

Engineering and Technology Education Leaders Forum

Council Room, University of Adelaide, North Terrace Campus

10.00am Sunday 6th December 2009

Attendees:

Tim Aubrey *UTS*, George Banky *SUT*, Wageeh Boles *QUT*, Frank Bullen *USQ*, Deborah Bunker *USyd*, Anna Carew *UTas*, Lynne Cohen *ECU*, Peter Cole *Murdoch*, Brenton Dansie *Uni SA*, David Dowling *USQ*, Katrina Falkner *Adelaide*, Peter Gibbings *USQ*, Elizabeth Godfrey *UTS*, Daryoush Habibi *ECU*, Roger Hadgraft *Melbourne*, Chris Johnson *ANU*, Mirjam Jonkman *CDU*, David Jorgensen *CQU*, Robin King *ACED*, Tony Koppi *ACDICT*, Alex Mazzouni *Swinburne*, Tim McCarthy *UoW*, Julie Mills *Uni SA*, Philip Ogunbona *UoW*, Neel Pandey *Manukan Institute of Technology*, Joe Petrolito *La Trobe*, Carl Reidsema *UNSW*, Jim Rodgerson *Manukan Institute of Technology*, Gerard Rowe *Uni Auckland*, Judy Sheard *Monash*, Willy Sher *Uni Newcastle*, Tom Steiner *RMIT*, David Suter *Adelaide*, Peter Sutton *UQ*, Janis Swan *Uni Waikato*, Phil Turner *JCU*, Janet Verblyla *USQ*, Hollie Zondanos *UTS*

Summary

The Discipline Support Strategy (DSS) for Engineering and Technology funded by the ALTC through ACED, in conjunction with ACDICT, is in its initial project phase. Its fundamental aim is to build a stronger community of engineering and information and communication technology educators committed to sustained improvements in teaching and learning. The *Engineering and Technology Leaders Forum* gives us the opportunity to scope current projects, investigate potential areas of research and identify educational leaders for each field. It was noted the DSS's immediate concern is identifying and approaching key members of the technology leader community before the first workshop as there were several notable absentees from this community.

The DSS's management group consists of:

- Robin King (EO of ACED);
- Tony Koppi (EO of ACDICT);
- Frank Bullen (nominee of ACED) ;
- John Roddick (nominee of ACDICT); and
- Hollie Zondanos (Senior Project Officer- based at UTS).

ALTC funded projects presented:

- **Wageeh Boles** (ALTC Associate Fellow) - *Bridging the gap: Matching students and staff through discipline-based self-evaluation and co-creation of more appropriate pedagogies in engineering*
- **Philip Ogunbona** *Addressing ICT curriculum recommendations from surveys of academics, workplace graduates and employers*
- **Robin King** *Curriculum Specification and Support Systems for Engineering Education*
- **Julie Mills** *Gender Inclusive Curriculum in Engineering and Construction Management*
- **Judy Sheard** *The culture of teaching and learning in ICT & engineering: facilitating research professors to be T&L Leaders*

- **David Dowling** *Defining Your Discipline*
- **Carl Reidsema** *Design based Curriculum Reform*
- **Tim McCarthy** *Pro-active Approach to Student Learning in Engineering Mechanics*
- **Roger Hadgraft** *ALTC Discipline Scholar in Engineering and (Information) Technology: 2009-2010*

Round table discussions on engineering and technology teaching and learning initiatives highlighted word at:

- University of Auckland, 3 projects focus on:
 - reducing first year attrition
 - reducing second year attrition
 - curricula enhancement
- Swinburne University of Technology, current projects focus on:
 - student retention tracking
 - alignment courses for outcome based education
 - reflection
 - student - creating a student portfolio of scholarship
 - academic – encourage to consider researching teaching a learning in daily activities
 - scholarship – support structure to advance T&L
 - industry engagement – broaden way to engage with industry

Round table discussion highlighted the following common issues which formed the basis of workgroup discussions:

- leadership - need to strengthen T&L communities
- workforce - academic supply
 - raising profile of T&L
 - transference of scholarship to practical application
 - TEQSA will coordinate marking and grading systems
 - understanding differing institutional honours agendas as a prelude to the exit debate
- articulation with TAFE and VET
- resource sharing

Detailed Notes

1. Welcome and Introductions

Katrina Falkner, David Jorgensen, Robin King and Tony Koppi

2. ALTC Discipline Support Strategy (DSS) for Engineering and Technology

ALTC has funded the Discipline Support Strategy for Engineering and Technology to take forward action on the recommendations of the discipline scoping studies in engineering (King, 2008) and information and communications technologies (Koppi & Naghdy, 2009). The ICT domain includes information systems. The strategy proposal was drafted cooperatively by representatives of the two deans' councils and aims to serve mutual interests.

