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INTERFACE:

ESTABLISHING KNOWLEDGE NETWORKS BETWEEN HIGHER VOCATIONAL EDUCATION AND BUSINESSES

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Abstract

The emerging knowledge society is one of the main reasons that underlie the appearance of the interactive combination of learning and working in higher education. It is argued that the coop education system and work-based learning can become important instruments in integrating learning and working only if coop education is organized as a knowledge network in which universities and business closely cooperate. Only then an innovative community can emerge in which student-employees work on their professional development. Based on this community perspective on coop education, a literature study and secondary analysis of evaluation and policy studies with relation to coop education are performed, in order to distinguish drivers for the development of coop higher education as well as factors that inhibit the acceptance of coop higher education. To further the conceptualisation of the coop system, the co-operation between HAS Den Bosch –University of Professional Education in Agriculture – and a number of business partners in a particular project (the Interface project) has been explored and examined. This article reports on the analysis of this project, focussing on the facilitating and inhibiting factors that play a role when establishing such knowledge networks. It is concluded that the further development of a system of coop higher education requires a number of advancements among others: further conceptualisation of this specific type of higher education, a quality assurance system that makes explicit what we mean by academic standards and

how students can meet these standards, and a clear description of responsibilities and obligations of the various parties involved. When it comes to the development of sustainable knowledge networks in which institutions of higher education and companies participate the design of a coop curriculum can be very helpful, but cultural differences still need to be overcome.

Key Words:

Coop curriculum

Cooperative university education

Knowledge networks

Networks between schools and businesses

University curriculum

Vocational education

Work-based learning

Introduction

Integrating work-based learning in the university curriculum seems to provide opportunities for higher education to connect with a knowledge society. Cooperative education is one of the strategies that help institutions for higher education, in specific universities for professional education, to establish knowledge links between formal education and knowledge intensive workplaces. The need for close links, and building knowledge networks of higher education and work environments in a knowledge economy is based on the assumption that the transition between formal education and the world of work has to be facilitated (OECD, 1999), and that knowledge development, knowledge circulation and knowledge valorisation between higher education and organisations should be intensified (OECD, 2000). In these knowledge networks improvements and innovations may occur that are essential for the development of a knowledge economy. Coop education primarily focuses on sustainable relationships between universities and companies for the benefit of an enriched curriculum for students. The difference between coop education and short periods of work experience and internships is based on the idea that the student has the status of employee, with a regular salary, making part of the working community. The work-based activities form an integral part of the curriculum, and successful completion is awarded with credits in the ECTS (European Credit Transfer System. Knowledge networks of universities and industry can link the explicit, codified scientific knowledge with working knowledge, practical know-how, which is rich in tacit knowledge (OECD,

2000). In this community of practice (Wenger, 1998) of workplace experts and faculty, students will participate, and move gradually to the centre of the community and become competent. To establish a system of cooperative education is an innovation project in itself. Therefore, coop project managers in school as well in the company should support these innovation objectives that are central to cooperative education and the establishment of knowledge networks.

In sum, in coop education practical work constitutes a vital part of the curriculum, and universities and businesses cooperate to create opportunities to learn at the workplace but also to facilitate students to integrate theoretical and practical knowledge and to develop useful competencies. As such, coop education can be regarded as a new way of linking experiential learning and formal school learning. In this article the need for integrating practice and theory in learning is related to the rise of the knowledge society. First, the discourse about the knowledge society gave rise to a redefinition of the concept of knowledge in itself: Knowledge is not longer viewed as cognitive based only, as social, contextual, and situational aspects are also acknowledged (Wenger, 1998). Consequently, knowledge is not only something to be found in books and articles, but is also present in working communities. “Communities of practice define what forms of competence are considered relevant and valid. Learning is taking place through participation and negotiation of identities in such communities” (Eteläpelto & Collin, 2004, p. 237). Secondly, the rise of the knowledge society urges employees to be prepared for lifelong learning and to play a vital role in knowledge development themselves.

Knowledge development is viewed as an interactive process in which theoretical knowledge and practical knowledge intertwine (Nonaka & Takeuchi 1999). From this perspective work-based learning as well as constructing knowledge from practical experiences are both necessary to gain relevant knowledge, to develop competences, and to be prepared for lifelong learning.

