Collaborative Teaching and Learning in the Workplace^[1]

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ABSTRACT This article considers teaching and learning as a collaborative enterprise in the workplace. The empirical data have been extracted from a field study among apprentices engaged in electromechanical vocational training and education in a major Danish industrial company. Typically, studies of apprenticeship learning do not view aspects of teaching as decisive parts of workplace learning. In this article, I will pin down the specific character of collaborative teaching and learning in the workplace, and compare this with the features of a teaching situation in school with a teacher transmitting knowledge to the pupils. While instruction at school is organised as part of a specifically planned teaching situation, the instruction in the workplace is a more loosely organised part of the joint activity structure of the daily work tasks. The conclusions reached in the article should be useful for the conceptual understanding of instruction and teaching in workplace learning, as well as for policy makers and professionals responsible for the design of apprenticeships and workplace learning.

Introduction

Studies of apprenticeship learning often point out that instruction and teaching are not central aspects of apprenticeship learning. There is a specific skill to be developed, but not taught. A master is simply not expected to 'teach' craft skills (Singleton, 1989, p. 26). Serious learning is expected to take place without didactic instruction through observation of the master working. Therefore, apprenticeship studies often describe the duties of the apprentice and his promotion to participation in new stages of production but they do not say much about teaching and instruction (Goody, 1989, p. 253).

In this article, I will argue that teaching does take place in apprenticeship learning and vocational education though it is often

organised very differently from traditional school teaching. In the workplace, teaching is very loosely organised as a possibility for the apprentice to get advice in order to be able to do the daily work. Teaching and learning is not restricted to specific hours, places and people, but takes place in connection with various social relations that the apprentice has to engage in as part of his/her apprenticeship. At school, teaching takes place, as part of a specifically planned teaching situation and is often carried out one-way from teacher to pupil. In the workplace, teaching or instruction is initiated as a necessary step in the production flow, and the apprentice may also function as a teacher in relation to the new apprentices. Studies of apprenticeship learning can therefore expand our somewhat traditional, ordinary conception of teaching as a stereotype transmission process of knowledge from the teacher to the pupil. Teaching can be a decentred and collective process stretched across time and location, and may be organised as part of daily processes of joint activity in the workplace.

The Company Studied

The examples drawn on in this article are taken from a field study, which formed part of my recently completed PhD-scholarship at Aalborg University, Denmark. The field study involved 10 male electromechanical apprentices with trainee service in a 100% Danish-owned industrial company located in a suburb to Aarhus, Jutland. I have conducted 10 qualitative interviews and made participant observations in the period between February 2001 and February 2002 with my attention drawn to the apprentices' everyday life and their experience of being part of vocational training. The company develops high-tech solutions, systems and products for civilian and military applications designed for use in extreme mission critical environments and situations, where human lives and valuable material assets are at stake.

The company employs in total 1100 people with 1000 employees located in Denmark and 100 employees in other European countries. There is an average of 3-4 just recently hired electromechanical apprentices every year and a standard of 10 electromechanical apprentices working at the company every year. Vocational training in Denmark lasts 4 years and the apprentices are ensured trainee service through a formal contract with a company. As an element of their education they go to vocational school for five periods each lasting between 5 or 10 weeks. The trade practice is part of a national, government-funded scheme, and the executive order requires that the trade practice contributes to the development of the apprentices' routine and to personal and professional skills and areas of competence.

In the company, the education of apprentices is a highly valued enterprise and the apprentices go through a planned progression of

tasks, which involve them in the activities of different departments as part of their three-and-a-half-year apprenticeship period. During the last year of the training, they are ensured continuous supervision by more experienced male and female journeymen at the workplace to enabling them to meet the requirements of the journeyman's test. Throughout their workplace education, the apprentices are also formally assessed on aspects such as the ability of independent problem-solving, flexibility and cooperation with others. Formal assessment and the accessibility of journeymen guiding the apprentices, does increase the apprentices' awareness that they have a responsibility to learn while working.

