Towards design guidelines for work related learning arrangements

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Abstract

Purpose – The purpose of the study is to produce design guidelines based on insights from both practice and theory that will enable teachers and educational developers to execute the design, implementation and evaluation of their work-related learning arrangements with stakeholders involved.

Design/methodology/approach – The first study reported in this paper can be characterised as an exploratory design study. The second and third study can be described as design-oriented research.

Findings – The case studies showed that to realize work related learning arrangements mutual understanding between stakeholders is needed to decide what has to be learned by the students and to create learning situations that have a high similarity with real working situations.

Research limitations/implications – The ultimate evaluation question whether students indeed show high levels of learning outcomes on the levels of the framework when they followed work-related learning arrangements that are arranged according to the design guidelines, fall out of the scope of this paper.

Practical implications – Factors that influence the intended and implemented design of work related arrangements are derived from practical and theoretical insights. Design guidelines to influence these factors in a positive direction are formulated, based on these insights. For the expected learning outcomes a dynamic framework is developed.

Social implications – Work related learning arrangements are still rare in higher education and practical experience is generally only gained during short periods of internships. So the finding that learning by experience and social interaction and learning by theory and reflection should be combined in joint work related learning arrangements to obtain the most impact on the ability to transfer, will not immediately become custom.

Originality/value – Teachers, educational developers and stakeholders who are involved in developing the design, implementation and evaluation of their joint work-related learning arrangements will find evidence based design guidelines and a framework to assess learning outcomes. The theoretical insights are based on a multidisciplinary combination of workplace learning theories, educational science and innovation management theory.

Keywords Work related learning, Higher education, Workplace learning theory, Educational science, Innovation management theory, Knowledge workers, Design, Workplace learning

Paper type Research paper

1. Introduction of work related learning in higher education

Work related learning is a topic of considerable interest currently and can be broadly seen to be concerned with all forms of training and learning closely related to the daily work of employees. From the angle of higher education work related learning is an important development because parts of the formal curriculum tend to be as closely related as possible to the future jobs of students. Work related learning is by these developments increasingly playing a central role in the lives of individuals, groups or teams and the agendas of organizations (see Masick and Volpe, 1999), and its

applicability to several disciplines is obvious. However, as this area of study becomes more prominent debates have opened about the nature of the field, as well as its configurations and effects. For example some authors define work related learning as a process of individual learning; others emphasize organizational learning. Some authors prefer to use the concept of work related learning for structured, formal training processes as well as informal learning, while others use the concept of work related learning exclusively for informal learning processes (Streumer, 2006).

The line of this paper on work related learning is a combination of the workplace learning theory, educational science and innovation management theory. In Dutch education workplace learning plays a large role in secondary vocational education. Workplace learning appears in the school-based pathway for 20 to 60 per cent of the duration of the vocational course, students attend school for the remaining part. In the work-based pathway workplace learning implies that students are for more than 60 percent of the time employed in a training company. In this paper work related learning is studied as it appears within higher education. In higher education work related learning is mostly known from individual half-year work placements of students during their four years of bachelor education. Work related learning arrangements for groups of students are still rare. Rotterdam University as a university of professional education developed an educational concept in which students for 50 per cent of their time are engaged in practise driven assignments to learn to work for their future jobs. Rotterdam University has experience with public-private partnerships in several domains (for example: health, education, building and constructing) to explore the powerful learning possibilities of the workplace as a suitable place where the gap between theory and practice can be bridged. The educational innovation that is taking place in all kind of configurations can be designated as the realization of work related learning arrangements in which bachelor students learn from work related learning projects with real assignments derived from the professional working field.

A work related learning arrangement is defined as an "arranged" learning process initiated by a practice driven assignment within an authentic work environment in which a group of students is performing job tasks that are relevant for their future jobs, the group accepts the responsibility to perform the tasks adequately, the company is responsible for the quality of work assignments and the expert-novice support and the university takes the responsibility for the quality of the training taking part at the workplace and the university.