Despite the arguments supporting expansion of coop education, fears and objections are also abounding. Though the clear benefits of coop education, the same concept raises serious questions about the goals and outcomes of such education, as well as about how to maintain educational standards when part of the training takes place off campus.

This article takes a closer look at the ambivalence expressed towards coop education, exploring both drivers and inhibiting factors for coop higher education to develop. Drivers and inhibiting factors will be extracted from literature, but also from a particular project for coop education, the Interface project. This project offered many opportunities to explore drivers and inhibitors springing from the process of developing a coop curriculum.

Research questions

The main questions that will be answered in this article are:

1. What are drivers for the development of coop higher education?

2. What factors inhibit the acceptance of the coop training system in higher education?
3. How can knowledge networks be established between universities for professional education and companies?

Method

This report is based on a number of sources. A literature study and secondary analysis of evaluation studies of experiments on cooperative university education by the Dutch Inspectorate of Higher Education and ITS (the Institute of Applied Social Research in the Netherlands) offer valuable information on research questions 1 and 2. The WDWO-research team (Community of Dual Academic Education) conducted a policy study for the University of Twente, which included a case study of the coop system of Aalborg University in Denmark. Here, coop education is introduced as an innovative strategy. The WDWO-research team gave many practical suggestions on how to apply the drivers for coop education and how to overcome some of the barriers.

The Interface project reports on the analysis of a particular project for coop education, conducted by the HAS Den Bosch - University of Professional Education in Agriculture -, and a consortium of business partners. The Interface project was launched by KLICT, a network organisation stimulating the development and application of knowledge in the area of chain and network science. Interface

focused on the facilitating and inhibiting factors that play a role when establishing knowledge links between school and business partners. The knowledge links have been established by designing a coop curriculum, where students work and study not only in school but also in the context of real life situations in a variety of companies. Theoretical assumptions and the practical experiences in the Interface project lead to suggestions for further development of sustainable knowledge links between higher vocational education and businesses. The evaluation of the Interface project is helpful in answering the third research question.

What are drivers for the development of coop higher education?

The main characteristic of the coop education system is that the work term is a vital part of the school curriculum: the workplace as a site of learning (Inspectie van het Onderwijs, 2001).

This perspective on coop education is new in the university system of Netherlands and is not very widespread abroad either. However, various reasons underlie the coop higher education system's emergence. Literature study gives rise to distinguish four main societal and educational developments that favour a new approach to coop education.

The emerging knowledge society

The increasing importance of knowledge in our society and economy also demands for a shift in higher education in order to prepare students adequately to function within this type of society. Research into developments and trends within European organizations revealed that customer orientation and flexibility are key conditions in order to improve and innovate products which is key to survive as organization (Blass, 2005; Tjepkema 2002; Walton, 2005). As a result of an immense increase in developing, improving and producing new products organizations must learn quickly, drawing on information from internal en external sources (Harrison & Kessels 2004). Venkatraman and Subramaniam (2002) argue that the key resources that help organizations survive are becoming knowledge and expertise. They state that we are heading for an economy of expertise in which individual competencies constitute the basis for such expertise. What type of individual competencies will be important in this respect? Kessels (2002) argues that rather than knowledge in itself, competencies as curiosity, collaboration and involvement will be most significant as continuous developments require individuals to be proactive in initiating improvements and to participate in innovations collaboratively. From this line of reasoning, higher education ought to contribute to the development of these competencies, preferably by creating authentic learning situations for students as the mastery of competencies requires experience in real practice

(Billett, 2001; Boshuizen, Bromme & Gruber, 2004; Kessels, 2002).

