychological research on expertise (Rehrl, Gruber, & Palonen, 2006).

In sum, professional competence is a multidimensional construct and its components develop all along the professional life through the engagement in social work practices. This contradicts the traditional notion of a sequential progress from a completed first phase of initial vocational education (apprenticeship) and a subsequent phase of application of the learnt knowledge and skills. The term 'workplace learning' indicates a shift in conceptions of professional competence by introducing the idea of simultaneous and integrated working and lifelong learning. From this point of view, changes at the workplace gain importance, as analyses from a macro perspective show.

A macro perspective

Many researchers take a perspective in analysing changes which stems from research in the fields of business administration, organisational theory, and human capital theory, or which incorporates the respective terminology (Boud & Garrick, 1999; Casey, 1999; Marsick & Watkins, 2002, 2003). They often focus on the concept of the learning organisation (Argyris & Schön, 1996; Senge, 1990) and on

changes driven by the development of society (learning society, knowledge society), economy (globalisation), or by restructuring of organisations (post-Taylorism). We argue that the perspective underlying this research is a macro perspective, because it claims trends on abstract complex levels like ‘the industry’, ‘the occupation’, or ‘the economy’. Economical, technical and organisational changes at work have been discussed widely (Appelbaum, Bailey, Berg, & Kalleberg, 2000), often under an organisational learning perspective, but also under a group and individual learning perspective (Appelbaum & Gallagher, 2000; Casey, 1999). For example, in the field of banking, Raehalme (1999) discussed plenty of extensive changes on the macro level under a learning perspective: Growth in electronic trade, further development of electronic pay systems, extended use of new technologies, increased importance of customer relations and orientation, internationalisation of trade and mergers, rise of the Euro, and a significant downsizing of staff because of expanded automation and rationalisation.

Under the macro perspective, such changes are seen as a continuous challenge, thus establishing permanent requirements for organisations and employees to adapt and to learn. An interesting consequence from the macro perspective is that the conception of a completed professional education seems to be insufficient and has to give way to the notion of permanent development of professional expertise in the sense of lifelong learning (Hager, 2004b). It thus helps to understand why a shift occurred from the traditional sequence education-work towards a paradigm of integrated working and learning, and which contextual variables drive such developments. It further serves to justify requirements of lifelong learning within the discourse about a learning society (Guile & Young, 2003; Jarvis, 2006). This implies the notion of the workplace as a learning environment which means an important shift in the metaphors of working and learning.

However, problems arise from such analyses when conclusions are drawn from the macro to the micro level, i.e. from the observed trend of change to the situation of a work team or an individual employee. The macro perspective seems

ineffective for explaining how learning processes take place on an individual or group level and how they contribute to the development of professional competence and expertise, because the unit of analysis is on the level of organisations or even society. While such a focus of course is not problematic per se, it indeed is when inferences from higher hierarchical levels (organisation, society) are drawn to lower hierarchical levels (group, individual). Drawing such conclusions may be erroneous both from a methodological and a conceptual point of view.

First, stating trends on an organisation or society level usually implies probabilistic information, because a single trend of change (e. g. globalisation; shift towards a knowledge society; organisational restructuring) is rather unlikely to have similar effects both in quantity and quality on all potentially concerned individuals. Such statements necessarily involve generalisations. However, for logical reasons such probabilistic information does not allow to conclude to a lower level of a single team or an individual, because this constitutes a multilevel problem, involving a change in the level of observational abstraction. From the observation of the existence of change in society, or an organisational development programme, it cannot be concluded to which degree a specific group, a citizen, or an employee is affected (Beer, Eisenstat, & Spector, 1990). To yield such descriptions, observations have to be made on both levels of analysis within the hierarchical levels of aggregation of individuals. As Billett (2001b, p. 47) puts it:

(...) identifying changes in work requirements cannot be undertaken at the industry or occupational level. How technology is applied, how the demands of changing work practice are manifested and identifying the changing organisation of work can best be understood at the workplace level, where these changes manifest themselves in particular practice.
(...)