Learning is defined as the conscious and unconscious (mental) activities by individuals, groups or organisations that result in more or less permanent changes in knowledge, skills and perceptions, changes in work processes, structures and cultures of groups and organisations. Streumer and van der Klink (2004) have pointed out that learning is not a sole individual process, but is also related to the learning of teams. Individual learning and group learning are both important and meaningful configurations of work related learning arrangements.

Learning is a continuous process that never stops; indeed working in the knowledge economy shows more and more similarities with learning processes: how to cope with new situations and how to find new solutions for new assignments? Learning how to learn becomes a key metacognitive capacity. Learning can be triggered in four separate forms:

(1) By experience.

(2) By social interaction.

(3) By theory.

(4) By reflection.

Because universities are not able to teach students everything they will need to know for the rest of their lives, work related learning arrangements try to equip students with the ability to transfer, to use what they have learned to solve new problems successfully or to learn quickly in new situations (Tuomi-Gröhn and Engeström, 2007).

Because work related learning arrangements are still rare in higher education this research project investigates two good practices to derive "practice based evidence". With this practical evidence and theoretical insights a new educational practise can be designed as "evidence based practise" by applying the design guidelines for work related learning arrangements as described in this paper. When taking the design perspective on work related learning arrangements it comes to questions like: How to turn the workplace into an effective learning environment? When mentioning the powerful learning possibilities of the workplace, then the possibilities to combine forms of learning are meant. However these are possibilities and have to be "arranged" for the students that are involved. Also learning outcomes are not to be taken for granted. We are just about to know if work related learning arrangements actually impact the ability to transfer of the students involved. So to investigate the potentially impact of work related learning arrangements on the ability to transfer: an explorative question and two design questions are raised, before the ultimate evaluation question can be posed.

2. Problem definition

The previously sketched issue of preparing students in higher education by work related learning arrangements for their future careers within the knowledge economy leads to the following problem statement:

- How can the quality of work related learning be enhanced within work related learning arrangements in order to deliver future knowledge workers that have an ability to transfer?

To investigate this problem statement, three research questions will be explored in this paper:

RQ1. Which factors influence quality of work related learning arrangements and how do these factors influence work related learning by students? (explorative question)

RQ2. How do design guidelines look like that influence the quality of work related learning by students? (design question)

RQ3. How to measure the impact of work related learning of students in work related learning arrangements? (design question)

The aim of the study is to produce design guidelines based on insights from both practice and theory that will enable teachers, educational advisors and developers to execute the design, implementation and evaluation of their work-related learning arrangements, with stakeholders involved.

Based on two case studies of work related learning arrangements in which students had participated, the factors are revealed that are associated with the quality of work

related learning. The findings of these two case studies are combined with insights from literature review on workplace learning theory, educational science and innovation management theory, to further investigate if the factors indeed stimulate work related learning. This grounding of empirical found factors and findings in theory leads towards a first version of design guidelines for the design of work related learning arrangements, as an answer to the second question. For the last (third) research question a design of a dynamic framework for learning and innovation is developed, based on literature on workplace learning theory, educational science and innovation management theory. This framework is necessary to measure attained levels of work related learning by students within work related learning arrangements. The ultimate evaluation question whether students indeed show high levels of learning outcomes on the levels of the framework when they followed work-related learning arrangements that are arranged according to the design guidelines, fall out of the scope of this paper.

3. Research method
This paper is based on evidence extracted from two case studies: *Learning to Build* and *Teacher Training at School*. The case studies are:

- Case 1. *Learning to Build* is a work related learning arrangement of 20 weeks (two days a week) with five fulltime bachelor students in their sixth or seventh semester of their bachelor education in building. The students get the opportunity to re-design existing houses. A clearance and building order had to be submitted for the official approval by the local authorities. After the approval the plan is carried out by secondary vocational education students being trained for skilled craftsmen jobs.
- Case 2. *Teaching Teachers at School* is a work related learning arrangement (with duration of three years) of bachelor students studying at the Institute for Teacher Training to become a teacher in a certain subject. This case study followed eight to ten first year students who participated during 25 weeks (two days a week) a concurrency curriculum in which the construction of practical theory is school centred and thoroughly investigated. Learning-to-connect practice with prior knowledge is mainly located at the school. Learning-to-collect subject matter knowledge is mainly located at the university.

