

‘Back into your arms’ – Exploring models for integrated university-professional learning in a lifelong perspective

Authors:

Hedvig Skonhoft Johannesen, OsloMet – Oslo Metropolitan University, hedvig.johannesen@hioa.no,

Petter Øyan, OsloMet – Oslo Metropolitan University, petter.oeyan@hioa.no,

Ellen Merethe Magnus, OsloMet – Oslo Metropolitan University, ellen-merethe.magnus@hioa.no

Abstract The purpose of this article is to explore different models for integrated university-professional learning within Norwegian higher education institutions in a proposed collaborative initiative with enterprise. The suggested model is a dualised model for a bachelor’s degree in engineering, involving a collaborative effort between higher education institutions and enterprises. The objective of the model is to develop expansive, lifelong learning for continuous development by transcending traditional boundaries between learning in university and learning in the workplace. Work is an important means for securing social inclusion, and an investment in lifelong learning is thus an important contribution to the requalification and reintegration of adults into the workforce. Norwegian higher education is, with a few exceptions, governmental and constitutes a central element of the tripartite system of collaboration, where labour organisations, employer’s organisations and government collectively bargain over welfare policy and there is a long-standing tradition of autonomy within the professions.

The increasing need for the requalification of professionals calls for a renewed approach to the integration of university- and working-life learning. The research question of this article is: to what extent can different models of integrated university-professional learning facilitate lifelong learning? The predominant models concerning lifelong learning do not incorporate the full benefits of learning from practice.

Our new model, a *dualised model*, has the potential to fulfil the key requirements for university- and working-life boundary learning, as it provides a greater permeability between work-based and university-based learning and includes adult learners.

Expansive lifelong learning and double-loop learning constitute the theoretical perspectives of our proposed new model.

Keywords: integration of university and working life; engineering education; expansive lifelong learning; dualised model; tripartite system

Introduction

How can traditional engineering education in Norway improve and enhance student learning with better, more amplified work-based learning through practice that ensures the student's lifelong learning? We propose a dualised model for an engineering programme comprising a joint university-industry degree. The objective of the proposed dualised model is to develop expansive, lifelong learning for continuous development by transcending traditional boundaries between learning in university and learning in the workplace (Engeström, 2001). The status quo shows weak links in the student's workplace learning in bachelor's level engineering education. For example, there is no tutored practice for students when they participate in mandatory in-service training in enterprises. The limited amount of plasticity and permeability between the engineering education in universities and tutored practice for students in enterprises in the Norwegian context does not contribute satisfactorily to the competences of graduate engineers. The current bachelor's education is inadequate with respect to student learning through guided practice and would benefit from a reworked and improved infrastructure and organisation in order to facilitate and enhance the quality of students' work-based learning (Billett et al., 2016). The world of work today and tomorrow will require professionals to develop new competencies, skills and knowledge that are formal, non-formal or informal, and are developed through education, training and work.

Work is an important means to ensure social inclusion, and efforts to keep people working are crucial, not only to provide them with an income, but also for their health and well-being (OECD, 2014). Thus, investment in lifelong learning is valuable for the individual and society as a whole. Higher education institutions (HEIs) are a key factor in lifelong learning. Traditionally, the products HEIs deliver to lifelong learning students are study programmes resulting in credits or a degree. The programmes or courses do not necessarily take into account that the typical lifelong learning student has acquired competence, knowledge and skills during his or her working life. Adult learners require different learning modes that include recognition of their prior learning compared to those necessary for young university students

with little or no exposure to working life (Amble, 2013; Knowles, 1970; Fejes and Köpsén, 2012).

The case proposed in this article is a model for a new, practice-based engineering programme at bachelor's level in Norway, which draws on integrated learning from university and industry in an equal partnership. The discussion will centre on how this integrated university-professional model can be related to an apprenticeship model for learning. This model for learning is suitable for adult learners in epistemological practices related to work-life development of their competencies, and also in accordance with the UK Apprenticeship Certificate (ACE) (Billett, 2004; Fuller and Unwin, 2003).

In accordance with institutional frameworks and requirements for students' proposed in-service training or apprenticeship, we propose a new model for engineering education at bachelor's level and suggest it will contribute substantially towards students learning how to solve engineering-related tasks, procedures and problems, first as apprentices and later as professionals in the workplace. Hence, this article aims to explore and expand the repertoire for renewed models of collaboration between university and industry, while ensuring better integration between HEIs and the world of work in order to enhance the relevance of professional education, but also to facilitate lifelong learning.