To provide opportunities to learn within authentic learning environments schools will need to cooperate with companies and businesses and coop education will be helpful in this respect. Besides, schools as well as organizations may benefit otherwise from closer cooperation with the world of work. Influenced by the emerging knowledge economy, higher education has long ceased to be an exclusive player in knowledge development (Blass, 2005; Jansink, Kwakman & Streumer, 2005). Companies, institutions, private research institutes and consulting agencies are becoming ever more explicitly involved in research and development of new knowledge. Higher education hardly benefits from ignoring knowledge-intensive organizations or by viewing them as competitors. They will do better to become knowledge productive partners. For knowledge development and production to occur in partnership, knowledge networks in which universities and organizations participate closely have to be established (Cohen et al., 2002; Harrison & Kessels, 2004; Wenger 1998). The argument raised is that coop higher education can be an important instrument in developing such knowledge networks whereas the connection with a knowledge network may be an important reason for both teaching staff and employers to participate in a coop training system.

Revaluing practical experiences as source for learning

Although learning from practical experiences is recognized for quite a long time, a revival of the value of learning from experiences is currently to be noticed (Billett, 2001; Boshuizen, Bromme & Gruber, 2004). This revival may be explained by insights generated by educational psychology and school to work transition studies.

Such insights and views, with a strong emphasis on authentic learning environments, are strong arguments supporting the coop system in higher education

Educational psychologists have been advocating constructivism as a new influential approach to learning promoting that general knowledge and skills arise from concrete practical experiences in specific contexts only. Moreover, practical learning is also advocated as enhancing the process of knowledge construction by offering concrete confrontation with practice, even in programmes in higher education (Boshuizen, Bromme & Gruber, 2004). Exposed to the realistic and meaningful contexts in the workplace, students will experience that acquiring abstract and generalized domain knowledge and meta-cognitive skills is easier than in a formal programme intended to impart abstract, theoretical knowledge through lecture courses.

Next to educational psychology, studies considering the transition from study to work support the idea of learning by practical experiences (Boshuizen, Bromme & Gruber, 2004). The OECD study (1999) on the transition from study to work mentions the opportunities of learning in a realistic context and learning through application as the strength of combining learning with working. Students in the Netherlands report similar learning experiences (Van den Broek, 2001; Geelen, 2000).

Although practical experiences are important, it is widely acknowledged that just experiences do not lead to learning in itself. In general is stressed that knowledge construction involves reflection and abstraction from several concrete

and personal situations (e.g. Duffy & Jonassen, 1992; Boekaerts & Simons, 1993; Nonaka & Takeuchi, 1995; Van der Sanden, 1997). Billett (2001) states that individuals learn from activities in which they engage in the workplace but that they also have to interpret these experiences in order to learn from these. Therefore, the kinds of activities in which individuals engage influence the learning process as well as learning outcomes, whereas also coaching and guidance are significant conditions in workplace learning.

Growing emphasis on job market orientation

Finally, the one most frequently invoked reason for a system of cooperative higher education is early introduction to a complex and demanding job market. Moreover, educated individuals are expected to develop competencies that are difficult to acquire in the traditional lecturing room, such as communication skills, the ability to work together on a team and being comfortable in a work environment. Besides, students have often the desire to learn about their domain of study from external experts (Van den Broek, 2001). As an introduction to the job market, coop education inspires enthusiasm in students. In addition to viewing this form of study as an effective and focused way of learning, students indicate that they have an edge on the job market compared with full-time students (OECD, 1999). The main benefits mentioned in the OECD study on the transition from study to work are that students who have completed the new study-work programme of Limouilou College in Quebec thus far had a job upon graduation, their performance improved,

and contacts increased between faculty and the work environment (OECD, 1999, p. 93).

In addition to greater compatibility between education and the job market, the need to enhance social, communication and commercial skills underlies coop curricula in higher education (Commissie beoordeling experimenten duale opleidingen wetenschappelijk onderwijs, 1999; Roobeek & Mandersloot, 1998). The context of a real work environment is indispensable for acquiring those skills. Although some debate exists whether students might master such skills just as easily on the job after their academic study, schools as well as businesses agree more and more that avoidance of learning situations throughout an educational programme for acquiring such generally acceptable competencies is not longer justifiable (e.g. Hall & Weaver, 2001).

The disappearing full time student

A pragmatic reason for promoting coop curricula is that the typical full-time student has all but disappeared. According to De Reuver (1999), 80 percent of all students in the Netherlands hold jobs alongside their studies. The OECD report (1999) refers to a rising trend among students of combining study and work. The main reason is that many students need to earn money for their tuition fee and cost of living. Other important factors include the independence and enjoyment they derive from work. The students also indicate that working while studying improves their chances of landing an appropriate job afterwards.

