

Connecting school and work placement:

Towards a learning and supervising strategy for learning about animal reproduction in Agricultural Education

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Summary

Problems with students connecting their learning in work placement and school are well recognized. Literature on these problems displays different perspectives with regard to the context, the intended outcomes, the relation between an individual and the collective, and the role of knowledge. To gain insight in these problems we report results of a design research project that addresses these problems in a context that provides challenging opportunities to put theories of learning to use: pre-vocational secondary education. The paper reports on the research-informed design and field-test of a learning and supervising strategy which is of use in the workplace.

After the elaboration of and the argumentation for the initial design principles based on literature on cultural historical activity theory and preliminary research, we will outline how the preliminary strategy was tested and present the main results of the first research cycle, focussing on the effectiveness of the design principles and their strategy components. In the final section the effectiveness of the strategy will be discussed.

Introduction

It is well recognized that students' learning in vocational education can be enhanced if they connect what they learn in school with what they learn in the workplace and vice versa (e.g. Griffiths & Guile, 2003; Konkola *et al*, 2007; Onstenk & Blokhuis, 2007). Work placement in vocational education often seems to be too short and incidental to gain appropriate knowledge, skills and competence in the workplace (Billet, 2002; Leney & Green, 2005) and knowingly connecting what is learned in both practices appears to be part of a solution for this problem. However, it is also recognized that students seldom identify a (direct) relationship between their actions at the workplace and their actions at school or the knowledge embedded in these actions (Hatano & Greeno, 1999; Lave & Wenger, 1991). Literature on cultural historical activity theory (CHAT) shows that transfer of knowledge between school and the workplace, which can both be conceived as activity systems, is possible if the educational setting meets demanding goals and conditions. Konkola *et al* (2007), for instance, argue that the emphasis should be on the chancing role of students, supervisors and others, which are all learning within a community that aims at creating knowledge instead of using existing knowledge. From this perspective, learning of an individual is embedded in the collaborative efforts and transitions within and between different activities and practices. These practices on their turn are meant to create new knowledge, activities and practices. In other words, in order to promote learning between school and the workplace the introduction of learning tasks may induce changes in the workplace and school (existing activity systems). As a consequence a new formed community of students, supervisors and other employees with its own desired outcomes will emerge. Konkola (as cited in Konkola *et al.*, 2007) refers to this new formed community together with its outcomes, instruments, rules and division of labor as the *boundary zone activity*.

Trying to fit the idea of an emerging boundary zone activity within different contexts of vocational education raises questions about what the *educational* outcome of the boundary zone activity should be and if a model of work placement and school relationship based on this perspective is bound to a certain level of education. Is it that the learning tasks tie the emerging community of students, supervisors and others to transfer and create knowledge within a certain domain or do the tasks and the educational outcome emerge together with the boundary zone activity? Will the transfer of knowledge have implications in other educational settings (e.g. other subjects or projects)? Is actual participation in a knowledge creating activity attainable for students in all levels of education?

To gain insight in problems and opportunities linked to these questions we started a design research project that addresses the problem of connecting learning in school and the workplace in pre-vocational secondary education (vmbo in The Netherlands). Vmbo and other lower levels of vocational education distinguish themselves from higher levels of vocational education on

characteristics that are related to this issue. For instance, because it is also meant as general education much time is spent on general subjects (e.g. mathematics and biology) and the periods of work placement are relatively short compared to higher levels of vocational education or even senior secondary vocational education. Besides this, trainee posts frequently consist of a few employees (e.g. bakery, grocery shop) and in some cases there even is only one possible supervisor (e.g. farmer, handyman). In contexts like these a (large) community of learners aiming at knowledge creation can simply not emerge. But although the conditions and goals set are difficult to meet, the issue of connecting learning in school and the workplace is still relevant in lower levels of vocational education, albeit with another or shifted purpose, i.e. connecting learning in the workplace with learning in vocational *and* general subjects.