To support lifelong learning it is necessary to analyse the learning of citizens throughout their lives, from cradle to grave. Recognition of prior skills and the development of competency, skills and knowledge in diverse learning trajectories throughout life requires particular attention. Furthermore, it must be understood that learning takes place in many contexts, including outside the formal educational system (Billett, 2011; Cannell, 2016; Field, 2000). The scope of this inquiry will therefore include explorations of integrated models of university- and work-based learning, with different models for a bachelor's degree in engineering as empirical cases. The aim is to analyse how both university and industry can provide advantageous learning contexts to enhance student learning in engineering programmes by bringing together academic with work-based benefits. The research question explored in this article is: to what extent can different models of integrated university-professional learning facilitate lifelong learning?

It is argued that lifelong learning requires analysis of citizens' learning trajectories, since predictions for future working life suggest substantial changes. Frey and Osborne estimated that 47% of the total US jobs are at risk when it comes to automation and computerisation (Frey and Osborne, 2013). Transportation, logistics, office and administrative tasks and service occupations are highly susceptible to computerisation. The competitive advantage of humans is decreasing as sensors improve and the cost of robotics falls. Employees holding a minimum of a bachelor's degree are less susceptible to computerisation. Blinder and Krueger estimated that approximately 25% of US jobs are potentially offshorable, with offshorability being most prevalent in production and administrative jobs (Blinder and Krueger, 2013). Hence, an increased demand for education and training among those with, as well as without, prior education should be expected.

Hickenbottom et al. postulated that skill-based technological change could cause an increased demand for cognitive skills while in the emerging stage (Hickenbottom et al., 2013). However, when the technology reaches the mature stage, the demand for cognitive skills is reduced. At this stage, holding a bachelor's degree will be more about holding a job than having a high-paying job. Brynjolfsson and McAfee pointed out the necessity of improving the rate and quality of organisational innovation and increasing human capital, thereby ensuring that people have the necessary skills to participate in the economy of tomorrow (Brynjolfsson and McAfee, 2012). This underpins the importance of lifelong learning. Even so, the educational sector lags behind when it comes to adopting information technology.

Other major changes will also affect the future working life. Established industries and sectors, for example, the petroleum industry and its supply chain, are undergoing substantial changes. Jobs are disappearing and the content of those that survive is likely to be altered. These changes require the need for academia and industry to collaborate closely to develop candidates with the required skills for tomorrow's working life.

The importance of skills to ensure the Norwegian society a competitive and stable economy, as well as the health and well-being of the population was pointed out by OECD (OECD, 2014). The *Norwegian strategy for skills policy* also highlights skills as a prerequisite for competitiveness (Norwegian Government, 2017). Both documents, as well as the White Paper, *Quality*

culture in higher education, emphasise lifelong learning to help prepare students for a working life that could include career changes to respond to a changing employment environment (Ministry of Education and Research, 2016). Ensuring the transferability of skills, competencies and knowledge into new occupational sectors, or ability to adapt to rapid changes in technology and knowledge production in work, will also entail a simultaneous vocationalisation of universities and recognition that workplaces are learning sites and laboratories for development (Mauroux et al., 2016).

In a Norwegian context, higher education is a central element in the tripartite system of collaboration and dialogue between government, business/university and labour, where government comprises higher education through a particular model where government finance HE. In addition there is also a long-standing tradition of autonomy in the professions that entails that workers and professionals are granted self-government and degrees of freedom in how they chose to solve tasks and problems at the workplaces (International Labour Organization, 1996-2015; Thorsrud and Emery, 1969). The Norwegian context provides a number of framing factors that enable the establishment of a model of integrated university-work-life learning. These include the tripartite cooperation and governmental policy, which finances several initiatives for increasing the rate of re-employment and reintegration from unemployed adults into the labour market. The tripartite model not only lowers the barriers for adult learners to return to university and higher education, but also facilitates the integration of refugees into the world of work after having attended integrated university-work-life courses. Supplying refugees who are already university educated with the necessary knowledge, skills and networks in areas such as language mutually benefits both Norwegian society and the refugees, upskilling them and giving them valuable work-life experience and contacts in enterprise.

The Norwegian welfare state model also supports economic incentives to stimulate the return of unemployed people to regularly waged employment. Hence, a reasonable question to explore and pilot from this contextual backdrop is whether a renewal of the university bachelor's degree, focusing on increased university-work-life integration, could also increase the participation of adult learners from a wide range of backgrounds in HEIs and future working life.