Research design
The study for the first research question can best be characterised as an exploratory design study (van den Akker *et al.*, 1999). This type of study leads, via theory and practice, to a number of cohesive factors, which are (possibly) of influence on the quality of work-related learning arrangements and the way in which this affects the quality of work-related learning. As an answer to the second question the factors found are translated into guidelines that can be used by lecturers and curriculum developers in the development of learning arrangements on the interface between learning and working. The study reported here has not yet examined whether these factors (effective design guidelines) can explain high-quality work-related learning. This will be discussed in a later study.

The study reported in this paper for the second and third question could best be described as design-oriented research (van Aken, 2004; Andriessen, 2004). When reconstructing the two cases, the reconstructive study approach was taken, as the aim

is to find factors that are crucial for the efficiency of the design and the effectiveness of work-related learning by students. There was as little intervention as possible in the reconstruction of the design and implementation of the work-related learning arrangements. Based on document analysis, interviews and observations, a reconstruction was made of which aspects of the work-related learning arrangement received in practice a great deal of attention and which, little.

In the case studies the work related learning arrangements were reconstructed by the nine curricular components of the spider web model of Van den Akker (2003). Also part of the reconstruction were the performance of coaching activities offered by teachers with an educational background or experts with a practical background and the practical assignments that were developed by the participating experts and instructional designers of the Rotterdam University. The encountered problematic efforts to change the design of effective work related learning arrangements are often manifested in major gaps between ideals and outcomes (Van den Akker, 2003). This leads to the decision that factors that are related to the quality of the intervention "work related learning arrangement" will be analysed on the levels of the "intended" and the "perceived" level of work related learning in order to examine the nature of the intervention and how it is perceived.

Instruments
In both case studies, the spider web model of Van den Akker (2003) is applied. The nine curricular components are shown in Figure 1 and described in Table I. The instrument is used of Van den Akker (2003) that is based on the instrument of Goodlad (1994; Goodlad and Su, 1992). A comparison is made between the ideal work-related learning arrangement (the intended curriculum) and the implemented work-related learning arrangement as perceived by participant in practice (the perceived curriculum). The comparison between the intended and the perceived design was elaborated on the basis of the curricular components from the spider web model of Van den Akker (2003).

Data collection and processing
To compile the scores for the curriculum as intended, the researchers studied the documents of the design of the work-related learning arrangement for the Learning to
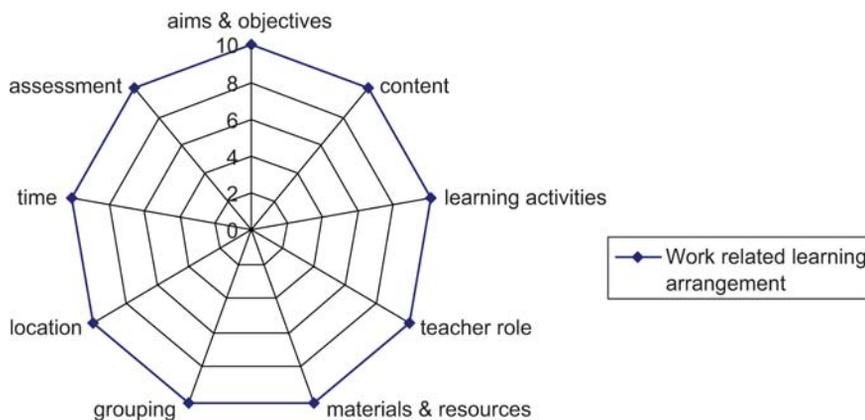
Source: Adapted from Van den Akker (2003)

Figure 1.
Spider web model with nine curricular components to determine the vision of work related learning arrangements

Build case, and the Teacher Training at School case. To compile the scores for the curriculum as perceived, several student meetings were observed and transcribed, as were meetings of the steering group and other more informal meetings. In addition, a questionnaire was completed by the participating students about their motivation, with a self-assessment of their initial standards of competency and the competencies to be acquired. The students were also asked how they felt about the supervision and the division of roles between the coaches (from the university) and mentors (from the company), the consultations with specialists and the time pressure of the work-related learning arrangement.