Students in vmbo generally find work placement a valuable experience. In contrast with that, much “school knowledge” is not meaningful to them. It can be argued that learning in both school and work placement may be enhanced, if students connect what they learn in general and vocational school subjects with what they learn in the workplace. This implies that similarities in “school knowledge” and “workplace knowledge” are to be recognized and that “school knowledge” has to be adapted to be of use in the workplace and vice versa.

In other words, work placement provides an opportunity for trainees and supervisors to experience that “school knowledge” is relevant in the workplace and “school knowledge” may help the trainee to understand the workplace. In addition, the rather traditional model of work placement (cf. Guile & Griffiths, 2001) found in vmbo and its relation to school subjects provides challenging opportunities to put theories of learning to use in an educational design with the aim to connect learning.

Our design research project tries to identify design principles for such a learning and supervising strategy and addresses the issue with a focus on the phenomenon of animal reproduction. From the perspective of the workplace, it was found that reproduction is crucial for the existence of certain practices (e.g. cattle farms and stud farms) and as a consequence knowledge of animal reproduction is needed to understand actions in the workplace (Mazereeuw *et al.*, 2009). From the perspective of school reproduction is identified as one of the key concepts in biology education in The Netherlands (Boersma *et al.*, 2007). For these reasons the strategy covers the school subjects ‘biology’ and ‘animal husbandry and care’ and coherent workplaces as trainee posts (e.g. cattle farms). This paper reports on the research-informed design and field-test of the part of the learning and supervising strategy which is of use in the workplace. We seek to answer the following research question:

What are design principles of a learning and supervising strategy of use in work placement in pre-vocational secondary education that effectively enables trainees to connect what is learned about animal reproduction in school and in the workplace?

The part of the strategy which is of use in the workplace has the following intended learning outcomes:

- trainees and supervisors experience a need to engage in the new (or changing) environment
- trainees experience that animal reproduction is relevant in the workplace and recognize that it is a means to reach an outcome;
- trainees experience a need to know and a sense of direction while engaging in the workplace, i.e., being aware of what ultimately counts in the workplace (e.g. farm profits);
- trainees and supervisors knowingly use knowledge of animal reproduction (learned in school) to explain phenomena and actions in the workplace.

For the definition of design principles we drew upon Prins (2010) who defines them as tools providing heuristic guidelines by means of strategy components for realizing expected pedagogic outcomes in an educational setting (Van den Akker, Gravenmeijer, McKenney & Nieveen, 2007). Design principles link strategy components (e.g. what to do, how precisely, when in the sequence, with what tools, and how to enact), expected pedagogic outcomes... and argumentations (e.g.

literature on educational research, empirical findings from previous studies and/or practical considerations (p. 179).

The learning and supervising strategy can be conceived as an elaboration of these design principles. It describes the elements of the design principles in detail and adds contextual influences.

Elaboration of the preliminary design principles

In this section we will give insight in the designing of the learning and supervising strategy by showing on what grounds the design has been elaborated and which preliminary design principles were used. The design principles should give insight in the argumentation that underlie the design in terms of theoretical notions from literature and findings from previous studies.

Outline of the conceptual frame work

To develop a conceptual framework for eliciting design principles, we mainly drew upon literature on situated learning (e.g. Hatano & Greeno, 1999; Lave & Wenger, 1991), consequential transitions (Beach, 1999), and CHAT (e.g. Griffiths & Guile, 2003; Tuomi-Gröhn & Engeström, 2003; Van Oers, 1998). Furthermore, the specific context of vmbo encouraged us to use different perspectives within educational research that were already used in workplace learning in general and vocational education specifically. As Konkola *et al.* (2007) pointed out, there are differences between these perspectives and in our opinion these differences could influence the selection and elaboration of the design principles. The main differences are to be found in the stable or dynamic nature of the 'community of practice' and the locus of learning being within the individual or intertwined between the individual and learning community. Were in the perspective of situated learning the community is seen as a stable environment, the other perspectives depict this as being dynamic and influenced from outside and inside. In the concept of consequential transitions Beach (1999) puts the locus of learning within the individual, whereas in the CHAT perspective the collaborative activity system learns and the individual is part of that system and learns as a consequence of the changing system. Therefore, the main difference may be that the origin or motive of learning differs in these perspectives. This may be aligned with the relation between the changing activity or practice and the need for transfer. In the studies of Beach students moved from a working environment to a learning environment and vice versa. The individual actually crossed a boundary by moving from one practice to another and back, whereas in other perspective the activity or practice (however dynamic) changes and the participants have to change with it. In the first case the individual actually crosses a boundary and may or may not change in the primary practice as a consequence, due to his or her individual needs. In the latter, the practice of the individual is gradually changing, but still the same. The need for an individual to change within this environment may be stronger because of the changing collective.