Theoretical perspectives on expanded lifelong learning

In elaborating on the integrated learning that occurs in-between university and the world of work, our focus is on approaches to lifelong learning that are expansive and experience-based. Further learning that takes place in social contexts are central to this inquiry, particularly perspectives inquiring how new knowledge, competencies and skills are produced and reproduced in social contexts (Eikeland, 2013; Engeström, 2001; Wenger, 1998). Learning in this perspective takes place when learners reflect on the experiences they have undergone, and use the responses and feedback from their surroundings and fellow learners to change their behaviour and find new learning trajectories (Dewey, 2007). Billett has emphasised the importance of personal epistemologies in integrating experiences in learning from education and practice (Billett, 2009). Furthermore, Billett discusses how a student's learning experiences in working life can be reinforced by a teacher's interventions at the workplace (Billett, 2015). Learning in the context of integrated learning in-between university and work is about the processes, but also about the contexts that influence behaviour and actions in manners that are durable among the learners, and which can also be defined from different perspectives, for example as social, situated and cognitive learning (Illeris, 2006).

To understand phenomena related to adults' integrated learning in-between university and work, the boundaries between formal, non-formal and informal learning structures become central issues for further exploration (Eikeland, 2013). The continual abundance of new information and knowledge will challenge the analytical perspectives on learning in order to capture the complexity (Knorr Cetina, 2006). Perspectives on expansive learning and Argyris' theory of double-loop learning might be helpful in analysing our proposed model of integrated learning in-between university and work: learning occurs whenever errors are detected and corrected. An error is any mismatch between intentions and actual consequences (Argyris, 1976; Engeström, 2001). Expansive learning as coined by Engeström shows an approach to learning that provides affordances for capturing new forms for learning in varied contexts:

Activity theory and its concept of expansive learning are examined with the help of four questions: 1. Who are the subjects of learning? 2. Why do they learn? 3. What do they learn? 4. How do they learn? Five central principles of activity theory are presented, namely activity

system as unit of analysis, multi-voicedness of activity, historicity of activity, contradictions as driving force of change in activity, and expansive cycles as possible form of transformation in activity. (Engeström, 2001, p. 133)

Fuller and Unwin have further elaborated the concept of expansive learning to comprise lifelong learning, and recognise that learning environments can be expansive but also restrictive (Fuller and Unwin, 2006). Wenger argues that different communities of practice constitute social contexts for learning, where workplaces and the ongoing practices in problem solving and work are central for learning together with others (Wenger, 1998). His social constructivist theory also provides a lens for developing models for integrated university-work learning, particularly where learning takes place in authentic situations in which real work tasks are governed and distributed in the community of practice (Wenger, 1998). This is in addition to context-related learning, determined by the learner's participatory learning in the field of practice (Lave and Wenger, 1991; Wenger, 1998). Challenges of learning at the boundaries have been discussed by Akkerman where demarcation of boundaries could be intentionally used to either preserve or diminish the boundaries (Akkerman, 2011). Etzkowitz has discussed the significance of boundary permeability in the context of regional innovation (Etzkowitz, 2012). Strong university boundaries may inhibit regional innovation and diminish the role of universities as a driving force in regional innovation. The permeability of the boundaries between the two learning contexts in question is therefore a concern addressed in the research methodology, in which a design model approach is applied to explore different models for the integration of university- and work-life learning.

Methodology

The methodology used in this study is based on design thinking (Cross, 2011). The methodology comprises the processes of understanding, ideating and implementing (Vechakul et al., 2015, p. 2553). Design thinking is well suited to innovating interactions between systems, in our case university and workplace learning in bachelor programs in engineering.

We combined best practice examples and analysis of policy documents related to lifelong learning at universities in a Norwegian context with structured discussions with stakeholders. This enabled us to establish a criteria catalogue and develop a design concept for a dualised model for integrated university-work-based learning.

We applied a systems approach to investigate the possibilities within the current regulatory framework and design a model for integrated learning in different contexts, with particular emphasis on a solution that also facilitates lifelong learning. The learning contexts span practical work-life situations, traditional classroom teaching and learning, laboratory experiments, and web-based or web-supported learning. The proposed study model design sums up the outcome of the development process and the model was examined for compliance with national regulatory requirements.

Overview of data

The data in the study consisted of subject-related, semi-structured focus group interviews, workshops and discussions with stakeholders and a review of relevant documents. The aim was to explore the prerequisites, and propose a new model, for an integrated university- and work-based bachelor programme in engineering. Data collection forums were set up for thorough discussions of better university- and work-life integration in the study programme. The process was organised so as to involve a broad range of stakeholders in discussions, workshops and seminars. This was an iterative process that led up to specification of the framework and design criteria for the dual model for engineering education at bachelor level.

