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DESIGNING LEARNING IN THE WORKPLACE

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Abstract

This study addresses product and process features of design products supporting learning in the workplace. From the perspective that learning in the workplace needs a specific design approach, six theoretical assumptions were derived from literature. Those assumptions were used to analyse sixteen design products and accompanying process reports composed by university students in human resource development (HRD). Results of this reconstruction study show that workplace learning designs contain specific product and process features in accordance with the theoretical assumptions. These features help to shape recommendations for designing and stimulating learning in the workplace.

Introduction

Learning in the workplace is of immense importance in many current theories about human resource development (Bassi *et al.*, 1998; Kessels and Poell, 2001; Klarus, 1998; Streumer, 2001; Torraco, 1999; Van der Klink, 2001). The workplace is described as a powerful learning environment for various reasons (see, for example, Poell, 1998). Firstly, some learning processes are believed to be more effective in the workplace, because they are difficult to master in school-based learning environments. Secondly, the practice-based structure of the workplace averts transfer problems in learning. The third reason is that a lot of work has become knowledge work in which learning in the workplace takes place naturally and integrally (Kessels, 2001). Despite different theoretical perspectives underlying these reasons (Onstenk, 1997), the question how to design, support and encourage learning in the workplace may be considered a combined issue. From a design perspective, the work setting appears as an explicit object of design.

Designing learning in the workplace

Current design theories and methodologies are of only limited use here, as they are often focused on the design of formal learning environments situated outside the work setting. In addition, a technological and systematic perspective usually prevails, with the designer as the main actor who sets objectives after analysing the problem and who designs products to achieve these objectives according to a specific sequence (Lowyck, 2001; Van der Waals, 2001; Visscher-Voerman, 1999). The role of the other actors in this process (the educator and the learner) is primarily reactive and consists of supplying information to analyse the problem, applying the design products provided and helping gather formative evaluation data as a means toward improving the product. This design methodology (also known as a systematic approach) embodies several assumptions, of which the most significant ones appear to be that: 1) the learning objectives may be established unambiguously by designers; 2) the methods for achieving these objectives may be determined by designers; 3) designers are responsible for solving the problem; and 4) designing and learning are two separate operations, in which design activities are regarded as prerequisites for learning activities.

These assumptions also reveal why such a design methodology is inadequate for designing the work setting to serve as a learning environment. In learning in the workplace, designers are never the only

actors, as the working context determines objectives and contents to a large extent, which necessitates consent and co-operation from many actors in designing learning processes within the work setting.
Moreover, learning in the workplace is not only about learning processes geared toward solving a problem. It also concerns development-oriented learning processes that facilitate and support achievement of organisational, professional and personal objectives (Kwakman, 2001). Such objectives are far harder for designers to establish unambiguously, because they often involve developing learning ability, independent knowledge acquisition, professional enrichment or career development (Kessels, 2001; Kwakman, 2001; Lowyck, 2001). From this perspective, it would also be illogical for the designer alone to present solutions to problems, as the process of searching for solutions has potentially powerful learning effects.

Which responsibilities remain for designers? Designers might help design the work setting to encourage and support workers in their independent search for solutions, acquisition of their own knowledge and development of their own professionalism. These are the principles underlying what is also known as constructivist design (Lowyck, 2001). In constructivist design, employees design their own curricula as a team and are supervised by a learning coach. As a result, learning is always an interactive process, in which educators and learners are not merely users of predetermined design products but are also co-constructors of the product. Working on this product underlies the curriculum, which involves prototyping: the product is subject to continuous refinement and improvement based on user feedback.
The procedure has major consequences for the design process, which becomes far more dynamic:

> if designing is cyclical and procedural rather than pre-programmed, and designers do not generate finished products ready for adoption and application by educators and learners, but is interactive instead, then opportunities for co-ordinating individual learning processes should be considered from an entirely different perspective. (Lowyck, 2001, p. 169)

Lowyck proposes a participatory approach involving as many different actors as possible. This approach closely resembles the relational design approach devised by Kessels, in which designers perform several design steps and operations by working closely with various concerned parties from the work setting (Kessels and Plomp, 1999). Both approaches affect the design process in three ways (see also Van der Waals, 2001):

1. Designers become coaches who help co-ordinate the many plans, activities and outcomes of learning. In doing so, they are not so much substantive experts but rather coaches of learning processes. Objectives and design products are therefore far harder to determine unambiguously in advance.
2. Because of the fading distinction between designing and learning, learners help design their own curricula and set the objectives.
3. Careful planning becomes less important in the preliminary stage, as concretisation occurs during implementation, and many decisions are taken along the process. This means that the plans and ideas formulated during the preliminary stage will change repeatedly during implementation.

