Promoting learning and transfer between school and workplace

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The aim of this article is to discuss the theoretical and practical problems in effecting transfer between school and work, and to present a new conceptualisation of transfer called \textit{developmental transfer} that shifts the emphasis from the individual transfer of knowledge to the collaborative efforts of organisations to create new knowledge and practices. We give an overview and evaluate the current notions of transfer and present the need and characteristics of the developmental transfer. In a case study, we also describe the concrete tools for promoting the developmental transfer in professional higher education. A new way of enhancing collaboration between the school and the workplace is based on successful boundary crossing and the formation of a shared object between activity systems.

Keywords: Transfer; Developmental transfer; Higher education; Activity system; Boundary crossing

Introduction

In complex societies, one of the driving forces behind individual and collective development is the communication and transfer of knowledge between institutions. The legitimacy of the educational sector rests heavily on assumptions that transfer occurs between an educational institution and a workplace. Collaboration between school and work has, on the other hand, been the main focus on improving the vocational education in the new millennium. This has been the trend in European countries,
where workplace learning is increasingly being discussed within a common European framework.

As the problem of integrating theory and practice has traditionally been approached as a problem of transfer, it is not surprising that the discussion about transfer has been intensive. During the last 100 years, many strong claims have been made for the importance of transfer in education. The intensification of the debate during the last 10–15 years is evident in articles by Anderson et al. (1996, 1997), Greeno (1997) and De Corte (1999). More recently, Tuomi-Gröhn and Engeström (2003) have published the book *Between School and Work: New Perspectives on Transfer and Boundary Crossing*. Other authors have also given extensive reviews of various aspects of transfer (Pea, 1987; Detterman, 1993; Greeno et al., 1993; Beach, 1999; Bransford & Schwartz, 1999; Packer, 2001; Carraher & Schliemann, 2002).

Achieving significant transfer in learning has proven to be difficult (see Gruber et al., 1995; Mayer & Wittrock, 1996). However, successful experiments with the cognitive approach (e.g. Singley & Anderson, 1989) and in cultural–historical activity theory (CHAT) (Tuomi-Gröhn, 2003) demonstrate that transfer of learning to new situations or tasks is not impossible. The partial incompatibility of these findings points to the need to find new conceptualisations of transfer and educational arrangements to facilitate it.

The discussion in the earlier-mentioned publications has mainly concentrated on the debate between cognitive approaches and situated or socio-cultural approaches. This tension serves as the backdrop of our presentation here. We base our work on a new developmental perspective on transfer that attempts to go beyond the opposition between cognitive notions and their situated challenges by shifting the emphasis from an individual to a collective conceptualisation of transfer. This view of transfer is based on cultural–historical activity theory (CHAT) (Vygotsky, 1929; Leont’ev, 1978) and is called *developmental transfer*. Developmental transfer gives us a framework with which we can explain how new knowledge, activities and practices are created.

The three aims of this article are: (1) to reframe the understanding of the idea of transfer of knowledge and what counts as transfer, based on a comparison of CHAT with other current approaches to transfer; (2) to present developmental transfer as a new approach to transfer between school and workplace; and (3) to give an example of how developmental transfer was successfully promoted in Finnish professional higher education, in an occupational therapy education.

**Current approaches to transfer**

In this section, we introduce and evaluate the current approaches to transfer in order to show that a novel developmental approach in vocational education is needed.

**Cognitive view of learning and transfer.** Cognitive notions of transfer are based on the idea that knowledge is transferred from the solution of one task to the solution of another task. The problem solver is seen as an active participant in the problem-solving
process, as one who must manage the way the prior knowledge is used to solve a new problem (see also Perkins & Salomon, 1987; Mayer & Wittrock, 1996; Soini, 1999).