The data were collected over a period of two years. An overview of the data collection process is shown in Table 1. The documents used in constructing possible models were the *OECD skills strategy diagnostic report: Norway 2014* (OECD, 2014), the *Norwegian strategy for skills policy 2017-2021* (Norwegian Government, 2017) and the White Paper, *Quality culture in higher education* (Ministry of Education and Research, 2016). The data were collated through writing minutes and field notes from meetings and workshops, and these texts were analysed by the researchers. The stakeholders who participated in the focus group interviews and various workshops also contributed field notes and texts that were analysed as data in this article. Denzin and Lincoln inspired our analytical approach in combining different qualitative methods with the aim of comprehending and analysing

subtle and deeper structures of meaning in the different social contexts where the data collection took place (Denzin and Lincoln, 2008).

Table 1. Data collection process

Data collection forum and documentation	Participants	Topic for discussion	Outcome	Date
Oslo and Akershus University College of Applied Sciences's Council for Cooperation with Working Life Minutes from meeting	Representatives of the Norwegian Parliament, cities of Oslo and Skedsmo, South-Eastern Norway Regional Health Authority, the Confederation of Norwegian Enterprise, Norwegian Labour and Welfare Administration	Ensuring capacity and competence for the local labour market, work inclusion, upskilling of own employees	Wish to explore work-based studies as a supplement to campus-based studies to strengthen the collaboration between HEIs and working life to ensure high employment rate	June 2014
Semi-structured focus group interviews in two-day workshop organised by the Confederation	Partners in the dual education system: HEI Duale Hochschule Baden-Württemberg, German large enterprises	Models for cooperation, incentives for collaboration, admission to dual education, quality	Learning from the German dual system. A dual system is feasible, but the German dual model	November 2015

<p>of Norwegian Enterprise in cooperation with Oslo and Akershus University College of Applied Sciences</p>	<p>Festo and Daimler, Stuttgart Chamber of Commerce, Industrie- und Handelskammer Stuttgart</p>	<p>assurance, coordination of learning activities</p>	<p>must be further developed for the Norwegian context</p>
<p>Field notes by moderators, and texts and models produced by the focus group participants</p>	<p>Representatives from Norwegian HEIs: Western Norway University of Applied Sciences and University College of Southeast Norway</p> <p>Representatives of the parties in the tripartite model: The Norwegian Confederation of Trade Unions, the Norwegian Association of Researchers, the Confederation of Norwegian Enterprise,</p>		

government officials, industry representatives and stakeholders in technology research, and student organisations

Follow-up seminars with the workshop participants	Representative s from Norwegian HEIs:	Relevance of competence and adaptability, synergies of collaboration	Analyses of different models for integrated work-life and	March 2016
Field notes by moderators, and texts and models produced by the focus group participants	Western Norway University of Applied Sciences and University College of Southeast Norway	between work life and HEIs, prerequisites for a fruitful collaboration between work life and HEIs	university learning. Need for thorough exploration of feasible models for integrated work-life and	
	Representative s of the parties in the tripartite model: The Norwegian Confederation of Trade Unions, the Norwegian Association of Researchers, the		university learning in bachelor programmes in engineering	

Confederation
of Norwegian
Enterprise,
government
officials,
industry
representatives
and
stakeholders in
technology
research, and
student
organisations

Round-table discussions at the Norwegian Parliament initiated by the Norwegian Confederation of Trade Unions	Representatives of the Standing Committee on Education, Research and Church Affairs, the Norwegian Parliament	Presentation of the process and models derived throughout the process	Support for bachelor programmes in engineering with high level of integrated university- and work- life learning	May 2016
--	--	---	--	-------------

Minutes from
meeting

Three models for integrated university-work-life learning

This section explores three models for integrated university-work-life learning, in which the models can be applied to professional higher education at bachelor's degree level. The reason for developing models for professional higher education through close cooperation between universities and workplaces is justified by providing students with a more integrated experience for the learning of theory and practice. Providing candidates with expanded learning of work processes through drawing on practical hands-on experience in the workplace, and also lectures on concepts and exercises in applying theory taught at a university, are regarded as relevant with new eyes when applied into practice (Billett, 2009; Engeström, 2001; Billett, 2004; Eikeland, 2013). An example of a model of integrated learning in diverse learning contexts in-between university and work is the application of the German dual system.

Model 1: the German dual system

The German dual system introduced in 1969 with the Vocational Training Act. It is an alliance between the federal government, federal states and companies. The dual system provides young people with training in occupations and trades in exchange between school and work, thereby allowing them to develop skills recognised by employers nationwide in what Brockmann et al. call a 'knowledge-based German VET system' (Brockmann et al., 2008). The German dual system was chosen as the point of departure in developing our dualised model in the Norwegian context due to its long-standing tradition of collaboration between HEIs, policymakers and businesses to provide a labour force that is educated and trained with competencies relevant to the current requirements of enterprises (Blossfeld and Stockmann, 1999). The training is certified by chambers of industry or crafts and trade businesses, as shown in Figure 1.

