How to Integrate R&D in Students' Learning?

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In this article I will shortly discuss the key elements of Laurea's way of integrating r&d in students' learning. Laurea was nominated as one of the Centres of Excellence in University of Applied Sciences Education 2010-2012 by the Finnish Higher Education Evaluation Council. The theme of the application in the contest was 'Student-centred R&D work integrated in learning'. The article covers the strategic setting and a brief description of how the integration of R&D is organized and steered by implementing the Learning by Developing – model. Development of learning environments is essential in this integration. Also partnerships and networks in working life have to be reassessed and widened. As an example, some of the key results are presented as well as FINHEEC's feedback to Laurea.

Keywords: student learning, Integrating r&d, Learning by Developing, learning environments

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Introduction

Finnish Higher Education Evaluation Council nominated Laurea University of Applied Sciences as one of The Centres of Excellence in University of Applied Sciences Education 2010–2012. The purpose of this article is to introduce the main elements of Laurea's application for the contest to be nominated as a centre of excellence. The theme of the application was 'Student-centred r&d work integrated in learning'. In addition to the written applications FINHEEC performed audit visits at the Universities of Applied Sciences which were in the final round. In total, Laurea has been nominated five times as a centre of excellence.

Laurea's strategic intent for 2015 is to be an internationally recognized higher education institution of future competence and metropolitan development. Future competence comprises specialisation in service innovations and value networks, an operating model Learning by Developing (LbD) which integrates learning and R&D and promotes workplace development, as well as internationally recognized and productive R&D. The operational entity of the application, i.e. student-centred R&D integrated with learning is established on the Learning by Developing (LbD) model, which

forms the core for Laurea's pedagogical thinking (Pedagogical Strategy 2007). Laurea's strategic choice is to firmly integrate its three main tasks (pedagogical, R&D and regional development). In the recent years the LbD model has seen a clear shift from the strong pedagogical orientation of its early days to stronger establishment on R&D. The development corresponds to the requirements of both European and Finnish higher education institutions and innovation policies.

Laurea's profile (Laurea Strategy 2010-2015) in the Finnish higher education system comprises:

1. Service innovations and value networks
2. Internationally acknowledged and productive research, development and innovation activity
3. An operating model that promotes the development of working life by integrating learning and R&D (Learning by Developing).

At Laurea the core competence in relation to the forecasted development of the operating environment is defined through four strategic focus areas, which are:
1. Service Business
2. Expertise in nursing and coping at home, in the form of general nursing education
3. Security and social responsibility
4. Student entrepreneurship

The focus areas contain the core competence of different degree programmes and student centred R&D, development of staff competence and recruitment which are strategically managed in accordance with them. 85% of the research projects carried out in year 2009 was targeted at Laurea's focus areas.

Integrating R&D in student learning

Laurea's R&D process is steered by operating environment dialogue, competence production and utilisation of innovations and competence. An individual R&D project process is directed by the process descriptions of the quality assurance system and guidelines of the project handbook. The Learning by Developing -model links R&D to curri-

culum delivery and teaching. R&D is based on open, student-centred, upward oriented ideation, and refining of research and development ideas, with a shift from customer orientation to customer and user driven activities. The significant change in work culture calls for commitment, enthusiasm and non-hierarchical ways of communication.

