Relationships among Civil Engineering Students' Approaches to Learning, Perceptions of the Teaching-Learning Environment, and Study Success

This study examines the relationship among civil engineering students' approaches to learning, their perceptions of the teaching-learning environment, and their study success. The aim was to identify civil engineering students' approaches to learning and how their approaches to learning are related to their perceptions of the learning-teaching environment and their study success. The data of the study consist of the students' answers to a questionnaire (n=215) and their study success data (n=204), which were gathered from their university's study register. The study success data consist of the cumulative study credits and weighted averages of their course grades. The students were classified into four clusters according to their approaches to learning. Differences in their perceptions of the teaching-learning environment and study success between the clusters were statistically significant. Students who belonged to clusters that emphasized the deep approach to learning experienced their teaching-learning environment more positively than did other students. Students who belonged to clusters emphasizing organized studying earned more credits and higher marks in their studies than did other students.
Vygotsky’s Zone of Proximal Development in Connection with Technology-Enhanced Learning Environments

Technology-enhanced learning environments (TELEs) that support social interaction between teachers and learners are common in engineering higher education institutes. TELEs are often equipped with professional hardware and software, which not only enable learners to gain access to variety of learning instruments, but also allow learners to practice with authentic equipment and design tools. Furthermore, teachers can use TELEs and scaffolding principles to organize teaching in several ways that are beyond traditional classrooms. This paper discusses the potential of TELEs to shape the zone of proximal development (ZPD) of learners such that they could do harder learning activities than would otherwise be possible in less conducive environments. In addition, an example of a conducive TELE is presented that might have enlarged ZPD of learners, and, as such, may partly explain good learning outcomes obtained. The illustrations in this paper may help teachers to gain better understanding of the benefits of environment creation as well as to organize learning episodes that are suitable for ZPD-based thinking.

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Bibliographical note
JUFOID=8743
Research output: Scientific - peer-review › Conference contribution

Pedagogical Content Knowledge in Product Development Education

Engineering education at university faces challenge concerning the efficiency in producing results in learning. Engineering Education will be exposed to globalisation resulting in tough competition between the service providers and individual contributors. This study focus on capturing and discussing teachers’ pedagogical content knowledge on product development education. Currently there are no holistic approaches presented from teacher knowledge viewpoint. The next steps how to develop this knowledge of product development teaching further by focusing on the continuous learning process.
WorldSkills achievers’ and their co-workers’ and employers' perceptions of vocational expertise and school-to-work pathways

This paper examines the perceptions of vocational expertise and school-to-work pathways among WorldSkills Competition (WSC) achievers and their co-workers and employers within the Finnish context. At the biennial international WSC, young people (aged 18-to-23 years) from over 60 countries demonstrate their skills in more than 40 trades. Individualized training for this competition is provided through the cooperation of vocational institutions (e.g., expert coaches, team leaders and competition panellists) and industry (e.g., mentors, sponsors, materials, equipment). Semi-structured thematic interviews (N=51) were conducted in 2013 and 2014 with former Finnish WSC medal or diploma winners (n=18) who had since begun their working lives (1-to-15 years of work experience). Their employers (n=16) and colleagues (n=17) were also interviewed. Results showed that in addition to vocation-specific knowledge and skills, problem-solving skills, creativity, social skills and self-regulatory skills were acknowledged as the most significant elements of vocational expertise. The findings also indicated that formal vocational education combined with deliberate practice and training based on expert mentoring improved the long-term career progress and vocational expertise of the WSC achievers.
Survey of health informatics education in Finland in 2017

The European Union and the USA collaborate in developing the skills of the application of information technology in the health care workforce. A part of this activity is a project which studies the gaps in the present education and proposes methods of filling these gaps. The objective of this paper is to identify the existing IT related education to the health care workforce in Finland. A secondary objective was to get an impression of the experience and attitudes of the members of this workforce about health IT education.

