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# Scottish Centre for Work-Based Learning (SCWBL)

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The *Scottish Centre for Work-Based Learning* is based at Glasgow Caledonian University (GCU), Glasgow, Scotland, UK. In 1998, an understanding was reached with the UNESCO International Centre for Engineering Education (UICEE) to establish the first satellite centre of the UICEE at the GCU. The satellite centre operated as the *Caledonian Centre for Engineering Education* (CCEE) until 2002, when it was superseded by the *Scottish Centre for Work-Based Learning*. When the Schools replaced the Faculty in 2002, work-based learning, which had been a main focus of the Caledonian Centre, was brought together within a centre situated within General and Professional Studies, which is part of Learning Services within the University. The article details the development surrounding the satellite centre since its inception in 1998 and the author discusses its activities and achievements to date, including the changes associated with the formation of the *Scottish Centre for Work-Based Learning* (SCWBL). In particular, there is a review of the role of the Centre in relation to research and development related to off-campus learning, with special emphasis on negotiated learning systems as a future vision. This is seen as a prime focus to support continuing professional development and life-long learning to support career planning for those in professional practice.

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## INTRODUCTION

In February 1998, a Memorandum of Understanding was signed between the UNESCO International Centre for Engineering Education (UICEE), based at Monash University, Melbourne, Australia, and the Faculty of Science and Technology of Glasgow Caledonian University (GCU), Glasgow, Scotland, UK, to establish the first UICEE satellite centre, called the *Caledonian Centre for Engineering Education* (CCEE). This Memorandum was signed by the Faculty while in attendance at the *1<sup>st</sup> UICEE Annual Conference on Engineering Education*, held at Monash University in mid-February 1998.

The Faculty was particularly attracted to the collaboration, as the UICEE is the world's first and only centre of its kind in engineering education with, as its centrepiece, human resource development on a global scale within engineering education.

The desire to address UNESCO's Constitution, which states that *...since wars began in the minds of men, it is in the minds of men that the defences of peace must be constructed*, was a prime mover in attracting the Faculty of Science and Technology to

become a partner of the UICEE by the establishment of the CCEE as a satellite centre. The globalisation and building of international cooperation is also in sympathy with the strategic aims and objectives of the GCU.

At the time of signing the Memorandum, part of the vision was to see a number of satellite centres established on a global basis so that an international network could be established with the UICEE as the quintessential pivot of the global operation. Within the short time span of five years, this vision has been accomplished, with the establishment of a number of centres strategically positioned geographically to synergise the sustainability of the UICEE [1][2].

The staff at the *Scottish Centre for Work-Based Learning* are particularly pleased to see this rapid growth towards the vision, which was discussed when the Centre was initiated, as well as having the UICEE as the driving force at the centre of this network. The basis has now been established to enhance engineering and technological education through effective global communications and to see the transfer of expertise in engineering and technology to developing nations.

### **The Caledonian Centre for Engineering, Education (CCEE), 1998-2000**

When the Centre was established, it was agreed with the UICEE that it would provide a focus for the development of academic and research-related activities in engineering education in the UK and Europe and that it would work closely with the UICEE to realise the progressive globalisation of engineering education. This would be accomplished by establishing the range of activities of the UICEE, which have been already well documented [3][4].

It was also agreed that the CCEE would participate with the UICEE in taking forward seminars, workshops and conferences. Since 1998, the staff of the CCEE have worked with the UICEE by having an active membership in the organising committees, such as the *Global Congress on Engineering Education* held at Krakow, Poland, in 1998, the *2<sup>nd</sup> Global Congress on Engineering Education* in Wismar, Germany, in 2000, and the *2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> UICEE Annual Conference on Engineering Education* in Auckland, New Zealand, Hobart, Australia, and Bangkok, Thailand respectively.

At these conferences, the Centre presented workshops relating to various aspects of work-based learning. At the outset, it was agreed with the UICEE that, since the GCU is a leading centre for work-based learning, the satellite centre would facilitate the transfer of this form of off-campus learning on a global basis and provide the focus for academic and research activities related to workplace/work-based learning.

As the growth of work-based learning and workplace learning developed, this became a major driving force within the Centre and, in 2000, led to the satellite centre being repositioned as the University was restructured. To give focus, the Centre was redesignated the *Scottish Centre for Work-Based Learning (SCWBL)*.

Initially, the CCEE, through the office of the Dean of the Faculty of Science and Technology, was established to directly interact with the UICEE to bring mutual benefit to each and to further the mission, aims and objectives of the UICEE, while at the same time benefiting the Faculty, its departments, staff and students.

The Centre was initially based on a close integration of the Department of Building and Surveying, the Department of Engineering, the Department of Energy and Environmental Technology and the Department of Physical Sciences, all of which formed part of the Faculty. The Department of Learning and Educational Development of the University also interacted with the Centre and an affiliate FE partner,

the Glasgow College of Building and Printing, was integrated with the Centre. The Caledonian College of Engineering in Muscat, Oman, offers a range of GCU engineering programmes and the College also joined the satellite centre.

A Co-ordinator was appointed by secondment from the Department of Engineering to manage and develop the Centre reporting to the Dean of Faculty and supported by a Centre interest group drawn from across the Departments supporting the development of the Centre.

Since its establishment, the Centre has, through its participating departments, offered the possibility for staff and students in institutions associated with the UICEE to register for part-time PhD programmes in engineering. This was taken up by one of the satellite centres and two other collaborating establishments.