As part of their work, the apprentices perform troubleshooting processes in electronic equipment. This requires complex knowledge of the principles and functions of the troubleshooting equipment. Much of this knowledge is gained during the involved periods in vocational school, but the apprentices are confronted with highly varied kinds of electronic equipment in the workplace. When the apprentice performs troubleshooting on newly encountered equipment he is often required to consult the experienced journeymen and masters at the workplace for advice, and the journeymen and masters are allowed to take time to supervise and instruct the apprentices.

With relevance to the seemingly broad spectrum of learning resources at the company, Fuller & Unwin (2004) have developed a 'expansive-restrictive framework' for analysis of approaches to apprenticeship. One could say that the company in question here shares many of the characteristics attributed to the expansive learning environments that:

include the opportunity for employees to: engage in multiple communities of practice, gain broad experience across the organisation; pursue knowledge-based as well as competence-based qualifications; learn off-the-job as well as on-the-job; have a recognised status as a learner; and have access to career progression and extended job roles. (Fuller & Unwin, 2004, p. 34)

In reading the conclusions of this article, the reader should keep in mind the comparatively well-developed structure of opportunities for instruction and learning in the workplace.

Collaborative Teaching and Learning

In using the terms collaborative teaching and learning I emphasise aspects of learning that involve didactical elements. It is a process in which others function as supporting guides in respect to the learner (Nielsen, 2004). With a theoretical assumption grounded in a view on learning as social practice, my point is that instruction and teaching, in

itself, does not enhance learning. Rather instruction creates a context within which learning may take place (Wenger, 1998, p. 266). In this way, instruction is one of the many structuring resources for learning. In this article, I specifically point to the grounding of possibilities for instruction in the social, the cultural and in the economical organisation of the apprenticeship situation.

Neglect of the Importance of Instruction in the Workplace

As mentioned, analyses of learning as social practice, as well as the specific apprenticeship studies of learning have not addressed instruction and teaching as a framework for learning processes at the workplace (Lave & Wenger, 1991; Wenger, 1998; Nielsen & Kvale, 1999a; Tanggaard, 2003; Elmholt, 2004). On the one hand, this is paradoxical since focus on the inter-subjective and cross-contextual relations of learning is very central in these works. On the other hand, perspectives on learning as social practice appear to neglect a close connection between teaching and learning. Jean Lave (1988) distinguishes teaching from learning on the basis of a distinction between a 'culture of practical understanding' and a 'culture of teaching'. The former concept of culture refers to culture as something learned through everyday living, while the latter concept refers to culture as something to be taught.

A central question is therefore: How to operate with a concept of instruction and teaching as part of a perspective on learning as social practice?

In his work on relations between work and learning, Engeström (1994) and Engeström et al (1996) has highlighted the role of teaching practices in the workplace. Engeström is inspired by the Russian psychologist Vygotsky's emphasis on the aspects of learning and verbal developmental processes in social support systems, and social interaction between the grown-up and the child. At the same time, Engeström stresses the point that 'deep' learning implies a highly structured teaching process to make this learning pedagogically intentional and *expansive*, rather than *adaptive* (see also Fuller & Unwin, 1998, 2004). Adaptive learning is understood as learning based on simple learning processes such as imitation and reinforcement from the environment, while expansive learning will tend to promote innovation, development and the creation of new ideas.

Engeström considers a broad range of practical initiatives for the development of conditions for expansive learning such as 'change laboratories' and learning networks as possible elements of workplaces. It is the concrete design of learning environments that can make these practical guidelines for the development of expansive learning effective. At the same time, I am critical of the implicit assumption in Engeström's work that a privileged place of learning always requires intentional

instruction and pedagogical structuring. As I will illustrate with the following examples, the apprentices seem to prefer instruction and teaching that is not necessarily pedagogically structured beforehand, but rather initiated by natural breaks in the professional workflow.

