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Dimensions of On-the-Job Learning Styles

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The aim of this study is to identify dimensions of on-the-job learning styles that can create an awareness among employees and offer them opportunities for the improvement of their on-the-job learning. In order to be able to select relevant dimensions, we propose four criteria: dimensions should: (a) concern activities and behaviour; (b) be changeable by learners; (c) be applicable to the workplace context; and (d) be uni-dimensional. After reviewing the literature in light of these criteria, we conclude that employees need to be aware of four core dimensions of on-the-job learning styles: (a) whether they are reproductive or developmental learners; (b) whether they tend to learn alone, from others, or with others; (c) whether they are holistic or analytical learners; and (d) how they engage in reflection (e.g. the depth of reflection).

Le but de cette étude est d'identifier les dimensions composant des styles d'apprentissage sur le tas et plus particulièrement la création d'une conscience parmi les salariés et l'opportunité d'accroître les possibilités d'apprentissage sur le tas. Afin de sélectionner des dimensions appropriées, nous proposons 4 critères: les dimensions doivent a) concerner des activités et le comportement, b) être variables selon les apprenants, c) être applicable dans un contexte de travail et d) être uni-dimensionnel. Une revue de la littérature à la lumière de ces critères montre que les salariés ont besoin d'être conscients de 4 dimensions fondamentales des styles d'apprentissage sur le tas: a) Sont-ils des apprenants "passifs" ou "actifs" ? b) Tendent-ils à apprendre seul, avec d'autres ou d'autres personnes ? c) Sont-ils des apprenants holistiques ou analytiques ? et d) Quelle est la façon dont ils s'engagent dans une réflexion (e.g. la profondeur de la réflexion)?

1. INTRODUCTION

According to the literature, the most significant sources of employee learning in addition to formal training and education, are the challenges of work

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itself and interactions with other people in the workplace (e.g. Eraut, 2004; Eraut, Alderton, Cole, & Senker, 1998; Mumford, 1995; Poell, van Dam, & van den Berg, 2004). We regard on-the-job learning as all implicit or explicit mental and/or overt activities and processes, performed in the context of work, leading to relatively permanent changes in knowledge, attitudes, or skills (cf. Billett, 1993; Bolhuis & Simons, 1999; Levy, 1987). On-the-job learning can be embedded in the ongoing work process, in specially designed learning programmes, or in situations outside work (Eraut et al., 1998). It includes all learning that improves the quality of employees' work, their employability, and their personal development (cf. van der Krogt, 2007). There is a growing literature about working conditions that stimulate on-the-job learning, such as challenging work, good working relationships, appropriate support and feedback from supervisors and colleagues (see Doornbos, 2006, for a recent overview). Still, in our view, knowledge about practical methods that can be used to improve on-the-job learning remains scarce.

Learning style theory suggests that a useful way to improve employees' on-the-job learning could be to make them aware of their on-the-job learning styles (Berings, Poell, & Simons, 2005; Desmedt, 2004; Kolb, 1974; Sadler-Smith, 2001). On-the-job learning styles can be defined as the tendency to use a particular combination of implicit and explicit learning activities that a person can and likes to perform on the job (Berings et al., 2005). It represents the learning activities that an individual employee is inclined and able to employ (Simons, 1997). As Figure 1 shows, the person adapts the combination of learning activities to each situation differently. The particular combination

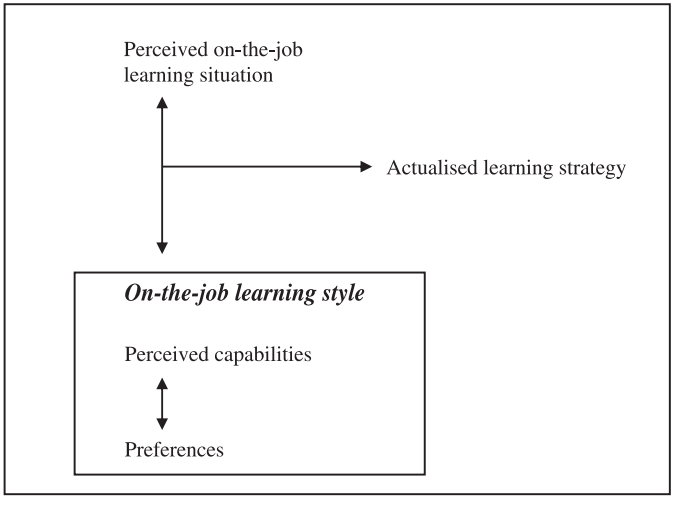

FIGURE 1. On-the-job learning styles (Berings et al., 2005).

used is called the actualised learning strategy. Learning is here represented using an organismic interaction model, in that the learning individual and the psychological meaning of the learning situation share a relationship of reciprocal action, in which each affects and changes the other (Kwakman, 1999; Overton & Reese, 1973). Learning style theory suggests that knowledge about their own and other possible on-the-job learning styles can make people aware of their options and choices in learning behaviour and, therefore, provide opportunities for adaptation (Berings et al., 2005; Coffield, Mosely, Hall, & Ecclestone, 2004). Currently, however, there is a lack of knowledge about on-the-job learning styles in the literature.