A number of cognitive psychologists refer to mental schemas as a theoretical basis for understanding transfer. Most versions of the symbolic schema theory use word ‘problems’ as a structural model. For instance, solving an arithmetic problem depends on recognising a pattern of relations among the quantities that are described in the problem. Transfer occurs if the pattern of quantities in the transfer problem is recognised as fitting a previously used schema. Transfer, therefore, requires the ability to interpret the learned symbolic schema in the transfer situation (Greeno et al., 1993).

The traditional cognitive view emphasises the static quality of transfer in experimental practice. Transfer is treated as a process of taking a given item and applying it somewhere else (see also Hatano & Greeno, 1999). However, more recent studies based on the cognitive approach, like that of Bransford and Schwarz (1999), refer to a future orientation of transfer where neither the knowledge nor the environment is considered static.

Some representatives of the theories of situated learning (notably Lave, 1988; see also Lave & Wenger, 1991; Greeno et al., 1993) have been critical of cognitively oriented transfer research. The target of critics is the separation of cognition from the social world, the separation of form and content implied in the practice of investigating isomorphic problem solving and a strictly cognitive explanation for continuity in activity across situations (Lave, 1988, p. 43).

Situated learning and transfer. According to situated approaches, knowledge is not only mentally structured but fundamentally bound to particular situations. Learning and knowing are processes of participation and apprenticeship in communities of practice. Because each situation is unique, a number of representatives of the situated learning approach (e.g. Lave, 1988) deny the possibilities of transfer.

Some other representatives (e.g. Greeno, 1997) take a more moderate stance and argue that what is transferred from task to task is not knowledge or abstract schemes but patterns of participatory processes across everyday situations. The context of the transfer is extended from tasks in a school to situations in everyday life outside school. Not only symbolic, abstract schemata are transferred but also, and mainly, action schemata. The issue confronting transfer, then, is to understand how learning to participate in one situation can influence (positively or negatively) one’s ability to participate in a related activity in a different situation (Greeno et al., 1993, p. 100). The master–novice relationship is considered important when learning about these interactions and transferring them to new situations. In order to emphasise this conceptualisation of transfer compared to previous approaches, Hatano and Greeno (1999) propose to use the term productivity, rather than transfer, to refer to the generality of learning in a situated approach.

The view of transfer as situated is promising, in that it switches the locus of learning from an isolated Cartesian individual to a novice participating in a community of practice. In doing so, it also expands the structures of knowledge to include not just
mental and symbolic representations but also physical artefacts and recurring
dynamics of social practice. However, this approach does not help students to apply
theoretical concepts and models in practice. In addition, the situated view of transfer
depicts communities of practice as stable environments and does not address the
outward movement, radical innovation and changes that are so common in today’s
working life environments (Tuomi-Gröhn & Engeström, 2003).

Socio-cultural perspective and transfer. Drawing on a number of socio-cultural oriented
theories, Beach (1999) has called attention to the dynamic nature of social situations.
Beach is critical of current cognitive notions of transfer that assume the static nature
of the tasks or situations across which transfer occurs. The result is that the role of the
individual learner is overemphasised and those who are involved in collective tasks or
who see them as dynamic processes are excluded from the processes of transfer.

Beach emphasises the changing, dynamic nature of transfer situations instead of
conceptualising transfer in terms of movement between static settings. Learning is
not only needed in the original learning situations, but also in transfer situations.
Beach’s framework defines the transfer above all as movement across the boundaries
doing different activity contexts, such as between a school and a place of internship,
between school and work, between different levels of education, etc. Transitions can
be multi-directional and reciprocal. It is not only the knowledge that moves, but the
entire human being, including his or her identity and social participation, changes as
well. In this process, the learner reconstructs his or her relation to the context.
According to Beach, transfer is a transition of multiple individual learning character-
istics between changing social situations. Beach uses the term consequential transition
instead of transfer to emphasise the dynamic nature of transfer.