Instruction as Part of Social Support Systems

It is often seen in descriptions of instruction and teaching that the focus is on verbal dialogue between the teacher and the pupil (Hogan & Pressley, 1997). In this article, the verbal dialogue is only considered one part of a complex structured context of instruction. Inspired by the concept of scaffolding, my perspective is on instruction as part of systems of social support in the environment (Wood et al, 1976, Hansen & Nielsen, 1999) or, rather, on instruction and teaching as parts of the ongoing joint activities in the workplace (Goody, 1989).[2]

Nielsen (2004) exemplifies scaffolding when referring to the baker-master who first demonstrates the entire process of making a cream cake and then gradually diminishes his support. In the scaffolding process, the apprentice gradually assumes more and more control of the working processes, while the instructor lets go of his or her control. In this case, instruction is described as an experience-based interaction, where the focus is not entirely on the cognitive transference of knowledge. With the process of scaffolding, the instructor is 'reading' the entire scaffolding situation and inferring his or her next step from the emotional reactions, the gestures and the actions of the learner.

A problematic aspect of the scaffolding concept is that the instruction process is described as a process in the asymmetrical relations between the experienced and the not so experienced. In this article, I provide examples of more symmetrical processes of instruction among the apprentices. In this case, by the term symmetrical I mean instruction happening among apprentices on almost the same level of competence. It is therefore suitable not only to point at the scaffolding of the apprentice by the master, but also to consider instruction a part of the joint activity structure of the daily work in the workplace.

Research Results

While interviewing the electromechanical apprentices during their education, they expressed the view that instruction is important, but while observing the here-and-now instruction and teaching during the work processes it was rather colloquial. Aspects of this relate to instruction as a process stretched across time and places.

A particular instruction process may continue for many days if the apprentice is working on a difficult task. Instruction does not only take place in relation to one person. Often the apprentices are in contact with

both the engineers, the technicians, others apprentices, the master, the journeymen and the unskilled workers located in different sections of the workplace. The apprentice often develops a significant relation, e.g. to another apprentice or a journeyman as instructor. Such significant relations develop if the instructor is available, and if the personal relation between the apprentice and the journeyman instructor is experienced as supportive from the point of view of the apprentice (and the journeyman). The relation to the master may also consist of the master serving as a mediator of instruction but, very often, the master is busy with administrative tasks.

It seems that the instruction performed at the workplace is collectively organised and distributed across many social relations and places. At the same time, the instruction processes that are considered meaningful from the point of view of the apprentices are not necessarily those that are pedagogically structured or those with learning as the intentional goal. In the following, I will describe and analyse a few of the many examples of instruction mentioned by the apprentices.

Examples of Instruction in the Workplace

In the interview extract below I am talking to Morten, an apprentice, about the journeymen (Hans and Ib) working at his side in the workplace. Morten has previously told me about the importance of these particular journeymen:

I: Can you tell me what it is that people like Hans and Ib are able to do?

Morten: They have a very solid, basic knowledge, and they are good at instruction tasks. The instruction goes on in a funny and cheerful way. They joke with people. I personally like them, and they fit the way I am. The important thing is that they master the instruction part, and that they have so much experience to draw on.

I: Can you give me an example from a situation where you have learned something from them?

Morten: It may be the most basic things, such as when you make an error in a troubleshooting situation. Hans is very good at pointing out my errors in a funny and humorous way. When I have difficulties in understanding the diagrams, he is very good at explaining the influence of the different components. You may say it's like a personal kind of teaching like a school lecture.

The above is a description of an example of instruction at a high professional and technical level and not just described as a transfer of knowledge. There are emotional elements involved and the instruction is

based on personal relationships. This importance of the personal relationship is often highlighted as an aspect of apprenticeship learning and contrasts with a view of learning and instruction as a functionalistic and neutral process of knowledge transmission. The instruction is initiated by the apprentice and is anchored in the highly professional attitude and knowledge of the instructors.