Literature on learning styles originates from the field of educational psychology, where an enormous number of studies on the topic have been published (Coffield et al., 2004). These are mostly, however, situated in educational settings. The present study investigates which dimensions of learning styles in studies from educational psychology can be applied sensibly in on-the-job contexts. The aim of this study is to identify those dimensions of on-the-job learning styles that can create an awareness of their learning styles among employees and offer them opportunities to improve their on-the-job learning. First, the differences between learning in educational contexts and on-the-job learning will be explored and criteria to identify dimensions of on-the-job learning styles will be derived accordingly. Second, the dimensions of learning styles in educational psychology literature will be explored and those learning style dimensions that fit the workplace context best will be selected. Third, literature about on-the-job learning will be used to translate these dimensions to the on-the-job context. Finally, the insights derived from the present study will be discussed with a view to future research and practice.

2. DIFFERENCES BETWEEN LEARNING IN EDUCATIONAL CONTEXTS AND LEARNING IN WORKPLACE CONTEXTS

In order to formulate criteria for dimensions of learning styles that can be translated to on-the-job learning settings and create awareness among employees, it is necessary to describe the differences between an educational perspective on learning and a workplace perspective on learning. After doing so, we will describe their implications for the dimensions of on-the-job learning styles to be identified in this study.

2.1. Differences in Learning Process, Learning Outcome, and Learning Setting

The most important differences between learning in the two contexts that are central to the purpose of this study are in the area of the learning

process. First of all, on-the-job learners have more opportunities to choose their own learning activities whereas in educational contexts it is mostly the teacher who makes the choices (even if the learning takes place outside of the classroom). Focusing on actual learning activities rather than learning preferences or orientations[1] is, therefore, even more relevant in the workplace context than it is in educational contexts. Since participation in learning activities can be actively directed by learners themselves, this activity-based approach offers most opportunities for the improvement of on-the-job learning (Berings et al., 2005).

Second, although group work is becoming increasingly popular, learning is still mainly an individual activity in educational contexts, while it is often a collaborative or collegial activity in workplace contexts (Beckett & Hager, 2002). Interaction with others is the main source of learning for employees (Doornbos, Bolhuis, & Simons, 2004; Eraut et al., 1998; Gear, McIntosch, & Squires, 1994). In our view, this aspect should therefore be represented in a description of employees' on-the-job learning styles. Finally, learning is mostly an explicit process in educational contexts, while many learning processes that take place in on-the-job contexts remain implicit (cf. Bolhuis & Simons, 1999; Eraut, 2000). The learning style dimensions to be identified should, therefore, also be applicable to implicit learning.

The most significant difference with regard to the learning outcomes is that most learning outcomes are made visible in educational contexts while learning outcomes are mostly tacit or regarded as part of a person's general capability in on-the-job contexts (Eraut, 2000). The most important difference between the two contexts with regard to the learning setting is that learning is the first priority in educational contexts and work is the first priority in organisational contexts. Therefore, learning is usually intended in educational contexts and is seen as a preparation for work, while learning is usually seen (often in retrospect only) as a side effect of work or a way of innovating work in workplaces (Nieuwenhuis & van Woerkom, 2003). Learning at the workplace usually takes place during work processes rather than during processes specifically intended for learning. People rarely, however, perceive or conceive these processes as learning opportunities. Such mostly implicit learning processes are afforded by the environment and by the people that employees work with. There may, however, also be an individual style component involved, in that people choose jobs with or without many fellow workers and they may to some extent also choose with whom they want to work.

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[1] Learning activities indicate what learning activities learners actually perform, whereas learning preferences indicate which circumstances learners prefer for learning and learning orientations refer to how people think about learning.

2.2. Summary of Criteria for Learning Style Dimensions Suitable to On-the-Job Learning

The goal of this study is to identify dimensions of on-the-job learning styles that can create an awareness among employees and offer them opportunities to improve their on-the-job learning. Summarising from the previous sections, therefore, (1) the dimensions should concern learning *activities*, indicating actual learning *behaviour*, which (2) can be *actively directed* by learners and which (3) should be *applicable to the workplace context*. The latter implies that there should be dimensions included that (a) regard learning as part of the preparation of work, the execution of work, and as a way of innovating work, (b) are applicable to explicit and implicit learning processes, and (c) are applicable to social learning processes. Furthermore, in addition to the criteria mentioned in previous paragraphs, in our view the dimensions (4) should also be easy to interpret. This implies that either the learning activities should be described *uni-dimensionally* (i.e. not as an amalgamation of many different aspects) or the dimensions should be derived easily from a multi-dimensional description.

3. SUITABILITY OF LEARNING STYLE DIMENSIONS FROM EDUCATIONAL PSYCHOLOGY

Many different models of learning styles have been described in the literature on educational psychology. Numerous overviews have been presented (e.g. Cassidy, 2004; Coffield et al., 2004; Rayner & Riding, 1997; Riding & Cheema, 1991; Sadler-Smith, 1997). The extensive and recent overview carried out by Coffield et al. (2004) is used as the starting point for our investigation. They found 71 models and selected 13 of these models for further exploration.[2] These are the models that are representative of the total range of models in the literature, that are widely quoted, that have led to further research by other authors, and that are widely used by practitioners in the field of education. They are all related to the field of post-16 learning (learners over 16 years of age).