Implementing the bachelor-master-system in European higher education may increase the number of (adult) university-students (Ministerie van Onderwijs, Cultuur en Wetenschappen, 2001). Regarding to trends as lifelong learning it is imaginable that students who already have jobs are motivated to develop themselves by studying on a bachelor- or master-degree. For the university it might be a great opportunity to offer education-programmes in which students would be able to combine their study with a job that is relevant to their field of study (Cohen et al., 2002).

If so many students already combine their study with work, then perhaps universities could do more to arrange this work time to benefit the course of study substantially. Instead of stocking shelves at the supermarket, cleaning or working as a courier or chauffeur, they might organize work that is more compatible with the essence of their studies. Law students would benefit from working at a law firm or court of justice. Aspiring administrators might do well at municipal or provincial offices or a ministry. Future art historians will thrive at a museum. Successful coordination of work and study, as is the intent of coop training courses, will benefit all parties.

What factors inhibit the acceptance of the coop training system in higher education?

Despite several powerful drivers enhancing the expansion of coop education, the coop educational system encounters also difficulties in developing in such direction. As mentioned in the introduction, the literature expresses fears and objection representing various inhibiting factors. In our view, those factors that inhibit the acceptance of coop education often stem from the fear of decline of level and the loss of academic freedom. In addition, some inhibiting factors of a more practical nature are also described; these factors reside within the separation of the school system and the world of work resulting in mutual misunderstandings. Inhibiting factors found in the literature will be described first, but will then be debated with the help of arguments extracted from some evaluation studies into coop education in the Netherlands.

The level of higher education

Many politicians, university administrators and faculty fear the demise of educational values in the formal in school curriculum (Billett, 2001). Common arguments expressed against coop education have to do with a concern for the shifting balance between theory and practice within coop curricula. As to a large extent, learning has to take place in the workplace there is a fear that students do not acquire sufficient theoretical knowledge. It is argued that higher education requires students to master complex knowledge and skills, and that reflection on experiences plays a critical role in learning (Boshuizen, Bromme & Gruber, 2004). As cooperative education is closely linked with practice at the workplace it does not qualify as a true scholarly programme according to this rationale as the daily grind

prevails over creativity (Schuyt, 1998). Work environments are believed to not properly stimulate knowledge growth nor reflection, as learning takes places in an environment that is not always suited for learning whereas the working environment and students themselves lack adequate qualities for reflection to occur. The concern is that cooperative university training will resemble less prestigious occupational programmes.

Nevertheless, a declining level of university qualifications is not in the interest of any of the parties involved. Students explicitly choose for the coop system to upgrade their qualifications, even when the study is prolonged and the curriculum is burdened with extra study obligations (Van den Broek, 2001). Faculty see means to enrich the curriculum by offering authentic and realistic learning opportunities in the world of work. Employers, who are willing to participate in the coop university system, are not primarily searching for cheap labour; their interest lies with attracting highly motivated and bright knowledge workers and with establishing sustainable relationships with knowledge centres like universities.

Fortunately, the mind-deadening grind of work environments, from which criticism and creativity have been exorcized, no longer dominates reality. This is true for knowledge intensive work environments in particular. Especially, the ability to engage in reflection and to abstract, curious exploration and encouragement of creative turmoil characterize organizations operating in dynamic knowledge networks. In this respect, the academic competencies have lost their exclusivity and form the core of a broadly growing knowledge society. Both universities and knowledge-intensive organizations benefit from joining forces to enhance each

other's expertise and opportunities (Gray, 1999; Van Ravens, 2000). A coop learning system will not only benefit but will also facilitate the necessary partnership university faculty and employers explore.

Academic autonomy

Another often-mentioned threat is the potential loss of academic autonomy when implementing coop education (Billett 2001). In this respect Schuyt states: 'Working for a firm basically means accepting the employer's justified interests and implicitly or explicitly underestimating the search for truth that figures in all scholarly disciplines' (Schuyt, 1998, p. 38).