The basis of Learning by Developing -model is in development projects that are genuinely rooted in the world of work, which aim to produce new competence, new knowledge and new practices. Laurea does not have separate R&D units but R&D has been strategically integrated on campus level with learning. The progress requires collaboration between lecturers, students and workplace experts. (Pedagogical Strategy 2007). The objectives of learning are challenges for future development as well as authentic development and problem situations arising at the workplace. In student-centred R&D (fig.1) students are at the centre of operations and development which focuses on the competence of students, staff and partners to function as proactive and pioneering developers. Student-driven R&D drives the activity even further - a new form of combining R&D and learning, where student not only implements the project, but also takes active responsibility for the related preparation and applications.
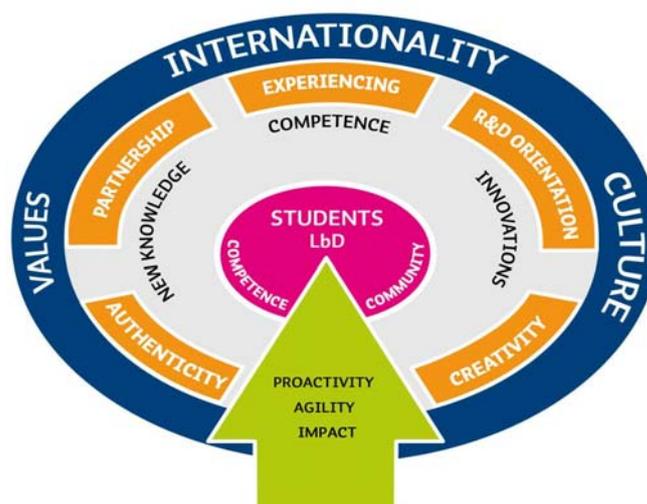

Fig.1 Integration of R&D in student's learning

R&D process development takes place in accordance with Laurea's quality assurance system making use of the performance indicators of the strategy implementation plan.

The effectiveness and results of the operating model that integrate student centred R&D and learning, and its development challenges are defined in relation to those of the operating environment utilising a Tekes (the Finnish Funding Agency for Technology and Innovation) model for measuring effectiveness. Dissemination takes place at the R&D project results seminar and documentation in the project reports. Knowledge transfer between campuses and networks is crucial in order to achieve synergy.

Partnerships in working life

Workplace connections based on Learning by Developing (LbD) create a structure, which systematically produces new competence and also transfers existing competence both for Laurea and for innovation system. These workplace connections cover the strategically chosen clusters of the operating environment. Workplace relations are preferably created in the context of permanent partnership structures instead of traditional projects. This kind of permanent structure forms the core for student-centred R&D and effectiveness.

The forms of working life connections are:
1. *Learning by Developing (LbD)*
2. *Development labs and networks*
3. *Adult students and alumni*
4. *Expert teachers from working life*
5. *Regional Advisory boards and International Advisory Board*
6. *Programme based regional development*
7. *Direct connections to the international working life*

Development of learning environments in integrating R&D

The integration of learning and R&D has placed new challenges on the physical and virtual learning environments of campuses. Student-centred R&D has shifted learning outside of the classroom and away from traditional schedules. Open, competence based R&D environments – development labs – have been created for the campuses, and communities of shared expertise have arisen to promote competence development. At the same time, a shared, long term operating structure has been created with the employment sector. Learning environments support the development of ex-

pertise networks and promote interaction, whereby new learning is created and tools, concepts and skills are adopted. From the point of view of R&D, learning environments are innovative environments for development characterised by an atmosphere that promotes learning. Projects implemented in different networks form another learning environment. eLearning, social media and virtual labs make latest technology the target of learning and research, and enable its use in teaching and projects.

Examples of results

The integration of R&D in student learning gives plenty of extremely interesting and productive results. A few of the results from the application are mentioned here below:

Societal/regional need:
The ESF-funded Good life for children and adolescents project involves the collaboration of students of business administration, social services and hospitality management and teachers together with workplace representatives in Hyvinkää. Together they develop welfare competence tools and methods for children and adolescents. In addition to study units, 23 theses were launched under the project in autumn 2008.

Externally funded projects:
Under the RIESCA project funded by Tekes, information security methods are developed for ensuring society's critical systems (such as railways, electric power stations, hydroelectric installations and nuclear power plants). Partners include Tekes, Universities of Oulu and Kuopio, EADS, Ixonos, Softera, Portalify and Police IT Management Agency. The project has already generated 495 R&D based credits, and three theses. The project has resulted e.g. in a scientific publication for the respected IEEE publication series drawn up by one of Laurea's principal lecturers and two adult students. It was presented at the Security Technology Conference of the US National Security Agency in Boston in 2009.