Engineering and Technology Mutual Interests
Students - attraction and motivation, attrition, low enrolments by women Curriculum – improve design, increase industry links, increase inclusivity Best-practice pedagogy - student-centred active learning Student assessment – with links to well-defined learning outcomes assessment standards are a new focus for discipline scholars Academic staff - need support to implement best-practice

- **Engineering emphasised - sharing of staff and physical resources**
- **ICT emphasised – the teaching-research-industry nexus**

King R (2008), *Addressing the Supply and Quality of Engineers for the New Century*
Koppi T, and Naghdy F (2009), *Managing Educational Change in the ICT discipline at the tertiary education level*

The ALTC is funding the strategy by contract with ACED. The presidents of the two deans' councils have signed a memorandum of agreement to implement the strategy over the funding period to February 2012. The strategy is part of the ALTC Learning Networks program, and as such, will work closely with the Engineering & Technology Discipline Scholar team (Roger Hadgraft and Ian Cameron).

The *Management Group* consists of Robin King (EO of ACED), Tony Koppi (EO of ACDICT) and a nominee from each deans' council, Frank Bullen (ACED) and John Roddick (ACDICT). The Strategy is supported by half-time Senior Project Officer, Hollie Zondanos, based at UTS.

- AD-TL groups, ACED, ACDICT, ALTC, AAEE, SIGCSE discussed with reference to Relationship map. It was identified that important member of the *Technology* community had not yet been contacted and it was the *DSS* responsibility to identify and contact these ASAP.
- Working groups (*point 5*) to scope potential areas for 2010 forums, workshops, mapping and planning

ALTC funds projects and systems to improve T & L and act on discipline recommendations

- Leadership Projects -next proposals due 18 March then 1 July
- Priority Projects - next proposals due 9 April then 29 July
- Competitive Grants - next proposals due 3 June
- ALTC Fellowships and Associate Fellowships
- Discipline Learning Networks
- discipline scholars
- discipline support strategies

3. ALTC Project Progress Reports – identification of generic and emerging issues

a. Wageeh Boles (ALTC Associate Fellow) <i>Bridging the gap: Matching students and staff through discipline-based self-evaluation and co-creation of more appropriate pedagogies in engineering</i>	
http://www.altcexchange.edu.au/group/bridging-gap-between-learning-and-teachingengineering .	
Institutions	Queensland University of Wollongong (lead), Central Queensland University and The University of Melbourne
Funded	
Status	Final report with ALTC – should be out soon
Summary	<ul style="list-style-type: none"> case study approach to explore the effect of learning styles, teaching styles and institutional norms to learning. Barriers to learning were explored through student focus groups, academic interviews and a thorough critical review of the literature.
Deliverables	<p>Development of the following resources:</p> <ul style="list-style-type: none"> four guides for academics on connecting teaching with learning and addressing barriers to learning; ten resources as papers, workshop materials and workbook, slides, etc; eight reports; three documents on the processes used for planning and running this fellowship program; two protocols for interviewing academic staff and conducting student focus groups, and; data (transcripts of student focus group discussions, and learning styles assessment results of participating students and academics.)

b. Philip Ogunbona <i>Addressing ICT curriculum recommendations from surveys of academics, workplace graduates and employers</i>	
Institutions	University of Wollongong (lead), Murdoch University, Swinburne University of Technology, The University of Queensland, Australian Council of Deans of Information and Communications Technology
Funded	2009
Status	Completion due November 2011
Summary	<p>Following surveys of the major stakeholders the project will address:</p> <ul style="list-style-type: none"> poor/ erroneous perceptions of ICT and the ICT profession; students' lack of understanding i.e. motivation in choosing to study ICT(or not); poor enrolment of women; lack of participation and attendance in class in some cases; and relatively high attrition; the lack of industry involvement in the design and implementation of the curriculum; and greater experience by students of industry, i.e., work-integrated learning; and understanding the nexus between teaching-research-industry learning in ICT
Outcomes	<ul style="list-style-type: none"> Through the support and dissemination capabilities of ACDICT and wherever practicable, ICT teaching groups undergo curriculum revision; industry and academia to established closer working relationships for curriculum design and delivery (ACS has incorporated relevant outcomes into its national accreditation practices); work-integrated learning strategies to be formulated and implemented at the local level; means of improving the perception of the ICT profession to be investigated and used to inform local practices; improved learning and teaching practices i.e. curriculum improvements (gender inclusive curricula and to minimise attrition) to disseminated across the ICT sector

