Work–Integrated Learning in Engineering, Built Environment and Technology: Diversity of Practice in Practice

Patrick Keleher
Central Queensland University, Australia

Arun Patil
Central Queensland University, Australia

R. E. Harreveld
Central Queensland University, Australia
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## Chapter 1
A Work-Integrated Learning Philosophy and the Educational Imperatives

*Bruce A. Calway, Swinburne University of Technology, Australia*
*Gerald A. Murphy, Swinburne University of Technology, Australia*

The chapter explores these WIL findings as: embedded life-long learning; continuing professional development; and the various learning modes that employ the work and learning interface. Further, any understanding of a WIL philosophy must incorporate a learner environment for individual 'action learning' and institutional (i.e. educational as well as workplace) 'active learning' as an initiative that addresses the specific educational imperatives and models outlined.

## Chapter 2
Continuing Professional Development: Work and Learning Integration for Professionals

*Gerald A. Murphy, Swinburne University of Technology, Australia*
*Bruce A. Calway, Swinburne University of Technology, Australia*

Organisations promote their services by stressing that their professional staff are members of the relevant professional association and by listing the certifications/credentials they hold. Practice alone is generally insufficient to ensure knowledge is effective and up to date. Continuing professional development (CPD) is a requirement for professionals to develop knowledge to enable them to competently and adequately provide services to clients or employers. Professionals work in environments where technical, legal, conceptual and/or social change mandates that processes, practices, knowledge and understanding need to evolve. Individual professionals, professional associations and the employers of professionals may have differing objectives for CPD and have vested interests to ensure that CPD is designed to, and meets actual objectives. Integrating work with learning is fundamental i.e. if learning is not seen as having practical application, it is not valued. The knowledge development of professionals can be enhanced through Work-Integrated Learning which takes into account that they: hold a Body of Knowledge; are adults; and operate in positions in which learning and work can be related. Informal Learning, in particular Communities of Practice, is significant in the transfer of learning to professionals.
This chapter presents a domain-independent computational environment which supports work-integrated learning at the professional workplace. The Advanced Process-Oriented Self-Directed Learning Environment (APOSDE) provides learning support during the execution of work tasks (instead of beforehand), within the work environment of the user (instead of within a separate learning system), and repurposes content which was not originally intended for learning (instead of relying on the expensive manual creation of learning material). Since this definition of work-integrated learning might differ from other definitions employed within this book, a short summary of the theoretical background is provided. Along the example of the company Innovation Service Network (ISN), a network of SME’s, a rich and practical description of the deployment and usage of APOSDE is given. The chapter provides the reader with firsthand experiences and discusses efforts and lessons learned, backed up with experiences gained in two other application settings, namely EADS in France and a Chamber of Commerce and industry in Germany.

Chapter 4
Industrial Training in Engineering Education in Spain

Urbano Dominguez, Universidad de Valladolid, Spain
Jesus Magdaleno, Universidad de Valladolid, Spain

Practical training in companies has been recognized for many years as an important component of the education of new engineering graduates all over the world. The format used to provide this education to students varies widely not only across national boundaries, but also within each country. This chapter deals first with the state of industrial training in engineering education in Spain, both in the old engineering degrees and in the new ones, following the European higher education area requirements, which are now in the process of introduction. An analysis is also carried out on the evaluation and assessment of industrial training when this activity is a part of first cycle engineering curricula, and the role played by the tutor is discussed. Finally, some weak points of industrial training in Spanish curricula are discussed, as well as some proposals to overcome that situation and to move towards a global approach of industrial training in engineering education.

Chapter 5
Work-Integrated Learning for Engineers in Coordination with Industries

Walter Nuninger, University of Lille, France
Jean Marie Châtelet, University of Lille, France

This chapter presents the curriculum and training process applied in the IESP department, standing for “Ingénieur d’Exploitation des Systèmes de Production” of the Ecole Polytechnique Universitaire de Lille (Polytech'Lille, F59 Lille, France), with an emphasis upon the WIL training process for exploitation engineers of production systems. The IESP department is dedicated to lifelong learning and apprenticeship leading to a master degree (French Engineer level) in the production field. It is an accredited program. This practice relies upon a background experience of 18 years with close partnerships.
with industry from many sectors, such as: energy, metallurgy, food industry, automotive, chemical engineering, and aeronautics. The graduates from Continuing Vocational Education and Training (CVT) that are already employed in the company improve their position. Younger graduates from Initial Vocational education and Training (IVT) that also validated their abilities are much more employable. They can work in any industrial sector dealing with engineering production having a strong technical and managerial skill base. In this chapter, the historical setting up and evolution is elaborated in the legal French education framework. The training model based on the IESP professional profile is presented. This model presents an academic curriculum with WBL that integrates a real formative work situation in the industry. The tools and methods developed all along the training process are also focused within a sustainable development policy. Finally, success and difficulties or challenges with mobility due to the globalization of the economy and innovation with respect to the economical crisis are also discussed.

Chapter 6
Global Impact for your Institution: International Experiential Education for Technical Students

Thomas M. Akins, Georgia Institute of Technology, USA
Debbie D. Gulick, Georgia Institute of Technology, USA

This chapter describes Georgia Institute of Technology’s (Georgia Tech) model for producing globally competent engineers. It details two aspects that Georgia Tech thinks are vital to its success: (1) the need for institutional support and resources and (2) making international experiential education a part of an institution’s culture.