The scores for the curricular components of the spider web model for the design as intended and the design as implemented (for both cases) are averages of the scores of the curriculum components, based on the available datasets (analysed documentation and analysed meetings. Qualitative analysis of the datasets was conducted and codes were allotted. Codes can be defined as keywords that describe a piece of text to which the code relates. They thus express the "meaning" of a text fragment. The codes were then put into categories that coincided with the curriculum components of the spider web.

Codes can express a positive, negative or neutral rating (based on text fragments from the analysed documents, observations and quotations by the respondents during meetings). The codes were rated on the basis of a ten-point scale, in which a score of 10 is very positive and a score of 0 very negative. The scores of the quotations were averaged by category. This produced an "average score" for each curriculum component of the spider web. This applies to all components of both the curriculum as intended and the curriculum as implemented (for both cases).

4. Findings of explorative case studies on work related learning

Both case studies showed that to realize work related learning arrangements mutual understanding between stakeholders is needed to decide what has to be learned by the students and to create learning situations that have a high similarity with real working situations. Authentic assignments tend to address students with a learning readiness to solve innovative problems who meanwhile developing themselves as knowledge professionals. Teachers and experts strive for a joint responsibility to support students in their acquisition ("learning-to-collect") of sufficient conceptual knowledge and in their engagement in social interaction processes ("learning-to-connect") to obtain knowledge and practical experiences at the workplace.

Vision. Why are they learning?	
Aims and objectives	Towards which goals are they learning?
Content	What are they learning?
Learning activities	How are they learning?
Teacher role	How is the teacher facilitating their learning?
Materials and resources	With what are they learning?
Grouping	With whom are they learning?
Location	Where are they learning?
Time	When are they learning?
Assessment	How to assess their learning progress?

Source: Van den Akker (2003)

Table I.
Curriculum components of work related learning arrangements

The main findings of the multiple case study were:

- The work related learning arrangements are specific "solutions" for the specific work related learning context and the specific subject domain(s).
- The curricular components of the spider web model are of general value to plan and implement work related learning arrangements.
- Comparing the intended and perceived design of work related learning arrangements is a usable measurement to examine the quality of work related learning arrangement as a set of interventions.
- The measurement of the attained level of work related learning (as an outcome of a work related learning arrangement) requires to distinguish between different levels of work related learning (individual, group, organization and network level).
- Learning by experience and social interaction are almost automatically generated by work related learning arrangements, where as learning by theory and learning by reflection are not spontaneously generated.
- The roles of teachers from school and experts from companies vary in the way they function as role models for students: experts are very strong role models, but teachers from school are not having much added value according to the students.

Based on the findings of this multiple case study it is concluded that as an answer to the first research question the components of the spider web model (Van den Akker, 2003) are important factors that influence the quality of a work related learning-arrangement as an intervention. In Figure 1 the nine components are visualized as a spider web, not only to illustrate its many interconnections to determine the overall rationale of the work related learning arrangement, but also to underline its vulnerability. Although the emphasis of curriculum design on specific components may vary over time, eventually the alignment between the elements is an important measure to determine the overall quality of work related learning arrangements. A striking example is that many workplace-learning initiatives tend to overemphasize the influence of the workplace as authentic learning place with usually initial attention to change the location of learning. Many implementation studies have exemplified the need for a more comprehensive approach and systematic attention to the other components before one can expect robust changes. As van der Klink (1999) put in the conclusion of his dissertation: "Despites all optimism, there is no strong evidence for the supremacy of the workplace as a learning environment".

The nine components that address specific questions about the curriculum design of work related learning by students are represented in Table I. The vision referring to overall principle or central "rationale" of the work related learning arrangement can be determined by the nine components, that are all ideally linked to the vision and preferably consistent with each other. The components do not only cover substantive issues but are also focusing on "organizational" aspects such as: grouping of students, locations for working and/or learning and available time for learning and learning tasks.