Overall, this approach to designing alters the format of both the design product and the design process.

The theoretical assumptions suggest that:

1. The product is more often a prototype than a finished product and is therefore not as immediately applicable.
2. Objectives are not formulated clearly in advance.
3. Various actors are involved in the design process.
4. Users have their own input in the process.
5. Changes occur in the course of implementation.
6. Designers serve as coaches.

Problem statement and research questions

We may conclude that changes concerning the design process are more elaborate than those concerning the product within the literature. One major reason might be that empirical data is not yet available regarding the application of the relational approach within the design of learning in the workplace and the features of products to be designed for this purpose.

This observation leads to the following problem statement:

Which design products support learning in the workplace, and what are the main features of their design process?

The response to this problem statement is intended to enhance our insight into the type of products that support learning in the workplace (first research question). An additional objective is to acquire empirical support for the theoretical assumptions concerning the design process by identifying its characteristics (second research question). Finally, we hope these results will enable us to derive several hypotheses about possible relations between product and process features (third research question).

Method

The study is to be defined as a reconstruction study, analysing existing design products and process reports. In the autumn of 2001, 16 third- and fourth-year Educational Science and Technology students at the University of Twente were instructed to design a workplace-learning plan. These assignments were carried out at 13 different organisations in various sectors. Each student submitted both a product report and a reflection report following this design assignment. Both reports were analysed for all students to respond to the problem statement.

Procedure

Altogether, 16 individual commissions were recruited by a team of instructors according to a list of sample products. The procedure for the students' assignments was based on the following principles:

- The assignments had rigid deadlines.
- In the preliminary stage each student drafted a plan of approach based on specific design criteria.
- Students were required to apply elements from the relational approach.
- University supervision targeted the design process and included explicit guidance with the relational design approach.
- The final version of the product depends on the design criteria drafted and the agreements with the organisation; this final version is the product for the organisation.
- Afterwards each student drafts a reflection report substantiating the design approach and process.

Analysis

The response to the first sub-question about design products to support learning in the workplace consisted of a description of the type of products designed (based on the finished products that the students generated). Next, the different products were categorised as well. The first step in categorisation was to assign them to the different categories in the sample list, which are a modified version of Onstenk's categories concerning learning potential at corporate organisations (1997):

1. products designed to establish and develop individual competencies;
2. products designed to establish and develop group competencies;
3. products concerning instructional facilities in the workplace;
4. products concerning learning opportunities embedded in job characteristics;
5. products concerning learning opportunities embedded in generating and storing information;
6. products concerning learning opportunities embedded in the social work setting.

The second step in categorisation was to subdivide the products according to whether they were suitable for immediate use.

To answer the second sub-question about design process features, we analysed reflection reports from students based on five analysis questions derived from assumptions in the work of Lowyck and Kessels. The analysis questions were as follows:

1. Have clear objectives been formulated?
2. Which different actors are involved in the design process?
3. What input do users have in the design process?
4. Has the execution stage changed?
5. What role do students play in the design process?

Answers to these five analysis questions were formulated for each design product. Next, the answers were categorised for each analysis question, and a corresponding matrix of product and process features was generated for all products. The patterns in this matrix were then analysed to trace possible links between product and process features (Miles and Huberman, 1994) to answer the third sub-question.

Results

Product descriptions

A concise description of the different assignments and ultimate design products is provided. Every product has been assigned a product designation (in parentheses) to be used throughout the remainder of the analysis.