An interest group underpinned the developments of the Centre until the change in structure in 2000 and had the following objectives:

- To bring together staff with an interest in engineering/technological education in a forum where they can exchange ideas leading to innovation and creativity;
- To provide staff with opportunities to develop projects that reflect improvements in the teaching/learning of engineering/technological education;
- To encourage and support refereed publications of results and the development of projects at refereed conferences;
- To provide staff with contacts within the UICEE who are interested in developing collaborative links.

### ***1<sup>ST</sup> CCEE CONFERENCE ON LIFE-LONG LEARNING FOR ENGINEERS***

In line with the objective of the Caledonian Centre to support work-based learning, a conference was organised, with support from the UICEE, under the theme of work-based learning and continuous development for engineers. The Conference was a major piece of work for the Centre and the theme was considered to be particularly relevant as research had indicated that off-campus learning would be a major area of growth over the next decade with work-based learning increasingly becoming the norm for the professional development of engineers [5]. The Conference was highly successful and was one of a number of regional conferences supported by the UICEE.

It became clear at this Conference that the process of taking technological education off-campus

into the workplace environment provided an important basis for a change in the mindset needed to stimulate life-long learning and CPD through an off-campus work-based model.

The Conference achieved the main objective of stimulating innovative debate on a range of aspects relating to off-campus life-long learning in the workplace environment. Through its strong international forum represented at the Conference, a global perspective was brought to the continuous professional development debate providing potential ways forward for the 21<sup>st</sup> Century. A volume of Conference Proceedings was provided in the form of refereed papers selected for publication in a special edition of the *Global Journal of Engineering Education*, Vol.3. No.3 [5].

### **Activities and Developments through the CCEE**

The UICEE has a particular interest in the establishment of a global curriculum for engineering education, particularly taking into account the needs of development of advanced technological processes and IT-related technologies. The CCEE has assisted the UICEE in taking forward the debate about global curriculum requirements and has assisted the UICEE in hosting a workshop debate on the way forward at one of the international conferences. At the invitation of the UICEE, the CCEE hosted a chat room on the Internet to stimulate further discussion on the complexities of achieving a common global curriculum. As a result of all this action research, the UICEE has now taken forward the development in the form of a global postgraduate range of qualifications up to the MSc level in engineering education.

The CCEE has played a role in this development, contributing to a development workshop for this qualification, which was held prior to the 3<sup>rd</sup> UICEE Annual Conference on Engineering Education in Hobart, Australia, in February 2000.

With its expertise in work-based learning, the Centre, is contributing to the development of the modular-based programme by developing the creative and innovative-based Thesis Minor module (GCEE14), which is completed in the workplace environment through the establishment of a learning contract consisting of work-related goals to be achieved in collaboration with the employing organisation. This module provides a realistic off-campus approach to dissertation development within the UICEE postgraduate framework of qualifications in engineering education.

The SCWBL continues to work with the UICEE

to resolve the complex issues issued surrounding the establishment of a globally suitable undergraduate curriculum, which is compatible with the conflicting requirements of advanced and developing nations.

The Centre acted as a focus point for the Faculty within the strategic planning period of the University to commit to the delivery of life-long learning, particularly through the development of widened access through flexible learning models based on workplace/work-based learning [6]. Again, working in collaboration with the Professor of Entrepreneurship, a model was put forward for the development of a thematic work-based learning contract in technopreneurship to provide a new mindset for technologists in creativity and innovation in high technology [7][8].

The Centre was funded by the Scottish Higher Education Funding Council to deliver, in conjunction with the Department of Learning and Educational Development, a model for a part-time foundation learning contract for employees returning to learning with no formal qualification. The basis of this development was to provide the return to learning through the workplace environment as a transition to combining on-campus learning with work-based learning.

The Centre supported student experience by continually reviewing leading edge publications relevant to improving the delivery of the programmes by updating the teaching and learning methods and disseminating this information to relevant areas of the Faculty portfolio.

The CCEE was a major contributor to updating the University Postgraduate Learning Contract Framework and took forward the extension of the Framework in order to deliver a Doctorate in Professional Practice (ProfD) [9][10]. The Centre was awarded a Continuous Professional Development Grant to advance this postgraduate framework across the GCU by providing staff development for supervisors and progressing the internal/external marketing of the framework.

Since the formation of the Centre, staff have participated as members of the UICEE's Academic Advisory Committee and in the International Liaison Group for Engineering Education (ILG-EE). Staff have also actively worked with the UICEE to support the development of a network of similar satellite centres.

A number of keynote addresses were made at several UICEE conferences and congresses, reporting on key factors that have been investigated regarding workplace learning at the undergraduate and postgraduate levels and the internationalisation of such programmes [11][12].

The importance of workplace/work-based learning in the development of life-long learning for engineers

was also taken forward through an action research project and reported elsewhere [5].

The Centre identified that workplace/work-based learning generated new challenges for achieving quality assurance. This aspect has formed a main project and results were published and incorporated into the extension of the GCU Postgraduate Leaving Contract Framework for Professional Doctorate level [13][14]. Due to the complex issues surrounding the quality assurance of off-campus work-based learning, this project is continuing through the SCWBL.

The developments in work-based learning at the University were recognised and praised at the government level by the Education Secretary, David Blunkett [15][16]. This was in addition to an invitation for the Dean of the Faculty of Science and Technology to present a paper on recent developments in work-based learning to the UK Deans of Science Group [17]. The Centre also presented results of action research and a workshop on online supervision of work-based learning at an ICEE-sponsored conference in the Czech Republic [18].

