Integrating Research and Education to Promote Innovations

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ABSTRACT

This study presents typologies of learning to bridge the gap between learning inside and outside higher education institutions. The different types of learning can be found in higher education institutions to promote the learning outcomes. The study also presents the approach of innovation pedagogy and an example of how it has been applied to form a multi-disciplinary structure of the faculty. The results of this study are useful for those who want to improve the quality of education and promote innovations.

Keywords: Higher education, Pedagogy, Learning, Knowledge, University, Innovations

1. INTRODUCTION

Learning includes two integrated but very different processes. The learning can be an external interaction process between the learner and his or her social, cultural or material environment or an internal psychological process of acquisition and elaboration where new impulses are connected with the results of prior learning (Illeris, 2009a). Learning is constructivist in nature so that the learner actively builds up or construes his or her learning as mental structures, but the term of the socio-cultural theory of learning is also commonly used (Peck et al., 2009). Both of the processes mentioned above must be actively involved if any learning is to take place.

The purpose of this study is to present typologies to bridge the gap between learning inside and outside higher education institutions and find ways to promote innovations. Innovations are created in value chains or networks, which combine business, technology and other subjects,

which combine different kind of knowledge needed in working life. Empirical evidence is presented from the Turku University of Applied Sciences, which does not have any business or technology faculties but the institution has created multi-disciplinary faculties and used the concept of innovation pedagogy to support the innovations.

Each higher education institution has its profile which differentiates it from other institutions. The Finnish Ministry of Education and Culture asked every higher education institution to define its profile. Therefore there is a need for a comprehensive and up-to-date understanding about the concept of learning that correspond the profile of the institution. The Turku University of Applied Sciences defined innovation pedagogy for its profile (Kettunen, 2011).

2. TYPES OF LEARNING AND KNOWLEDGE IN DIFFERENT CONTEXTS

The transfer problem of education psychology is concerned with the challenge of transfer the learned in one context to apply in a different context. The challenge is how the higher education institution can be more applicable outside the institution. Typically, education is too much oriented towards the reproduction of the subject matters of institutions. Illeris (2009b, 145) argues that the learning theories have been too narrow in their scope and at least in the English-speaking countries the learning theories have been dominated by the behaviourist approach up to the 1980s.

Table 1 collects the four types of learning and knowledge in the context of higher education. The types of learning and knowledge are extended and combined in this study with the context of higher education. Illeris (2009b) presents a typology of four basic learning types

based on his earlier study (Illeris, 2007) and the earlier work by Piaget (1952). The concept of expansive learning can be found Engeström (1987) and the concept of transformative learning from Mezirow (1991). The different types of learning and knowledge can be found in higher education.

Originally the typologies of learning and knowledge are based on the different theoretical backgrounds and developed in different ways. They have come close to the understanding about education in higher education. In practice the four levels of transfer are not sharply separated as the typology may indicate. All of these typologies can be found in higher education and are necessary to build up the capacities and competence of an individual. The challenge of a higher education institution is to find variation and balance in the use of these levels.

Table 1. Types of learning, knowledge and context in higher education

Type of learning	Type of knowledge	Context
Cumulative of mechanical learning • Learning of concepts and facts • Learning is characterised by a type of automation	Replication of knowledge • Repetition of knowledge	Lecture, literature and memorization in examinations • No context of meaning or personal importance
Assimilative learning or learning by addition • New element is linked as an addition to a scheme • Learning is easy to recall and apply in the field in question	Application of knowledge • Use acquired knowledge under new circumstances • Follow the rules and procedures related to the knowledge	Problem solving and development • Gradual development of capacities • Incremental innovations
Accommodative or transcendent learning • Situation that is difficult relate to any existing scheme • One breaks down an existing scheme and reconstructs it in a new way	Interpretation of knowledge • Understanding involves personal perspectives or ways of seeing • Requires professional insight and an intellectual effort	Research • New idea has to be discovered and solved • Produces results which are significantly new or different • Radical innovations
Expansive or transformative learning • Personality changes or changes in the organisation of the self • Includes emotional and social patterns	Association of knowledge • A sense of purpose, appropriateness and feasibility	Personal growth and internships • Acquisition depends on a wealth of professional experience • Transformative learning can often be experienced physically in internships

3. COGNITIVE DEVELOPMENT

According to Mezirow (1991), development is at the heart of transformational learning and the link between development and learning is explicit. Merriam (2004) and Mezirow (2004) argue that one must be at a mature level of cognitive functioning to engage in the transformational learning process and be able to critically reflect and engage in rational discourse. Numerous studies (Taylor, 2000) offer support for the notion that development is an outcome of transformational learning. Fostering greater autonomy in thinking is both a goal and method for adult educators and achieving greater autonomy in thinking is a product of transformative learning (Mezirow, 2000, 29). A rather high level of cognitive functioning is a prerequisite for transformational learning (Merriam, 2004, 61). Feinstein (2004) notes that critical reflection and reflective discourse are used to facilitate transformative learning.