When deriving work related learning by students from the extend to which the work related learning arrangement as an intervention is realized in practice, the quality

of work related learning arrangements can be measured. When the measures are compared by the extent in which the arrangement is implemented as perceived by the participants and the operational arrangement such as manifested by teachers in practice (this is called the curriculum as implemented) and the extend in which the arrangement was planned (this is called the curriculum as intended). See Figure 2, which illustrates this comparison for case study 1: Learn to Build. For each curricular component of the curriculum as intended and the curriculum as implemented is taken an average score (based on the available datasets such as documentation and analysed meetings) on a scale of 1 (badly worked out) to 10 (excellent worked out). The figure shows that most components in the curriculum as implemented show a decline in quality compared to how the work related learning arrangement was intended. Because in this case study students were more creative in their time planning and location of learning, these components were evaluated higher in the curriculum as implemented, compared with the planned curriculum as intended.

To be able to assess the learning outcomes by the attained level of work related learning by students in arrangements requires a multilevel framework of learning by individuals, groups, organizations, and networks. The way different forms of learning can be generated by work-related learning arrangements and the supportive roles of teachers are components that need more profound literature review that is found in the next paragraph.

5. Literature review on findings of multiple case study on work related learning

The empirical findings of the multiple case study are in this paragraph combined with insights from a literature review on workplace learning theory, educational science and innovation management theory. Are these findings in other studies also associated to stimulate work related learning? This grounding of empirical found factors in theory leads to a first version of design guidelines for the design of work related learning arrangements and leads to an answer on the second research question within the next paragraph.

Work related learning arrangements are context specific solutions
Work related learning arrangements take the form of all kinds of configurations. The domain specific aspects of the education leads to several different "solutions" and designs for work related learning arrangements. A "thick description" of the context of
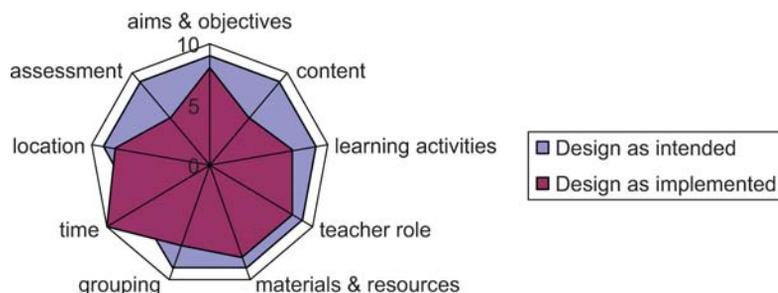
Figure 2.
Spider web model with nine curricular components to compare the quality of the design as intended and design as implemented of the work related learning arrangement of case study 1 Learning to Build

Sources: Adapted by Van den Akker (2003) and Lappia (2009)

the case study is necessary to describe all the factors that influenced the design specifications. Important insights from literature are that work related learning arrangements reflect different perspectives on work related learning and their different rationalities. Nieuwenhuis (2004) divides four rationalities: learning for security (diploma), learning for productivity, learning for innovation, and learning for participation, and self-realisation. In each rationality educational goals become more open. Work related learning arrangements in higher education are more placed in the rationality of learning for innovation and learning for participation and self realisation, where as workplace learning in secondary vocational education is more placed in the rationality of learning for security (diploma) and productivity.

Curricular components of spider web model are generalizable components of work related learning arrangements

To compare different solutions as an intervention to enhance work related learning, arrangements require a more general model which was found in the Spider web model (see Figure 1) that distinguishes the following nine curricular components that have to be planned and implemented: aims and objectives, content, learning activities, teacher role(s), materials and resources, grouping, location, time and assessment. These nine curricular components together determine the vision of the work related learning arrangement. To make sure the intervention provides students with the ability to transfer what they have learned for the rest of their careers, it is necessary not only to examine the nature of the interventions by these nine components but also how the interventions are implemented. There are several curriculum definitions. Curriculum is a "plan for learning" and most definitions contain the elements of content, purpose and organization of learning. The more elaborated list of components of Van den Akker (2003) fits the explorative goal of the multiple case studies and illustrates the familiar expression: every chain is as strong as its weakest link. This seems an appropriate metaphor for a curriculum configuration such as a work related learning arrangement, pointing to the complexity of efforts to improve its design and implementation in a balanced, consistent and sustainable manner.