Two of the models selected by Coffield et al.—Apter's motivational styles (Apter, Mallows, & Williams, 1998) and Myers Briggs' personality types (1987)—are relevant for general motivational and personality characteristics but cannot be translated directly to learning activities. The other 11 models do actually concern learning and will therefore be used as the starting point for the overview of learning style models in the literature. These are: Entwistle's

[2] Coffield et al. were predominantly interested in the instruments that accompany the learning style models. The present study is concerned mainly with the theoretical models themselves.

deep and surface learning approaches (1981, 1988), Vermunt's learning styles (1992), Kolb's learning styles (1984), Honey and Mumford's learning cycle (1986), Jackson's learning styles (2002), Herrmann's brain dominance (1989), Allinson and Hayes' intuition and analysis (1996), Dunn, Dunn, and Price's model of learning preferences (Dunn, 2003; Dunn, Dunn, & Price, 1989), Gregorc's mind-styles model (1982), Riding and Cheema's cognitive styles (1991), and Sternberg's thinking styles (1997). The learning cycles put forward by Kolb, by Honey and Mumford, and by Jackson are discussed separately in the overview by Coffield et al., but they contain so many similarities that they will be described and discussed together in our overview.

Appendix 1 shows an overview of conceptual similarities with other models found in the literature so as to provide an overview of the whole range of learning style dimensions found in the educational psychology literature. These other models use different terminologies, but they do show great conceptual similarity. This overview also demonstrates the overlap among the 11 models that were taken as the starting point.

In the next section, each model is described briefly and the usefulness of the models in workplace contexts is then discussed using the criteria mentioned in the previous section.

3.1. Deep and Surface Learning Approaches (Entwistle, 1981, 1988)

Deep learners search for meaning, use previous experience, relate facts, and conclude. Surface learners search for facts, put most effort into memorising, and are uneasy about the learning situation. The actual learning activities within this dimension are multi-dimensional, since many different activities are included, and are defined for achieving typically educational goals. They are hardly applicable to the workplace context. Therefore, this model does not meet the criteria used in this paper.

3.2. Vermunt's Learning Styles (1992)

Vermunt regards learning styles as a mixture of the following aspects: cognitive processing, learning orientation, mental model of learning, and regulation of learning. Using combinations of these aspects, he defines four learning styles: meaning-directed, application-directed, reproduction-directed and undirected. Meaning-directed learners relate key concepts to each other and application-directed learners relate them to everyday experiences. Reproduction-directed learners memorise the learning content, while undirected learners use ambivalent learning strategies.

Vermunt's model of learning styles contains many different aspects and is therefore multi-dimensional. For the purposes of this paper we could have

TABLE 1
Comparison of the Learning Cycles of Kolb (1984), Honey and Mumford (1986), and Jackson (2002)

Kolb	*Honey and Mumford*	*Jackson*	*Description*
Concrete experience	Activist	Initiator	Doing and experiencing things and learning by trial and error.
Reflective observation	Reflector	Reasoner	Observing experiences from many different angles and trying to understand the logic underlying problems before making a move.
Abstract conceptualisation	Theorist	Analyst	Reviewing information, analysing, and forming abstract concepts and generalisations before acting.
Active experimentation	Pragmatist	Implementer	Trying out ideas, theories, and techniques to see if these work in practice.

chosen to focus only on the aspect cognitive processing since learning activities are being looked for; however, from this perspective it can also be concluded that this model does not meet the criteria used in this paper. It is typically designed for educational goals, in the sense of the preparation for work, and not for learning situations in the execution of work or as a way of innovating work.

3.3. Kolb's (1984), Honey and Mumford's (1986), and Jackson's Learning Cycles (2002)

These three learning style models have great conceptual similarities. They all describe learning as a cyclical process, involving four distinct learning stages that learners follow in sequence. Each step in the learning cycle represents a different learning strategy. Preferences for certain strategies become habitual by repeating successful strategies, and as a result learning styles develop. A brief description of the comparable stages of the learning cycle is given in Table 1.

The models are constructed on classical theories from Dewey, Lewin, Piaget, Vygotsky, Guilford, Freire, Illich, Pepper, Jung and others (Kolb, 1984). Honey and Mumford made a slight modification to Kolb's terminology in order to make it more suitable to managerial populations. Jackson claims

that his model describes both functional and dysfunctional learning, whereas Kolb describes only learning in general.

The suitability of the different aspects in these comparable learning style models will be discussed using Kolb's terminology. The aspects concrete experience and active experimentation are multi-dimensional, because other mental learning activities take place while doing and trying in order to actually achieve learning results. The aspect of abstract conceptualisation describes a sequence in performing different learning activities so that this aspect is also multi-dimensional. The sequence in which different learning activities are used can be important information, but the aim of this study is to select the dimensions that can be included in a model of on-the-job learning styles. If this aspect is looked at from a different viewpoint, namely whether a person forms abstract concepts, it can be viewed as a dimension that describes "what" a person learns, rather than "how" a person learns, so that this dimension is also unsuitable for the purpose of this paper. The aspect of reflective observation, finally, also describes a sequence in performing different learning activities. However, when this aspect is looked at from a different point of view, namely as a dimension of whether a person reflects on learning situations, this dimension could be very suitable in a description of employees' on-the-job learning styles. This dimension describes the activity of reflection, which can actively be directed by learners themselves.