In order to gain further experience of online techniques, the Centre participated in a Virtual International Conference hosted from Hawaii, attended virtual paper sessions, took part in the synchronous discussion sessions, attended various virtual social events and presented a paper [19].

### **Glasgow Caledonian University and the SCWBL**

Glasgow Caledonian University is a major provider of professional and vocational higher education, serving clients on a national and international basis. Over 15,000 students attend the University following programmes leading to a range of qualifications at the undergraduate, professional and postgraduate levels. Glasgow Caledonian University is committed to excellence in learning and teaching and to providing the highest standard of education in a modern, professional environment. It seeks to widen and increase access to higher education and to equip students with the skills and knowledge to pursue their chosen career.

Glasgow Caledonian University (GCU) was established with a full University charter in 1993. The GCU was formed from its predecessor institutions: Glasgow Polytechnic and Queen's College Glasgow. Engineering and technological education was conducted through a Faculty of Science and Technology until 2002, when the Faculty was replaced by three Schools. The Schools offer a range of disciplines covering construction, environment, computing, mathematics, physical sciences and engineering disciplines. A modern

portfolio of undergraduate and postgraduate programmes are offered alongside research degrees.

The University took a decision to replace the Faculties with Schools; thus, the Faculty of Science and Technology was replaced by three Schools, which operated from 2002. At that time, the opportunity was taken to review the role of the Caledonian Centre and, as work-based learning had been a main focus of the Centre, it was decided to restructure and take forward the satellite link through a Centre designated the Scottish Centre for Work-Based Learning. The Centre needed a central location within the University to facilitate interaction with the new School structure. On this basis, it was situated within the newly created Learning Services under General and Professional Studies. Learning Services was also the result of University restructuring and provided the ideal centralised base for the SCWBL as the satellite link with the UICEE.

From General and Professional Studies, the Centre is structured such that it has a *hub and spoke* relationship with the Schools in relation to ongoing developments associated with work-based learning.

The *hub and spoke* model is facilitated through each School having appointed a member of staff to coordinate and to be the first point of contact of the School with the staff of the Centre in relation to supervision of learning contracts or other developments.

The new satellite centre was given an official launch event in May 2002 with over 200 people attending the event from industry and business. The Centre has a group of full-time staff led by a senior lecturer and supported by an administrator. The supervision of many of the learning contracts within the undergraduate and postgraduate work-based framework is undertaken by staff in the Schools through operation of the *hub and spoke* relationship.

The Centre is line managed by the Director of General and Professional Studies (GAPS) and the ongoing development and research in the Centre is supported by a part-time professor of work-based learning, who is also directly involved with developments with the UICEE and other UICEE satellite centres. The professor is also a Deputy Chairman of the UICEE Academic Advisory Committee (AAC). Other staff in GAPS are involved in the development of the Centre and its programmes where it is related to the Work-based Learning Contract Frameworks and, in particular, negotiated learning and thematic pathways derived from these Frameworks.

The development and ongoing activities of the Centre are reported through GAPS to the Learning Services Board in Learning Services, which is line managed by a Pro-Vice Chancellor of the University.

Strategic developments are presented by the Pro-VC to the major committees in the University and the Executive Board of the University.

### **The Scottish Centre for Work-Based Learning (SCWBL)**

The mission of *Scottish Centre for Work-Based Learning* (SCWBL) is to play a major role to realise the University vision and be:

*Innovative in programmes, learning and research, inclusive of all society and responsive to the needs of the individual.*

With all of the pressures of modern life on the individual, finding the time to study whilst holding down a job, and raising a family, etc, can be very difficult. An innovative method of gaining accredited degree qualifications, whether postgraduate or undergraduate, while remaining in work and with no loss of income, concerns learning contracts: that is gaining credit towards a degree based on agreed projects/learning goals carried out by the candidate in the workplace under academic and mentor supervision. The professional development needs of the individual in the context of their employers' business aims being of paramount importance.

The objectives of a work-based learning degree is to create a synergy between knowledge, work and learning, and the application of that knowledge in the practical work situation. Thus, it would provide genuine benefits to the employer as well. This exciting and fully flexible route to a wide range of qualifications, from Bachelors' degree to Professional Doctorate is growing exponentially in popularity. The SCWBL is expanding the numbers of those registered with learning contracts at Glasgow Caledonian University, thereby affording more and more people from all sections of the community a realistic opportunity to develop professionally, gain higher education qualifications and thus partake in important life-long learning in order to boost their employability and effectiveness in relation to their employers' business.

The Centre objectives are as follows:

- To establish a clear identity as the centre of expertise and excellence in relation to work-based learning in Scotland and on a global basis;
- To design and deliver work-based learning programmes that are specifically related to professional development;
- To consolidate and expand the Postgraduate Learning Contract Framework;

- To expand the Undergraduate Learning Contract Framework;
- To undertake applied research and development in work-based learning.

All work-based learning contracts are administered and managed by the SCWBL at Glasgow Caledonian University and supervision of learning contracts is agreed with the Schools and other academic units.

The main areas of research and scholarly activity are as follows:

- Extending work-based learning into lifeplace learning so as to include measured and credited learning in the home (family), the community and by use of the workplace;
- Understanding the nature of tacit knowledge and its role in work-based learning;
- Understanding the role of the workplace environment in relation to the development of advanced knowledge skills associated with emotional intelligence (EQ-i);
- Role of work-based learning in CPD development;
- The development of problem-based, work-based learning and controlling factors;
- Methodologies for negotiated learning systems involving mode 1 and mode 2 learning.