Thus we argue that it is substantially normative or prescriptive to derive conclusions from macro level statements about changes to the level of concrete

workplaces. It remains unclear if and how such changes result in micro level changes that affect individuals at their workplace and enable learning processes.

Second, following constructivist theories, the notion has to be taken into account that individuals subjectively evaluate their environment and act on basis of their idiosyncratic construction of reality. Addressees of changes may regard them as irrelevant or ignore them while they are salient for external observers. Reverse, it is possible that employees experience salient changes which are latent for observers. Thus, changes are not only relevant as 'objective' processes, but their subjective individual interpretation has to receive attention as well. Only then it is possible to explain, why people do or do not interpret them as affordances to learn at the workplace. As Billett (2004) notes, workplace learning is dually dependent, on the one hand on the affordances and constraints a workplace provides, on the other hand on the individual's interpretation of and decision to engage in such affordances. Although possibilities to participate in workplace practices may be highly structured (Billett, 2001b), the recognition and the use of learning possibilities cannot be taken for granted. Ellström (2001) makes a similar argument by stating that even if a certain work situation offers a high degree of learning potential – e. g. by providing complex, challenging tasks and degrees of freedom for finding own solutions – a subject may not be able to take advantage of this because he or she lacks the knowledge or self-confidence to do so. He concludes that in addition to the necessary objective job characteristics the individual subjective interpretation needs to be taken into account. Thus, to answer how individuals use workplace changes as learning opportunities, at least three levels of variables have to be taken into account: the conditions at a specific workplace, the individual's specific interpretation of such conditions, and individual variables that lead to such interpretations. Variables on all three levels interact and either foster or constrain learning processes.

In sum, we regard conclusions from observations of changes on a macro level to either changes on a micro level or to learning at the workplace to be normative in nature. The macro perspective is useful to provide reasons why

concepts like workplace learning become relevant. Effects of changes on the macro level therefore are important for the conceptualisation of professional competence development. However, research focusing on a macro perspective cannot account for the complex interpretative relationships discussed above, because it usually focuses on trends that are assumed to be equally valid within a society, a profession, or an organisation. We argue that taking a micro perspective can account for such diversity and can offer plausible explanations of how workplace learning can foster the development of professional competence. Therefore it offers rich possibilities how to empirically investigate such processes.

A micro perspective

The role of changes for workplace learning can be analysed from a quite different perspective as well, a micro perspective. Both levels of abstraction can be mixed up easily and therefore should be distinguished carefully. Contributions who successfully combine arguments from both perspectives are rare (Ellström, 2001; Hoeve & Nieuwenhuis, 2006; Järvinen & Poikela, 2001). The micro perspective is mainly descriptive. It has its roots in two fields of research that contribute to the explanation of professional expertise. One field is the analysis of experts' domain knowledge, memory, and problem-solving skills in cognitive psychology (Ericsson, Charness, Feltovich, & Hoffman, 2006). The second contribution comes from constructivist approaches that model learning as problem-solving activities and legitimate participation in common shared practices at a specific workplace (Lave & Wenger, 1991). Both perspectives are used and combined in current research on expertise and professional development (Billett, 2001a; Boshuizen et al., 2004). Using the micro perspective, the analysis of changes at the workplace is still important for understanding workplace learning. However, local changes in daily work are addressed instead of global changes as addressed from a macro perspective. The former occur in concrete, observable tasks, routines and actions at the workplace. Thus, under the micro perspective, 'the workplace' is not a global label but refers to these specific, observable variables. This follows a notion that

organisations can be described as a set of interlocking routines, which describe what is being done by whom and why within the organisation (Hoeve & Nieuwenhuis, 2006). Despite much recent work focussing on the macro perspective, we plead for taking a micro perspective, because it seems more capable to describe and explain under which circumstances individuals engage in which kind of learning activities given a specific workplace, and what kind of knowledge results from such learning. In the following sections, we describe how such learning can be modelled in two ways, in form of (1) the establishment and modification of scripts and routines, (2) the engagement in learning activities.