This paper presents the results of the survey of how information technology is educated to the students of the health care professions in Finland in the year 2017. In addition to literature search including also the study guides of many major health care professional education organizations, 24 telephone interviews of health care professionals in different fields in Finland were made.

The results show that although basic information technology education is often available at every level of education, it is expected that the health care professionals learn to use the health information systems during their training periods or later in working life. The interviews showed that the given education varied considerably and some of the personnel had received no or only a little education on IT during studies. As the amount and quality of on-the-job information technology education varies, many health care professionals are not able to fully benefit from the information systems if their general feeling is that they just "survive" from daily activities with them.

General information

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Authors: Tolonen, J., Värri, A.
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Research output: Scientific - peer-review » Article

A teacher? A mentor? A friend? - Teacher mentoring experience at Tampere University of Technology

In this paper, we research a recently set up engineering students' teacher mentoring programme with special interest on teacher mentors' expectations and experiences from the point of view of self-efficacy and motivation. We aim to have an insight in the teacher mentors' met and non-met expectations and see if this has effect on the teacher mentors' motivation and expectations of the outcomes of the mentoring programme. We also examine how beneficial the teacher mentors consider the programme to be to the students and how this is linked to their motivation.

General information
Guiding the workplace learning in vocational education and training: A literature review

This review provides an overview of the empirical research concerning guidance in the context of vocational education and training (VET). The study examines practices, providers and supporting and hindering factors related to guidance and learning at the workplace. After the inclusion/exclusion process, the final number of research articles included in this review is 18. Results show strong evidence for the collective nature of workplace guidance, with the entire work community providing learners with guidance and assistance. Guidance provided to VET students at workplaces seems to relate strongly to the activities of the members of communities of practice. Guidance provided by the members of communities of practice opens up opportunities for learners to participate in collective practices by gradually assuming more responsibility and more demanding tasks as their skills develop. The learner’s self-regulative skills, such as responsibility and the ability to take the initiative and to actively seek guidance, affect how guidance is afforded to him/her in the work community during training. Furthermore, these skills may also determine the learner’s prospects for developing expertise in future workplaces.
Structural development of substance in engineering education: Method of cornerstones

During the current millennium, engineering education has confronted an emerging problem with learning. Driving forces have mainly been economical, since financial pressure and effort for increasing efficiency have given rise to growing amount of accessed and graduated students. Consequently, in the lack of time and financial resources, universities have had a tendency to decrease the emphasis on thorough and time-consuming learning of fundamentals. As a result, so called immediate skills have gained excessive role in comparison with long-term skills in engineering education. According to a generally accepted view, students learn to carry out engineering tasks quite well, but they do not necessarily learn to think. Recently, a study carried out at MIT ended up to call for “coherent and interconnected curriculum structure” to achieve excellence in engineering education. We suggest that by utilizing the hierarchical structure of natural sciences in engineering education, such a coherent and interconnected structure can be created. In this paper, we show how the method of cornerstones is implemented to clarify engineering substance and to promote higher learning. By making cornerstone-based structure visible to students, we aim to clarify and harmonize the substance and to promote both immediate and long-term engineering skills.
Teacher perceptions of teaching CLIL courses

After various definitions and discussions about what CLIL / ICLHE is, there is a need to take a critical stance on the actual teaching practices teachers employ in (adjunct) CLIL classrooms in a higher education setting. We aim to contribute to a better understanding of teacher perceptions of teaching CLIL courses, which can lead to a better ability in identifying staff training needs. Based on a questionnaire and small-scale interview, we give the voice to the teachers to describe their current teaching from the ICLHE point of view. Through thematic analysis we focus on the areas the interviews show as in need of development. These are identified based on how the teachers describe their own teaching. The results report similarities, but also differences, between the responses to questionnaire items and interview answers on the same topics.

There is a need for a deeper understanding of the pedagogical and didactic differences between CLIL teaching and subject-specific language teaching. The results show that these teachers would benefit from training focusing on the basic didactic practices of CLIL, and especially on the cognitive dimension in CLIL teaching. The results provide information from an adjunct CLIL context to researchers and serve as guide for future teacher development.