Beach’s framework is promising in emphasising the dynamic nature of transfer.
However, in his approach, the locus of learning is still firmly in the individual. In addition,
while Beach points out that multiple processes are involved in consequential
transitions, he does not really elaborate on the specific nature of these processes.

Developmental perspectives and transfer. From the point of view of activity theory,
previous accounts of transfer are inadequate in that the unit of analysis of learning
and transfer is still depicted as an individual, confined within his or her relatively
enclosed ‘situational domain’ or movement between different organisations. An
activity–theoretical view (Engeström, 1987) offers a new unit of analysis of learning
and cognition: a collective, object-orientated activity system. The learning of an
activity system (Leont’ev, 1978), such as a school or work organisation, and the
learning of an individual are intertwined, and the individual’s learning is understand-
able only if we understand the ways in which the entire activity system ‘learns’. In this
view, significant learning processes take place in collective activities. Collective learning
can be described as in Figure 1.

Figure 1 describes individual activities as a part of collective activities. The upper
part of the triangle describes the individual activities. In an activity system, the word
subject refers to the ‘individual’, e.g. a student, whose point of view is adopted in the analysis. The object refers to the ‘raw material’ or ‘problem area’ to which the activity is directed, e.g. the profession to be learned. The object of the activity is oriented towards a particular goal and is transformed to produce outcomes. Examples of the outcomes in professional higher education are the graduated experts. Results are achieved with the help of mediating instruments, understood here as mental or material tools and signs that are available within an organisation. Examples of tools in professional higher education might include learning strategies or theoretical and practical models of the profession to be learned.

The bottom row of the model describes the relationship between an individual and a collective activity system. Rules refer to the explicit or implicit regulations that constrain actions. For instance, rules could be the degree regulations that govern the actions of the students. Community denotes all the participants, e.g. students, teachers and student counsellors who share the same object in an effort to produce change in the object. Division of labour refers to the distribution of tasks, authority and benefits among these participants.

As social organisations are constantly growing and changing, demands for professional expertise have also encountered new challenges. Expertise is not only manifested in performing known tasks. New problems arise constantly, and there is little reason to expect that their solutions can be quickly turned into routine repeatable procedures. These conditions give rise to a need for a horizontal expertise, where practitioners must move across boundaries to seek and give help, and they must be able to find information and tools wherever these happen to be available (see Engeström et al., 1995). The master–novice relationship is becoming problematic because new situations demand dialogical, collaborative problem-solving approaches. A central feature of this kind of expertise may be characterised as the boundary crossing between activity systems. This implies bringing information, knowledge and practices from one activity system to another.
In preparing to face constantly changing society, the subjects of different activity systems, such as a student, a teacher or a practitioner, have to cross the boundaries of their own activity system to seek and bring information, knowledge and practices from other activity systems. In this mode of activities, namely boundary crossing (Engeström et al., 1995), the basic model is expanded to include minimally two interacting activity systems (Figure 2). Boundaries between school and workplaces have developed over a long period of time. They emerge easily during internship periods where the theoretical and practical studies are separated from each other. However, school and workplace could have a potentially shared object that rises from the work activity and its developmental needs.

From the student’s point of view, one’s future workplace will inevitably be caught in developmental turmoil. Thus, the best way to learn is to become engaged in real life processes of change while still in school. Internship periods, often extended and substantively remodelled, produce natural opportunities for schools to take on new roles and foster collaboration with workplaces.

Collaboration between school and work offers a new possibility and challenge to reconceptualise the problem of transfer. Since 1998, a research group in the University of Helsinki, the Center for Activity Theory and Developmental Work Research, has actively developed a new developmental perspective to transfer called ‘developmental transfer’.

Engeström (2001b) defines three characteristics of developmental transfer: (1) learning is a process where several activity systems, such as a school and a workplace, implement a shared developmental project with contributions from all the participants; (2) one or more theoretical concepts created during the learning process facilitate the understanding and reconstructing the object of work in a new way. For instance, the problems of the patient can turn the student to reconstruct the object of the studies from acquiring new knowledge to a patient needing care. This is a decisive change; (3) and the learning process leads to implementation of the new concepts as tools or models of new activities or solutions.