As the major centre for work-based learning partnerships and related education, the Centre makes available documentation that reflects the latest advances and thinking on knowledge, work and learning. This is facilitated through membership of the UAc Work-Based Learning Network in the UK.

Publications, some of which reveal the latest advances and thinking on learning issues, are facilitated through the close association with the UAc. It should also be noted that Glasgow Caledonian University has produced a set of definitive work-based reports on relevant *good practice*. A listing of recommended publications (books, papers and reports relevant to work-based learning) can be viewed on the Centre's Web site.

Work-based learning is a sub-set of workplace learning. It refers specifically to the achievement of *planned learning outcomes* that are derived from the experience of performing the work role function. In addition, it is normal practice to complement the experience with directed reading, research or group work to ensure that the learning is taken forward in the context of current theory or practice. Such experiential learning must be evidenced and assessed before it can be recognised by the University, and so that the work-based learning is underpinned by rigorous quality assurance.

The assessments of *competence* have increased in importance over the last decade. In the context of higher education (HE), competence is more than the ability to perform tasks; it includes capability and involves the following:

- Assimilate underpinning knowledge and understanding;
- Acquire and utilise core skills;
- Develop the cognitive processes needed to apply the knowledge and understanding to workplace issues.

The role of the SCWBL is to help design and deliver a range of vocational work-based learning. This provision can be delivered off-campus and is flexible to the needs of those already in employment who wish to develop their knowledge, skills and learning. The SCWBL integrates work-based developments in the University, and provides a consistent and coherent approach to new programme development in collaboration with staff in the Schools and other relevant academic units.

SCWBL staff have an overall responsibility within the University for the following work-based learning programmes:

- The Postgraduate Learning Contract Framework;
- The Undergraduate Learning Contract Framework;
- The Certificate in Management Work-based Learning.

In addition, SCWBL staff undertake work in the following areas:

- Research into work-based learning;
- The provision of staff development for work-based learning;
- The delivery of specific work-based learning consultancy services;
- Membership of the steering group for the national UAcce Work-Based Learning, Network, UK.

In order to support the marketing of the Centre on a global scale, a Web site has been set up with a comprehensive homepage on the Internet. This Web site provides information on the infrastructure, activities and successes achieved by the Centre. The site can be accessed directly through the GCU's homepage or, alternatively, through the UICEE's Web site [20]. Of particular interest is the availability through the Centre of a team of consultants on workplace/work-based learning who are prepared to work with clients on a global basis to provide expert support in the establishment of off-campus workplace/work-based

learning, as originally proposed when the CCEE was set up as a satellite centre of the UICEE. The consultant team is particularly interested in providing developing countries with development support to introduce off-campus learning in the workplace environment

In particular, the value of further developing the number of satellite centres so as to strengthen the global network is recognised as a key target, and the SCWBL will continue to support the UICEE in moving forward in this direction. The Centre will certainly continue to provide the transfer of workplace off-campus learning to other interested institutions on a global basis.

The University is committed to widened access through articulation, increased part-time provision of life-long learning and addressing the issues of social inclusion [21]. Workplace/work-based learning is an ideal vehicle through which all of these issues can be addressed and project work will be continued on already-published works on the economic and social issues of work-based learning and the client-server approach [22][23]. By supporting such off-campus developments, the SCWBL will be able to play a key role in contributing to the delivery of these University strategic objectives.

The SCWBL will work with other UICEE satellite centres to facilitate potential students and staff being able to complete a postgraduate learning contract leading to an MSc or ProfD. The advantage for staff/students is that of being able to complete the qualification while continuing to deliver in their own workplace. Work has already started in this respect, with work-based learning opportunities being presented at various satellite centres.

The SCWBL also offers a workshop that describes work-based learning in the UK and how programmes have developed in the shape of learning contract frameworks and will be of interest to all concerned with the integration of knowledge, work and learning.

### **3<sup>rd</sup> Global Congress on Engineering Education**

The final role of the CCEE was to contribute to a major event held at Glasgow Caledonian University in July 2002, namely the *3<sup>rd</sup> Global Congress on Engineering Education*. This was sponsored and organised by UICEE with the University as the host, principal co-sponsor and co-organiser. It was hosted by the Faculty of Science and Technology and the CCEE. The Congress provided a venue to continue the debate relating to the effects of globalisation on engineering and technological education.

Over 100 papers from 30 countries worldwide stimulated useful debates and facilitated the identification

of critical issues. The Congress was an academically exceptionally fruitful event with the majority of papers being of a very high academic standard.

A Special Edition of the *Global Journal of Engineering Education* (GJEE), Vol.7, No.1 (2003), was published dedicated to the Congress. Expanded and revised versions of award papers presented at the Congress were included in this issue. It reflected the global trends of engineering and technological education that need to be taken into account by engineering educators. In particular, the papers discussed key issues for practising engineers to consider in relation to the globalisation of engineering as a discipline. This edition contained a Guest Editorial by Prof. Colin U. Chisholm, the former Dean of the Faculty of Science and Technology, an introductory address by Prof. Zenon J. Pudlowski, Director of the UICEE, and Opening Welcome addresses by Dr Ian Johnston, VC and Principal of the University, and Prof. Colin Chisholm, the Organising Committee Chairman.