Assessing business learning by analysing ERP simulation log files

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Authors: Nisula, K., Pekkola, S.
How to develop a new innovation education tool: case of impact canvas

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Authors: Aarikka-Stenroos, L., Boedeker, S., Köppä, L., Langwaldt, J.
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Affective experiences and student engagement in higher education

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Authors: Helander, N., Boedeker, M., Hellsten, P., Jussila, J., Myllärniemi, J., Tukiainen, M.
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Integrating mobile orienteering to team forming activity in a software engineering course

One of the most important skills software engineers need when entering work life is working in teams, including communicating, collaborating, as well as coordinating work in a team. This paper presents a team building activity aiming to support the first phases of team formation with a mobile orienteering activity. Created tasks at orienteering checkpoints were related to communication, collaboration and work division. Students were enthusiastic about the activity and expressed in their group reports on the activity that it supported the team building activity well, helped break the ice and supported agreeing the ways of working. Students also liked getting out of the classroom. The approach seems promising and we will investigate in the future similar type of activities in the first phases of team formation as well as will explore further integrating physical activity to the exercise sessions.
How to facilitate freshmen learning and support their transition to a university study environment

ABSTRACT
Most freshmen enter universities with high expectations and with good motivation, but too many are driven into performing instead of true learning. The issues are not only related to the challenge of comprehending the substance, social and other factors have an impact as well. All these multifaceted needs should be accounted for to facilitate student learning. Learning is an individual process and remarkable improvement in the learning practices is possible, if proper actions are addressed early enough. We motivate and describe a study of the experience obtained from a set of tailor-made courses that were given alongside standard curriculum. The courses aimed to provide a “safe community” to address the multifaceted needs. Such support was integrated into regular coursework where active learning techniques, e.g. interactive small groups were incorporated. To assess impact of the courses we employ the feedback obtained during the courses and longitudinal statistical data about students’ success.

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Organisations: Department of Electronics and Communications Engineering, Department of Electrical Engineering

I feel great - university students affective experiences on learning and teaching

According to Kolb [1], experience is the source of learning and development. This is a statement that serves as the starting point of this study. We argue that the role of affective experiences cannot be overlooked when evaluating university learning and teaching. In the present paper, we will study students’ affective experiences in higher education setting, specifically in engineering education in a technological university. The perceived affective experiences are empirically analysed through a mystery shopper data set, which was gathered in the case university by a group of students. The study bases theoretically on affective experiences framework, more familiar from the consumer behaviour research stream. The aim of the study is to analyse what kinds of affective experiences students recognise when studying in a technical university and further to elaborate, how these affective experiences could be used to increase student engagement and the students’ motivation to learn. The study provides an innovative approach to university learning and teaching by applying mystery shopper method and affective experience approach from more businessoriented disciplines. The contribution to education science is the increased understanding of the role of affective experience in learning.

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Self-regulation and competence in work-based learning

This chapter discusses the connection between self-regulation and competence in both formal and informal contexts of vocational and professional education. The goal is to show that self-regulation has a theoretical linkage to a multifaceted and holistic approach to competence and that self-regulatory abilities play a role in the development of vocational competence. Different theoretical approaches to self-regulation and competence and the link between the two concepts are discussed. We argue that self-regulation plays an important role in the development of competence, as it is needed to acquire competencies, unified sets of knowledge, skills and views. Self-regulation acts as an indirect factor between competencies and direct formal, non-formal and informal learning processes (e.g. vocational studies, leisure time activities and work) aimed to develop them. In this chapter, we present results of empirical studies on self-regulation and competence to support this argumentation. Several studies with vocational skills competition competitors show that strong self-regulatory abilities are related to successful competition performances. Also results from a study with Finnish in-service air traffic controllers indicate a link between vocational excellence and self-regulative action. Our conclusion is that self-regulatory skills should be taught in addition to the vocation-specific skills in competence-based vocational and professional education.
STACK assignments in university mathematics education

Students' learning process can be assisted and diversified with the help of e-learning tools and virtual environments. In Tampere University of Technology, the aim is to utilize software that delivers assignments, checks students' answers and gives feedback to the students, in the mathematics courses. The software that has been used is called STACK, which can be integrated into Moodle. STACK assignments have been created as a part of the STEM education material bank Abacus.