The dual system covers initial vocational education and training, as well as higher education at all three cycles of higher education. Influential German corporations such as Daimler and Festo, both of which are members of the Chambers of Commerce and Industry in the state of Baden-Württemberg, claim that dual educations are profitable as education development and quality assurance are of mutual value to all partners; the aforementioned dual

model supports long-term cooperation between education and the partner companies. The dual system as practiced by German higher education institutions might not seem realistic in a Norwegian context. However, Model 3, to be discussed shortly, amends the model slightly in order to include more work-based learning, as expansive learning in higher education is more integrated with work-based learning. It also targets adult learners in phases of transforming and evolving their skills and competencies, as required by rapid changes in today's workplace. Before Model 3 is explained and discussed, it is necessary to look into the traditional model for bachelor's programmes in Norway: Model 2.

Place Figure 1 The German dual system

Model 2: bachelor's programmes in Norway

With the exception of those in education, health and welfare, the typical Norwegian bachelor's programme contains very little, if any, mandatory in-service practical training. Visiting guest lecturers, excursions to businesses, seminars and career events all expose students to working life within the university, but the university is seen as the prime learning context. Although research for their thesis might take place in industry, work-based learning in enterprises is kept to a minimum, as working life is not seen as providing a solid base for learning outside academia.

Model 2 for a typical bachelor's programme clearly demonstrates shortcomings when it comes to accommodating lifelong learning, as the boundaries in-between university and work are rigid. In addition, this makes it more difficult than necessary for adult learners already employed to approach the university in order to complete an unfinished bachelor's degree, as shown in Figure 2. A model that may be better-suited for facilitating integrated learning in-between universities and for adult learners might be a dualised model for integrated university- and work-based learning, as described in Model 3.

Place Figure 2 Bachelor's programmes in Norway

Model 3: dualised model for integrated university-work-based learning

Parties in the Norwegian tripartite system of collaboration and cooperation have expressed a strong interest in the German dual model, and the

Confederation of Norwegian Enterprise and the Norwegian Confederation of Trade Unions have recently proposed mandatory practical training in all bachelor programmes. This would support our proposed model, which we have labelled a dualised model for integrated university-work-based learning, as shown in Figure 3.

We propose that a sustainable model must fulfil certain criteria:

- Studies and work must be realised within the framework of the existing national system and meet the general requirements for all educational programmes.
- Parties in the tripartite system of collaboration must provide support and contributions.
- A pool of industry partners with a long-term commitment to the model must be established.
- A model of cooperation between industry and higher education is a prerequisite.
- The admission criteria must accommodate a wide range of applicants, with particular attention given to the recognition and validation of prior learning of adult learners.
- Lifelong learning must be implemented by the model and throughout both learning contexts.

Place Figure 3 Dualised model for integrated university-work-based learning

All HEIs have common interests with partners in industry in ensuring that education is relevant for societal needs, as well as ensuring that persons with relevant competencies are routed into formal education and graduate with sustainable skills and knowledge relevant for the world of work. In this model, learning based upon reflections on one's own experiences is 'exported' from work surroundings to an academic setting, hence allowing the student to find new learning trajectories.

Combining relevant work and education has resulted in our proposed model, supporting a higher integration between formal and informal learning, thereby enabling the lifelong coordination of work, income and studies. Our proposed model has certain similarities to the recently established master's degree programme in systems engineering at University College of Southeast

Norway in delivering more work-based practice for students in order to bridge academia and businesses (Kulberg, 2017).

Discussion

The key components of our proposed model comprise a three-year bachelor's programme coordinated with student employment in industry throughout the entire programme. The combination of paid, part-time employment during and between semesters provides the structural framework for student trainees to become better prepared for working life than their fellow students on university-only programs. To be successful, these programmes must include pedagogical interventions before, during and after practical training periods to augment the students' learning in working life (Billett, 2015).

One might speculate that students who have graduated from programs organised as in our proposed Model 3 might have a better base for lifelong learning. Together with their ability to create their own personal epistemologies as suggested by Billett (2009), this might increase their ability to remain employable throughout their working life. Work-based placements throughout education and training would ensure continuity and support collaborations between university and business partners. Dualised education may also create a direct entrance to employment for students at different ages, and require a minimum of internal job training. Therefore, newly graduated candidates are productive from day one. Candidates with qualifications from other countries, such as immigrants, can also be requalified for full employment at a rapid rate, as their prior competency is validated simultaneously through the work-based training that is integrated with university courses.

A monthly 30-hour workload for industry placement and an additional six-week work period during university holidays would not conflict with the eligibility for student loans and stipends. This could add up to approximately 600 paid work-hours per year. A national survey (Studiebarometeret in Norwegian) among second-year Norwegian students showed that the average time spent on paid work is 7.2 hours per week (Norwegian Agency for Quality Assurance in Higher Education, 2017).