Flexible Services is a Tekes project on the strategic research agenda of the ICT strategic competence centre, where Laurea's students develop user driven open innovations for companies in practice (UDOI project). Partners include e.g. Elisa, Digita and TIVIT Oy, which are responsible for the strategic competence centre of the ICT area.
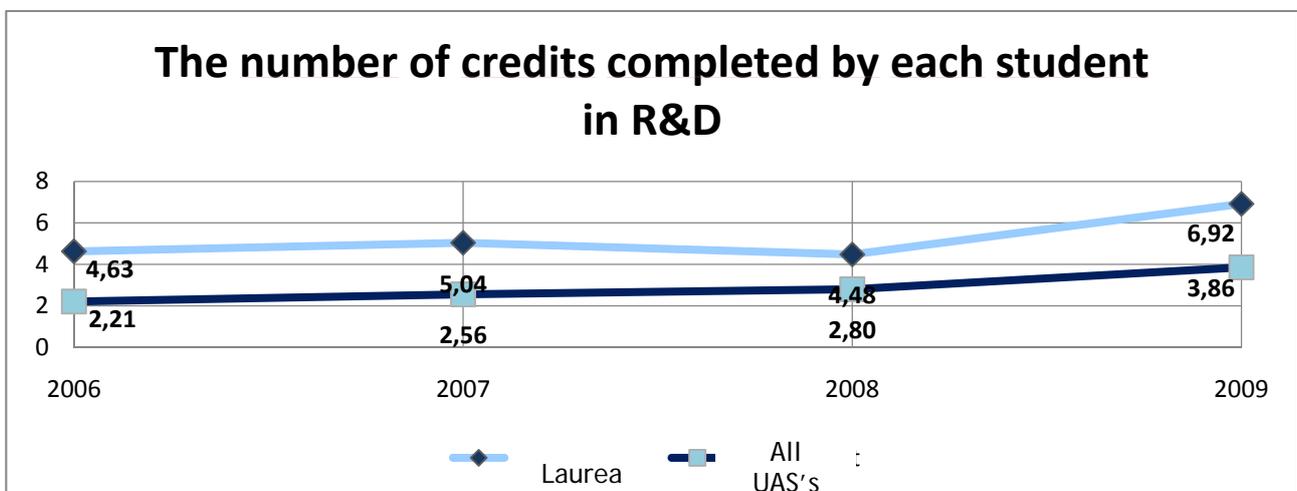
Innovation target:

Under the CaringTV project funded by Tekes and the European Regional Development Fund, students develop and produce customer driven interactive programmes and guidance and support services. A model for family care living and a guidance and support concept for virtual services as well as a theoretical model detailing the significance of CaringTV were produced under the project. In addition to the study units and credits, 22 theses were written. CaringTV was selected as one of EU's 'best practices', and has been licensed a patent in USA and Japan. At present, students are involved in the commercialisation of the innovation.

Promotion of student entrepreneurship:

Laurea is promoting student entrepreneurship in accordance with its targets by participating in the Inno-TULI and AMK-TULI projects. During 2008, an average of 50 projects ideas were recognised under the TULI programme, and 5 R&D based student companies were born within Laurea. 2 invention notifications were approved and 8 transfer of rights agreements were drawn up. Laurea's business administration education was profiled towards entrepreneurship. Further incentive for the promotion of entrepreneurship has been received from Cambridge Boot Camp, Laurea's entrepreneurial camps in Cambridge. By 2009 40% of the 48 participants have established a company during their studies. In most of these activities R&D was integrated in learning.