So, given the context of students moving from one dynamic practice (school) to another (work) and having to adapt to that, we decided to make use of both perspectives in the process of designing a learning and supervising strategy and the elaboration of the preliminary design principles.

Next we will outline the preliminary design principles that were used to design the learning and supervising strategy. The argumentation, strategy components and expected pedagogic outcomes of each design principle will be described.

The three design principles are:

- '*socialization in the workplace*' to experience a need to engage in the new (or changing) environment
- '*knowledge as an instrument to reach an outcome*' to experience that knowledge of animal reproduction is relevant in the workplace, to recognize that it is a means to reach an outcome and to experience a need to know and a sense of direction
- '*from a motive to engage in action towards a motive to explain*' to identify and elaborate a (primary) relationship between school and work placement and to knowingly use knowledge of animal reproduction in the workplace

'Socialization in the workplace'

While participating in the workplace an *employee* is most certainly influenced by the ideas of other employees and the conditions of the workplace (Engeström, 1987). In their turn, the other employees

are also influenced by their colleagues, conditions in the workplace and by influences from outside the workplace (Beach, 1999). A *trainee of vmbo*, however, participates in the workplace for a short period of time and will not socialize to an extent as may be expected from an employee. Every individual, and especially trainees, may therefore perform actions that are not completely in accordance with the intended outcomes of the workplace, due to his or her personal goals and needs (Billet, 2002). So, actions performed by a trainee are not only structured by collaborative efforts in the workplace, they also seem to be structured by the reciprocal relationship between personal goals and the intended outcomes of the workplace. Personal knowledge, needs and values of trainees become linked with and adapt to shared knowledge, shared outcomes and values that are common in the workplace (cf. Brugman, 1988).

From this perspective, before engaging in the workplace, the knowledge, needs and values of the trainee have been shaped outside this workplace and will adjust, expanded, etcetera in the process of socialization. This process therefore includes reflecting on actions (Schön, 1983) with a focus on changes in needs, values and knowledge of the trainee towards that what is important in the workplace, the intended outcomes. Socialization consists of giving meaning to a new practice (e.g. the workplace) with ones own knowledge, needs and values, and giving new meanings to known practices (e.g. school) with new insights. Therefore, it is reasonable to assume that socialization starts with engaging in actions that prompts the trainees' knowledge, needs and values, based on prior experiences which can be related to the workplace.

<i>Strategy components</i>	<i>Expected pedagogic outcomes</i>
<ol style="list-style-type: none"> 1. Supervisor and trainee undertake an orientation talk that besides getting acquainted, focuses on the prior experiences of the trainee with similar workplaces or at school. This results in appointing the first actions that they engage in 2. Trainees and supervisors engage in these first actions together and reflect in action 3. Trainee and supervisor reflect on these actions by analyzing their own experiences, needs, values and knowledge 	<ol style="list-style-type: none"> 1. The supervisor and trainee get an idea about what to expect in the first days of work placement 2. The trainee (partly) knows how to perform the actions in which he or she engages. 2. The trainee may experience a need to get to know the workplace and its participants 2. The supervisor may experience a need to get to know the trainee 2. The trainee may experience a need to perform the actions properly 3. The trainee may experience a need to expand his or her competence in the <u>e</u> workplace