Justified interests among employers, students and school programmes, which may conflict in some cases, do not mean that the academic truth-seeking objective cannot or may not play a role in the intended partnership. Understandably, this thorny issue has already alerted scholars engaged in applied research (Köbben & Tromp, 1999). If the employer has reason to highlight or – conversely – to obfuscate and distort certain research results and is willing to use the means to achieve this end, the quest for the truth will be frustrated. Student involvement in such practices will certainly taint the coop model's reputation. If, however, the parties concerned share the same view about knowledge development, as intended by coop curricula, and record it in the work-study agreement, they need not blur the distinction between scientific truth and economic interest.

Besides the feared influence on research results employers might be willing to influence the content of the curriculum in exchange for the salary they pay for the student-employees. When establishing a partnership between schools and companies for successful implementation of a coop training system, companies do influence the curriculum as their working environment has to become an integral part of the school curriculum. As such, their influence is enhanced, but only with the explicit goal to favour student learning. So, in conceptualising, designing and developing such a curriculum the influence of the cooperating companies and institutions is obvious. However, this does not automatically mean a loss of educational freedom. From a point of view of quality assurance and accountability, the teaching staff should bear final responsibility for the educational qualifications. The study-work agreement between student, university and company should stress this typical faculty responsibility. A quality assurance system, which has not yet been established for coop systems (Inspectie van het Onderwijs, 2001), could provide an education licence for participating companies. Apparent lack of learning potential of the workplace, poor coaching of students and violation of the principal of academic autonomy would then be reasons to recall the education licence.

Gap between schools and the world of work

Inhibiting factors of a more practical nature relate to the unfamiliarity of schools with the world of work, as well as the lack of educational awareness in companies. For school staff members it appears to be difficult to adopt a language that is understood in companies. School managers may have reached formal agreements

on cooperation with relevant companies, staff feels uneasy in approaching local supervisors when it comes to planning concrete student assignments. Often, the main focus on production and service in a company, and not on creating a favourable learning environment for students leads to miscommunication. It is difficult to bridge the gap between the two worlds. The internal structure of companies does not enhance the necessary educational awareness. HR-managers who often actively support the idea of coop education, find it difficult to persuade production managers for cooperation with representatives of the university. Although senior management may have a strong sense of the importance of collaboration between the company and the university, in day tot day practice is appears to be difficult to create relevant student-workers positions on the shop floor and to appoint qualified coaches. Even when the university has established long standing contracts on doing applied research, it still is difficult to transform the cooperation in terms of building a joint learning experience for students.

In a sense, the differences when it comes to joined efforts in creating learning networks for students can be explained from the many years of almost complete separation between the world of higher education and the world of work, which applies to the situation in The Netherlands, in particular. Especially, those small and medium sized companies, that have neglected their internal human resource development, find it difficult to participate in knowledge networks with higher education. An entirely different phenomenon arises as well. Current studies in the Netherlands reveal that participating employers look for critical and innovative talent in selecting their student employees. This external selection might

even turn the coop system into a curriculum for a new elite of highly gifted individuals, leaving the regular full-time programme for the remainder. The expectation that the coop academic education system attracts highly motivated and talented students seems to be confirmed by the experimental programmes (Inspectie van het Onderwijs, 2001; Van den Broek, 2001).

How can knowledge networks be established between schools of higher professional education and companies?

In view of the complex and demanding labour market, recent insights from educational psychology, the emerging knowledge economy, and evaluation studies do show that integrating work-based learning in higher education is a relevant issue. The coop system can enrich the traditional supply of higher education and strengthen the cooperation between institutes for higher education, industry and institutions.

Moreover, the development of a knowledge network between schools and businesses requires establishment of different knowledge links: strategies to develop and activities to be organized. The desirability of interaction between universities and firms varies considerably. The boundaries between these institutions are becoming increasingly diffuse. The capacity of companies to create and use knowledge lays not so much in their possession of knowledge or technical expertise but in their culture and 'absorptive capacity' (Cohen & Levinthal, 1990).

We made similar observations in our experiences in designing a coop curriculum within the Interface project. Evaluation of this project revealed that three major strategies are favourable for further development of a coop university curriculum: the establishment of a solid coaching system, the careful selection and design of student activities in the workplace, and an appropriate assessment of learning outcomes.