3.4. Brain Dominance (Herrmann, 1989)

Brain dominance can be by the left-hand or right-hand side of the brain and cerebral (top/front) or limbic (bottom/rear). Dominance by the left cortex means that an individual is rational: logical, analytical, fact-based, and quantitative. Dominance by the left limbic means that someone is organised: sequential, planned, and detailed. Dominance by the right limbic makes someone interpersonal: feeling-based, kinaesthetic, and emotional. Finally, dominance by the right cortex means that someone is imaginative: holistic, intuitive, integrating, and synthesising. This distinction between different parts of the brain is now much debated (e.g. Sala, 1999).

This model is multi-dimensional since many different dimensions are put together as one. Further, the main characteristics of the different parts of the brain, which indicate whether someone is organised, interpersonal, or imaginative, cannot be directly translated to learning activities. Therefore, this model does not meet the criteria used in this paper.

3.5. Intuition and Analysis (Allinson & Hayes, 1996)

Intuition refers to "immediate judgement based on feeling and the adoption of a global perspective" and analysis refers to "judgement based on mental

reasoning and a focus on detail" (p. 122). The model was constructed on the distinction between the left and right hemispheres of the brain.

This model focuses on information processing activities, which learners can direct actively themselves. It is applicable in all possible contexts, including work contexts. Therefore it meets the criteria used in this paper and seems to be directly translatable to on-the-job learning settings.

3.6. Model of Learning Preferences (Dunn, 2003; Dunn et al., 1989)

This model describes the manner in which stimuli affect an individual's ability to perceive, interact with, and respond to the learning environment. This includes environmental, emotional, sociological, physical, and psychological stimuli.

This model does not concern learning activities but learning preferences. The model concerns variables that affect learning styles, rather than learning styles themselves (Sternberg, 1997). Except for the sociological stimulus of learning alone or with peers and the psychological stimuli of reflectivity and impulsivity, the preferences described in this model cannot be translated to learning activities that can actively be directed by the learners themselves. Namely, it is not possible to translate, for instance, room temperature, sense of responsibility, or mobility, to actual learning activities. Therefore, only a translation of the sociological and psychological stimuli to activity-based dimensions of learning styles meets the criteria used in this paper for on-the-job learning styles. Herewith, we include a social dimension of on-the-job learning styles. The psychological stimuli ally with the reflection dimension from Kolb's model.

3.7. Cognitive Styles (Riding & Cheema, 1991)

Riding and Cheema combined previous models of cognitive styles of other authors into two dimensions: the holistic-analytical dimension and the verbal-imagery dimension. The holistic-analytical dimension describes the fact that some individuals tend to process information in wholes (holists), whereas others process information in parts (analytics). The verbal-imagery dimension describes the tendency to process information in verbal or visual form.

This dimension is a combination of many different aspects. It is a compilation of different previous models and is therefore multi-dimensional. Moreover, many of the aspects involved cannot directly be translated to learning activities so that this model does not meet the criteria used in this paper.

3.8. Thinking Styles (Sternberg, 1997)

Sternberg distinguishes 13 thinking styles to delineate a cognitive profile of how people direct their intelligence. These include three *functions* of mental

self-government: legislative (creating, imagining, and planning), executive (implementing and doing), and judicial self-government (judging, evaluating, and comparing). The four *forms* of mental self-government are oligarchic—which allows for multiple equally important goals; monarchic—focusing on one item or aspect of that item until it is completed; hierarchic—focusing on multiple goals with different priorities; and anarchic—mental self-government, with a great flexibility of approaches, motivated by a pot-pourri of needs and goals that are often difficult to sort out. The two *levels* of mental self-government are local—meaning engagement with specific, concrete details; and global—preferring general and abstract thinking. The *scope* of mental self-government can be internal—which means working independently from others; or external—meaning working and interacting with others at different stages of progress. Finally, the *leaning* of mental self-government can be liberal—in the sense of going beyond existing rules and procedures; or conservative—concerning adherence to existing rules and procedures and seeking familiarity in life and work.

The functions of mental self-government are multi-dimensional, since they concern different learning activities, and the levels and forms of mental self-government concern learning objectives rather than learning activities. Therefore, these dimensions do not meet the criteria used in this paper. In contrast, the scope and leaning of mental self-government seem suitable dimensions of on-the-job learning styles. As shown in Appendix 1, they are similar to respectively learning alone or with peers (Dunn, 2003; Dunn et al., 1989), and random and sequential ordering (Gregorc, 1982).

3.9. Mind-styles Model: Perception and Ordering (Gregorc, 1982)

This model describes two forms of perception: concrete and abstract. Concrete learners register information directly through physical stimuli, tending to be oriented towards the pragmatics of a situation. They make hardly any relationships between ideas or concepts. Abstract learners ignore or dislike details, abstract relationships from objects of experience, and organise them in terms of their interrelatedness. Two forms of ordering are also described: sequential and random ordering. Sequential learners organise information in a linear manner, preferring to follow a previously developed plan rather than relying on impulse. Random learners organise information in their mind by chunks and in no particular order. They are impulsive rather than planned.