Staff from the Centre presented papers at the Congress relating to ongoing research on the future sustainability of engineering education and aspects relating to emotional intelligence (EQ-I) and work-based learning [24-26].

### **Activities of the SCWBL with Other Centres**

Within the Centre, development work is being taken forward to revise the existing framework for work-based learning to increase the flexibility of the negotiated learning by making available a wide range of off-campus and on-campus learning constructed according to the requirements of the students. Within GAPS, the Caledonian degree provided students with the facility to negotiate those modules that they wished to complete each year. While this provided significant flexibility, it was a degree based on study within the campus using the modules available across the University.

As part of extending negotiated learning, the degree is being modified to facilitate students negotiating to complete some of their studies through completing work-based learning modules in their place of work. Those modules are being made available for students to complete during a third semester over the summer period. This means that students can negotiate their studies based on a mixture of on-campus modules and off-campus work-based modules. As part of this development, a pilot study is underway where students can negotiate to complete a lifelace learning module in the home or the community.

The Undergraduate Framework has also been further developed to provide a pathway for holders of

higher national diplomas or their equivalent – such that students are able to undertake a top-up work-based learning BA/BSc degree. The programme is delivered part-time through evening workshops, tutorials, over the Internet and via workplace activities.

Developments relating to the franchise of the work-based frameworks are also being taken forward. Early in 2003, work was completed on the establishment of the first franchise with an external organisation. Much of the development work was associated with the establishment of secure quality assurance for the operation of the franchise. The University held an accreditation event to approve the external organisation as being able to deliver a thematic pathway on leadership capability at the postgraduate level up to MSc. The Thematic Learning Contract was also approved by the Postgraduate Learning Contract Board within the University as a separate exercise.

In accrediting the external institution to supervise the Thematic Learning Contract, only those staff approved as Associate Lecturers of the University are in a position to supervise students in the workplace. This franchise is now ongoing with a leading European company, with students being supervised in various workplaces across Europe. Each student is able to progressively complete the Leadership Capability Thematic Learning Contract from the postgraduate certified level to MSc level.

This development is of fundamental importance for future development. The expansion of the Postgraduate Learning Contract Framework is limited by the available supervision in the University and the accreditation of external staff as associate lecturers. Other limitations include identification of external institutions to deliver a Thematic Learning Contract. These elements offer a route for considerable expansion.

More recently, attempts have been made to expand work-based learning into China and Taiwan. Discussions to date have shown that there is serious interest in China for students to complete work-based postgraduate degrees. However, in discussions, it was obvious that the University would not have sufficient supervision available to satisfy the estimated demand. Discussions are now ongoing to explore models of collaboration with various Chinese universities, including the progressive development of an appropriate franchise model with interested universities. It is considered that the successful development of an appropriate franchise model will have global transferability and hence facilitate considerable expansion for the GCU.

In Taiwan, discussions also took place with the two UICEE satellite centres in Taiwan located at the National Changhua University of Education (NCUE),

Changhua, and the Chinese Culture University (CCU), Taipei.

At the NCUE, two Memoranda of Understanding were signed with the College of Engineering and the College of Technology. Ongoing discussions are now taking place to reach a Memorandum of Agreement relating to engineering programmes in the College of Engineering, which are a close match to the programmes offered in the comparable School at the GCU. Where a close match is established, students from the College of Engineering will be able to articulate to the third or final year of the corresponding programme at the GCU and then, if successful, continue with an MSc programme of study at the School. With the College of Technology, similar considerations are taking place and the possibility of creating joint research studies is being considered at the doctorate level.

At the CCU, ongoing discussions that may lead to a Memorandum of Agreement are concerned with joint research between staff at the GCU and the CCU in the field of materials engineering. It is intended to progressively develop the link with the UICEE Partner institution using a common interest in the field of electrodeposited materials as the starting point for collaboration.

Collaboration with the African Satellite Centre at Kigali Institute of Science, Technology and Management (KIST), Kigali, Rwanda, has been ongoing after the signing of a Memorandum of Agreement with the GCU at a ceremony conducted at the *3<sup>rd</sup> Global Congress on Engineering Education* held at Glasgow Caledonian University in July 2002. At the same ceremony, a Memorandum of Agreement was signed between the UICEE and KIST to establish a satellite centre at KIST. Over the past year, ongoing developments have involved staff from KIST developing work-based projects for consideration as potential study areas at the postgraduate level using the postgraduate framework at the SCWBL. Staff at KIST and the GCU are working together to establish a number of postgraduate learning contracts at the MSc and ProfD levels, and already projects for ProfD have been approved and are now ongoing. KIST has taken a keen interest in the methodologies of work-based learning and, in the longer term, the intention is to establish work-based learning programmes at KIST.

Much work has gone into the establishment of the satellite centre and this had led to the joint development of an application for a grant to support the satellite centre at KIST in taking forward sustainable development in the region. The SCWBL has worked closely with staff in the satellite centre at KIST to develop an application to DVID and, if successful, staff from

Glasgow will visit KIST to help take forward this sustainability project.

Ongoing development also involves an examination of the engineering programmes at KIST to determine whether a close match can be found with programmes at the GCU so as to facilitate Rwandan students completing a degree in the School in Glasgow. This is in line with the articulations development described later in the article for engineering undergraduate programmes in the School of Engineering, Science and Design at the GCU.