'Knowledge as an instrument to reach an outcome'

Because in a workplace it is important that certain actions are performed correctly, it may provide a social environment in which knowledge, competence and skills become meaningful for its participants (Engeström, 1999; Stevenson, 2002; Van Oers, 1998). This could mean that if trainees participate in a workplace where knowledge of reproduction is used, this knowledge may also become meaningful to them. Recognizing the relevance of certain actions and their own shortages may enhance their motives to engage in these actions and generate a need to expand their knowledge, skills and competence. Since the shared relevance of actions in the workplace appears to originate from the expected outcomes, these can provide *a sense of direction* for its subjects while engaging in different actions in the workplace. If trainees are to experience this sense of direction, relations between the outcomes of the workplace and the actions undertaken need to be recognized. However, in a previous study it was found that trainees who are engaged in activity are mainly oriented towards certain actions and not towards the workplace as whole (Mazereeuw *et al.*, 2009). Because of this the process of recognizing their contribution to the workplace is hindered. Reflecting on their actions in the workplace and their contribution to the main desired outcomes may support this process.

The sense of direction can be enhanced if a trainee becomes aware of the objectives that are probably shared by different stud farms. Trainees who are participating in the workplace may become aware of the fact that the relevance of their actions exceeds the one workplace in which they participate.

<i>Strategy components</i>	<i>Expected pedagogic outcomes</i>
<ol style="list-style-type: none"> 1. Supervisor shows the workplace and certain actions and underlines the central role of reproduction in reaching the main outcomes of the workplace; e.g. cows have to calve as soon as possible in order to produce more milk. 2. Trainee and supervisors engage in actions that correspond with these outcomes and which require knowledge of reproduction; e.g. determining if cows are in heat, determining if a cow is in calf or determining if a cow is about to calf. 3. Trainee and supervisor reflect on these actions with a focus on analyzing their own experiences, needs and values and outlining their contribution to the outcomes of the workplace. Besides this, reflection focuses on the perspective of a possible forthcoming profession. 	<p>1/3. Trainees (and supervisors) experience that animal reproduction is relevant in the workplace</p> <p>1/3. Trainees (and supervisors) experience that knowledge of animal reproduction is a means to reach an outcome.</p> <p>2/3. Trainees (and supervisors) experience a need to know and a sense of direction while engaging in the workplace, i.e., being aware of what ultimately counts in the workplace(e.g. farm profits) and knowing how they contribute.</p> <p>2/3. Trainees' orientation shifts towards the workplace as a whole.</p>

'From a motive to engage in action towards a motive to explain'

The former design principle still portrays activities and the workplace as being static. This is not the case. Often activities and workplaces change gradually and as a consequence the participants change gradually with it. Development of the collective can be induced by changes in the workplace and the development of a trainee can be induced through participation in such a workplace and through successive participation in *more than one* practice (school and workplace). In the case of successive participation in practices, identification of similarities between these two practices may lead to supplements, adjustments or reformation of what has been learnt so far (Griffiths & Guile, 2003; Van Oers, 1998)¹. As regards to connecting school and the workplace, which can be conceived as two different practices, the similarities to be identified may well be the knowledge (of animal reproduction) used in both practices. Working and thinking methods used in the workplace and school usually differ quite a lot. Since the knowledge used in these practices can be partly similar the question arises how these different kinds of knowledge can be connected.

When engaged in activity trainees and supervisors seldom explain what they are doing or why they are doing it, they work (Mazereeuw *et al.*, 2009). If they would try to explain they would in some cases need to use knowledge which is normally not explicitly used in the workplace (Eraut, 2004). For instance, just before a cow has to deliver a calve her uterus ligaments loosen. An experienced cattle farmer can feel this near the tails of the cow. In this situation it is not common for supervisors to explain why they are feeling the cow there, why they are doing that at that particular time and how it is possible that the uterus ligaments loosen. Introducing a learning task that provides a motive for the trainee and the supervisor to explain their actions and the phenomenon could serve as a starting point for them to do so. In the example, if the trainee and the supervisor want to succeed, they will have to use school knowledge. In terms of the example, at a particular moment hormones induce the loosening of the uterus ligaments, together with that other physical changes in the cow prepare her for delivering the calve. By using this knowledge in practice trainees and supervisors may identify a relationship between the workplace and the subject of biology. So the learning task may be conceived as a boundary crossing object from which a boundary zone activity may emerge, i.e. using "school knowledge" and "workplace knowledge" to explain activity, actions and phenomena in the workplace.