A sustainable dual education as exemplified in Model 3 strongly emphasises the value of mutual collaboration and integrated learning partnerships between HEIs and enterprises. This is characterised by dialogue and mutual respect, use of suitable meeting arenas, sharing of experiences and knowledge, and learning each other's language and codes of conduct. One concept could be to develop a system in which students do not visit higher education to study for a bachelor's degree, never to return, but instead become 'members' of a lifelong learning community. This community, afforded by an integrated university- and work-life learning, could follow and support the personal career development of its members, helping them become lifelong learners. It would also serve the needs of business development and change by re-training employees. A lifelong learning perspective may be of particularly high value to Norwegian industries with locations in remote regions and requirements for competency development in their employees. Due to long travel distances, they could benefit from dualised, lifelong learning opportunities.

Feasibility of the dualised model

The dualised model requires a long-term commitment from enterprise partners to engage in a partnership with universities. The enterprises must provide sufficient resources, such as access to facilities and qualified personnel, for collaboration with HEIs and the tutoring of students. Equally, HEIs must be involved in the enterprises beyond the education of their own students, thus ensuring government support within the tripartite system through the financial model of HEIs in Norway.

The sharing of competencies between HEIs and enterprises is an important prerequisite for mutual collaboration at all levels, including at strategic and managerial levels. As a result, the dualised model is intended to accommodate several learning solutions, such as:

- regular full-time studies
- prolonged studies, including extended study periods
- distributed learning utilising e-learning resources
- distance learning
- session-based learning, supporting distributed and distance learning.

The feasibility of the piloting, implementation and success of the dualised model requires certain prerequisites from the three parties concerned (the enterprises, employee's/student's and the HEIs). To secure commitment to, and motivation for, a dualised model for integrated university- and work-life learning, it must be explained how targeted industries in Norway context would benefit from a long-term commitment.

For example, industry involvement is justified by the advances in technology and rapid changes in the labour market that are faced by businesses. Businesses can reduce the impact of abrupt changes by offering their employees opportunities to participate in higher education and develop new skills while maintaining their employment. By doing this, enterprises develop, build on and supplement their adult learner employees in boundary learning between work and university, while benefitting from their employees remaining part of their workforce instead of leaving the company to go to university.

Conclusion

The employee/student's benefits of the dualised model is making it easier to achieve personal ambitions they already hold of completing a bachelor's degree and a professional certification while still at work. The model's design, offering a combination of work and university studies, makes it possible for adult learners with family and financial obligations to attend university. The employees/students are subsequently given the opportunity to fulfil their own life goals, mutually benefiting their workplace's requirements for employing higher qualified professionals, while participating as members of a lifelong learners' community.

The funding scheme of Norwegian HEIs implies that educating adult learners is an integrated component of the wider social responsibility of HEIs. From the perspective of the welfare state in the tripartite model, attending to the particular needs of adult learners in qualifying and requalify necessitates taking advantage of the talent pool of the population. Additionally, the model of dualised education contributes towards reducing the number of persons relying on social security benefits, taking advantage of more people being able to perform specialised and professional work while simultaneously expanding their learning, both at work and as university students. Subsequently, this proposed community of lifelong learners could encourage universities to make available the necessary courses and tools for

requalification that are demanded by rapid changes and emerging topics within a framework of innovative pedagogies regarding the boundaries between university and work.

Aligned with Engeström's (2001) model of expansive learning, the research presented in this article where students and the learning organisations at university and workplaces are perceived as one: the subjects of learning. The students learn to become lifelong learners who can dip into expansive, lifelong learning in a context of continuous professional learning that provides greater porousness in-between university and workplaces. Questions regarding why, what and how they learn will be explored in further empirical studies. These studies will include analyses of the activity systems used and how mediating artefacts, rules and communities interact to develop learners' competencies, skills and knowledge in manners much sought after in our society (Engeström, 2001). In particular, we will look at how students are given scope to design and evolve their own expansive, lifelong learning in skilful manners (Fuller and Unwin, 2006; Billett, 2015).

As proposed in Model 3, integrated education and professional learning between universities and work entails providing accredited studies that give academic qualifications and, alongside this, courses of practice-based learning. Methods of acknowledging non-formal education in the academic credit system must be established, i.e. by introducing a means by which former merits may be documented, validated and recognised as equal to a formal education. Missing elements can be identified as part of courses constructed to give students the opportunity to perform self-managed studies, and be supplemented by existing courses where necessary. The integrated learning model, in which universities and workplaces collaborate in providing students in different life stages with relevant experience and training, can also be regarded as double-loop learning in Argyris' sense (Argyris, 1976). Our proposed model contributes to a renewal and questioning of practices, values and beliefs that can lead to the development of universities as organisations, as well as improvements in the collaborating partner workplaces.