Student credits in R&D:

The number of credits completed by each student in R&D

Year	Laurea	All UAS's
2006	4,63	2,21
2007	5,04	2,56
2008	4,48	2,80
2009	6,92	3,86

The total number of credits in R&D:

The number of credits in R&D

Bar chart showing the number of credits in R&D:
- 2006: 32186
- 2007: 35315
- 2008: 31080
- 2009: 49057
- Laurea's target 2009: 51496
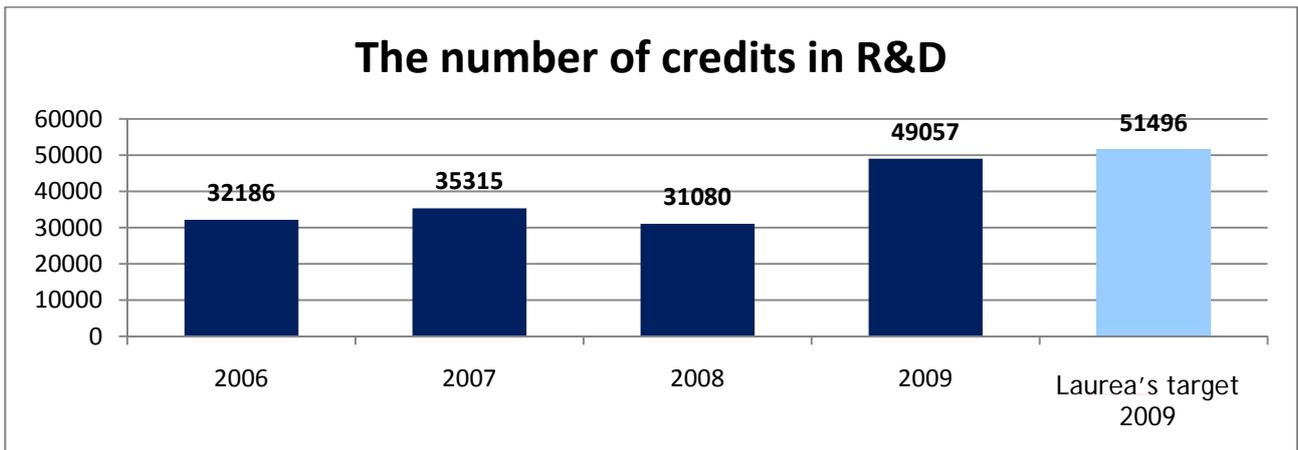
Self-evaluation of graduate students in 2008 (N=844):

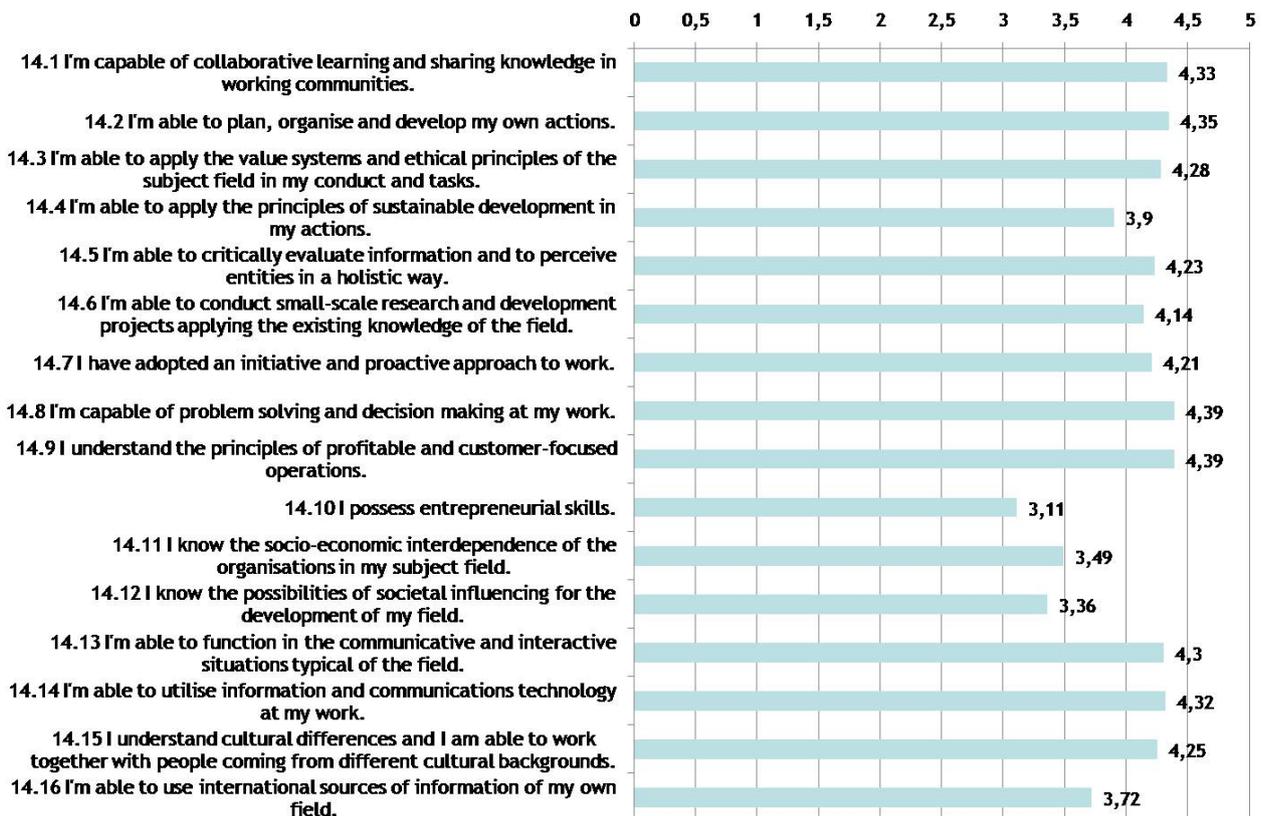**14. Evaluate to what extent the following statements apply to your experiences regarding the development of your competence.**