A collaboration has been established with the satellite centre at Aalborg University, Aalborg, Denmark, for the past 18 months and the basis of the collaboration is the bringing together of expertise in problem-based and work-based learning. To take forward this collaboration, applications have been made to the European Union (EU) for supporting grants and, on the basis of this collaborative work, is now being taken forward to develop models for CPD learning using problem-based and work-based learning methodologies. As CPD supports career planning and development, part of the project work is concerned with identifying the role of tacit knowledge alongside explicit knowledge as a model for CPD study.

In particular, the SCWBL examines the development of a toolkit to support CPD studies that will facilitate the integration of requisite tacit knowledge with the required explicit knowledge. Workplace learning methodologies have been chosen as the way forward as tacit knowledge is integral to the workplace environment and the organisation involved. Much of the project work is concerned with how to identify the relevant tacit knowledge and integrate it with explicit knowledge so that the tacit knowledge becomes explicit codified knowledge. A fundamental part of the work is to examine what aspects of tacit knowledge are suitable for conversion to codified knowledge. This work also involves close collaboration with engineering at the University of Wales Institute, Cardiff, Wales, UK, who are also included in the project.

Further developments relating to work-based and problem-based learning are ongoing with further EU applications in preparation. In particular an application is being prepared to extend the concepts of problem-based and work-based learning to the home (family) environment and the community environment. This new development is described as lifelace learning.

Ongoing collaboration through a Memorandum of Agreement has taken place for some time with the satellite centre at Hochschule Wismar - University of Technology, Business and Design, Wismar, Germany. This has involved joint participation in applications to the EU for grants. Still ongoing is the potential develop-

ment of a European Master's degree in engineering, the establishment of work-based learning at Wismar and joint-venture collaboration in relation to surface engineering. Both the GCU and HSW have research teams working in the area of deposition of thin films and the aim is to establish collaborative and joint research in the specialist area of engineering and to facilitate postgraduate education through problem-based applied research.

Ongoing developments have been successful with the *Central Asia Centre for Engineering Education*, based at Tomsk Polytechnic University (TPU), Tomsk, Russia, and there are now regular visits by GCU staff to the TPU in order to take forward collaborative developments relating to engineering education.

The SCWBL continues to publish the results of its developments, scholarly activity and research at conferences and in journals related to both the UICEE and other organisations. During the changeover period from the CCEE to the SCWBL, further work relating to development relating to entrepreneurship and its role in the engineering curriculum was presented at the *5<sup>th</sup> Baltic Region Seminar on Engineering Education* in Gdynia, Poland (2001) [27]. An article relating to further work on entrepreneurship was published in the inaugural issue of the *World Transactions on Engineering and Technology Education* (2002) [28].

Important developments relating to an undergraduate negotiated learning model for the facilitation of broad-based engineering and technological education was presented at the *6<sup>th</sup> Baltic Region Seminar on Engineering Education* held in Wismar/Warnemünde, Germany (2002) [29].

More fundamental work on new models and modes of work-based learning involving a study of the role of tacit knowledge was presented at the *6<sup>th</sup> UICEE Annual Conference on Engineering Education* in Cairns, Australia (2003) [30][31]. Additionally, an article relating to research into work-based learning methodologies was published in the *GJEE* (2003) [32].

More recently, work relating to curriculum development and assessment for knowledge-based engineering graduates and more fundamental work relating to extending from the workplace to the home and community in terms of lifeplace learning were presented at the *7<sup>th</sup> Baltic Region Seminar on Engineering Education*, St Petersburg, Russia (2003) [33][34]. Staff from the SCWBL also provided an invited keynote paper presentation on negotiated learning methodologies as a way forward for engineering at the *1<sup>st</sup> North-East Asia International Conference on Engineering and Technology Education* at the NCUE in Changhua, Taiwan (2003) [35].

In November 2003, staff attended the *1<sup>st</sup> International Conference of the UAcE Work-Based Learning Network* in Cyprus. Presentations were made relating to major developments and research within the SCWBL on the extension of work-based learning to lifeplace learning for the formalisation of learning in the community and in the family (home) and on research into the integration and transfer of tacit knowledge to explicit knowledge [36][37].

The SCWBL, through its relationship with the UAcE work-based learning network in the UK, has presented continuing research and development work relating to work-based learning at the UK conference and in the journal, *New Capability* [38][39].

SCWBL staff also attended the *4<sup>th</sup> UICEE Annual Conference on Engineering Education*, Bangkok, Thailand, where leading edge developments relating to the role of generic descriptors for work-based professional doctorates were presented [40]. Results were reported at the same Conference relating to the role of structured workplace studies in undergraduate and postgraduate engineering programmes [41].

Studies relating to models for lifeplace learning and the potential for this to considerably widen entry to off-campus learning were presented at an *International Conference on Life-long Learning* held at the GCU in July 2003 [42].

### **Global Collaboration with Engineering Programmes at the GCU**

The Faculty of Science and Technology has had a successful history of articulation to later years of a number of its programmes and this success has been continued by the School of Engineering, Science and Design. It is intended to provide this facility to the satellite centres as appropriate, thereby facilitating engineering students with the possibility to complete an engineering degree at Glasgow Caledonian University.

It is intended to take this articulation forward alongside other joint ventures involving postgraduate degrees. This type of development is already ongoing with three UICEE centres alongside other universities globally.

At the undergraduate level, the School will cooperate with other institutions in determining whether or not the programmes they have are a close match to a GCU programme. Where such a seamless match can be verified, students from that institution will be able to enter the corresponding programme in the School by articulating into the third or final year of the degree. This means that a student can complete two/three years at their institution and then complete

a degree in the School in Glasgow, thus gaining a valuable new experience without having to spend the full four years of study in the School at the GCU. This type of articulation can only be achieved through a close association and agreement between the institution and the GCU School. In order to achieve a seamless match of programmes, the institution needs to make available complete details of its programmes in order to determine whether a matching programme is available.