![Activity system of school and workplace](image)

**Figure 2.** School and workplace as integrating activity systems
In this phase, we can raise a question: what actually transfers in the case of developmental transfer? It is not only the transfer of individual knowledge from task to task, or the transfer of individual practices from one everyday situation to another, but also a change of identity during the training process. Instead, the goal is to give tools to students and practitioners to deal effectively with new situations. This model of confronting a new situation with a process of expansive learning (Engeström, 1987) and multi-voiced discussion between two activity systems transfers from one work situation to another. This is the very essence of developmental transfer.

Because activity systems are, by their nature, diverse, hybrid and multi-voiced, contradictions and conflicts between different types of activities and activity systems can be the moving forces for expansive learning cycles in activity systems. Expansion happens substantively, by constructing a more encompassing object and motive for the activity (substance dimension), and socially, by recruiting a growing number of participants in the transformation effort (social dimension) (Engeström, 1987). In studies based on developmental transfer (Lambert, 1999; Tuomi-Gröhn, 2001; Konkola, 2003; Lukkarinen, 2005) the results of the developmental projects have been evaluated by analysing: (1) the expansion of new insights and working methods to other units or organisations; and (2) further developments of the knowledge and insights created, either in the original workplace or in other social organisations.

With an aim to promote developmental transfer the school is in an important position to offer its expertise and support the efforts of workplaces to change by organising developmental projects across the boundaries between school and work and by participating actively in developmental work. This means that school becomes a collective change agent that works in partnerships with local community organisations and workplaces. It implies that the school needs to prepare its teachers and students not just to do their assigned routine jobs but also to work as boundary crossers between the school and the work organisation, bringing new intellectual and practical tools and insights into the processes of change (Tuomi-Gröhn & Engeström, 2003).

Developmental projects based on activity theory differ from many project work models between school and work in some remarkable features: (1) the learner is not only the student but the entire team of student, teacher and practitioner. There are not just a student and supervisors but many learners; (2) the role of a teacher is to be a change agent instead of a distributor of knowledge; (3) the aim is to create new knowledge and also new practices. ‘Traditional’ projects are based on the application of existing knowledge, whereas here the aim is the expansion of knowledge and practices created to other units or organisations. These are demanding goals for educational projects but the results (see Tuomi-Gröhn 2001; Lukkarinen, 2005) indicate that they are not impossible to achieve.

In the case of activity theory and developmental transfer, we do not deny the meaning of individual learning and transfer but consider them as embedded in the collaborative efforts and transitions between activity systems in the creation of new knowledge, activities and practices and their transitions to new activity systems.
Comparison of different conceptualisations of transfer

Table 1 summarises current conceptualisations of transfer according to the basis of transfer, what transfers from where to where and what transfer is called according to each approach.

The first notion of transfer, the cognitive approach, is based on the transition of knowledge from one task to another task. Transfer will occur if the pattern of the abstract schema model in the transfer problem is recognised to fit the same schema that was used in initial learning. Research on transfer based on the cognitive approach is usually carried out in school settings.

In professional higher education, cognitive transfer has been one of the dominant approaches in promoting transfer. Internships have been designed to move from applying theory learnt at school to practical application. The emphasis is on the individual acquisition of knowledge and the application of that knowledge in problem-solving situations at workplaces.

The second notion of transfer is based on interaction between an individual and a social and material context. This view expands the context of transfer from schools to everyday situations. According to situated notions, patterns of participatory processes, in other words action schemata, can be transferred from one relatively stable everyday situation to another. The term ‘productivity’ may be more apt than transfer in describing what happens here because the focus is outcome-oriented.