Statement	Value
14.1 I'm capable of collaborative learning and sharing knowledge in working communities.	4,33
14.2 I'm able to plan, organise and develop my own actions.	4,35
14.3 I'm able to apply the value systems and ethical principles of the subject field in my conduct and tasks.	4,28
14.4 I'm able to apply the principles of sustainable development in my actions.	3,9
14.5 I'm able to critically evaluate information and to perceive entities in a holistic way.	4,23
14.6 I'm able to conduct small-scale research and development projects applying the existing knowledge of the field.	4,14
14.7 I have adopted an initiative and proactive approach to work.	4,21
14.8 I'm capable of problem solving and decision making at my work.	4,39
14.9 I understand the principles of profitable and customer-focused operations.	4,39
14.10 I possess entrepreneurial skills.	3,11
14.11 I know the socio-economic interdependence of the organisations in my subject field.	3,49
14.12 I know the possibilities of societal influencing for the development of my field.	3,36
14.13 I'm able to function in the communicative and interactive situations typical of the field.	4,3
14.14 I'm able to utilise information and communications technology at my work.	4,32
14.15 I understand cultural differences and I am able to work together with people coming from different cultural backgrounds.	4,25
14.16 I'm able to use international sources of information of my own field.	3,72

Feedback by the Finnish Higher Education Evaluation Council

As a conclusion for this article part of FINHEEC's feedback is directly translated and presented below:

Outcomes

Laurea's evidence is mainly qualitative. The generally high level of results indicates that student-centric R&D is a good choice for pedagogy at a university of applied sciences. Among universities of applied sciences in Finland, Laurea produces the highest number of ECTS credits from R&D. In addition, the students' participation in publication, project preparation and even project management activities proves that they are central actors in Laurea's R&D operations.

As the pedagogical model becomes established evenly throughout Laurea, the students' annual R&D involvement level may rise further.

Summary of evaluation results

One of the particular strengths of R&D activities at Laurea University of Applied Sciences is the role of students as central actors and takers of responsibility. Laurea has the will to continuously develop and improve its pedagogical model. Other strengths are Laurea's open interaction with its operating environment, its agility in responding to the needs of the environment, and the apparent functionality of its management model.

Some of the challenges that were found were implementing the pedagogical model more comprehensively throughout the institution and taking care of the competence and coping ability of teachers in the turmoil of change. (Auvinen, P., Kauppi, A., Kotila, H., Loikkanen, A., Markus, A., Peltokangas, N., Holm, K. & Kajaste, M. 2010, 146-148.)

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