Comparing design as intended and design as perceived makes sense

The theory on curriculum representations developed by Goodlad (1972) and van den Akker (1998) is a generally accepted and sound starting point for the design of new frameworks. Vos *et al.* (2010) used the intended curriculum representation and the divided implemented curriculum representation into the perceived and the operational curriculum. They conducted face validity sessions with experts and the teachers involved in context-based chemistry teaching and concluded that that there was strong support for these categories. They added in their framework also three levels of thinking and acting of teachers such as van Hiele (1986) distinguished in the communication of teachers on new materials and new visions of curriculum. The levels describe the successive levels of meta-cognitive mastery of teachers on innovative materials and the mastery of the innovation itself.

Measuring attained level of work related learning requires more levels of learning

The intended and perceived work related learning arrangements are leading to a certain attained level of work related learning. The results of these case studies, and the

literature review on workplace learning (Streumer and van der Klink, 2004), knowledge management, and social innovation (Volberda *et al.*, 2007), gave the idea to split the attained level of work related learning into the different levels of learning: individual, group, organization and (open innovation) network learning. The student needs to participate in a larger and more complex setting and thereby expanding their learning and participation level.

Different outcomes on different forms of learning require different teaching instruction
Because learning by experience and social interaction are almost automatically generated by work related learning arrangements, where as learning by theory and learning by reflection is not spontaneously generated. These findings in higher education are highly similar to findings of Poortman (2007) among students in secondary vocational education: "Nearly all social interaction processes are involved through workplace learning in virtually all cases, although their proportion may not always be adjusted to the student's needs. There is no generally occurring internal acquisition process, because this depends on specific combinations of cognitive, emotional and social elements". Learning-to-collect enough knowledge depends on prior cognitive structures (prior knowledge) of the learner and the required psychological energy (motivation and emotion). Poortman (2007) adopted Illeris' learning theory (2002) that differentiates between four subsequent learning processes that generally have more impact on cognitive structures and require more psychological energy:

(1) Accumulative.

(2) Assimilative.

(3) Accommodative.

(4) Transformative learning processes (see Figure 3).

They categorize six different social interaction processes:

(1) Perception.

(2) Transmission.

(3) Experience.

(4) Imitation.

(5) Activity.

(6) Participation.

These categories are partially overlapping and a "higher" category implies a more active role and more independence for the learner.

In the findings of the multiple case studies two metaphors that are present in the learning theory of Illeris (2002) also occur in practise: the acquisition metaphor that learning is viewed as the acquisition and accumulation of knowledge. And the participation metaphor: learning is an ongoing activity that is tied to the context in which it takes place and implies increasing participation in communities of practices. In case study 2: the learning processes were called learning-to-collect and learning-to-connect. In the assessment of learning outcomes both learning processes are relevant and probably require different teaching instruction strategies.

Levels of internal acquisition learning processes and outcomes					
To:	Measure pre & post	Accumulate	Assimilate	Accomo-date	Trans-formate
Social-economic & cultural level	P.M.: Out of scope of this research project	Idem	Idem	Idem	Idem
Network level	Idem for network	Accumulation of 8 groups	Schedules and job aids	Not observed	Idem
Organiza-tion level	Idem for organization	Engineering company & university are collecting plans for reconstruction	The evaluation questions are added to the existing evaluation	Reflection on expert-novice relationships requires critical reflection of expert	Not observed
Group level	Prior knowledge, motivation and emotions of group / Group initiative and activity degree / Interaction activity and role of other(s) (organizations)	Between groups of students not much knowledge is accumulated. The network of mentors and teachers is the linking pin between student groups	The evaluation questionnaire is applied in the next student groups. Results are not related to former student groups.	No learning of a higher order is possible because of lack of accumulation	Idem
Individual level	Prior knowledge, motivation and emotions of individual / Learners initiative and activity degree	All students accumulated their information about the legislations of the council of Rotterdam for applying for a clearance & building order. When they do not continue working for engineering companies in Rotterdam this knowledge will fade away	All students disliked counting in the technical-physical domain, but because they did this task together their knowledge of constructing is enlarged (their motivation grew, but kept lower than for their own specific tasks)	Three students reach the level of accommo-dation in relation to their specific task: their prior represen-tation of knowledge is challenged and requires recon-struction to fit with new collected knowledge	Two students undergo a trans-formation process: the project leader got over her anxious nightmares of confronting the commissioner of the project and an upcoming architect got reinforced of his artistic ambitions