Written feedback can be generated in STACK assignments as necessary. Feedback guides the students to identify their errors and revise them. It can also motivate the students to try again after giving a wrong answer.

This study concerns the use of STACK in TUT mathematics courses. Especially we are interested in:
- how do the points gathered and the time of the last submission in STACK exercises correlate with the exam grades?
- when and for how long do the students solve the STACK assignments?
- how does the activity in STACK differ between honours and engineering mathematics students?

In STACK assignments, the students were able to give their answers in Moodle. For each lecture week, they had one week to solve and return the answers. All the student activity related to the STACK assignments was saved in the Moodle logs. Data was analysed with Matlab by the means of educational data mining.

We observed that the activity in STACK was the greatest near the deadline. We also found that, on average, the better the grade, the earlier the students gave their final answers in STACK. Additionally, the honours mathematics students made their submissions earlier: many of them considered STACK exercises as a good way to revise the subjects considered in the lectures, while engineering mathematics students mostly rehearsed with STACK near the deadline.

According to the survey polls, students found the STACK exercises as a nice and efficient way to rehearse and learn mathematics. Especially, the instant feedback was mostly appreciated. However, some of the students felt writing the answers with a computer unappealing, but generally this aspect was not considered a problem.

Utilizing electronic exams in programming courses: a case study

A great number of university students' work during their studies, leading to problems with the scheduling of courses and examinations. One way to solve the problem related to exams is to utilize electronic tests, which allow flexible timetables and video-based control against cheating. In Finland, a consortium of 20 universities is using a recently developed electronic examination system called Exam. The system supports essay and multiple choice examinations in particular. In this study, we experiment with the Exam system in computer programming tests. The outcome of the study is discussed from both the students' and teachers' perspectives.
Virtual Reality Situational Language Trainer for Second Language: Design & Evaluation

This study focuses on the knowledge sharing barriers in the space between learning and teaching in higher education as reported by mystery shoppers. There is surprisingly little context-specific research on learning and teaching in a knowledge-intensive community like a university from the perspective of knowledge management (KM). Discussing learning and teaching within KM is based on considering students controversially as customers or stakeholders. Thus including them more meaningfully in assessing and developing teaching practices, or knowledge flow, seems justified. The specific aim of this paper is to first recognise possible knowledge sharing barriers and then categorize such barriers emerging from the material into three larger domains, namely, individual barriers, technological barriers and organisational barriers.

There were 45 students from all faculties participating in a mystery shopper project in a Finnish university of technology. They observed their learning experience for six weeks in order to supplement data from other sources, to add a student voice on the process of developing learning and teaching in higher education.

The research approach represents qualitative content analysis in which knowledge-sharing barriers were recognised from the qualitative mystery shopper data. The results identify teaching practices that contribute to creating knowledge sharing barriers. More detailed and almost real-time contextual activity sampling is suggested as a method for further study and also an avenue for instant feedback for teaching staff. The results will provide data on current knowledge practices and learning processes in a technical university in Finland.

MYSTERY SHOPPERS RECOGNISING KNOWLEDGE SHARING BARRIERS IN HIGHER EDUCATION

This study focuses on the knowledge sharing barriers in the space between learning and teaching in higher education as reported by mystery shoppers. There is surprisingly little context-specific research on learning and teaching in a knowledge-intensive community like a university from the perspective of knowledge management (KM). Discussing learning and teaching within KM is based on considering students controversially as customers or stakeholders. Thus including them more meaningfully in assessing and developing teaching practices, or knowledge flow, seems justified. The specific aim of this paper is to first recognise possible knowledge sharing barriers and then categorize such barriers emerging from the material into three larger domains, namely, individual barriers, technological barriers and organisational barriers.