Much of the potential power for change within the lifelong learning community lies in the reflective process of challenging and changing underlying assumptions of how learning, tasks and work procedures should be performed. The UK Apprenticeship Certificate, among others, has shown that practice-based learning might be a more sustainable pathway towards qualifications, and such an approach could be extended to bachelor's degree

programmes in engineering in Norway. The contribution of expansive lifelong learning to the amalgam of learning between HEIs and enterprise in our suggested model could play a part in widening participation in higher education. In addition, it could help to develop renewable modes of experience-based learning appropriate for a time of rapid change.

The dualised bachelor's education in engineering might be a road to travel for learners to expand in a lifelong perspective about how they can advance their learning epistemologies. It would also enhance integrated boundary learning in-between universities and workplaces, and create transformative, sustainable organisations. Furthermore, the proposed model is potentially better suited than the one currently in operation to accommodate students with prior qualifications.

References

- Akkerman, S.F. (2011) 'Learning at Boundaries', *International Journal of Educational Research*, 50, 1: 21-25.
- Amble, N. (2013) 'Autonomy and Control When Working With Humans – A Reflection On Sociotechnical Concepts', *Nordic Journal of Work Life Studies*, 3, 4: 45-62.
- Argyris, C. (1976) 'Single-Loop and Double-Loop Models in Research on Decision Making', *Administrative Science Quarterly*, 21, 3: 363-375.

- Billett, S. (2004) 'Workplace Participatory Practices: Conceptualising Workplaces as Learning Environments', *Journal of Workplace Learning*, 16, 6: 312-324.
- Billett, S. (2009) 'Personal Epistemologies, Work and Learning', *Educational Research Review*, 4, 3: 210-219.
- Billett, S. (2011) *Vocational Education: Purposes, Traditions and Prospects*, Dordrecht: Springer.
- Billett, S. (2015) 'The Practices of Using and Integrating Practice-Based Learning in Higher Education' in Monica Kennedy, Stephen Billett, Silvia Gherardi and Laurie Grealish (eds.) *Practice-Based Learning in Higher Education: Jostling Cultures*, Dordrecht: Springer.
- Billett, S., Cain, M. and Le, A.H. (2016) 'Augmenting Higher Education Students' Work Experiences: Preferred Purposes and Processes', *Studies in Higher Education*: 1-16.
- Blinder, A.S. and Krueger, A.B. (2013) 'Alternative Measures of Offshorability: A Survey Approach', *Journal of Labor Economics*, 31, 2: S97-S128.
- Blossfeld, H.-P. and Stockmann, R. (1999) 'Guest Editors' Introduction The German Dual System in Comparative Perspective', *International Journal of Sociology*, 28, 4: 3-28.
- Brockmann, M., Clarke, L. and Winch, C. (2008) 'Knowledge, Skills, Competence: European Divergences in Vocational Education and Training (VET) – the English, German and Dutch Cases', *Oxford Review of Education*, 34, 5: 547-567.
- Brynjolfsson, E. and McAfee, A. (2012) *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*, Lexington, MA: Digital Frontier Press.
- Cannell, P. (2016) 'Lifelong Learning and Partnerships: Rethinking the Boundaries of the University in the Digital Age', *Widening Participation and Lifelong Learning*, 18, 1: 61-73.
- Cross, N. (2011) *Design Thinking: Understanding How Designers Think and Work*, London: Bloomsbury Academic.
- Denzin, N.K. and Lincoln, Y.S. (eds.) (2008) *Strategies of Qualitative Inquiry*, 3rd edn, Los Angeles: Sage.
- Dewey, J. (2007) *Democracy and Education. An Introduction to the Philosophy of Education*, United Kingdom: NuVisions Publications, LLC.
- Eikeland, O. (2013) 'Symbiotic Learning Systems: Reorganizing and Integrating Learning Efforts and Responsibilities Between Higher Educational Institutions (HEIs) and Work Places', *Journal of the Knowledge Economy*, 4, 1: 98-118.
- Engeström, Y. (2001) 'Expansive Learning at Work: Toward an Activity Theoretical Reconceptualization', *Journal of Education and Work*, 14, 1: 133-156.