¹ Griffiths and Guile (2003) : a "formulation of generalizations, based on the identification of a primary general relationship (a kernel concept) in the subject being studied in such a way that it helps people develop a new understanding of the world" (pp. 60).

Van Oers (1998) : "any process of desituating depends on the ability of contextualizing something in a new way (i.e. recontextualizing), of creating an alternative (mental) context for a well-known action, object or symbol" (pp. 483).

However, it is known that participating in different practices is often accompanied by problems in connecting the different kinds of knowledge used in these practices (Van Oers, 1998). There seems to be a dichotomy between practical knowledge, more frequently used in the workplace, and theoretical knowledge, more frequently used in school. This dichotomy may hinder the possibility of connecting the knowledge used in the workplace with the knowledge used in school (Eraut, 2000; 2004).

As far as the connection of work placement and school is concerned we argue that the situated knowledge embedded in a practice needs to be codified and connected to codified knowledge embedded in school. The reason we make this claim is because, following Tuomi-Gröhn and Engeström (2003), we believe that however necessary tacit knowledge is for performing in a specific workplace, it is not a very sound basis for development in vocational or general education. What is more, if the knowledge that connects both practices has to be communicated, it is unavoidable that codified knowledge emerges.

The different practices (school and work) may challenge the student to develop knowledge, skills and competence in order to cope with the different demands within these practices (Griffiths & Guile, 2003). Reflection that focuses on similarities of the knowledge used in school and in the workplace may improve trainees' recognition of a possible connection. Furthermore, a learning task may serve as a boundary crossing object from which a boundary zone activity will emerge: using “school knowledge” and “workplace knowledge” to explain activity, actions and phenomena in the workplace.

<i>Strategy components</i>	<i>Expected pedagogic outcomes</i>
<ol style="list-style-type: none"> 1. Trainee and supervisor together design a cow calendar in which work actions and the reproductive cycle of a cow is aligned. 2. Trainee and supervisor elaborate a learning task that focuses on explaining why these actions have to be performed, so that a motive for explanation is introduced. 3. Reflection on the product of these two learning tasks with a focus on <ul style="list-style-type: none"> - the comparison of meanings of vocabulary words common in the workplace (e.g. heat, rectal palpation) and school biology (e.g. egg-cell, hormone); - the use of vocabulary words of school biology in the workplace 	<ol style="list-style-type: none"> 1. Trainee experiences a need to know concerning the reproductive cycle of the cow and actions that are not yet performed. 2. Trainee and supervisor experience a need to explain the relation between work actions and the reproductive cycle of the cow. 2. Trainee and supervisor use vocabulary words that are also commonly used in school, e.g. from biology. 2/3. Trainee and supervisor use vocabulary words of the workplace and school biology, compare these words and connect their meanings 3. Trainee and supervisor knowingly use knowledge of animal reproduction learned in school to explain actions (performed) in the workplace.

Methods

Educational design research

To answer the research questions a design research approach was selected. Educational design research can be conceived as a systematic study of designing, developing and evaluating an intervention with the aim to solve complex problems in educational settings. Besides determining if a design is effective the educational design research also aims at creating new knowledge and argumentation of its design principles (Plomp, 2007; Van den Akker *et al.*, 2007). In this study we used the model of design research of Kortland and Klaassen (2009) which is made up of the phases indicated in figure 1.