The two forms of information-perception cannot actively be directed or influenced by the learners themselves (Curry, 1983). The ordering dimension entails information processing activities, which can actively be directed by the learners themselves and are applicable in all possible contexts. This dimension, therefore, offers possibilities for on-the-job learning styles.

TABLE 2
Overview of Learning Style Models in the Educational Psychology Literature and their Suitability in On-the-Job Learning Contexts

Model	*Suitability for on-the-job learning contexts*
1. Deep and surface learning approaches (Entwistle, 1981, 1988)	Not suitable
2. Vermunt's learning styles (1992)	Not suitable
3. Kolb's (1984), Honey and Mumford's (1986) and Jackson's learning cycles (2002)	A translation of the element of reflection can be suitable
4. Brain dominance (Herrmann, 1989)	Not suitable
5. Intuition and analysis (Allinson & Hayes, 1996)	The intuition-analysis dimension can be suitable
6. Model of learning preferences (Dunn, 2003; Dunn et al., 1989)	A translation of the sociological and psychological stimuli can be suitable
7. Cognitive styles (Riding & Cheema, 1991)	Not suitable
8. Thinking styles (Sternberg, 1997)	The scope and leaning of mental self-government can be suitable
9. Mind-styles model: ordering and perception (Gregorc, 1982)	The two forms of ordering, sequential and random ordering, can be suitable

3.10. Conclusions on Suitability

Table 2 summarises the conclusions of the above exploration concerning the suitability of the dimensions distinguished for on-the-job learning contexts, that is, dimensions that can create an awareness among employees and offer them opportunities for the improvement of their on-the-job learning, using the criteria summarised in paragraph 2.2.

Four learning style dimensions that can be suitable to on-the-job learning are inferred from the above overview:

- sequential and random ordering, derived from Gregorc (1982) and Sternberg (1997);
- learning alone or with others, derived from Dunn et al. (1989) and Sternberg (1997);
- intuitive and analytical learning, derived from Allinson and Hayes (1996); and
- forms of reflection, derived from Kolb (1984), Honey and Mumford (1986), Jackson (2002), and Dunn (2003, Dunn et al., 1989).

These dimensions indicate learning activities that can be actively directed by the learners themselves. They are applicable to the preparation of work, the execution of work, and the innovation of work. They are applicable to both explicit and implicit learning processes, and a social learning dimension is included.

4. TRANSLATION TO ON-THE-JOB LEARNING

The literature about on-the-job learning has paid attention to theories that show great similarities with the learning style dimensions selected here but different terminology is often used. In the next section the learning style dimensions selected from the field of educational psychology are extended by adding terminology and theories from the field of on-the-job learning in order to connect these two areas of research.

4.1. Reproductive and Developmental Learning

The first learning style dimension distinguished is derived from sequential and random ordering (Gregorc, 1982) and similar dimensions, and shows great similarities with the distinction between reproductive and developmental learning as described by Ellström (2005). Reproductive learning is learning with a focus on a subject's adjustment to and mastery of certain given tasks or situations. This learning strategy can be very effective in the execution of work, focusing on performance and security. However, employees are increasingly also asked to contribute to the innovation of work (Nieuwenhuis & van Woerkom, 2003). There is a need to explore, question, reframe, and transform a situation in this form of learning, rather than simply adapt to a predefined reality. Developmental learning is learning while transforming rather than reproducing a prevailing situation, hence developing new solutions (Ellström, 2005).

Ellström emphasises that reproductive and developmental learning are complementary, but that one way of learning can be dominant. Intermediate forms of learning may also be possible, such as productive learning, as described by Engeström (1987), in which the given outcome is reached by experimentation. The distinction between reproductive learning and developmental learning is similar to Argyris and Schön's (1978) distinction in single-loop and double-loop learning. The terminology used by Ellström—reproductive and developmental learning—will be adopted to describe this dimension of learning styles.

4.2. Learning Alone, Learning from Others, and Learning with Others

The second dimension distinguished is the social learning style dimension (i.e. learning alone or with others; Dunn, 2003; Dunn et al., 1989). This dimension should receive significant attention in workplace settings, since in these settings interaction with others is the main source of learning (Doornbos et al., 2004; Eraut et al., 1998; Eraut, 2001; Gear et al., 1994). Cultural artefacts can play an important role in group settings, since

they may assist people in sharing and extending cultural knowledge. Other people are directly or indirectly involved in almost all learning activities. These can be interaction partners from within the working group, such as collaboration partners, mentors, mentees, and coaches, as well as interaction partners from outside the working group, such as clients or suppliers, people elsewhere in one's own or other organisations (Eraut et al., 1998).

Several authors describe social dimensions of learning, but often not entirely in terms of learning activities (e.g. Dunn, 2003; Dunn et al., 1989; Eraut et al., 1998; Riechmann & Grasha, 1974; Salomon & Perkins, 1998). Doornbos, van Eekelen, and Koopmans (2006) describe five different forms of learning from social interaction in terms of activities performed by interaction partners: responding to the employees' work, being a role model, supporting learning (e.g. by giving a lecture or course), providing information or reactions to the employee, and exchanging information. In the first four forms the interaction partner supports the employee's learning (making for a one-way interaction) and in the fifth form both interaction partners learn from the (two-way) interaction (D'Abate, Eddy, & Tannenbaum, 2003).