Establishment and modification of scripts and routines

Scripts and routines. The question how workplace learning contributes to the development of professional competence and expertise can be analysed effectively on the micro level. In this context scripts and routines in the working process are the central units of analysis. As Hoeve and Nieuwenhuis (2006) argue, the concept of routines is very useful for analysing knowledge, practice, and changes in knowledge as well as practice. They distinguish between scripts on an individual level and routines on a group level. Both can be defined as a set of default rules that apply until challenged, and that can be changed if the context challenges the script or the routine, respectively. Script theory is a concept from cognitive psychology that describes generalised knowledge structures of an individual which develop in the course of time and serve as a framework for the accomplishment of similar recurring tasks (Anderson, 2005; Schank & Abelson, 1977). Script theory can be subsumed under schema theories of conceptual knowledge representation, but unlike schemata scripts refer to episodic events. They describe sequences of events and appropriate actions in given contexts, e. g. for the accomplishment of tasks in a workplace. Routines are similar to individual scripts, but refer to recurrent interaction patterns that are valid on a collective group level (Becker, 2004; Gersick & Hackman, 1990; Hoeve & Nieuwenhuis, 2006). Thus, both routines and scripts serve as guidelines that describe default procedures for work

practice. They can be interpreted both as the knowledge underlying such a practice and as the descriptions or prescriptions of processes of a work practice. Hoeve and Nieuwenhuis (2006) use these concepts to analyse innovation processes, but the concepts can also serve to understand the micro structure of changes both at an individual and a group level.

Learning as modification of scripts and routines. Changes in work practice as well as learning processes can be understood as changes of scripts and routines. This represents a view in which learning is closely linked with action. Thus both cannot be sharply distinguished (Hager, 2004a). The change of scripts can be modelled using Kolodner's (1983) notion of a dynamic episodic memory. The content of dynamic memory changes by the experience and integration of new episodes in the existing knowledge structure. Next to the generalisation over similar episodes, indexing deviances from defaults is an important mechanism. This allows for modifying scripts according to experiences of deviance, e. g. a change in tasks or an error. This process of tuning and modification of knowledge on basis of generalisation and indexing of deviations is an important factor in acquiring the competence to deal with novel situations and exceptions.

Similarly, the process of change of routines can be conceptualised as an adaptive process in six steps (Hoeve, Mittendorff, & Nieuwenhuis, 2003). First a dominant design is established by repeated trials and experimentation (consolidation); the routine is applied in new contexts (generalisation), differentiated (differentiation) and connected with other routines (reciprocation). Reciprocation results in the reconfigured establishment of a new routine (invention), which becomes standard after eliminating inappropriate elements (consolidation).

Thus, individual and group learning can be described as changes in scripts and routines. The description of the individual process may seem to neglect the social nature of learning processes. This is not the case. The notion of changing scripts – of course – concerns individual cognitive processes, which however are triggered by the engagement in both working and learning activities. These imply

social negotiations under the conditions of a socio-culturally developed practice. The change of scripts changes the learner's knowledge, his or her actions, and, as a consequence, the environment. Thus, a central outcome of such learning is the creation of a new pattern of relations with a social and technical-organisational environment. Therefore such learning is inherently social and contextual (Hager, 2004a).

Further, changing routines can be considered to be a collective learning process, involving necessarily individual learning, resulting in a change of scripts. Individual learning may be carried to the group level and lead to negotiation and decision processes about changing a routine. This again requires learning processes of other individuals in a team who have to take over and realise the modified routine in their own practice. In this perspective, group learning is mediated through individual learning and problem-solving activities. Thus, group learning cannot be understood without taking individual learning into account (Ellström, 2001; Järvinen & Poikela, 2001).

What triggers modifications in scripts and routines? Learning as change of scripts and routines does not happen automatically. It is bound to situations that ask for the engagement in activities which in turn lead to such modifications, and to the individual or collective decision to engage in such activities. Gersick and Hackman (1990) discuss several conditions under which routines will be broken up, of which we will address two because they apply to the modification of routines as well as to the modification of individual scripts: encountering novelty, for instance through changes in work tasks, and the experience of errors.