Situated approaches are recently becoming popular in professional higher education (Tuomi-Gröhn & Engeström, 2001). It has been suggested that students are motivated to learn the practices of experts in real work as such when participating in meaningful actions at the workplace. This view of transfer has led to arranging various kinds of internship situations for each student. In this way

<table>
<thead>
<tr>
<th>Approach to transfer</th>
<th>Basis of transfer</th>
<th>What transfers?</th>
<th>From where and where to?</th>
<th>Transfer is called</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive</td>
<td>Task</td>
<td>Abstract schemata</td>
<td>From task to task, usually in school context</td>
<td>Transfer</td>
</tr>
<tr>
<td>Situated</td>
<td>Individual in stable context</td>
<td>Social participation</td>
<td>From one static everyday situation to another</td>
<td>Productivity</td>
</tr>
<tr>
<td>Socio-cultural</td>
<td>Individual in dynamic contexts</td>
<td>Personal knowledge, social participation and identity</td>
<td>From one changing social organization to another</td>
<td>Consequential transition</td>
</tr>
<tr>
<td>Activity theory</td>
<td>Collaborative activity systems</td>
<td>Collaborative concept formation New concepts are used as tools or models of new activities</td>
<td>From one dynamic activity system to another</td>
<td>Developmental transfer</td>
</tr>
</tbody>
</table>

Table 1. Comparison of different conceptualizations of transfer
each student is able to see how principles and different types of knowledge are used in practice.

To a certain extent, the conceptualisation of transfer based on socio-cultural views combines previous approaches that see the unit of analysis of transfer as involving both individual cognition and participatory everyday processes along with growth of an individual’s identity. All these are involved when a student moves between changing social situations from home to school or from workplace to school and back. These transitions are multi-directional and reciprocal. Instead of transfer, Beach uses the term ‘consequential transition’.

In professional higher education, we can also see features of consequential transition when students are moving between school and workplace. The most important feature is the strong emphasis on identity construction. This topic comes up when the teacher traces the development of the students and when students discuss the practices with experienced practitioners.

The important difference between developmental transfer and other current notions of transfer is that developmental transfer conceptualises learning and transfer as a collective process, the entire activity system as the unit of analysis (Figure 2). The aim of developmental transfer is to create new knowledge and practices and the expansion of these activities to both school and working life organisations.

Promoting developmental transfer in occupational therapy education

Traditionally, internships in occupational therapy education have been the most common means of linking studies with working life. During their internships, students practise in different kinds of hospitals and rehabilitation centres. Tutorial conversations, organised once or twice during the internship, have been the most usual means of reinforcing collaboration between school and workplace.

In an analysis of these kinds of tutorial discussions, Konkola (2001) found that the main tutorial activities are guidance and evaluation. Konkola made the significant observation concerning these conversations that while a teacher and a student discuss the student and his or her learning, the occupational therapist rarely takes part. Similarly, when the student and the occupational therapist discuss events at workplaces during the internship, the teacher keeps quiet. These observations can be explained by the lack of shared interests and experiences.

Internships have long been structured around learning tasks. Usually these learning tasks are set by the teachers and serve as the means of attaining the individual goals of the student. They appear as the student’s private means of learning and creating knowledge, free from interference from the work community (Lambert, 2001, 2003a).

According to Konkola (2000) and Lambert (2001, 2003a), traditional tutorial conversations and learning tasks are not designed to promote collaboration between school and working life. However, these carry the crucial potential for developmental transfer.

In the occupational therapy education, developmental transfer is applied by creating a developmental project where three parties learn in collaboration and dialogue: the
school, the student and the occupational therapy unit aiming at expanding knowledge and practices.

The starting point of the research project in the occupational therapy education was that learning tasks could be consciously transferred into pedagogical tools that can serve as boundary objects (Star, 1989) between school and work (Lambert, 2001, 2003a). Then, the main characteristics of the learning tasks are that they stimulate students, teachers and practitioners to look for shared interests and to create joint projects to meet these challenges. For this joint activity, new kinds of concrete places for collaboration, negotiation and boundary crossing are needed. Lambert (1999, 2003b) has developed the model of ‘learning studio’ as a boundary-crossing place, where students, teachers and practitioners can discuss together their developmental projects in a multi-voiced debate.