Levels of analysis of the social interaction processes

Note: Cells filled in with examples of case study 1: Learning to Build
Sources: Inspired by Volberda (2006, 2007); Volberda *et al.* (2007) and Poortman (2007)

Figure 3.
Dynamic framework of learning and innovation: acquisition of learning processes resulting in learning outcomes divided in social interaction levels

Different added value of teacher roles as role models for students
As found in the multiple case study experts in work related learning arrangements function as strong role models for students in higher education, but teachers from school are not having much added value according to the students. Also Poortman

(2007) concludes that teachers play a very small role in the students' learning processes. Nevertheless learning processes of students related to the role of the teacher and expert-novice support should be further investigated.

This literature review gives input to formulate in the sixth paragraph an answer to the second research question about design guidelines, to plan and implement work related learning arrangements that are of good quality.

6. Towards design guidelines for work related learning arrangements

Based on the empirical and theoretical insights a first version of design guidelines for work related learning arrangements are described in this paragraph. The design guidelines zoom in from macro level, via micro level to practical organizational level.

Design guidelines for the intended work related learning arrangement on macro level to be described in a starting document and substantive learning materials:

- *Rationale*. Clarify the rationale of the work related learning arrangement as a central mission or major orientation point for the other nine components that are ideally linked to the rationale and preferably consistent with each other (Van den Akker, 2003).

- *Aims and objectives*. Decide with representatives of the company involved in the work related learning arrangement by executing a needs assessment (Kessels, 1993) or by continuous monitoring which competences are required for future knowledge workers and keep in mind that learning outcomes may vary between the different levels of learning (individual, group, organization and network) try to describe as concrete as possible the aims and objectives of the work related learning arrangement and its expected learning outcomes (Streumer and van der Klink, 2004).

- *Content*. Put central an authentic object and assignment that comes from practice and sets an urge for new knowledge products that has learning potential because there are many disciplines or "activity systems" involved (Tuomi-Gröhn and Engeström, 2007) or there is a must to transform former basic principles (Poortman, 2007).

Design guidelines for the work related learning arrangements on micro level to be coherently addressed to expect successful implementation and continuation:

- *Learning activities*. Balance out learning activities that follow formalised working processes (as referencing points at one hand) and offer enough space for learning and employee participation in the solution of working problems and development of new working processes (as challenging at the other hand) (Ellström, 2001).

- *Teacher roles*. Treat students as junior colleagues. Teachers from schools should act as senior advisors facilitating mainly the acquisition and accumulation of new knowledge by learning by theory and reflection within the open innovation network. Expert-apprenticeships should focus on the learning by experience and social interaction and thereby enhancing the self supportiveness of the students in their learning (Illeris, 2002; Poortman, 2007).

- *Materials and resources*. Learning materials should call upon prior knowledge of students and stimulate students to consult experts that are available at the

working place. Depending on the cognitive level of the students, learning resources have to be made context specific to have added value for the students and experts must be able to disclose their knowledge on a question-based manner (Lappia, 2009).