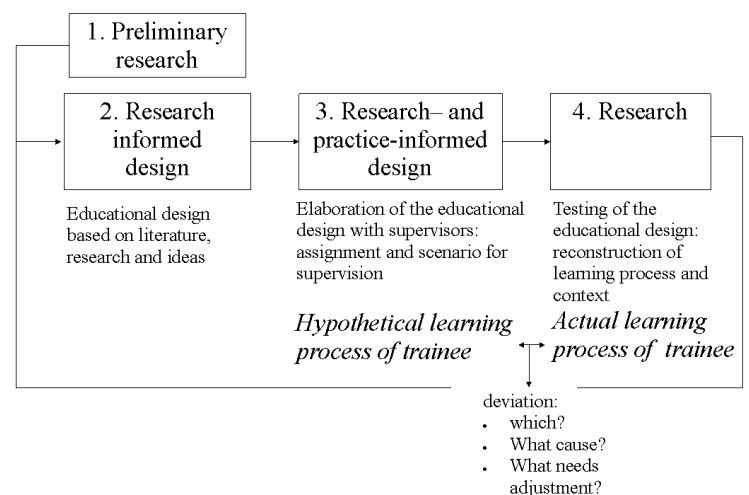


Figure 1. Representation of the design research model (Kortland & Klaassen, 2009)

In the first phase (preliminary research) the relevance of the study was determined. Besides being relevant for practitioners, the strategy should also be based on state of the art scientific knowledge. For this reason a preliminary study (Mazereeuw *et al.*, 2009) was conducted before the process of designing the intervention. The purpose of this study was to construct a conceptual framework, identify problems in work placement based on this framework and elicit preliminary design principles, based on the theoretical, empirical, and practical input.

In the second phase (research informed design) the consistency of the design was determined. The strategy was “logically” designed based on the information from the preliminary research. However, this information sometimes contradicts and choices had to be made. In their turn these choices were discussed with experts in educational research and experts in educational practice (including supervisors from the workplace).

In the third phase (research and practice informed design) the hypothetical learning processes were described in the learning and supervising strategy which consists of a blue-print of student learning tasks and a protocol for students and supervisors how to enact. The strategy is general to all (prior) cases studied and was elaborated in student learning tasks and a so-called scenario which is context specific. In the scenario activities of trainees and supervisors, followed by corresponding expected learning outcomes were described and justified step-by-step. The expected usability of the intervention for which it was designed was tested and revised by discussing it with the actual supervisors. The expected effectiveness of the intervention, is described in the strategy and scenario and these were also discussed with experts in educational research and experts in educational practice.

The actual activities and learning processes were ‘reconstructed’ in phase four (Research or field test). Here the actual usability and effectiveness were determined in a field test of the strategy in which data was collected consistently with the expected usability and effectiveness. Differences and similarities between the hypothetical and actual learning process and outcomes will be used to re-inform the strategy and repeat phases two, three and four.

Selection of workplaces, trainees and supervisors

To select workplaces and trainees a number of criteria were used. First, we were looking for a context in accordance with those portrayed on page one: within the lower levels of agricultural vocational education with a relatively short period of work placement. Second, knowledge of animal reproduction had to be a means to reach an outcome of the workplace. Third, a workplace had to be a small company in the sense that it consists of only a few employees. From a list of students in a certain work placement period of one participating school nine cases met these criteria. Eventually eight supervisors, each representing a different workplace - seven cattle farms and one stud farm - and six trainees agreed to participate in the study. The study was conducted with the six complete cases. The trainees were aged 15 or 16. The supervisors had at least two years of experience.

Data collection

To reconstruct the learning processes of trainees and supervisors, the effectiveness of the strategy and information about the context data was collected per case as depicted in figure 2.