An internship provides a natural setting for collaboration between school and workplace. It identifies a terrain where these two activity systems encounter each other. In order to illustrate the previous approaches to transfer and to present our novel approach, we use, as an example, the case of occupational therapy education within professional higher education in Finland. In the present case, we are looking for those possibilities or obstacles that appear when school and workplace collaborate in an effort to tap the potential for transfer.

Developing a new learning task for internships. In the occupational therapy education, a new learning task called ‘therapy process and professionalism’ was developed by a teacher team and introduced during the third internship period in the fifth semester of degree studies. The aim of the task was to promote the collaboration between school and workplace in development of the occupational therapy.

In the first phase of the learning task, students were encouraged to act as agents for change and interview the occupational therapists at the workplace in question. The main focus of this interview task was to evoke special interest in developing some area of occupational therapy and to create a basis for a joint project between the occupational therapy education and the workplace. Students were asked to use the model of an activity system when framing interview questions.

In the second phase, the students, the teachers and the occupational therapists were encouraged to form a team in order to create a joint project around the developmental need founded in the interview. They were asked to make a plan to deal with the developmental need. The second phase included meetings, networks and experiments that were needed for the project.

In the third phase, the students were asked to arrange a learning studio in which they were required to call together the staff of the workplace, the teachers and other necessary participants to evaluate and further develop the results and insights of the developmental project.

To determine the usefulness of this new learning task, particularly its suitability for creating boundary objects and crossing boundaries, we had to evaluate the task in use. This was also necessary in order to determine whether the features needed to promote developmental transfer were present.
Development of mirror rehabilitation. Sari, an occupational therapy student, completed her internship (seven weeks) at a district hospital in Helsinki. This hospital had an occupational therapy unit with special experience in treating patients with stroke. It appeared from the initial interview that there was a need to update traditional occupational therapy methods for patients with stroke because of shortened treatment periods and new information about rehabilitation.

The occupational therapist involved in the internship reported that a well-known brain researcher from Helsinki University of Technology had developed a new method for rehabilitating patients with stroke. This therapy was associated with new findings concerning the connection between the visual and motor areas of the brain (Hari et al., 1998). This connection is facilitated by using a mirror in the following way: the patient is requested to sit at a table with both arms extended out on the table. A mirror is placed upright between the arms, the paralysed arm behind the mirror (see Figure 3). When the patient starts to move his or her healthy arm, looking at the same time in the mirror, he or she receives a visual impression that his or her paralysed arm is also moving. This visual reflection is thought to activate the neurological systems of the brain and thus have a positive impact on the paralysed arm (Hovilahti-Laine & Salonen, 2001).

Nobody had had an opportunity to try out this new method before it was studied in the internship, despite considerable interest in it. The occupational therapists suggested to Sari that she might explore the theoretical basis and applicability of that method as a learning task for her internship.

During the internship, Sari made a formal contact with the brain researcher from Helsinki University of Technology, who was very pleased to hear that her ideas and research findings were going to be tested. Especially important was the fact that Sari, her teacher and the occupational therapist met regularly during the internship and examined the theoretical basis for the method jointly. They called the method mirror rehabilitation and planned how Sari could experiment with it.

According to the plan, Sari used the mirror rehabilitation method with a patient and collected data from that experiment. Sari wrote a summary of her experimental

Figure 3. Patient with mirror (Source: Hovilahti-Laine & Salonen, 2001)
work and the new knowledge it had produced. She arranged a learning studio at the hospital at the end of her internship and invited the brain researcher, the staff from the hospital and the teacher to attend. At this learning studio, the brain researcher reported her latest discoveries about brain functions, and Sari gave an account of her experiences with the mirror rehabilitation method. The participants were eager to experiment with a mirror themselves in order to confirm its effectiveness and to evaluate its possible adaptation for use in treating other patient groups (e.g. patients with amputation).