Compared with teaching at vocational school the major difference is that the explanations are anchored in the concrete problem solving, and not isolated verbal instructions followed by practical problem solving. At the same time, the apprentice points to his personal relation to the journeymen. This may contrast with the typical experience at vocational school of being only face-to-face with a teacher only during the scheduled teaching situation. The possibility of developing a personal relation with the instructor, which does enhance learning, is better at the workplace than in the school, where the apprentice only spends a relatively short part of his or her education. One study of instruction in an apprenticeship situation shows how apprentices often prefer instruction based on the concrete illustration and demonstration of the relevant task (Nielsen, 2004). This is a very different instruction progress from that of the traditional school situation. At school, the students often have to read and memorise a book or a theoretical explanation and subsequently put this knowledge into practical use. The instruction in school is typically based on memory of the knowledge taught, while the workplace instruction is mediated by technical role models and supporting tools as part of the instruction.

Instruction Initiated by the Apprentice

One of the important aspects of the above-mentioned example of an instruction process in the workplace is that it is organised as a possibility in the social space of work. It is not an aspect of instruction only schematised at certain times and in certain places. It is more informally initiated by breaks in the normal flow of work.

In the example presented instruction takes place on the initiative of the apprentice and is not determined by a time schedule. One may therefore also critically ask if it is not too easy to skip or forget this kind of instruction, when the tides are high at the workplace. The free or flowing organisation of the instruction could perhaps, at times, make it difficult for the apprentice to find room for instruction? Some apprentices may not be as extrovert or aggressive as might sometimes be necessary to obtain the necessary instruction from the journeymen or the master. At the same time, I found that the journeymen were allowed to take time to instruct the apprentices, so it seems that the journeymen accept some responsibility when it comes to the instruction of the apprentice.

From the above analysis I conclude that the instruction at the workplace requires the apprentice to ask for it or in other ways initiate it. It is noticeable that the instruction in the workplace is considered meaningful from the point of view of the apprentice because of its very personal and technically mediated character. It is a form of instruction characterised by its point of departure in the subject matter, rather than in predetermined pedagogical forms as a means in itself. The instruction at school is mainly organised as a teaching situation on scheduled hours and places, while the instruction at the workplace is more flowingly organised as part of the joint activity structure of the daily work.

So far I have analysed an example of instruction considered meaningful from the point of view of an apprentice. I have focused on instruction in the workplace as technically mediated, initiated by the apprentice and very often based on personal relations. This implies a perspective on instruction as much more than a neutral and emotion-free process independent of its contextual anchor. Relating to this there is now a growing literature on emotional labor and the need to create pedagogic contexts in which learners feel valued and are thereby empowered to learn (Avis & Bathmaker, 2004). In the following sections of this article, I will narrow the analysis on the contextual and the particular relational nature of instruction at the workplace by considering a distinction between the accessible and the assigned instruction.

Accessible Instruction

It is not always the pedagogically intentional instruction that is considered the most valuable from the point of view of the apprentices. It is clear that the apprentices, although they might be assigned a particular instructor in the workplace, often seem to seek out their own preferred learning relations and instructors. At the same time, it is a highly valued norm in the vocational field that if the apprentice is any good, he will make the journeymen teach him (Becker, 1972). One apprentice comments on this difference between the accessible and the assigned instruction in the following interview extract:

Anders: At the workplace you are often assigned a person who will be your instructor, but you quickly find persons to learn from. There may be persons mastering the instruction task differently, and you discover who fits your style. At the workplace, it is your own responsibility to learn something. You can always find someone to tell you how to do things. If you do not learn something, it is your own fault. You have a possibility of learning many things.

Anders expresses the view that instruction in the workplace is organised as a possibility in the social space, which you have to seek out yourself.