Changes in concrete working tasks and the codified knowledge that underpins them are central triggers for the modification of scripts and routines or even for the establishment of new ones. These changes are often externally driven because they typically involve decisions that come from outside the group – e.g. to adopt a new practice or technology. Such changes may be driven by decisions and trends on a higher hierarchical level. However, in order to judge their effect on learning and their impact on the practice of an individual or a team, the changes

should be evaluated at the concrete workplace level. Such changes trigger the establishment and modification of scripts and routines, because the new work tasks cannot be accomplished with the existing scripts and routines. The changes constitute situations that are novel and require the engagement in creative problem-solving activities or the integration of not yet practiced procedures (Billett, 2001b; Gersick & Hackman, 1990). According to Ellström (2001) the degree to which working tasks are experienced as challenging is an important factor for workplace learning. Tasks are challenging if the subjects cannot rely on the permanent reapplication of similar or automatised routines, but rather have to integrate new knowledge and skills. This again builds the base for the establishment of new routines.

Next to such changes another type of situations is important: the experience of errors occurring in daily work (Gersick & Hackman, 1990). Similar to changes, errors create situations in which an established script or routine is questioned. Unlike changes, errors emerge more directly out of a current practice. Learning from errors plays a significant role in experience based learning (Gruber, 1999; Kolodner, 1983). Errors can be used to reflect where existing scripts or routines do not hold and thus can be starting points for change. It is difficult to define in general what constitutes an error, because this includes an evaluation based on norms. The interpretation and acceptance of norms may differ substantially between workplaces or even between individuals at one workplace. Undoubtedly, errors can be seen as actions that endanger the accomplishment of desired goals. Labelling such an action as an error involves the judgement of skilful members of the community. One example is the inappropriate use or generalisation of a script or routine to a situation in which it does not hold. In such a case, the cause of the deviation lies in a discrepancy between the requirements of a situation and the response to this situation. Another example is that a script or routine is executed deficiently. The modification of a routine means here the indication of deviant cases. In such cases, underlying scripts can be modified by adding an index referring to the situation in which it has proven to be inappropriate. On the group

level, errors can lead to dissatisfaction with the existing routines. Consequently, activities are initiated which aim at changing either the routine or the organisational conditions that allowed the error to happen.

In the discussion up to now we analysed how workplace learning can be conceptualised by the establishment and modification of scripts and routines, and how changes and errors at work can provide situations which trigger these processes. A next step is to discuss how these processes can be operationalised for empirical research. While group learning through changing routines occurs in form of concrete, observable activities, the change of scripts is more difficult to assess, because it concerns a mental representation process. Thus, empirical research has to rely on the assessment of either the occurrence of antecedents or of learning activities which are supposed to effect such changes. In the next section, we discuss a model of relevant learning processes through the engagement in learning activities.

Engagement in learning activities

Much of learning at work occurs implicitly through engagement in work tasks. However, learning after a situation of change or an error should typically take place either in a deliberate mode or in a reactive mode (Eraut, Alderton, Cole, & Senker, 1998). Learning in a deliberate mode is basically intentional, and time is especially set aside for it. Learning in a reactive mode follows nearly spontaneous as a direct reaction to a specific event. In both cases, learning includes a deliberate or reactive adaptive process to the encountered episode which can be modelled as self-regulated engagement in learning activities (van de Wiel, Szegedi, & Weggeman, 2004). Learning activities are defined as actions which are supposed to effect a change in the individual's knowledge or skills. This implies intentionality and consciousness, as goal-oriented action and problem-solving are employed in order to achieve the change. It is, however, important to note that this does not necessarily imply awareness of the learning process. The focus of intention is not necessarily

directed towards learning, and it might be that the individual would not even call the process 'learning'.