The coaching system

The main objective of the coaching system is to facilitate the learning setting for the student in an environment that is mainly focussed on operational work. Although the necessity of coaching is not new in itself, the Interface project enlightens the competencies needed for high quality coaching. The coach (who is the company supervisor of the student) should act as a spider in the web, not just at the local shop floor, but also in the wider organisation. The coach selects and plans the student activities within the framework of the general competencies of the school and the personal development plan of the student. The selection of the student's activities should include challenging tasks and offer a safe haven for making mistakes. This is often a thorny objective in a company context. The coach should signal potential problems in the progress the student makes, should communicate in a transparent way and offer direct feedback. This requires high level coaching skills of the company partner in the coop system. The coach should help to select appropriate student activities and offer guidance, reflection and feedback to enhance the learning opportunities.

Student activities in the workplace

In concurrence with the constructivist approach on learning, students have to perform activities in order to learn. For workplace learning, participation in work related activities is most significant. We learned in the Interface project what characteristics of those working activities turned out as most meaningful. It appears to be important that student activities comprise a variety of tasks and assignments. These tasks and assignments should not only be just of an operational nature, but also offer opportunities for participating in policy building processes and in innovative projects. Tasks and assignments should offer the student opportunities to work and meet various colleagues, experts and clients. Assignments increase in effectiveness when they are feasible in time and fit with personal interests and capabilities. This can be enhanced when the student works on a personal development plan during his or her internship. When they are exposed to the real life world of work they better understand the necessary personal development. It appears to be important that students feel treated as a full member of the staff with specific responsibilities, and that students feel recognized and respected as valuable members of the working community. The student-worker should feel embedded in the company.

To find one's way in the company, it is very helpful when assignments give clear indications of what is a relevant product and what criteria should be met. Such assignments, that are of genuine relevance to the company increase motivation, energy and support from all parties involved. The design of such assignments offers

coaches and managers a valuable moment of reflection on their day tot day work practices. In addition to the planned assignments of the student it is important that there is still some room for participation in ad hoc activities to learn in an informal way about the knowledge networks in a work environment. The coach also plays a crucial role in the extent to which students engage in these informal activities as the coach may help students by noticing and selecting activities to undertake.

A second outcome of our evaluation is that coop education is likely to benefit from a competency-based curriculum and favours the development of specific competencies. To link the school curriculum to a coop-curriculum, student activities are best stated in terms of competencies to be achieved by students. Competencies describe the capabilities students need to solve problems, design and conduct research, and to advice clients. Often it is difficult and time consuming to describe all the possible competencies to be achieved in a school curriculum. Here, the description of a limited number of critical problem situations, design matters, or research approaches is often recommended in stead of trying to list an exhaustive series of desirable skills coupled with practical situations. The advantage of competencies over traditional content descriptions is that such competencies can mostly be developed and achieved outside the traditional school premises, in an authentic work environment. A curriculum that is based on the theoretical content of compulsory textbooks is not likely to be attained in a coop system. However, when described in terms of capabilities, problem solving skills, research, design or consulting skills, the educational standards often include the founding theory, and even on a higher competency level. The outcomes of the curriculum

are stated in productive capabilities instead of reproductive knowledge items. The development of such capabilities needs to take place in active workshops, laboratories, fieldwork, and in real life work environments. The other way round, a coop curriculum is probably not feasible when the desired outcomes of the university curriculum are not stated in terms of competencies.

On the basis of the experiences in the Interface project we learned that the competencies that are of specific value appeared to be the development of personal capabilities, learning to organize and to achieve, developing an alertness for what is going on in the work environment, to find your way in the confrontation with multiple perspectives and approaches to a given task or problem, the application of theoretical knowledge in a real life work context, the development of effective oral and written communication skills to participate in such context, and to develop professional motivation and fulfilment.