Design guidelines for the organization of work related learning arrangements:

- *Grouping*. Allocate students based on their individual motives for learning over the various learning trajectories and groups. Keep in mind that groups should best be formed with a cognitive distance between the individuals and groups that is large enough to learn from each others new perspectives, but small enough to reach mutual understanding

- *Location*. The physical and authentic workplace should be the central working place for work related learning arrangements. Concurrent to the working and learning at the workplace, cognitive and reflective learning can be organized on a separated more quiet place that allows students to reflect upon their working and learning.

- *Time*. Make a timetable for work related learning that allows a combination of creative turmoil and deadlines to deliver the new knowledge products and periods of peace and stability to reflect upon results and offers opportunities for feedback (Kessels and Keursten, 2001).

Before design guidelines for the ninth component "assessment" of the attained level of work related learning can be developed the dynamic framework with which we might observe the performance and learning outcomes of work related learning arrangements deserves our attention. Because assessment of learning is critical for successful curriculum change, we develop in the next paragraph a new dynamic framework for work related learning and innovation on different social interaction levels and different levels of generating and elaborating new knowledge.

7. Dynamic framework for work related learning and innovation

The literature review gave the idea to split the attained level of work related learning into different levels of learning: individual, group, organization and (open innovation) network learning. Because assessment of learning is critical for successful curriculum change, in this paper a dynamic framework is developed as an answer to the last research question. The impact of work related learning is visualize by stating the learning outcomes of the acquisition of knowledge in processes like accumulation, assimilation, accommodation and transformation and divide them into different social interaction levels. The learning outcomes as written down in the cells need to be joint products of social interaction and cognitive integration of knowledge and experiences. In this way the axes show in a way similarities to the distinction Kessels (1993) made to operationalize quality of training into curriculum consistency with internal consistency and external consistency. Work related learning arrangements are internally consistent when they facilitate an accumulating level of knowledge acquisition and the learning environment, learning activities, teacher roles and expert-novice support facilitate to obtain the necessary ability to transfer. Work related learning arrangements should also be externally consistent. What an individual student will learn in his learning group should be aligned with but also influence the ideas that the

participating labour organization holds on the central subject and the other organizations within the open innovation network.

8. Concluding remarks and future research

In the last paragraph the answer to the last research question is formulated: How to measure the impact of work related learning of students in work related learning arrangements? When students are involved in work related learning arrangements in higher education, social interaction learning processes and cognitive integration learning processes have to be arranged in order to facilitate students to learn constructively and to progressively recontextualize knowledge, skills and attitudes. To measure the impact of work related learning of students it is important to distinguish between the process of consequential transition of internal acquisition learning processes (which involves changes in the identity of the individual) and the expended learning between different levels (activity systems) of the social interaction learning processes. The dynamic framework forms a basis for an assessment tool in which both learning process are combined into a dynamic whole.

A concluding remark is that to keep being able to manage innovative knowledge services in the current uncertain knowledge economy, it is important to prepare students in work related learning arrangements in higher education to social interaction learning processes and cognitive integration learning processes. Only by doing so in combination: cognition, social and emotional aspects of learning is addressed. To use the right information and knowledge requires a high level of connotative (emotionally focused) power among the participants of work related learning.

In the next research projects and case studies the dynamic framework will be further operationalized. It might serve as a systematic and relational approach to offer a framework to see whether work related learning arrangements are leading to the great expectations that students are indeed able to develop an ability to transfer. If this outcome is attained, students will be able to adapt easily to the rapid changes in economic, technical and social conditions and are prepared to the related lifelong learning trend. The expectations for future studies are that:

· the design guidelines are leading to a work related learning arrangement that is of sufficient quality to have a positive impact on work related learning by students;

· the dynamic framework as an assessment tool will make learning outcomes and ability to transfer measurable; and

· the dynamic framework as such might trigger the expected positive work related learning outcomes, because it offers clear expectations about the learning processes that participants of work related learning arrangements are expected to go through to realize the expected outcomes like solutions for the assignments.

Work related learning arrangements are still rare in higher education and practical experience is generally only gained during short periods of internships. So the finding that learning by experience and social interaction and learning by theory and reflection should be combined in joint work related learning arrangements to obtain the most impact on the ability to transfer, will not immediately become custom.

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Further reading

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