Criticos (1993) observed that valuable is not the experience itself but the intellectual growth that follows the process of reflecting on experience. Effective learning does not follow from positive experience but from effective reflection (Criticos, 1993, 162). Critical reflection, or premise reflection on assumptions, involves examining long-held, socially constructed assumptions, beliefs, and values about the experience or problem. Brookfield (2000, 139) concurred that an act of learning can be called transformative only if it involves a fundamental questioning and reordering of how one thinks or acts.

Reflective discourse is specialized dialogue devoted to searching for a common understanding and the assessment of the justification of an interpretation or belief (Mezirow, 2000, 10-11). Critical reflection and reflective discourse assume a certain level of cognitive development, but studies find that many adults do not operate at higher levels of cognitive functioning (Merriam, 2004, 63).

Mezirow (2000, 21) has acknowledged the possibility that critical reflection may not be necessary for transformational learning to occur, but the transformations through assimilative learning occur "our situation changes, and, beyond our scope of awareness, we make a tacit judgment to move toward a way of thinking or behaving that we deem more appropriate to our new situation (Mezirow, 1998, 191). Mindless assimilation seems quite a different process from "critical reflection and rational discourse".

Mezirow (2004) and Merriam (2004) recognize that the fully developed learner moves through a series of development form to arrive at the highest potential for understanding to engage in transformative learning. They recognize that this occurs only in adulthood but not in all or even most adults. This view is rather a limited view of higher education and development. Mezirow (2004) concludes that there is a need for a theory in the process of development.

Paloniemi et al. (2010) recognise individual, collaborative group-based and networked learning even though they do not emphasise the role of transfer and the learning inside and outside the higher education institution. They emphasise the role of socio-cultural learning, where the individual learning has been extended to learning in different contexts, situations and cultures. They present evidence that collaborative learning is able to produces better results than individual learning. It has been stipulated that the applied research and development of the universities of applied sciences support the regional development.

Multidisciplinary activities are appealing to increase the effectiveness of research and development and economic growth. The challenges of interdisciplinary include according to Kirjonen and Satka (2010) the definition of the research task, language and communication, the various limitations of research, the difficulties of research career and to become qualified, the sufficiency of know-how and motivation. On the other hand, they list the many benefits of interdisciplinary activities such as the opening of thinking, broader views, better effectiveness, the effective use of data and the development of new ideas. They do not emphasise the role of applied research and development which is based on the customer needs, which are responded with multidisciplinary projects.

4. INNOVATION PEDAGOGY FOR THE UNIVERSITIES OF APPLIED SCIENCES

Education at the Finnish universities of applied sciences includes internships which are at least half a year, applied research and development which in integrated with education to create capabilities for students participate in the projects of working life. Education also includes project work and the thesis planned to support the companies and public sector in the region. The integration of research and development requires, however, the multidisciplinary education of activities to understand the customer needs and solve the problems in an innovative way.

Education at the Finnish traditional research universities includes lectures, literature and examinations to create the strong intellectual and informative basis of learning and knowledge. Collaborative and networked learning is not systematically used in every subject, which is perhaps due to the fact that teacher training is not required as at the traditional universities.

Internships are included only in a few subjects where it is necessary.

The typical procedure of project work is that a group of students selects a relevant problem counselled by a teacher, plan the project, investigate the problem and write a report and present the results of the project. The presentation together with the report forms the basis for a grade or approval. In this form, the project work is group-based collaborative learning inside the institution and it does not outreach and engage with the external customers and partners outside the institution.

The alternative form of project work is that the teachers apply funding from the European union, other funding bodies or directly from customer organisations, look for partners to the projects and integrates the project with education so that students are able to find a useful role in the project and achieve real work experience in project work, study in networked collaboration and create capabilities that can be used after graduation in working life.