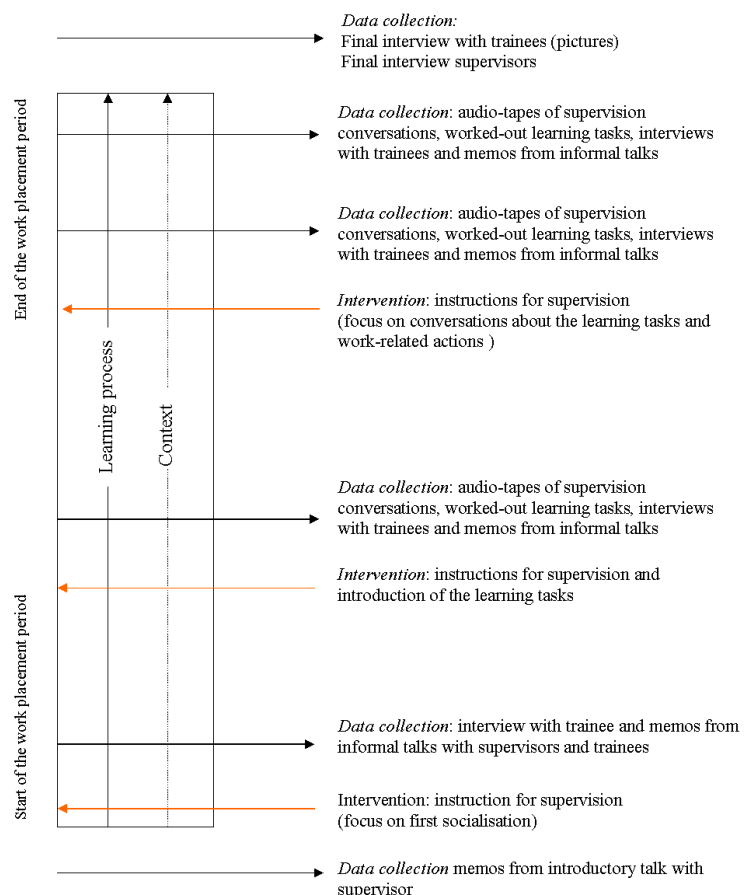


Figure 2. Data collection

Analysis

This paper focuses on the effectiveness of the learning and supervising strategy. Therefore analysis focused on the four major learning outcomes as well as the expected pedagogic outcomes described in each design principle. The audio-taped interviews, conversations and documents were analyzed by close reading and highlighting the passages related to the design principles and its outcomes. This was followed by axial coding, allowing us to summarize and congregate the information.

Results

In this section we will outline the main results of the first field test of the strategy with a focus on its effectiveness. Differences between hypothetical or expected learning processes, in terms of reasoned learning outcomes, and actual learning processes in terms of measurable outcomes will be compared. Because the paper reports on the first field test of the strategy these results have to be conceived as preliminary. The findings of this study will be used to inform the strategy in a next design cycle.

Intended learning outcome 1: trainees and supervisors experience a need to engage in the new (or changing) environment

The interviews with trainees show that all six of them experienced a need to perform properly and wanted to expand his or her competence in this workplace. The data also shows that the reasons trainees had for wanting to expand their competence differ. For example one trainee pointed out that he just wanted to make the best of it, while another saw it as an opportunity to learn something about his future occupation.

Intended learning outcome 2: trainees experience that animal reproduction is relevant in the workplace and recognise that it is a means to reach an outcome.

Data from the informal talks with supervisors and the interviews indicate that all of them recognized the relevance of animal reproduction and that it is a means to reach an outcome. Data from the interviews with trainees, learning tasks and the conversations show that this is the case with four out of six trainees. The two trainees who did not attain the outcome both seemed to recognize the relevance of animal reproduction but did not seem to relate that to an outcome of the workplace.

Intended learning outcome 3: trainees experience a need to know and a sense of direction while engaging in the workplace.

Data from the interviews with trainees and the conversations show that all four trainees mentioned above experienced a sense of direction, i.e., on multiple occasions they made a connection between what they were doing and an outcome of the workplace. The same data sources indicate that two trainees experienced a need to know about animal reproduction that was consistent throughout the work placement period. The other trainees seemed to alternate between wanting to know about the workplace and animal reproduction and not wanting to know. In two cases the main reasons for not wanting to know had to do with their idea about their further education not being in the same domain.