A classification that indicates the activities of the learners themselves is needed in order to elaborate social forms of learning in the context of on-the-job learning styles. Simplifying the insights above leads to three different types of learning activities performed by the learners themselves: learning alone, learning from others, and learning with others. Learning alone is learning where no direct social interaction is involved. This type of learning activity involves learning from individual reflection and learning from indirect interaction, for example, learning from media or other cultural artefacts. Learning *from* others is learning through direct social interaction with other people. It contributes to the development of the learner but not necessarily to the development of others. Finally, learning *with* others occurs when both interaction partners learn from each other (cf. Doornbos et al., 2004). This involves both knowledge exchange and collaborative knowledge construction. Doornbos et al. (2004) suggest that the different types of learning activity in this social learning style dimension are complementary; in some situations it is more effective to learn alone, while in other situations it is more effective to learn from or with others.

4.3. Holistic and Analytical Learning

The third learning style dimension that we distinguished, namely intuitive and analytical learning (derived from Allinson & Hayes, 1996), in contrast to the other dimensions originates from and has been studied using samples with employees and managers (cf. Allinson & Hayes, 1996; Sadler-Smith, 1998; Sadler-Smith, Allinson, & Hayes, 2000). The terminology of Riding and Cheema (1991) will be followed, who summarised a range of similar

dimensions using the terms (w)holistic and analytical learning. Analysts are individuals who mostly prefer to pay attention to detail. They approach new information and experiences with a systematic method of investigation. Holists, on the other hand, are less concerned with detail. They have adopted a broad perspective on new information and experience and tend to integrate many inputs simultaneously.

Despite its origin in research on samples with employees and managers, the holistic-analytical style dimension has received much more attention in studies on educational psychology than in studies on workplace learning. This may be due to its cognitive basis, which is more common in the former literature, and to the complexity of workplace contexts, which makes it harder and perhaps less desirable to describe the learning process in such a structured way. Some parallels can be drawn, however, with the Dreyfus model in literature on expertise development (e.g. Benner, 1982; Dreyfus, Dreyfus, & Athanasiou, 1986).

In the latter model, people who encounter situations from a context-free analytical perspective are regarded as novices, and people who encounter situations from a context-sensitive holistic perspective are regarded as experts on the job. Although this may be suggested by the comparison with novices and experts, we believe that one cannot indisputably conclude that people who are more holistic are more effective learners than people who are more analytical, or that, as Dreyfus et al. (1986) proposed, novices always learn best by using mostly analytic strategies and experts always learn best by using mostly holistic strategies. We believe that in some learning situations it is most effective for an individual to use holistic strategies and for the same individual, in other situations, it is most effective to use analytical strategies. And in some situations it may even be best to combine both strategies; for example, in medical diagnosis an experienced doctor's first hunches are usually holistic, but confirmation of these hunches is then analytically received by getting biochemical evidence or by using optimal differential diagnoses (cf. Benner, 1982; Sadler-Smith, 1998).

4.4. Reflection

There is a large body of literature in the field of on-the-job learning and other fields of study that focus on reflection, the fourth learning style dimension distinguished. Boyd and Fales (1983, p. 100) offer a definition of reflection that is convenient for the context of on-the-job learning: "Reflective learning is the process of internally examining and exploring an issue of concern, triggered by an experience, which creates and clarifies meaning in terms of self, and which results in a changed conceptual perspective". Reflection may, however, not only concern issues, but also events, persons, and books. An important kind of reflection concerns the decision about what is problematic

and what is taken for granted. The concept of reflection is, thus, even broader than Boyd and Fales' definition. Mezirow (1990, p. 1) describes its result: "Reflection enables us to correct distortions in our beliefs and errors in problem solving". Many different aspects of reflection can be distinguished:

- the amount of reflection (Kagan, 1965; Kagan, Rosman, Day, Albert, & Philips, 1964; Petzold, 1985);
- the content of reflection, such as task or social reflection (Swift & West, 1998), reflection on single or multiple contents (Alvesson & Sköldberg, 2000), and reflection on events or problems, or reflection on the self of the learner (self-reflection or reflexivity; Mezirow, 1990);
- the depth of reflection, such as shallow, moderate, or deep reflection (Swift & West, 1998), reflection or critical reflection (Mezirow, 1985; van Woerkom, 2003; Walton, 1999), and single- and double-loop learning (Argyris & Schön, 1978);
- the timing of reflection, such as reflection-in-action or reflection-on-action (Schön, 1987) and inductive or deductive learning (Felder & Silverman, 1988; Juch, 1983);
- the social dimension of reflection, such as reflecting alone or in social interaction (Swift & West, 1998; van Woerkom, 2003).