The School has already successfully matched programmes and is willing to cooperate with other UICEE satellite centres to facilitate students being able to come from overseas to enjoy a new experience and complete their degree in the School. The process of determining articulation to later years of a programme in the School involves detailed studies of the programmes of the collaborating institutions.

The SCWBL looks forward to working with the School to extend its area of collaboration with other satellite centres.

Work is also ongoing to extend and develop collaboration at the postgraduate level. Previously, the earlier CCEE offered staff from other satellite centres the opportunity to study for a PhD on a part-time basis. This was successfully taken up by a staff member from another UICEE satellite centre.

On the basis of previous success, the School and the SCWBL are now extending this development and are willing to consider a joint MSc with a suitable institution where an overseas student could complete the lecture studies in the School and then return to his/her home institution to complete the project/dissertation. With regard to PhD study, the School will also be willing to collaborate with institutions where the student/staff could spend up to one year full-time in the School followed by a return to his/her home institution to complete the PhD on a part-time basis. In each case, the collaboration would be based on a Memorandum of Agreement. The School will also consider developments relating to MSc and ProfD by work-based learning, where the staff/student can study in his/her own workplace. The only limitation in extending these developments is the availability of subject experts in the areas in which prospective candidates wish to study.

### Web-Based Journal

The SCWBL represents the University in taking forward the publication of a new journal through a Memorandum of Agreement between four British Universities established through their common association with the Universities Association for

Continuing Education (UACE) Work-based Learning Network.

The UACE is the premiere organisation for continuing education and life-long learning in UK higher education. This network has raised the profile of work-based learning with a view to facilitating the recognised benefits to all potential learners. It aims to promote learning for, in and through work (paid or unpaid), and to establish and disseminate good practice in relation to the development, facilitation and assessment of work-based learning. The GCU hosts the UACE Web site through the SCWBL.

This peer-reviewed *Journal of Knowledge, Work and Learning* provides an international point of reference for the policy, research and development issues of people who have strategic and/or operational responsibilities in the broad arena of work. Drawing on the spheres of the professional, the academic and the experiential practitioner, the Journal contains papers on knowledge that is not confined to discrete disciplines; it focuses on the multidimensional knowledge needed for work.

The scope of the Journal is as wide as possible within the main theme in knowledge management in organisations; the individual's opportunity for learning and self-development that can, in turn inform practice; a professional praxis in a *real* work situation that provides the possibility of learning through a reflective and analytic interrogation of practice; the work of professional and trade associations in continuing professional development.

Work-based learning is essentially transdisciplinary and is of interest to most disciplinary areas especially those with a particular applied focus, such as engineering and technology. This Journal will appeal to academics and students from all disciplines who are interested in the applied nature of their subject area.

In the first instance, the Journal is being launched in an electronic format and the author, through the SCWBL, will provide the initial managing editorship.

The launch of this Journal will provide another vehicle through which educators associated with the UICEE and its satellite centres can seek refereed publications that relate to aspects associated with the integration of knowledge, work and learning.

### Link with the Oman College of Engineering, Muscat

During 1995, in line with its strategic plan to support developing countries, the GCU proceeded with the establishment of an engineering college in the Sultanate of Oman [43]. The University became the academic contractor for this project and supported

the development of the academic infrastructure in its totality, leading initially to the establishment of four university diploma programmes in engineering discipline areas relevant to the developing workforce in Oman.

The Caledonian College of Engineering in Oman was opened after intensive development in September 1996 and enrolled its first main group of students in 1997. The programmes were constructed so that students who successfully completed a diploma were able to articulate to the third year of a corresponding programme at the GCU. This represented a major project for the Faculty and the University.

In order to sustain staff development and growth in engineering education development, the College in Oman was integrated as a member of the CCEE. The main objective was to facilitate the growth of engineering education through action research and other scholarly activity, thereby supporting the staff in the effective delivery of the range of engineering programmes. The College has identified work-based learning as a future development and has set up a joint investigative project with the Centre.

The College was recently recognised as an accredited university college and was last year approved by the GCU to deliver a range of honours degrees in engineering and the built environment through the Caledonian Degree Framework, which is hosted by GAPS and supported by the SCWBL.

With the further and extensive development leading to University College status, the College signed an agreement to become a UICEE partner member and to establish a satellite centre at a ceremony held during the *3<sup>rd</sup> Global Congress on Engineering Education*, which was hosted by the GCU in mid-2003. In its last year, the Caledonian satellite centre played a key role in the discussions leading to Oman College becoming a partner of the UICEE.

### Awards

While operating as the CCEE and during 1998, the Centre proposed Professor Zenon J. Pudlowski, Director of the UICEE, to the Honorary Degrees Committee of the GCU for consideration of an honorary degree. At the Graduation Awards ceremony in July 1998, Prof. Pudlowski was awarded an Honorary Doctorate of Technology in recognition of his role in taking forward the world's first and only UNESCO Centre for the globalisation of engineering education within the spirit of charter of the United Nations.