Intended learning outcome 4: trainees and supervisors knowingly use knowledge of animal reproduction learned in school to explain phenomena and actions in the workplace.

Data from informal talks and interviews with supervisors and the conversations indicate that all the supervisors knowingly used knowledge of animal reproduction. Vocabulary words common in school biology were used to explain actions and phenomena in the workplace. However, the data also indicates that four out of six supervisors experienced difficulties in explaining why certain actions were performed or why a certain phenomenon occurred. The interviews with trainees, worked-out learning tasks and conversations show that all trainees used school and workplace knowledge of animal reproduction. However, the data also indicates that in three cases the trainees *knowingly* used “school knowledge” to explain actions and phenomena in the workplace, meaning that examples of spontaneous connections with school subjects were found.

Data from conversations, worked out learning tasks and interviews with trainees indicate that with the exception of one, all trainees had difficulties with starting and prolonging the learning tasks that should appeal to a motif to explain actions and phenomena in the workplace.

Discussion

After the first field test of the strategy it is not possible to draw final conclusions about the effectiveness of the strategy and its design principles. Therefore, in this section we will discuss the design principles against the background of the results until now and the questions that arise.

'socialization in the workplace' to experience a need to engage in the new (or changing) environment

There are not sufficient data to decide about the effectiveness of this design principle and its strategy components. There are, however, some indications that a focus on the *individual* engaged in (changing) activity may be effective. The process of socialization seemed to be different for each trainee and the differences found seemed consistent throughout the period of work placement. By this we mean that in each moment of data collection differences in the knowledge, needs and values formulated by the trainees were found. Besides this, the expressed knowledge, needs and values of the trainees displayed adjustments during the entire work placement period.

'knowledge as an instrument to reach an outcome' to experience that knowledge of animal reproduction is relevant in the workplace, to recognize that it is a means to reach an outcome and to experience a need to know and a sense of direction

This design principle and its strategy components have shown to be effective in letting trainees experience that knowledge of animal reproduction is relevant. Some indications were found that the strategy was also effective in letting the trainees experience that animal reproduction can be a means to reach an outcome. For instance, it seemed clear to trainees that cows had to calve to be able to produce milk and that several actions performed in the workplace indirectly contribute to the production of milk because they directly contribute to the calving of cows. The data also indicates that the strategy may lead to a sense of direction, meaning that the trainees understand that their own actions contribute to the main outcomes.

The design principle and the strategy components have not shown to be effective in letting trainees experience a need to know. Apparently, the trainees that experienced the importance of animal reproduction did not all experience a need to further elaborate their knowledge, skills or competence in related actions. We got the impression that the need to elaborate knowledge, skills and competence may in our cases be related to the initial motive of a student to participate in the workplace. Student that developed a need to know at the start of the work placement period, displayed this consistently throughout the period. In these particular cases the influence of the strategy can be questioned.

The remarks above again raises questions about the development of knowledge, needs and values of an individual in relation to the activity he or she engages in. The six trainees showed differences on these elements.

Can a strategy that focuses on both the collective and the effects on an individual level be more effective in work placement for vmbo?

'from a motive to engage in action towards a motive to explain' to identify and elaborate a (primary) relationship between school and work placement and to knowingly use knowledge of animal reproduction in the workplace

The data shows that this design principle and its strategy components are effective in promoting supervisors and trainees to use knowledge of animal reproduction to describe actions and phenomena in the workplace. It has also shown not to be effective in promoting trainees to be aware of the use of "school knowledge". This seems to be enhanced by difficulties with developing a motive to explain actions and phenomena in the workplace.

Developing a motive to explain actions and phenomena in the workplace may well be one of main foci in the next design cycle and field test. The relation between the motive to explain and being aware of "school knowledge" as an adequate means to understand the workplace will be further elaborated in the next design cycle.

In the next design cycle the strategy will be adjusted based on the findings of the first field test in relation to the conceptual framework. In its turn this adjusted strategy will also be tested and revised.

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