A model of learning activities can be derived from experiential learning theory. An experiential learning cycle includes the steps of encountering a specific conflicting episode (e. g. change, error), reflection and analysis, development of a revised strategy for action, and experimenting and evaluating the strategy (Gruber, 1999; Kolb, 1984; van de Wiel et al., 2004). The latter three can be performed individually or socially shared. Social learning activities are especially interesting both from an individual perspective and from a group learning perspective. The role of social exchange has been stressed in constructivist learning theories in general (Lave & Wenger, 1991), but in particular in theories on workplace learning and professional development (Billett, 2004; Eraut et al., 1998; Smith, 2003). For the individual, engagement in social learning activities delivers opportunities for co-construction of knowledge and meaning from the situation. By including others' perspectives, the own, possibly limited, perspective is extended. Activities which do not only aim to quickly fix an encountered problem, but rather to address underlying causes typically require deliberate collaboration with others (Edmondson, 2004; van Woerkom, 2003). The effect is reciprocal: Other team members themselves have the opportunity to take profit from the experience of an individual, and the group as a whole can change its routines. Communication and exchange support the development of shared knowledge and understanding, but also of solutions and strategies to handle changes, errors, and critical situations.

Thus, deliberate or reactive experiential learning after the experience of a change or an error episode can be modelled and assessed by the engagement in learning activities. Modelling workplace learning as engagement in learning activities has been applied in different contexts (Billett, 2000; Cseh, Watkins, & Marsick, 2000; Eraut et al., 1998; Kwakman, 2003). The model described above, however, only provides a starting point and still is too generic for a direct application in empirical research. It has to be adjusted to the specific field at hand in order to develop empirical investigations.

Outlook: Some ideas for future empirical investigations

In our analysis how triggers for workplace learning and workplace learning processes can be analysed under a micro perspective, we argued that workplace learning on the individual and group level can result from two major classes of situations: (1) changes in concrete tasks and action patterns, which are caused externally, and (2) errors in daily work practice which require changes. Both processes do not automatically generate learning. Rather this depends on the interpretation of such a situation and on the individual or group decision to engage in learning activities or not. Should workplace learning occur, then the individual or group knowledge, i. e. scripts or routines, is changed. This in turn leads to changed individual or collective practice.

Conceptualising competence development as changes in routines and scripts reveals the enormous potential of workplace learning for the development of professional competence and expertise. Existing scripts and routines are reinforced and fine-tuned by recurrent application. Changes and errors provide triggers for modifying and extending scripts and routines by engagement in adaptive problem-solving. They provide the basis for cognitive flexibility in dealing with novel, non-routine tasks (Billett, 2001c). Further, engaging in socially shared working and learning activities provides the basis for becoming a fuller member of the community of practice by reinforcing existing network ties and by creating new ones. Thus, a major advantage of the proposed perspective is that it directly links antecedents, learning processes, and concrete outcomes in form of the development of professional expertise. This gives opportunity to address a number of research questions through empirical investigation: How do employees perceive episodes involving changes or errors? How do employees react in face of such situations? To which extent is this reaction mediated by the perception of workplace conditions? Unlike research from the more normative macro perspective, studies using such a micro perspective take individual subjectivity into account and lead to empirically revisable hypotheses about the relationship between experience at work and competence development. There are plenty of possibilities

for future research in this field, using both qualitative and quantitative methodology. In the last section, we provide some sketches of research projects from our group, in which we analyse changes and workplace learning from such a micro perspective.

One project analyses the roles of changes in working tasks and of a reflective handling of errors for learning in the field of banking (Gruber, Heid, & Bauer, 2005). Two central research questions are posed. (1) Do employees whose working context is changing frequently have increased chances for competence development as compared to employees whose work is mainly characterised by applying existing routines? (2) To which degree does the competence development depend on the kind and quality of reflection on success or failure in mastering novel working tasks? Since both, subjective and external measurements are of relevance, a combination of participating observation and expert interview is used to acquire such insights. Case simulations of customer counselling are used for assessing performance in routine and novel tasks, including thinking-aloud techniques. The results of these studies serve for intervention and implementation studies.