1) The assignment was to design an instrument to identify competencies of staff at the personnel departments of a hospital. These departments were combined during a recent merge between several hospitals. The final product is a framework for such an instrument. In addition, the management team has been issued recommendations for staff to elaborate this framework independently (competence mapping).
2) The assignment was to develop a system or procedure for staff at a small agency for corporate education specialised in multimedia educational programs to enhance their understanding and awareness of each other's respective disciplines to reduce miscommunications. The final product is a visual diagram of the procedure for producing multimedia educational programs (metro line).
3) The assignment was to draft an interview protocol for identifying priorities of management in implementing a development-based staff policy at a polytechnic institute for agricultural science. The final product is a definitive interview protocol for conducting these interviews (interview protocol).
4) The assignment was to compile a competence profile for horticulturists and assistant supervisors at a small horticultural firm. The competence profile was supposed to pinpoint the attitude, knowledge and skills concerned. The final product is a description of how the horticultural firm can develop this competence profile independently, including a prototype of a competence profile as a reference for ongoing development (competence profile description).
5) The assignment was to design a structure for meetings where nurses at a psychiatric hospital could share experiences. The final report is an advisory report about the different ways for nursing staff to share experiences (experience-sharing intervention).
6) The assignment was to analyse the discrepancies between the current and required levels of competence among supervisors at a medium-sized town hall. The municipality is introducing self-steering teams, but the expectations and requirements for this new structure remain unclear. The finished product is an elaborate competence profile for district team managers supervising these self-steering teams (competence profile).
7) The assignment was to organise a workshop for a self-steering team at a working conditions supervision organisation with a view toward generating a list of skills necessary to optimise the team's performance and for members to learn from each other. The final product is a guideline for a

workshop where self-steering teams are encouraged to think about skills needed to optimise their performance (workshop guideline).

8) The assignment was to compile new instructions for participants in a management course at a major international electronics firm to formulate instructional objectives. The finished product is an improved set of instructions to help future participants chart their personal instructional objectives independently prior to the course. In addition, several recommendations with respect to the role of the coach in the preparatory stage have been provided (instructional objectives).
9) The assignment was to draft guidelines for coaching interviews between supervisors and their staff at a major service firm providing travel advice over the phone. The management considered the current instrument inadequate for assessing performance. The finished product offers several recommendations for feedback during coaching interviews (coaching advice).
10) The assignment was to design a procedure for establishing a foundation for introducing result-oriented management (ROM) at a hospital. The finished product was a proposal for a procedure (ROM procedure).
11) The assignment was to redesign an existing personal development plan (PDP) to generate a digital version for a major agricultural distribution firm. The finished product was a hard copy and digital version suitable for immediate installation and use (PDP).
12) The assignment was to determine what hospital supervisors needed to learn about conducting performance reviews and to propose an appropriate learning project. As a new system for performance reviews was introduced, the administration did not expect supervisors to be sufficiently competent to handle this new system. The final product is a proposal for improving expertise through supervision (supervision proposal).
13) The assignment was to draft non-verbal operating instructions for foreign workers who knew very little Dutch and were employed temporarily at a major agricultural distribution firm. The final product is an advisory report about the perception of the problem on the work floor and the solutions presented by the work floor (operating instruction consult).
14) The assignment was to develop a curriculum for R&D technicians at a major technological firm. The firm acknowledged a lack of adequate educational opportunities for this category of staff, despite the vast technological progress they are confronted with. The final product is a prototype for a learning project to determine the learning needs of this group of technicians (learning needs project).
15) The assignment was to redesign (preferably in a digital format) an instrument for determining educational needs at a major agricultural distributor. The final product is an advisory report about the opportunities provided by the instrument (educational needs advisory report).
16) The assignment was to develop an analytical framework for identifying the learning potential of jobs within a meteorological organisation. The head of the educational division felt that certain positions offered insufficient learning opportunities. The final product is a problem analysis of the learning potential of a specific position and an advisory report for identifying the learning potential of other positions (learning potential advisory report).