Staff representing the CCEE have gained the following awards through the UICEE since the establishment of the satellite centre:

- One UICEE Gold Badge of Honour Award for ... *distinguished contributions to engineering education, outstanding achievements in the globalisation of engineering education through the activities of the Centre and, in particular, for remarkable service to the UICEE*;
- Two UICEE Silver Badge of Honour Awards;
- One Diamond Best Paper Award for a paper on quality assurance issues relating to the delivery of work-based learning programmes, selected by the participants at the *3<sup>rd</sup> UICEE Annual Conference on Engineering Education*, Hobart, Australia [13].

In 2003, a special UICEE Director's Award for distinguished contribution was accorded to a SCWBL paper on the assessment of how work-based learning methodologies may contribute to the development of engineering education in the 21<sup>st</sup> Century. This was presented at the *6<sup>th</sup> UICEE Annual Conference on Engineering Education*, Cairns, Australia.

### SUMMARY

The Caledonian Centre for Engineering Education (CCEE) operated in a highly successful manner since its inception in early 1998, acting through its establishment as the first satellite centre of the UICEE as the catalyst for the development of a network of centres on a global basis.

The CCEE, and now the SCWBL, support the mission, aims and objectives of the UICEE and, in particular, support the growth and development of workplace/work-based learning on a global basis.

As a member of the network of satellite centres, the SCWBL continues to work closely with the UICEE to facilitate the delivery of engineering education worldwide with a particular emphasis on supporting developing countries.

Resulting from its particular strengths in workplace/work-based learning, the SCWBL will continue to take a lead role in providing a consultancy service alongside seminars, workshops and conferences sponsored by the UICEE to underpin the global development of off-campus life-long learning within the workplace environment as the future focus for engineering education [44]. The SCWBL will continue to support new developments through action research, such as exploring the change in mindset needed to support the growth of new high technology workplace developments and the change in mindset of society in relation to the contribution of engineers to the global society.

The Centre will continue to build links with other satellite centres as one of its major global activities,

building on the earlier established links with the following UICEE satellite centres:

- *Central Asia Centre for Engineering Education* at Tomsk Polytechnic University, Tomsk, Russia;
- *Gottlob Frege Centre for Engineering Science and Design* at Hochschule Wismar, Wismar, Germany,
- *UICEE Centre for Problem-Based Learning* at Aalborg University, Aalborg, Denmark;
- *Centre for Electrical and Electronic Engineering Education* at St Petersburg State Electro-technical University, St Petersburg, Russia;
- *African Centre for Engineering and Technology Education* at Kigali Institute of Science, Technology and Management, Kigali, Rwanda;
- *Gulf Centre for Engineering Education* at the Caledonian College of Engineering, Muscat, Oman;
- *Centre for Cultures and Technologies in Asia* at the Chinese Cultural University, Taipei, Taiwan;
- *North-East Asia Centre for Technology and Vocational Education* at the National Changhua University of Education, Changhua, Taiwan.

The SCWBL will also collaborate with the UICEE by providing support in seeking out new partners to further stimulate the growth of global engineering and technological education.

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Colin Urquhart Chisholm graduated with a BSc Hons in Metallurgy from Strathclyde University and with a Doctor of Philosophy from St Andrews/Dundee University in 1962 and 1968 respectively. From 1963 to 1965, he was a lecturer at Wolverhampton and Staffordshire College of Technology (now Wolverhampton University). From 1965 to 1971, he was a lecturer in materials science at Dundee Institute of Art and Technology (now Abertay University) where he researched in processes for alloy electrodeposition and the study of the structure of the deposited alloys. After spending a period as a senior lecturer at Robert Gordons Institute of Technology (now Robert Gordons University), he became Associate Head of Engineering at Paisley College of Technology (now Paisley University) and thereafter

Head of School of Engineering at Glasgow College of Technology (now Glasgow Caledonian University) where he was awarded a professorship. He was Dean of the Faculty of Science and Technology at Glasgow Caledonian University (GCU) from 1993 to 2002, and, since 2002, he has taken up the position of Dean of Development. He has also been a member of the Executive Management team and is the Professor of Research and Development in the Scottish Centre for Work-Based Learning (SCWBL), a satellite centre of the UICEE.

Prof. Chisholm is also a Deputy Chairman of the UICEE Academic Advisory Committee.

Prof. Chisholm is an acknowledged international researcher in the field of electrodeposition of alloys and leads collaboration as Chairman of Surface Technology International, which involves a group of European universities. Since 1985, he has maintained a major collaboration with a team of researchers at Eotvos Lorand University in Budapest, Hungary.

For the last decade, he has led action research and development relating to work-based learning and, at GCU, has developed an innovative Postgraduate Learning Contract Framework for work-based learning, which has been operational since 1992.

More recently, he negotiated on behalf of GCU with the UNESCO International Centre for Engineering Education (UICEE) leading to the establishment in 1998 of the first satellite centre of the UICEE, named the Caledonian Centre for Engineering Education (CCEE) at the GCU.

He was awarded the UICEE Silver Badge of Honour for Distinguished Contributions to Engineering Education at the *Global Congress on Engineering Education* in Krakow, Poland, in September 1998, and more recently at the *2<sup>nd</sup> Global Congress on Engineering Education* in Wismar, Germany, in July 2000, he was also awarded the UICEE Gold Badge of Honour.

He has published over 250 scientific papers in refereed journals and conference proceedings and supervised over 40 PhD/ProfD students. More recently, Professor Chisholm, in collaboration with the team for Surface Technology International, published the first paper regarding the successful deposition of tin-chromium and tin-zinc chromium alloys. Prof. Chisholm has also received a number of awards for published papers presented at international conferences.