A second project focuses on the individual interpretation of affordances and constraints for learning at the workplace (Bauer, Rehr, & Harteis, in press). In a first step, staff members of several universities were surveyed for their perception of how social relationships at their workplace are conducive for mutual exchange, support, and advice seeking. Further, the subjects were asked for their perception of task characteristics and organisational structures. The goal was to develop an instrument, which assesses workplace characteristics which are assumed to foster motivation and learning. Next steps in this project incorporate the use of multilevel techniques in order to combine the analysis of perception of workplace affordances with information of cultural differences between work teams or organisations.

At last, a current project investigates the engagement in learning activities after an error episode in the field of nursing (Bauer, 2006; Bauer & Mulder, 2006). It is assumed that the individual interpretation of the error situation as well as the

perception of a safe and supportive climate in the work team is systematically related with the readiness to engage in socially oriented learning activities, like seeking help and advice from experienced colleagues, jointly analysing possible causes, and developing strategies to avoid similar errors in future. The study focuses on knowledge and rule based errors. In a survey, the engagement in learning is assessed in reference to concrete cases of errors. The cases were constructed on basis of examples which were collected in a prior interview study with experts in nursing.

All these projects have in common that the researchers take a micro perspective. This leads to a number of communalities. (1) The studies employ an interpretative paradigm, because it is assumed that the individual perception of workplace affordances (changes, errors) is crucial for motivated activity and learning in daily work practice. (2) The studies focus on the engagement in learning activities of several kinds – as solving working tasks, intentional learning, or becoming a full member of a community of practice. (3) The studies are based on a model of professional competence which combines capacities as formulated by classical research on expertise with the more recent discussion about the social nature of expertise.

A criticism of the proposed perspective might be that it seems to prefer an individual, cognitive psychological approach. However, this criticism does not take all potentials of the micro perspective into account. From this perspective, it is possible to analyse the role of social exchange and social construction of knowledge under the conditions of a concrete workplace, as well. We argued that the outcomes of such learning processes are inherently related with activity so that such learning processes continually affect the context in which they occur. We argue against a dualism of cognitive and socio-cultural perspectives in researching learning at work, and instead for trying to find explanative links between these theories (Billett, 1996; Smith, 2003). It seems that the micro perspective on workplace changes and workplace learning is a prolific one, for this purpose.

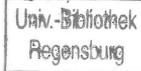
References

- Anderson, J. R. (2005). *Cognitive psychology and its implications*. New York: Freeman.
- Appelbaum, E., Bailey, T., Berg, P., & Kalleberg, A. L. (2000). *Manufacturing advantage. Why high-performance systems pay off*. Ithaca: Cornell University Press.
- Appelbaum, S. H., & Gallagher, J. (2000). The competitive advantage of organizational learning. *Journal of Workplace Learning*, 12, 40-56.
- Argyris, C., & Schön, D. (1996). *Organizational learning II: Theory, method, and practice*. Reading: Addison-Wesley.
- Bauer, J. (2006, April). *Error culture in health care: Modeling nurses' error related learning activities*. Paper presented at the 87th Annual Meeting of the American Educational Research Association, San Francisco, USA.
- Bauer, J., & Mulder, R. H. (2006, October). *Hospital nurses' learning from errors. Comparison of two research methods for assessing learning from errors at work*. Paper presented at the 3rd EARLI SIG Professional Learning and Development Conference, Heerlen, The Netherlands.
- Bauer, J., Rehrl, M., & Harteis, C. (in press). Learning culture: Theoretical framework and methodology of assessment from a motivational perspective. In H. Gruber & T. Palonen (Eds.), *Learning at the workplace. New developments on the relation between working and learning*. Turku: University of Turku Press.
- Becker, M. C. (2004). Organizational routines: A review of the literature. *Industrial and Corporate Change*, 13, 643-677.
- Beer, M., Eisenstat, R. A., & Spector, B. (1990). Why change programs don't produce change. *Harvard Business Review*, 68, 158-166.
- Billett, S. (1996). Situated learning: Bridging sociocultural and cognitive theorising. *Learning and Instruction*, 6, 263-280.
- Billett, S. (2000). Guided learning at work. *Journal of Workplace Learning*, 12, 272-285.
- Billett, S. (2001a). Knowing in practice: Re-conceptualising vocational expertise. *Learning and Instruction*, 11, 431-452.
- Billett, S. (2001b). *Learning in the workplace: Strategies for effective practice*. Crows Nest: Allen & Unwin.
- Billett, S. (2001c). Learning through work: Workplace affordances and individual engagement. *Journal of Workplace Learning*, 13, 209-214.
- Billett, S. (2004). Workplace participatory practices. Conceptualising workplaces as learning environments. *Journal of Workplace Learning*, 16, 312-324.
- Boshuizen, H. P. A., Bromme, R., & Gruber, H. (Eds.). (2004). *Professional learning: Gaps and transitions on the way from novice to expert*. Dordrecht: Kluwer.
- Boud, D., & Garrick, J. (1999). Understandings of workplace learning. In D. Boud & J. Garrick (Eds.), *Understanding learning at work* (pp. 1-11). London: Routledge.
- Casey, C. (1999). The changing contexts of work. In D. Boud & J. Garrick (Eds.), *Understanding learning at work* (pp. 15-28). London: Routledge.
- Clancey, W. (1997). *Situated cognition. On human knowledge and computer representations*. Cambridge: Cambridge University Press.