Product features

The 16 products were subsequently categorised according to learning potential and product type (see Table 1). With respect to learning potential, all products conformed to the predetermined categories. The table reflects products in only three of the six categories: individual competence development (7x), group competence development (6x) and learning opportunities embedded in job characteristics (3x).
With respect to product type, it was expected that there would be 1) a finished product ready for immediate user implementation or application or 2) a prototype requiring additional user elaboration or development. Although both product types occur (5x finished product, 1x prototype), the analysis revealed a third type consisting of an advisory report (7x). Products assigned to this category contained recommendations or ideas requiring additional discussion and decisions within the organisation. The analysis also revealed a few hybrid products comprising both a finished product and an advisory report in one case and a combination of a prototype with an advisory report in two cases.

Table 1: Products categorised according to learning potential and product type

	Learning potential category	Product type
1. Competence mapping	group competence	prototype + advice
2. Metro line	job characteristics	finished product
3. Interview protocol	individual competence	finished product
4. Competence profile description	group competence	prototype + advice
5.Experience-sharing intervention	group competence	advice
6. Competence profile	individual competence	finished product
7. Workshop guideline	group competence	finished product
8. Instructional objectives	individual competence	finished product + advice advice
9. Coaching advice	individual competence	finished product
10. ROM procedure	job characteristics	advice
11. PDP	individual competence	prototype
12. Supervision proposal	individual competence	advice
13. Operating instruction consult	group competence	advice
14. Learning needs project	group competence	advice
15. Educational needs advisory report	individual competence	advice
16. Learning potential advisory report	job characteristics	advice

Process features

We analysed the design process for each product based on the analysis questions formulated to identify process features. Possible answers to each question and their distribution among the 16 products will be indicated below. Specific product features are listed in Table 2.

Objectives The analysis question concerning the material is whether clear objectives have been formulated. The answers are either negative or affirmative. With only two products (that is, 2 and 8), objectives were formulated explicitly, although the type of objectives varied considerably. The 'metro line' product included improvement goals that the product was supposed to further, while the 'instructional objectives' product formulates instructional objectives. No objectives were stated for the other 14 products.

Table 2: Matrix of product and process features, itemized by product category

Product	3. Interview protocol	6. Competence profile	8. Instructional objectives	9. Coaching advice	11. PDP	12. Supervision proposal	15. Educational needs advisory report	1. Competence mapping
Category	Ind.comp.	Ind.comp.	Ind.comp.	Ind.comp.	Ind.comp.	Ind.comp.	Ind.comp.	Group comp.
Type	Finished product	Finished product	Finished product + Advice	Advice	Finished product	Prototype	Advice	Prototype + Advice
Objectives?	No	No	Yes	No	No	No	No	No
Actors	Principal	Principal Target-group Manager	Principal Target-group	Principal Target-group Team-leaders	Principal Target-group	Principal Target-group Project-group	Principal Target-group Manager	Principal Target-group Managers
User input	none	Pilot design	Information	Information	Pilot design	Co-design	Information	Information
Modifications?	No	No	No	Yes, from product into advice	No	Yes, from product into prototype	Yes, from product into prototype + less linear process	Yes, from product into prototype
Role of students	Designer	Designer	Designer	Advisor	Designer	Process-coach	Advisor	Advisor

Product	4. Competence profile description	5. Experience-sharing intervention	7. Workshop guideline	13. Operating instruction consult	14. Learning needs project	2. Metro line	10. ROM procedure	16. Learning potential advisory report
Category	Group comp.	Group comp.	Group comp.	Group comp.	Group comp.	Learning opportunity	Learning opportunity	Learning opportunity
Type	Prototype + Advice	Advice	Finished product	Advice	Advice	Finished product	Finished product	Advice
Object-ives?	No	No	No	No	No	Yes	No	No
Actors	Principal Target-group Manager	Principal Target-group	Principal Target-group	Principal Target-group Managers Co-workers	Target-group Managers	Target-group	Proj. group (target-group) Steering-group External expert	Principal Target-group
User input	Informat-ion	Informat-ion	Co-design	Informat-ion	Design	Co-design	Design	Informat-ion
Modifi-cations?	Yes, from product into prototype + advice	No	Yes, different finished product	Yes, from product into advice	Yes, from product into prototype	Yes, from advice into design	Yes, new actor involved in process	Yes, from product into advice
Role of students	Advisor	Advisor	Process-coach	Advisor	Process-coach	Process-coach	Process-coach	Advisor