Chapter 7
Running a Successful Practice School: Challenges and Lessons Learned

Hong-ming Ku, King Mongkut’s University of Technology, Thailand
Saranya Thonglek, University of Queensland, Australia

The Chemical Engineering Practice School (ChEPS) at King Mongkut’s University of Technology Thonburi (KMU) in Bangkok is a two-year international curriculum modeled after Massachusetts Institute of Technology’s School of Chemical Engineering Practice. The aim of this Master’s program is to produce professional chemical engineers with strong fundamentals, practical experience, and a good command of English. The program’s uniqueness lies in its strong linkage with the industrial sector. This chapter contains a history of ChEPS and details how KMU operates the program. The key factors contributing to the success of the program are identified. Moreover, critical analyses gleaned from the faculty, the alumni, and the industrial sponsors are carried out to examine the current strengths of ChEPS and to identify areas for improvement. Key challenges still facing the program are also outlined. Finally, potential solutions to these challenges are recommended.

Chapter 8
Work-Integrated Learning in Postgraduate Design Research: Regional Collaboration between the Chinese Mainland and Hong Kong

Kin Wai Michael Siu, The Hong Kong Polytechnic University, China

Instead of only staying in the university to carry out research, postgraduate research students nowadays are expected to gain knowledge and experience through work-integrated learning. The advantages of
this kind of learning include better support and facilities for research and more comprehensive and in-
depth experience in the research area. The learning also provides an opportunity for students to gain
other research experience and explore other research interests. However, sometimes such kind of learn-
ing opportunity is not available or not the best available locally, therefore work-integrated learning is
necessary or better to be carried out in remote regions. Taking regional collaboration of work-integrated
learning for postgraduate design research students between the Chinese mainland and Hong Kong as
a case study, this chapter discusses the advantages, merits, issues, and problems of regional collabo-
ration. The chapter then identifies possibilities for improvement and directions for further investigation.

Chapter 9
Integrating Work and Learning in a Postgraduate Maintenance Management Program .................. 184
Patrick Keleher, Central Queensland University, Australia
Arun Patil, Central Queensland University, Australia
Gopinath Chattopadhyay, Central Queensland University, Australia

Central Queensland University conducts a suite of postgraduate programs in maintenance management.
There is an emphasis upon Work Integrated Learning, and the programs are delivered in a flexible
mode by academics and lecturer-practitioners so that learners are provided with an authentic learning
experience. The learners are mature aged, experienced practitioners who are either graduate engineers
or trades qualified, working in the maintenance management area of their organisation. Study materials
have been designed and developed through the collaboration and consultation with industry, university,
and practitioner stakeholders to ensure the student's learning and the assessment of that learning is in-
corporated into the tasks and responsibilities of learners in their workplace. A blended learning delivery
model includes the opportunity for students to attend a two day residential school. Ongoing improve-
ment of the academic program, consultancy, and research opportunities arises from engagement with
stakeholders through a number of mechanisms including a conference to showcase innovative practices
of physical asset and maintenance management.

Chapter 10
A Self-Paced Flexible ‘Learning While Earning’ Process ................................................................. 206
P. Kaye Clark, Central Queensland University, Australia

Three of the professions directly related to the construction industries by which Central Queensland
University’s undergraduate Built Environment programs are accredited, form the foci of this chapter.
The students enrolled in those programs are working in the relevant industries during their part-time ex-
ternal studies. Although learning while working ‘on the building site’ has been known since human be-
ings first began constructing shelter, relevant background theories of philosophy and psychology have
been introduced here and utilised to provide substantive support for a debate regarding the mixture of
formal and informal opportunities for work-integrated learning to which these students are introduced.
The strengths and weaknesses of flexible external studies, as well as the nature of their workplace-based
learning in these programs, are discussed at length. Greater emphasis is placed on the need to capitalise
on the many opportunities for reinforcement of, and reflection about principles and practices introduced
in either or both their employment and/or undergraduate studies, than merely on the advantages or dis-
advantages of flexible external studies. These students’ truly work-integrated learning experience may
be considered to be a ‘self-paced flexible learning while earning’ process.
Chapter 11
Work Integrated Learning and Construction Project Management: A Case Study of an Industry-Academia Partnership in Ireland

Ken Thomas, Waterford Institute of Technology, Ireland
John Wall, Waterford Institute of Technology, Ireland
Brian Graham, Waterford Institute of Technology, Ireland
Patrick Troy, BAM Contractors Ltd., Ireland
David Crowe, BAM Contractors Ltd., Ireland
Aidan O’Connell, BAM Contractors Ltd., Ireland

This chapter concerns the design, delivery and management of a unique part-time postgraduate MSc in Construction Project Management (MScCPM) programme through an industry-academia partnership in Ireland during the period 2007-2010. The partners are BAM Contractors, part of the wider Royal BAM Group based in The Netherlands, and Waterford Institute of Technology (WIT). There are many innovative Work Integrated Learning (WIL) aspects to this bespoken programme, including the blending of teaching and assessment by both WIT lecturers and senior BAM staff. There is also a blend of traditional classroom activities and e-learning technologies to suit the geographically dispersed participants. All stakeholders in this programme have benefited from their participation. These benefits and the associated lessons learned are described in the hope that they may be of use to those developing WIL postgraduate programmes in the future.

Chapter 12
An archetype of WIL in Information Technology at Baden-Württemberg Cooperative State University Ravensburg, Germany

Karin Reinhard, Baden-Württemberg State University of Cooperative Education, Germany
Shalini Singh, Durban University of Technology, Republic of South Africa

The chapter provides an overview of Work Integrated Learning (WIL) into the Information Technology (IT) programme offered at the Baden-Württemberg Cooperative State University in Ravensburg, Germany. The opinions and debates of leading role-players in WIL are featured. The university’s pose and the operations adopted in managing this programme will be presented. These include the structure of the IT programme, its accreditation process, strengths, and weaknesses. The chapter concludes with the programmes direction for the future.

Compilation of References

About the Contributors

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