Assessment of learning outcomes

The Interface project clearly shows that assessment of the student achievements turned to be a specific new teaching task, urging teachers to develop new competencies themselves. All parties within to coop education projects expressed a need for transparent criteria on the basis of which the products of learning as well as the learning process can be assessed. Clarity on the terms of reference was a great help in the assessment procedure of the student's products, however, assessing the process of personal development still remained an unresolved matter. For the school faculty it appears almost impossible to grade and mark

student achievements in a work environment as if it were the outcome of a traditional pen and pencil school test. The quality of the assessment process increases by clarifying the various roles in the assessment procedure. Here the responsibilities of the company coach and school faculty meet. Frequent problems arise when the coach and faculty develop incompatible judgements. The development of assignments and their assessment criteria requires time-consuming involvement from coaches and faculty. In particular this is true as a careful integration is required of the interests of the company, the school objectives, and the personal development plan of the student. As the school faculty plays a leading role in this process, relative new competencies of faculty members are involved. These competencies become even more critical when conflicts arise between company, student and school. It appears to be important that faculty members are able to facilitate discussions on the various roles of assessment. This may lead to a number of dilemmas: should the assessment procedure and criteria lead to selection and exclusion, or should they encourage further adaptive development? Should they focus on a set of context specific competencies, or is an integrated approach required that covers a broad domain of professional activities? Should the assessment procedures be developed independent from the specific work environment to ensure standardisation, transparency and objective quality assurance of the educational process, or should it be tailor-made in order to fit best with the specific learning experiences that the student-employee has been exposed to? The Dutch Education Council has extensively discussed these dilemmas, and came to the conclusion that assessment procedures should not close the door for

young people, but offer the key that opens up their future (Grotendorst, 2006). Faculty members can learn to deal with these dilemmas by exploring the various backgrounds, assumptions and conventions on assessment, as they are often implicit. In dialogue with different stakeholders they may choose a specific approach that complies with the overall objectives of the coop education project.

Conclusion

In the Interface project we have learned that creating learning opportunities for students in the real context of the working life can abolish the traditional separation between the world of work and the system of higher education. In particular, assignments in knowledge intensive companies may expand the learning opportunities of the school curriculum, as well as bridging the gap between knowledge institutes and the day-to-day practice of the shop floor. Coop education brings about valuable learning experiences to teaching staff and to company workers, especially the coaches. Moreover, the creation of learning opportunities for students at the workplace will be beneficial for all other employees in the companies involved. Companies that take knowledge development seriously can profit deliberately of these effects by hiring coop education students.

On the basis of the experiences in the Interface project we may conclude that the coop system offers valuable opportunities for companies and schools to build sustainable networks in an emerging knowledge economy. However, based on the literature study and the experiences in the Interface project the conclusion may also be drawn that the further development of a system of coop higher

education requires a number of advancements among others: further conceptualisation of this specific type of higher education, a quality assurance system that makes explicit what we mean by academic standards and how students can meet these standards, and a clear description of responsibilities and obligations of the various parties involved. Coop education seems best to develop when it is embedded in a knowledge network in which universities of professional education and companies participate. Such networks focus on real life issues where the combined know-how of experts in the field and the expertise of university faculty lead to improvements and innovations. In such an environment the apprenticeship of the student-employee profits most of the knowledge links that are essential for a rich learning experience outside the classroom.

The experiences in the Interface project also lead to a number of general recommendations that form the conclusion of this article. Although the development of coop education leads organizations to build knowledge networks, the implementation of coop education has to be viewed as a major innovation in itself. Introducing coop education urges schools and companies to collaborate very closely and in a completely different way than they are used to. Although networking may be practiced more often, networking with the aim of knowledge development is not quite common in higher education. Thus, it appears to be important that coop project managers in school as well in the company support the innovation objectives that are central to cooperative education and the establishment of knowledge networks. Senior management, in school as well in the company, need actively monitor these objectives and highlight these whenever

possible. The required culture change in both institutions does not happen all by itself. The design and implementation of a coop system needs to be embedded in a substantial project, including staff, budget and time allocation. It is difficult to plan such projects when it is one of the many sub tasks of HR-officers and school faculty. Over a long period key figures should spend at least two days a week on such a project, to generate ideas, to plan activities, to meet and to build relationships and alliances. Successful projects start with motivated participants who see the professional challenge of the intended innovation. Open procedures and free choice for faculty members to participate in the coop education system seem to be indispensable for overcoming the many barriers and for achieving lasting success.

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