- Cseh, M., Watkins, K. E., & Marsick, V. J. (2000). Informal and incidental learning in the workplace. In G. Straka (Ed.), *Conceptions of self-directed learning: Theoretical and conceptual considerations* (pp. 59-74). Münster: Waxmann.
- Edmondson, A. C. (2004). Learning from errors in health care: Frequent opportunities, pervasive barriers. *Quality and Safety in Health Care*, 13, 3-9.
- Ellström, P.-E. (2001). Integrating learning and work: Problems and prospects. *Human Resource Development Quarterly*, 12, 421-435.
- Engeström, Y. (2004). The new generation of expertise: Seven theses. In H. Rainbird, A. Fuller, & A. Munro (Eds.), *Workplace learning in context* (pp. 145-165). London: Routledge.
- Eraut, M., Alderton, J., Cole, G., & Senker, P. (1998). *Development of knowledge and skills in employment* (Research Report No. 5). University of Sussex, Institute of Education.
- Ericsson, K. A., Charness, N., Feltovich, P., & Hoffman, R. (Eds.). (2006). *Handbook on expertise and expert performance*. Cambridge: Cambridge University Press.
- Gersick, C. J. G., & Hackman, J. R. (1990). Habitual routines in task-performing groups. *Organizational Behavior and Human Decision Processes*, 47, 65-97.
- Gruber, H. (1999). *Erfahrung als Grundlage kompetenten Handelns*. [Experience as basis of competent action] Bern: Huber.
- Gruber, H., Heid, H., & Bauer, J. (2005). *Forschungsprogramm Kompetenzentwicklung im Arbeitsprozess: Die Rolle von Arbeitsplatz-Veränderungen und Reflexion für Workplace Learning* [Research program competence development at the workplace. The role of workplace changes and reflection for workplace learning] (Research Report No. 17). Regensburg: Universität Regensburg, Lehrstuhl für Lehr-Lern-Forschung.
- Guile, D., & Young, M. (2003). Transfer and transition in vocational education: Some theoretical considerations. In T. Tuomi-Gröhn & Y. Engeström (Eds.), *Between school and work. New perspectives on transfer and boundary-crossing* (pp. 63-81). Amsterdam: Pergamon.
- Hager, P. (1999). Finding a good theory of workplace learning. In D. Boud & J. Garrick (Eds.), *Understanding learning at work* (pp. 65-82). London: Routledge.
- Hager, P. (2004a). The conceptualization and measurement of learning at work. In H. Rainbird, A. Fuller, & A. Munro (Eds.), *Workplace learning in context* (pp. 242-258). London: Routledge.
- Hager, P. (2004b). Lifelong learning in the workplace? Challenges and issues. *Journal of Workplace Learning*, 16, 22-32.
- Hakkarainen, K., Palonen, T., Paavola, S., & Lehtinen, E. (2004). *Communities of networked expertise: Educational and professional perspectives*. Amsterdam: Elsevier.
- Hoeve, A., Mittendorf, K., & Nieuwenhuis, L. F. M. (2003). *The interface between learning and innovation: Building a conceptual model*. Paper presented at the 3rd International Conference of Researching Work and Learning (RWL), Tampere, Finland.
- Hoeve, A., & Nieuwenhuis, L. F. M. (2006). Learning routines in innovation processes. *Journal of Workplace Learning*, 18, 171-185.