The assigned instructor is not always the chosen one. It is evident that the apprentices build their own learning networks and seek out instructors who fit their personality. This indicates that relations of instruction in the workplace are very emotionally dependent and also dependent on whether the instructor appreciates his or her task.

However, problems arise in respect to those apprentices who are not extrovert enough to seek their own instructors. At the same time, the example illustrates the difficulties in gaining access to instruction in the workplace. It seems that the apprentices themselves have to find an instructor because of poor access to the assigned instructor. The apprentice apparently creates his own learning field through a selected learning network consisting of instructors with both the time and ability to instruct the apprentices. The responsibility for their own learning is not a valued pedagogical concept in the workplace, but it is sometimes a necessary condition for learning enough to perform the tasks of work. As I will show, the difficulties in gaining access to instructors often means that the apprentices use each other for help, inspiration and instruction.

Symmetrical Instruction

There is a specific distinction which regards teaching and learning as a collective and decentralised process in the workplace, namely, the contrast between symmetrical and asymmetrical instruction. Symmetrical instruction often takes place in apprentice relations with equal social position. Asymmetrical instruction is defined as taking place in the relations between the experienced and the not so experienced. Asymmetrical instruction resembles the technically-mediated instruction mentioned in the first empirical example, but the composition of the instruction is primarily based on a strong asymmetry.

Studies of apprenticeship and vocational education often highlight how apprentices are capable of both instructing and learning from each other (Fuller & Unwin, 2004). Considering the concept of instruction in the general pedagogical literature, this is seldom mentioned as an issue. Lave & Wenger (1991) refer to the symmetrical relations between the apprentices as one of the most effective aspects of learning possibilities. Nielsen's (2004) results, based on a survey among 234 students in the Danish vocational education system, also show that the apprentices use each other as learning resources.

My studies indicate that the apprentices use each other first of all as the most accessible possibility of instruction. The apprentices help each other deal with the frequent shift in roles they have to fill out as students in vocational school and apprentices in the workplace. The other apprentices possess the most immediate knowledge of what is required of the apprentice to constantly move between school and work. A significant aspect of the asymmetrical instruction is that it is based on a

safe base with room for technical innovation and reflection. Through the cooperation with other apprentices, new ideas and possible products can be developed. Competition is also an aspect of this relation between the apprentices with regard to getting the best ideas and developing new designs for and repairing the mobile phone or the radio.

The apprentices also point out learning through teaching each other, and thereby gaining further knowledge about their own position in the field and about which subjects they master, and which subjects need more work:

Niels: If another apprentice asks you about something you have to know about that something. When you explain a subject matter to someone, you learn it yourself. Of course it is the same at vocational school. You learn a lot by instructing other students and get greater knowledge about your own work.

It is clear that the apprentice instructing and guiding his fellow apprentices may learn much about his own work. The requirement of explaining to another person how to approach a difficult task involves reflection on one's own work that reveals its various aspects to the instructor. Being an instructor for fellow apprentices may therefore make the apprentices develop a critical attitude towards the usual work. This symmetrical instruction contrasts with the asymmetrical instruction from the journeyman to the apprentice.

Asymmetrical Instruction

In interviews, the apprentices often mention to their observations of the work of the journeymen as a means of learning the involved task. Typically, the journeyman shows his own way of working and then gradually lets the apprentice imitate the procedure. This instruction often looks like a typical scaffolding situation using the progression of observation – demonstration – imitation and concrete problem solving.

The apprentices also mention the journeymen pushing them to exceed their level of competence. In the following, an apprentice refers to the often silent conditions of the competent instruction in the workplace:

I: Can you give me an example of a competent instructor?

Bjarne: Well Hans just knows when you scratch your head and do not know how to proceed – he just says 'Hey, Bjarne look over here'. You haven't said anything but he just knows. I ask him: 'How did you know that I was looking for that'. He says: 'I just know these kinds of things'. He is very cool. He has had apprentices by his side for such a long time.