- Etzkowitz, H. (2012) 'Triple Helix Clusters: Boundary Permeability at University-Industry-Government Interfaces as a Regional Innovation Strategy', *Environment and Planning C: Government and Policy*, 30, 5: 766-779.
- Fejes, A. and Köpsén, S. (2012) 'Vocational Teachers' Identity Formation Through Boundary Crossing', *Journal of Education and Work*, 27, 3: 265-283.
- Field, J. (2000) *Lifelong Learning and the New Educational Order*, Stoke-on-Trent: Trentham Books.
- Frey, C.B. and Osborne, M.A. (2013) 'The Future of Employment: How Susceptible Are Jobs to Computerisation?', *Technological Forecasting and Social Change*, 114: 254-280.
- Fuller, A. and Unwin, L. (2003) 'Learning as Apprentices in the Contemporary UK Workplace: Creating and Managing Expansive and Restrictive Participation', *Journal of Education and Work*, 16, 4: 407-426.
- Fuller, A. and Unwin, L. (2006) 'Expansive and Restrictive Learning Environments' in Karen Evans, Phil Hodkinson, Helen Rainbird and Lorna Unwin (eds.) *Improving Workplace Learning*, London: Routledge.
- Hickenbottom, K.L., Hancock, N.T., Hutchings, N.R., Appleton, E.W., Beaudry, E.G., Xu, P. and Cath, T.Y. (2013) 'Forward Osmosis Treatment of Drilling Mud and Fracturing Wastewater From Oil and Gas Operations', *Desalination*, 312: 60-66.
- Illeris, K. (2006) *Læring*, Frederiksberg: Roskilde Universitetsforl.
- International Labour Organization (1996-2015) *International labour standards on tripartite consultation*, Geneva: International Labour Organization. [Online]. Available at <http://www.ilo.org/global/standards/subjects-covered-by-international-labour-standards/tripartite-consultation/lang-en/index.htm> (accessed: 9 April 2017).
- Knorr Cetina, K. (2006) 'Knowledge in a Knowledge Society: Five Transitions', *Knowledge, Work and Society*, 4, 3: 23-41.
- Knowles, M. (1970) *The Modern Practice of Adult Education: From Pedagogy to Andragogy*, Englewoods, NJ: Cambridge Adult Education.
- Kulberg, J.-H. (2017) 'Industriakademiet viktig for industrien', 8 September 2017. [Online]. Available at <https://www.usn.no/aktuelt/industriakademiet-viktig-for-industrien-article210630-6683.html> (accessed: 25 September 2017).
- Lave, J. and Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*, Cambridge: Cambridge University Press.
- Mauroux, L., Zufferey, J.D., Rodondi, E., Cattaneo, A.A.P., Motta, E. and Gurtner, J.-L. (2016) 'Writing Reflective Learning Journals: Promoting the Use of Learning Strategies and Supporting the

- Development of Professional Skills’ in Guilia Ortoleva, Mireille Bétrancourt and Stephen Billett (eds.) *Writing for Professional Development*, Boston: Brill.
- Ministry of Education and Research (2016) *Quality culture in higher education*, Oslo: Norwegian Government. [Online]. Available at <https://www.regjeringen.no/en/dokumenter/meld.-st.-16-20162017/id2536007/> (accessed 8 December 2017).
- Norwegian Agency for Quality Assurance in Higher Education (2017) ‘Studiebarometeret (student’s survey of quality in higher education)’. [Online]. Available at <http://www.studiebarometeret.no/en/> (accessed: 29 September 2017).
- Norwegian Government (2017) *Norwegian strategy for skills policy 2017-2021*, Oslo, Ministry of Education and Research. [Online]. Available at <https://www.regjeringen.no/contentassets/673832a51fc340a3a5796154dd5d5f04/strategi-kompetanse-eng.pdf> (accessed: 8 December 2017).
- OECD (2017) ‘About the OECD’. [Online]. Available at <http://www.oecd.org/about/> (accessed: 20 June 2017).
- OECD (2014) *OECD skills strategy diagnostic report: Norway 2014*, Paris: Directorate for Education – OECD. [Online]. Available at https://www.regjeringen.no/globalassets/upload/asd/dokumenter/2014/rapporter/corrected_version_28_may_2014.pdf?id=2224431 (accessed: 8 December 2017).
- Thorsrud, E. and Emery, F.E. (1969) *Mot en ny bedriftsorganisasjon. eksperimenter i industrielt demokrati, Fra samarbeidsprosjektet LO/NAF*, Oslo: Johan Grundt Tanum Forlag.
- Vechakul, J., Shrimali, B.P. and Sandhu, J.S. (2015) ‘Human-Centered Design as an Approach for Place-Based Innovation in Public Health: A Case Study from Oakland, California’, *Maternal and Child Health Journal*, 19, 12: 2552-2559.
- Wenger, E. (1998) *Communities of Practice: Learning, Meaning, and Identity*, Cambridge: Cambridge University Press.