Different actors This question concerned the different actors involved in the design process. The answer to this question included a description of the types of actors who figured in the process for each product. Altogether, there are eight different types of actors: principal, target group, management, team leaders, project group, steering group, external experts and co-workers. The number of different actors for each product ranges from one to four: two cases involve one type of actor; six cases involve two types of actors; seven cases involve three types of actors, and one type involves four types of actors. The types of actors most frequently involved are the target group (15x) and the principal (13x). The designs in which no principal participated, however, are by part-time students who act as principals in their own work setting or who performed the assignment as part of their professional duties.

User input This analysis question refers to input from users (frequently the target group) in the design process. Because the target group was involved in designing nearly all products, input from this group was identifiable in nearly all products. The analysis distinguishes three categories of target group input: information, pilot design and co-design. The information category concerns the opinion or experience of users required for resolving the problem, to generate ideas for solving the problem or to produce the design. The pilot design entails gathering formative evaluation data in which users are asked to evaluate a prototype of the product. This information serves to improve the product. In the co-design category, the target group input is considered a partial construction of the solution or the product. Users help design the product, which means that they provide substantive input and consequently help. The analysis reveals all three types of input: there is information provided by users (8x) and input through a pilot design (2x), and there are joint designs (5x).

Modifications during implementation To determine whether modifications took place during implementation, each student was asked to indicate in the reflection report whether there had been any deviations from the original approach formulated at the start of the assignment. The answer was either negative or affirmative: with affirmative answers, the type of modification was examined as well. Eleven products had undergone changes during implementation. There were three types of modifications, including product type changes (9x), changes concerning the actual product (1x) and procedural changes (2x). Most changes therefore involve product type modifications. All but one concern transformation of a finished product into a prototype or process intervention.

Role of students Three possible answers emerge from the analysis concerning the question about the role of students in the design process: designer, advisor and process coach. Students are considered designers

when they act as substantive specialists or experts and design solutions independently or based on literature or information provided by concerned parties (4x). They are considered advisors when they generate products meeting the criteria for advisory reports, even if combined with a prototype (7x). They are considered process coaches when they supervise a group of people in the design process and devise, develop and carry out interventions for this process (5x).

Relation between product and process features

Table 2 lists the product and process features for each product. The question is whether patterns are identifiable in the combinations of different features. First we checked whether the product features were related. Neither the category nor the type product features were related, because all product types occurred in the different categories, except for the learning opportunity category, where there was no prototype. Since the learning opportunity category is the smallest one, however, it does not lead to any conclusions.

Next, we examined whether the different process features occurred in certain combinations. The table reveals a link between three of the five process features, namely between 'user input,' 'modifications' and 'role of students.' The results indicate that the student's role in the design process corresponds with the manner of user input in the process and the incidence of changes during the design stage. Only when students acted as designers cases appear in which users had no input and did not test designs. In addition, all four students who assumed this role indicated that no modifications occurred during implementation. With all students who acted as advisors, the user input consisted of dispensing information, whereas the user input for all students who acted as process coaches consisted of co-design. In both these capacities, modifications occurred during the design process in all but one of the cases.

The next question is whether specific product and process features are related. To this end we have examined whether student roles were related to a specific category or product type. We found that the designer role applied only for products in the individual competence development category. Because other roles occur in this category as well, there is no one-to-one relationship between product category and designer role. Designing a product in this category therefore does not automatically mean that the student acts as the designer. Still, the absence of the designer role from other product categories suggests the following type of cohesion: in acting as the designer, products are often designed for the individual-competence development category. As for the other roles, both the advisor and the designer roles occur in all product categories.
Connections are identifiable between the different roles and product types as well. From the role of designer only finished products are developed, of which one coincided with an advisory report. In the role of advisor only advisory reports are drafted, of which two coincided with a prototype. From the role of process coach all different product types were present. The kind of role in the design process therefore does not seem to depend on the product type. Rather, the role assumed appeared to determine the product type. The following inference arises: designers are more likely to develop finished products, while advisors are more likely to draft advisory reports.