People use personal heuristics and short cuts for information processing and decision-making during work activities. Many of their actions have become routines, which saves energy. This could be called habitual action (Kember & Leung, 2000), active processing (De Chiantis & Kirton, 1996; Felder & Silverman, 1988), or knowing-in-action (Schön, 1987). However, these routines sometimes do not function (van Woerkom, 2003) and lead to bias in decision-making (Kahneman & Tversky, 1996). Reflection is then needed to change perspective. Thus, in some situations it is most effective to reflect and in other situations it is better to rely on routines, since too much reflection may lead to indecisiveness and inertia (Schippers, 2003).

4.5. Overlap and Complementarity among the Four Dimensions

Since on-the-job learning is a comprehensive activity that entails many different processes, such as working, thinking, making decisions, and innovating (Berings et al., 2005), it is not surprising that the dimensions distinguished above contain some overlap. The difference between single-loop and double-loop learning (Argyris & Schön, 1978), for example, is related both to the distinction between reproductive and developmental learning and to reflection. Single-loop learning is the detection and correction of

errors in relation to a given set of operating norms; double-loop learning is questioning the accepted norms in a learning situation. Riding and Cheema (1991) and Sadler-Smith (1998) found many similarities between the style dimensions referred to as developmental and reproductive learning and as holistic and analytical learning.

The dimensions do not just overlap, they complement each other as well. The different dimensions are needed to obtain a comprehensive view of the actual learning processes occurring in order to be able to give a profound description of the learning processes of individual employees. People can, for example, reflect alone or with others and they can use both holistic and analytical learning strategies in both reproductive and developmental learning.

5. CONCLUSION

Four core dimensions of on-the-job learning styles that can create awareness among employees and offer them opportunities for the improvement of their on-the-job learning were found in the literature on educational psychology: whether they tend to use reproductive or developmental learning strategies; whether they tend to learn alone, from others, or with others; whether they tend to use holistic or analytical learning strategies; and how they engage in reflection (e.g. the depth of reflection).

Learning styles describe the tendency to use a particular combination of learning activities across different learning situations. Individuals use different learning strategies based on their personal learning style and the particular learning situation. All four core dimensions described above are complementary to one another. The literature described above suggests that different learning strategies will be most effective for different individuals in different learning situations. If they are aware of their learning style, employees may be able to adapt their use of learning strategies to fit specific learning situations. This is called adaptive flexibility (Berings et al., 2005).

6. DISCUSSION

Literature on learning styles was explored in this study and four core dimensions of on-the-job learning styles were selected. The dimensions mentioned in the literature review by Coffield et al. (2004) were used as a starting point for an overview of educational psychology literature on learning style dimensions. The authors claimed that their selection was representative for the total range of literature. The overview of learning style dimensions was completed by adding similar models found in the literature. Nevertheless, it is possible that other dimensions would have been found had another approach been used.

The selection of the four core dimensions was driven by our aim that the selected dimensions be able to create an awareness among employees, offering them opportunities to improve their on-the-job learning. More on-the-job learning style dimensions could be distinguished with the use of other selection criteria, for example, to establish purely theoretical individual differences in on-the-job learning.

The on-the-job learning style dimensions that have been distinguished can be elaborated differently and may carry a different significance depending on the goals of the various researchers or practitioners and their specific professions. In a separate study (Berings, Gelissen, & Poell, 2007), semi-structured interviews held in Dutch hospitals with supervisors and educators, who were considered experts on nurses' on-the-job learning, were used to explore the importance and face validity of these dimensions for the nursing profession. The results showed that it is useful for nurses to be aware of the different aspects of the reflection dimension, including the question whether they reflect alone or with others. The usefulness of an awareness of the other dimensions (i.e. reproductive or developmental learning and holistic or analytical learning) was judged differently by the various experts. These dimensions showed low face validity. But what does this imply? Does it mean that it is not useful to make nurses aware of these dimensions? Or does it mean that the awareness of these dimensions in the nursing profession is low, and that, based on theoretical grounds, it is useful to make nurses more aware of these dimensions? We think it is useful to explain and make them aware of these dimensions, so that they can broaden their personal learning theories. They can expand their vocabulary and think and talk about their learning activities in a more elaborate manner than they used to. It should be noted, however, that these propositions still need to be investigated more thoroughly in future research, just like the importance and face validity of the learning style dimensions that might be distinguished in other professions.

This study has elucidated which learning style dimensions are relevant to be distinguished in workplace contexts in order to make employees aware of them. The findings provide many opportunities for researchers to develop instruments to identify these learning styles. Supervisors, mentors, coaches, and other HR professionals could use such instruments to make employees aware of their on-the-job learning styles. A coaching session for employees could be organised, for example, to reflect on their use of learning strategies in different learning situations. Various alternative learning strategies can be discussed and new learning strategies, in addition to their current personal preferences, can be tried out and developed in everyday work and learning processes, leading to a possible improvement in employees' on-the-job learning (Berings et al., 2005). Such instruments can be used to improve the individual job fit, that is, a good fit between learning style

and the learning demands of a job, or to manage the composition of a team in order to promote effective learning (Hayes & Allinson, 1998). In this study we have tried to identify those dimensions of on-the-job learning styles that can create an awareness among employees and offer them opportunities to improve their on-the-job learning. The empirical effects of the proposed interventions should still be investigated, however. Only then will we be able to find out whether an awareness of on-the-job learning styles actually improves employees' on-the-job learning.