- Järvinen, A., & Poikela, E. (2001). Modeling reflective and contextual learning at work. *Journal of Workplace Learning*, 13, 282-289.
- Jarvis, P. (2006). Beyond the learning society: Globalisation and the moral imperative for reflective social change. *International Journal of Lifelong Education*, 25, 201-211.
- Kolb, D. A. (1984). *Experiential learning*. Englewood Cliffs: Prentice Hall.
- Kolodner, J. (1983). Towards an understanding of the role of experience in the evolution from novice to expert. *International Journal of Man-Machine Studies*, 19, 497-518.
- Kwakman, K. (2003). Factors affecting teachers' participation in professional learning activities. *Teaching and Teacher Education*, 19, 149-170.
- Lave, J., & Wenger, E. (1991). *Situated learning. Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Marsick, V. J., & Watkins, K. E. (2002). Envisioning new organisations for learning. In F. Reeve, M. Cartwright, & R. Edwards (Eds.), *Supporting lifelong learning* (pp. 34-50). London: Routledge.
- Marsick, V. J., & Watkins, K. E. (2003). Demonstrating the value of an organization's learning culture: The dimensions of the learning organization questionnaire. *Advances in Developing Human Resources*, 5, 132-151.
- Mehra, A., Kilduff, M., & Brass, D. J. (2001). The social networks of high and low selfmonitors: Implications for workplace performance. *Administrative Science Quarterly*, 46, 121-146.
- Palonen, T. (2003). *Shared knowledge and the web of relationships*. Turku: University of Turku.
- Rachalme, O. (1999). The bank office as a learning environment. In P. Ruohotie, J. Honka, & A. Savanto (Eds.), *The developmental challenges in the cooperation of education and training and working life* (pp. 71-88). Tampere: Edita.
- Rehrl, M., Gruber, H., & Palonen, T. (2006, July). *Expertise development in science: Network analysis of EARLI SIG "Professional learning and development" activities*. Paper presented at the conference "Expertise in Context", Berlin, Germany.
- Schank, R. C., & Abelson, R. (1977). *Scripts, plans, goals, and understanding*. Hillsdale: Erlbaum.
- Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Random House.
- Simons, P. R.-J., & Ruijters, M. C. P. (2004). Learning professionals: Towards an integrated model. In H. P. A. Boshuizen, R. Bromme, & H. Gruber (Eds.), *Professional learning: Gaps and transitions on the way from novice to expert* (pp. 207-229). Dordrecht: Kluwer.
- Smith, P. J. (2003). Workplace learning and flexible delivery. *Review of Educational Research*, 73, 53-88.
- Stark, R., Mandl, H., Gruber, H., & Renkl, A. (1998). Indeed, sometimes knowledge does not help: A replication study. *Instructional Science*, 26, 391-407.
- van de Wiel, M. W. J., Szegedi, K. H. P., & Weggeman, M. C. D. P. (2004). Professional learning: Deliberate attempts at developing expertise. In H. P. A.

- Boshuizen, R. Bromme, & H. Gruber (Eds.), *Professional learning: Gaps and transitions on the way from novice to expert* (pp. 181-206). Dordrecht: Kluwer.
- van Woerkom, M. (2003). *Critical reflection at work. Bridging individual and organisational learning*. Twente: Twente University.



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