Conclusions and discussion

We will start this concluding discussion by dealing with the theoretical assumptions arising from the theory about constructivist and relational design. To what extent do the results confirm these assumptions? Next, we consider the problem statement and answer the question about how product and process features relate to designing learning in the workplace. We conclude by indicating the recommendations for designing learning in the workplace.

Six theoretical assumptions have been derived with respect to product and process features in designing learning in the workplace through a relational approach. Because elements of this approach apply in all designs, the assumptions may be verified according to the findings described in Table 2.

The only assumption concerning the product features is that the product is more likely to be a prototype. This research does not demonstrate this, because very few prototypes have been designed. Moreover,

there was a third product type, namely advisory reports. The share of finished products (31%), however, is far smaller than the share of other products (69%). Because these other products are far less directly applicable than finished products, we conclude that a more relational design approach clearly involves the design of products that are less immediately applicable.

Five assumptions concerned process features. The first assumption that objectives cannot be formulated clearly is borne out by the results: most designs do not include explicit formulations of objectives. Although the design process is systematic, these objectives are far less explicit and seem to depend on the designer's intentions rather than on the type of assignment. After all, students were required to apply elements from the relational design approach, which led many to establish explicit interactions with concerned parties within the organisation. The reports also reveal that most students took for granted that the objective was to design the product described in the assignment.

The second assumption was that different actors were involved in the design process. Nearly all designs reflect interaction with a principal and the target group, whereas other actors are involved as well in half the designs. Determining whether the results confirm this assumption is complicated, as this depends in part on the number of actors whose involvement is relevant in the design. This varies for each design.
The third assumption concerned personal input from users. The results strongly confirm this assumption. All but one of the designs reflect considerable personal input from the users, although this input varies according to the measure of actual user influence on the design. The fourth assumption related to modifications during implementation. Once again, this assumption is substantiated by the results, which indicate changes in 61% of the designs.
The fifth and final assumption was that designers were mainly coaches. Because students serve as advisors or process coaches with 75% of the designs and as designers with 25%, the results confirm this assumption as well.

Applying the relational design approach thus gives rise to specific product and process features. Still, several designs lack such features, especially the ones where students act as 'designers', and no changes occur during implementation. The relational approach, notwithstanding the intention to apply it, appears less pronounced in these designs. Based on the role assumed, the systematic approach has ultimately prevailed.

How does this conclusion about the relational approach affect our problem statement? Eventually, answering the first sub-question about the design products requires questioning which of the different products designed promote learning in the workplace. They are definitely the advice and prototype products, since both these products involve additional actions, decisions and development on the part of concerned parties and thus activate learning. In addition, the finished product type supports learning in the workplace as well, but only when designed specifically with the designer in the role of process coach. In this case, concerned parties help produce the design and have presumably learned through the design activities. Moreover, such finished products occur only in the group competence development and learning opportunity categories. With finished products designed by taking the role of designer, the likelihood that learning occurred or will occur is minimal. In cases where the designer has taken all major decisions, the actual application of an immediately usable product becomes questionable. Accordingly, we conclude that finished products designed in this manner do not support learning in the workplace.
Considering the process features of designs that really promote learning in the workplace, (so, the design process of prototypes, advisory reports and finished products where the designer acts as the process coach), we identified three distinctive features in the design process: 1) the target group provides input by supplying information or by participating in the design; 2) changes occur in the implementation stage; and 3) the designer acts as an advisor or process coach.

Which recommendations do these conclusions yield for designing learning in the workplace? First, the likelihood that learning in the workplace will occur increases if a certain product type or category is designed. Explicitly aiming for products in the form of a prototype or advisory report or products designed to cultivate group competencies or learning opportunities thus facilitates learning in the workplace. Second, applying a design approach in which the designer acts more like a coach than a substantive expert may promote learning in the workplace. As the research reveals, this may be

accomplished (also by students), by explicitly encouraging designers to involve the target group in the design process and to introduce changes in the course of implementation. HRD professionals who deliberately intend to improve learning in the workplace, can take advantage in applying these recommendations in practice.

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