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APPENDIX 1

Conceptual similarities of the dimensions described in this paper with other dimensions found in literature. Similarities indicated by one of the original authors are shown by *, additional similarities indicated by Coffield et al. are shown by %, and further additional similarities indicated by the authors of the present paper are shown by #.

1. Deep and surface learning approaches (Entwistle, 1981, 1988)
- Deep and surface learning achievements (Biggs, 1985)*
- Elaborative and reiterative processing (Schmeck, 1983)*
- Deep and surface-level processing (Marton, 1975)*
- Meaning-directed and replication-directed learning (Vermunt, 1992)*

2. Vermunt's learning styles (1992)

a. Meaning-directed and reproduction-directed approach:
- Deep and surface learning approach (Entwistle, 1981, 1988)* and similar constructs

b. Regulation of learning:
- Self-regulation and passive learning (Corno & Mandinach, 1983)%

3. Kolb's (1984), Honey and Mumford's (1986), and Jackson's learning cycles (2002)

a. Complete model:
- Sensing, thinking, addressing, and doing (Juch, 1983)*

b. Concrete experience and abstract conceptualisation:
- Theories about the left and right hemisphere of the brain*

c. Reflective observation and active experimentation:
- Active and reflective processing (De Chiantis & Kirton, 1996; Felder & Silverman, 1988)*
- Reflectivity and impulsivity (Dunn, 2003; Kagan, 1965)*
- The functions of mental self-government (Sternberg, 1997)#

4. Brain dominance (Herrmann, 1989)

Herrmann's model is constructed on other brain-based models, such as the left and right hemisphere (Sperry, 1977)* and the reptilian brain, limbic system and neo-cortex (MacLean, 1978)*. Conceptual relationships exist with many other theories, since each quadrant in the model contains many different characteristics.

5. Intuition and analysis (Allinson & Hayes, 1996)
- Holistic and analytical learning (Riding, 1997)*
- Global and analytical learning (Letteri, 1980)*
- Intuition and sensing (Briggs Myers, 1962; Felder & Silverman, 1988; Jung, 1923)#
- Activists and theorists (Honey & Mumford, 1986)*
- Broad and narrow category width (Pettigrew, 1958)#
- Field independence and field dependence (Witkin, 1962, 1976)#

6. Model of learning preferences (Dunn, 2003; Dunn et al., 1989)
a. Physical stimuli:
  – Visual and auditory learning (Paivio, 1971)#
  – Verbal-imagery dimension (Riding & Cheema, 1991)#
  – Visual and verbal organisation (Felder & Silverman, 1988)*
b. Sociological stimulus (learning alone or with peers):
  – Interaction dimensions (Riechmann & Grasha, 1974)#
  – Scope of mental self-government (Sternberg, 1997)#
c. Psychological stimuli of global and analytical learning:
  – Intuition and analysis (Allinson & Hayes, 1996)#
d. Stimuli of impulsive and reflective behaviour:
  – Reflective observation and active experimentation (Kolb, 1984)# and related constructs#

7. Cognitive styles (Riding & Cheema, 1991)
a. Holistic-analytical dimension:
  – Field dependence and field independence (Witkin, 1962)*
  – Levelling and sharpening (Holzman & Klein, 1954)*
  – Impulsivity and reflectivity (Kagan et al., 1964)*
  – Holists and serialists (Pask, 1972)*
  – Broad and narrow category width (Pettigrew, 1958)#
  – Intuition and analysis (Allinson & Hayes, 1996)*
b. Verbal-imagery dimension:
  – Verbal-imagery dimension (Riding & Taylor, 1976)*,
  – Verbaliser and visualiser (Richardson, 1977)*
  – Visual and auditory learning (Dunn et al., 1989#; Felder & Silverman, 1988#; Paivio, 1971*)

8. Thinking styles (Sternberg, 1997)
a. Levels of mental self-government:
  – Abstract and concrete perception (Gregorc, 1982)# and related dimensions
b. Functions of mental self-government:
  – Reflective observation and active experimentation (Kolb, 1984) and related models
c. Scope of mental self-government:
  – Sociological learning preferences (Dunn et al., 1989)#
  – Interaction dimensions (Riechmann & Grasha, 1974)#
d. Leaning of mental self-government:
  – Random and sequential ordering (Gregorc, 1982)#
  – Assimilation and accommodation (Piaget, 1970)%
  – Assimilation and exploring (Kaufmann, 1979)#
  – Convergent and divergent thinking (Guilford, 1967%; Hudson, 1968#; Wallach & Kogan, 1965)#
  – Inductive and deductive learning (Felder & Silverman, 1988)#
  – Adaptation and innovation (Kirton, 1976)%

9. Mind-styles model: perception and ordering (Gregorc, 1982)
a. Concrete and abstract perception:
  – Concrete and abstract learning (Kolb, 1984)%
  – Activists and theorists (Honey & Mumford, 1986)#
  – Initiators and analysts (Jackson, 2002)#
  – Levels of mental self-government (Sternberg, 1997)#
b. Sequential and random ordering:
  – Leaning of mental self-government (Sternberg, 1997)# and related dimensions