This internship and the learning task formed the basis for a longer period of collaboration between the occupational therapy education, the hospital, the brain researcher and another student. During this collaborative work with a shared object many new contacts (e.g. with the Department of Psychology of the University of California at San Diego) were made, and, as a result, theory-building and practical knowledge related to mirror rehabilitation expanded both in working life and in the school.

Characteristics of developmental transfer in the mirror rehabilitation project. According to Engeström (2001b), there are three characteristics of developmental transfer: (1) learning is a process where several activity systems implement a shared developmental project with contributions from all participants; (2) one or more theoretical concepts created during the learning process facilitate the understanding and reconstructing of the object of work in a new way; and (3) the learning process leads to implementation of the new concepts as tools or models of new activities or solutions. An analysis of the new approach to internship in occupational therapy education and especially of the example of Sari’s internship reveals many characteristics of developmental transfer.

First, learning was consciously designed to occur across the boundaries between the occupational therapy education and the hospital. Both the participants of the joint project were acting as boundary crossers. Concrete boundary crossing between organisations and areas of expertise occurred when the student got in touch with the brain researcher, and the brain researcher attended the learning studio organised at the hospital. Above all, the student and the teacher were acting as boundary crossers because of their strong role as intermediaries in the joint project. They organised the boundary-crossing events in meetings and arranged the learning studio on the mirror rehabilitation method. The learning studio turned out to be an especially important locus of collaboration and collective learning for the staff of the hospital, the student, the teacher and the brain researcher.

Second, the participants found a shared object for the joint project in applying the findings of recent brain research in the rehabilitation of patients with stroke (theoretical insight). Participants critically read the research on mirror neurons (see Murata et al., 1997; Hari et al., 1998) and the use of a mirror as a therapeutic mean (Altschuler et al., 1999) and conducted a pilot experiment with a patient with stroke. During the process, they created the term ‘mirror rehabilitation’ to refer to this new treatment approach (implication of the theoretical insight).
Third, subsequent events demonstrated a clear relationship between developmental transfer and expansions of the insights. In the hospital, the occupational therapists and the other practitioners started using the mirror rehabilitation method more systematically and more frequently (social expansion). Participants were also interested in developing the mirror rehabilitation method further in order to gain more knowledge about it (content expansion). The new method was also demonstrated and introduced to other hospitals in the Helsinki area with the help of the student, the teacher and occupational therapists.

It is significant that the learning task in this internship consisted of many boundary-object characteristics (Lambert, 2003a) that stimulated student, teacher and practitioner to look for shared interests and to create joint projects. The task was left sufficiently open to allow flexible application in practice as well as boundary crossing between several activity systems in searching for different kinds of expertise. The new learning task and boundary-crossing places related to it proved to be useful tools for collaboration between school and workplace.

**Conclusion**

This article has had a three-fold aim: (1) to reframe the understanding of the idea of transfer of knowledge and of what counts as transfer, based on a comparison of the CHAT with the other current approaches to transfer; (2) to present the new view of developmental transfer as a new approach to transfer; and (3) to give an example of how to promote developmental transfer.

We have argued that the cognitive, the situated and the socio-cultural approaches to transfer do not adequately explain learning and change at the collective level of activity. There is a need to account for transfer in a way that takes into account the means by which collective changes in activity systems emerge. The view of developmental transfer conceptualises learning and transfer as a collective process and the entire activity system as the unit of analysis. The focus on collective activities makes it possible to understand how collective reciprocal developments between school and workplace take place and how these developments create the conditions for individual development, as occurred in the occupational therapy internship in our example.