Innovative projects can be created at the third level of learning and knowledge. There must be some kind of innovative element in the project application which is solved in the project using the networked collaboration. A radical innovation is a new product, service or re-engineered process, but typically the innovations are incremental in applied research and development (Tidd et al., 2001). Radical innovations are close to re-engineering of processes which produce new products or services (Hammer & Champy, 1993). Incremental innovations are improved products, services and processes and hence close to the concept of continuous improvement in quality assurance.

The universities of applied sciences aim to be valuable institutions in regional development. The customer needs do not typically follow the subject, the degree programme or field of study. Therefore the project teams have members from many backgrounds. Multi-field faculties and operations across the faculties support the projects of applied research and development, which have shown their ability to respond the needs of working life. This is different from the creation of new universal knowledge which is an ideal of traditional research universities which have discipline-oriented faculties and subjects.
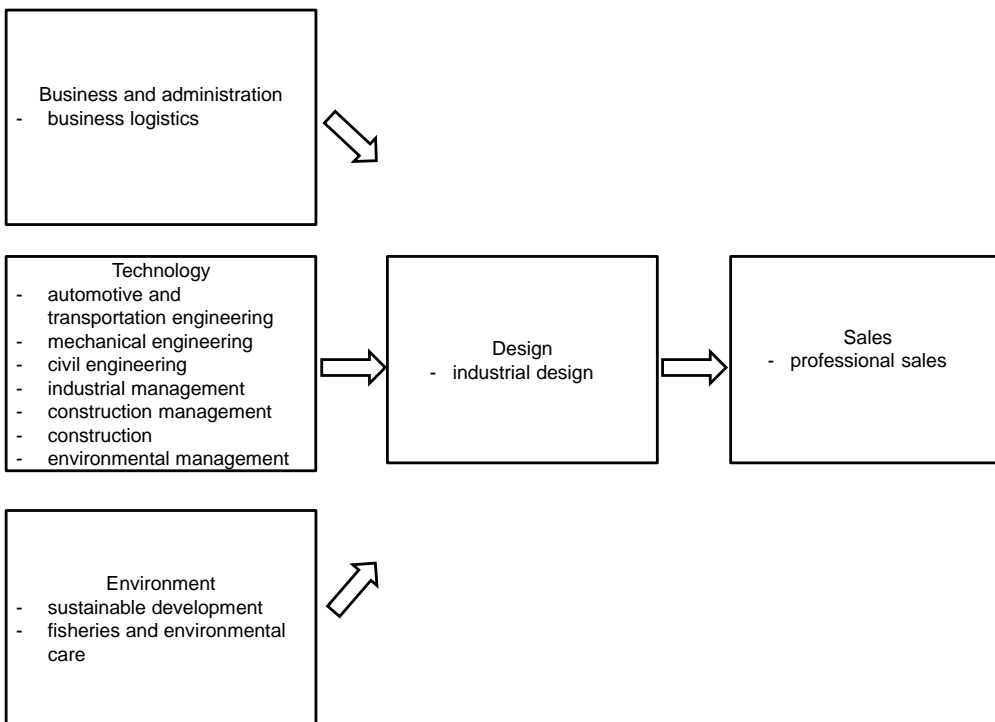

Figure 1. Innovative faculty in higher education

Figure 1 depicts the innovative faculty of higher education. The Faculty of Technology, Environment and Business of the Turku University of Applied Sciences have been planned to combine business, environment and technology. The next steps in the innovation process are the design and sales education. Many other faculties of the institution have been planned in a similar way to combine business, technology and some other knowledge.

5. CONCLUSIONS

Learning is not mechanical or isolated formation of knowledge that can be recalled and used in situations mentally similar to the learning context. Typically, this type of education learning is based on lectures and literature and includes concepts and facts which are memorized in examinations with no context of meaning or personal importance. A more advanced learning includes gradual development of capacities and problem solving, where the new element is linked as an addition to a scheme or pattern. This type of learning can produce incremental innovations. A new step is taken in learning when the learner breaks down an existing scheme and uses the knowledge in a new situation. This kind of learning may take place, when the learner accepts something that is significantly new or different. Learning may also produce outcomes which change the personality or the identity of the learner. That can be characterised as professional growth.

When education is integrated with development projects assimilative learning may take place. In assimilative learning, problems are solved and new elements are linked as an addition to a theoretical model or the framework. Assimilative learning takes place also when knowledge is applied in practice so that it develops the products, services and processes and hence produces incremental innovations. Accommodative or transcendent learning takes place when education is integrated with projects so that they produce new products, services or processes. These can be called radical innovations.

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