The asymmetrical instruction in the above appears to be mediated by the journeyman silently monitoring the work of the apprentice. The journeyman 'reads' the gestures and the actions of the apprentice and the following instruction functions as a kind of 'frustration control' helping the apprentice with the troubling task. The instruction process also involves the apprentice admiring the journeyman. This indicates that instruction implies much more than just the internalisation of knowledge and skills. The journeyman in the above example seems to incarnate the learning 'telos' of the apprentice who wants to be just as competent as the journeymen. In this respect, other apprentices often mention the problematic aspects of their own admiration for the journeymen:

Niels: There are many journeymen that I admire in a professional respect but it is also a dilemma. One the one hand, you may take over their bad habits, and one the other hand you try to copy some of their very effective procedures.

The very asymmetry between the journeymen or the master, and the apprentice may be critical. The apprentice may copy bad habits and many apprentices may not be as reflective about this aspect as the apprentice in the above example. The example is also very interesting because it points to the direct relationship between instruction and imitation. It means that instruction does not per definition lead to a critical stance toward the existing or toward expansive learning as claimed by Engeström (cf. neglect on the importance of instruction in the workplace).

Conclusion

Through the above examples, I have highlighted the aspects of instruction in the workplace, which was mentioned by the apprentices interviewed as part of my field study on apprenticeship learning in the Danish vocational education system.

First of all, instruction was analysed as a structuring resource or a context for learning. The above examples show how instruction is often a very collective and a collaborative process in the workplace involving many social relations and places and not only the relation between the master and the apprentice. One of the fundamental differences between vocational school instruction and workplace instruction is that the instruction at vocational school is often organised as part of a teaching situation and as something taking place at certain times and places, while the instruction at the workplace is much more flowingly organised to take place when the need for instruction arises. It is clear that instruction in the workplace typically follows a line from an apprentice initiative to a journeyman instructing, while the instruction, as part of a teaching situation at vocational school typically goes the other way around from

the teacher initiating a lecture and the student being receptive in respect to the material taught.

The instruction that the apprentices find most valuable is the instruction connecting directly to their future identity as a skilled worker. This attributes coherence between the content and form of the instruction process.

The examples used in the above also show that instruction involves more than the internalisation of skills and knowledge. Rather, instruction is part of wider processes of identity change from being a student in the vocational school system entering into adult life as a skilled professional. Instruction processes will involve aspects of admiration, respect and 'blind' imitation of the instructor and, thereby, much more than transmission of knowledge. A journeyman instructor at the workplace may also be a role model for life for the apprentice.

Referring to the distinction between the assigned and the accessible instruction, I have highlighted an important aspect of instruction in the workplace. It is not always the assigned instructor who is the preferred instructor by the apprentice. This means that the apprentice often creates his or her own network of instructors who fit the apprentice's personality. Very often, the instruction is invested with personal dimensions, and my examples therefore point at instruction as invested with emotions and emotional labor on behalf of both the apprentice and the instructor. It is an illusion to think of instruction as only a neutral process aiming at the transfer of knowledge.

As part of the decentralisation of the instruction process from covering only the relationships between the apprentice and the master, I have pointed at the need to consider both the symmetrical and the asymmetrical relations of instruction at the workplace. There are many other opportunities for instruction and learning than usually implied in the relation between the master and the apprentice. My point is that we need to open our eyes to the highly differentiated contexts for learning and instruction in everyday life, and that this new view on the decentralised process of instruction may make the designers of learning environments more keen on adopting the fine distinctions between the function and the use of instruction in the workplace and at vocational school.

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Notes

- [1] The article is a revised paper originally presented at the symposium 'Vocational Education and Training in Denmark 1' at NERA's 32nd Congress in Island, 11-13 March 2004
- [2] The concept of scaffolding was applied in an article elaborating on examples from the electromechanical field (Tanggaard, 2003).

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