As part of understanding and implementing developmental transfer, the minimal unit of analysis is two activity interacting systems, as conceptualised in the third generation of activity theory (Engeström, 2001a). This analysis raises a focus on the boundaries and the processes of constant questioning and their redefinition (Kerosuo, 2003).

At an intermediate level of our theory, we have developed and described new tools for the boundary crossing. ‘Learning studio’ as a boundary-crossing place (Lambert, 1999, 2003a) has proved to be useful in designating a specific place where the boundary-crossers can engage in co-operation between interacting activity systems. We have also approached boundary objects (Star, 1989) as tools that help us understand and develop shared objects between school and workplace. We have shown that the idea of learning tasks as such a boundary object (Lambert, 2001, 2003b) has been crucially important in promoting developmental transfer.
To understand learning in the complex and multi-voiced area between school and work, the tools described above have been meaningful. This area is like a ‘no-man’s land’ and can be called ‘boundary zone’ (Konkola 2001, 2003). It refers to the territory where participants from different activity systems meet. A boundary zone is an area that is free from prearranged routines or rigid patterns. It is also an area where each activity system reflects its own structure, attitudes, beliefs, norms and roles. Because elements from both sides are always interacting in the boundary zone, it is considered to be an area where it is possible to extend the object of each participating activity system and to create a shared object between them. In this way, the activity itself is reorganised, resulting in new opportunities for learning.

Boundary zone has proved to be an important area where we have focused our change efforts and empirical studies in the further research of developmental transfer. We have preliminary observations about the experiments where new tools and solutions for co-operation at the boundary zone between school and work have been produced. Teacher and supervisor at the workplace can act as a boundary-crossing dyad (Lambert, 2004; Spets, 2006) that moves together between organisations, and participates together in developmental activities in both communities. Also writing and textual tools have been developed for promoting developmental transfer between school and work (Lambert & Vanhanen-Nuutinen, 2005). These tools aim to help teachers, students and practitioners to write within the joint projects texts that can reach the potential readers from working life and support the object construction at workplaces.

Promoting learning and developmental transfer at the boundary zone has fostered the emerging of a new kind of activity, called ‘boundary-zone activity’ (Konkola, 2003). In boundary-zone activity the subject is no longer an individual student performing his or her learning tasks separately from the practitioners and their work challenges, but a team consisting of one or more teachers, students and practitioners. This team has a shared task: to develop work practices by benefiting from each participant’s theoretical and practical expertise and with the help of a network of the necessary activity systems. The concept of boundary-zone activity takes us one step forward in our efforts to understand the processes which lead to developmental transfer. In this joint activity, despite or even as a result of disturbances and contradictions, a new activity transforms and coordinates the previously divergent activity systems. A key issue is that these changes occur both at the level of horizontal and vertical expertise. Collective and multi-directional changes need to be part of the process of developmental transfer.

Thus far, we have shown that it is possible to promote developmental transfer between school and work by constructing tools for learning and boundary crossing. From an activity-theoretical perspective the appropriation, use and development of artefacts that mediate the joint activity is a key for understanding workplace learning and the development of work practices (Miettinen & Virkkunen, 2006). However, we need longitudinal studies that describe and analyse how different activity systems interact and create possibilities for developmental transfer. These studies need to explore the relationship between the material world, institutional trajectories of
different activity systems and individuals’ learning trajectories (Flo & Ludvigsen, 2002). By varying the level of description, we can develop a better understanding of the collective transformation that takes place and how individuals learn as part of this collective change.

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Notes

1. See Greeno (1997) and Gruber et al. (1995) for a more comprehensive presentation of different views of transfer and situated learning theories.
2. Here, the term ‘internship’ refers to a period of fieldwork or practical training in the occupational therapy education.
3. Gutiérrez et al. (1995) have used the concept of the ‘third space’ in a similar vein when describing the learning and development that take place when ideas and needs from different cultures meet, collide and form new meanings.

References