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A Barrier framework for open e-learning in public administrations

E-Learning and openness in education are receiving ever increasing attention in businesses as well as in academia. However, these practices have only to small extent been introduced in public administrations. The study addresses this gap by presenting a literature review on Open Educational Resources [OER] and E-Learning in the public sector. The main goal of the article is to identify challenges to open E-Learning in public administrations. Experiences will be conceptualized as barriers which need to be considered when introducing open E-Learning systems and programs in administrations. The main outcome is a systematic review of lessons learned, presented as a contextualized Barrier Framework which is suitable to analyze requirements when introducing E-Learning and OER in public administrations.
Examples of the Teaching of the Health Questions of Electric and Magnetic Fields at Tampere University of Technology in Finland

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Authors: Korpinen, L., Pääkkönen, R.
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Volume: 5
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Finnish Innovations and Technologies in Schools: a Guide towards New Ecosystems of Learning

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Prologue: Towards a Global Ecosystem

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Research output: Scientific - peer-review › Chapter

Matka AVOmerelle: Avoimuutta ja verkostomaista toimintakulttuuria tutkimassa

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Angry Birds for Fun in Learning

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Children as co-creators of video stories: mobile videos for learning

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Organisations: Regulation of learning and active learning methods (REALMEE), University of Helsinki
Authors: Multisilta, J., Niemi, H.
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Content and Language Integration as a part of a degree reform at Tampere University of Technology

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Digitaalisen tarinankerronnan monet mahdollisuudet

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Number of pages: 25
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Research output: Scientific - peer-review › Chapter

Digital Storytelling for 21st -Century Skills in Virtual Learning Environments
This article finds that the new virtual learning environments comprise more spaces and practices in which digital resources, tools, and applications are used. The article introduces how digital storytelling can create virtual learning environments when it is used for learning 21st-century skills and competencies needed in students’ future working life. The study describes how students (n = 319) in three countries and their teachers (n = 28) value digital storytelling and what they think students have learned. Their experiences are analyzed using a theoretical conceptualization of the global sharing pedagogy that sets categories of processes or tools as mediators: 1) learner-driven knowledge and skills creation, 2) collaboration, 3) networking, and 4) digital literacy. Analyses have been quantitative and qualitative. The article describes students’ experiences when they created their digital stories and how they engaged in learning. The major findings are that students enjoyed creating their stories, and they were very engaged in their work. They learned many 21st-century skills when creating their digital stories.

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Organisations: University of Helsinki
Videot nuorten maailmassa ja digitaalinen tarinankerronta

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Oppilaiden tuottamien videoiden käyttö opetuksessa

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Number of pages: 12
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Research output: Scientific › Chapter
Designing Learning Ecosystems for Mobile Social Media
Social media has gained interest not only in entertainment applications, but also with learning and business applications; however, there are not many research frameworks available for designing learning activities for learning ecosystems based on mobile social media. In this chapter, a framework for designing and analyzing learning activities in learning ecosystems that are based on mobile and social media is presented. The framework is based on Activity Theory (AT) and Experiential Learning Theory (ELT). In the chapter the existing research on e-learning, mobile learning, and multimodal learning are discussed and reviewed. The research on learning ecosystems based on mobile social media is also positioned to this multi-scientific research field. Finally, two examples of using the framework for designing, learning, and analyzing learning activities in mobile social media learning ecosystems are presented.

On Actor-Network Theory and Learning Ecosystems based on Mobile Social Media
In this paper we will define learning ecosystems based on social media and try to describe the learning process in these environments using Actor-Network Theory. Especially, we are interested in the question of how an ad-hoc group of learners could be understood as an actor-network in ANT. We claim, that the availability of social media does not guarantee that the actors in the social media system form the actor-network. However, it would be important to know under which conditions the actor-network is formed and what kind of quality we get from the actor-networks. Finally, we conclude that pedagogically meaningful and high-quality learning ecosystems based on mobile social media can be described as actor-networks.