c. Robin King *Curriculum Specification and Support Systems for Engineering Education*

http://www.altc.edu.au/project-curriculum-specification-support-uts-2008	
Institutions	University of Technology Sydney (lead), with CQ University, University of Melbourne, University of Queensland, University of South Australia, Australian Council of Engineering Deans, Engineers Australia, Australasian Association for Engineering education
Funded	2008
Status	Ongoing
Summary	<p>The intention is to involve all 32 engineering schools in one or more of the four project areas:</p> <ul style="list-style-type: none"> • Understanding and Reducing Attrition in Engineering Education • Graduate Certificate Unit • Revision of Stage 1 Competency Standards • New Pathways <p>Each project area will develop draft materials (e.g.) guidelines, specifications, standards, and curriculum) for testing amongst the participating engineering schools. Examples of best-practice will be collected. New program and support concepts will be tested by potential student groups. The graduate course will be trialed at one or more participating university.</p>
Outcomes	<ul style="list-style-type: none"> • Revised national competency standards and broad program specifications to underpin flexible outcomes-based curriculum design for engineering award programs; • Guidelines for new and revised program pathways and support systems for increasing access to engineering qualifications; • Guidelines on curriculum design and delivery strategies to reduce attrition and • Formulation and trial of a graduate course unit in engineering pedagogy, curriculum development and delivery.

d. Julie Mills <i>Gender Inclusive Curriculum in Engineering and Construction Management</i>	
http://www.altc.edu.au/project-gender-inclusive-curriculum-unisa-2008	
Institutions	University of South Australia (Lead), The University of Melbourne, The University of Newcastle, University of Technology, Sydney
Funded	2008
Status	Ongoing - 2010
Summary	<p>This project will develop and promote a more inclusive style of teaching and learning in Engineering and Construction Management (E&CM) in order to accommodate the increasingly diverse student body.</p> <ul style="list-style-type: none"> • Surveys of staff and students to benchmark current inclusive practice - completed • Gathering of exemplars of good practice in E&CM courses in Australia and internationally –ongoing • Awareness-raising through dissemination of exemplars and staff workshops – ongoing <p>Embedding inclusive requirements in professional accreditation processes – ongoing</p>
Outcomes	<ul style="list-style-type: none"> • Improved retention rates of women in E&CM; • Increased awareness of staff in E&CM of inclusive curriculum and consequent changes to teaching and learning practice; • The embedding of inclusive curriculum principles into institutional quality processes for course and program development and approval and into accreditation criteria for E&CM programs with the relevant accrediting bodies.

e. Judy Sheard <i>The culture of teaching and learning in ICT & engineering: facilitating research professors to be T&L Leaders</i>	
http://www.altc.edu.au/project-culture-teaching-learning-qut-2007	
Institutions	Queensland University of Technology (Lead – Sylvia Edwards), Monash University, University of Technology Sydney
Funded	2008
Status	Ongoing - 2011
Summary	This project seeks to raise the profile and encourage recognition of the fundamental

Summary	<p>This project seeks to raise the profile and encourage recognition of the fundamental importance of teaching in the professoriate and to facilitate the transfer of the practices and the project model developed within the Engineering and ICT domains to other disciplines and universities via 'bridging mechanisms'. Surveys and focus groups will be used along with data mining to evaluate the effectiveness of the approach for leadership development.</p> <ul style="list-style-type: none"> • Bridge 1: raise awareness of T&L in research professorship – complete • Bridge 2: challenge the transfer of skills • Bridge 3: evaluation and testing level of engagement
Outcomes	<ul style="list-style-type: none"> • Implementation of a model where the research professoriate facilitate development of the T&L culture, • Increase in awareness of, and interest in, pedagogical issues among research professors, • Determination of whether research leadership skills can be rapidly transferred to the context of T&L using learning transference,

f. David Dowling <i>Defining Your Discipline</i>	
Institutions	University of Southern Queensland (lead), University of Tasmania
Funded	2009
Status	Ongoing – 2011
Summary	<p>Aims:</p> <ul style="list-style-type: none"> • To identify and develop an efficient, effective, and inclusive consultation process that can be used by discipline stakeholders to define Graduate Outcomes for their discipline. • To use the consultative process to deliver nationally agreed Graduate Outcomes for at least two engineering disciplines: one small discipline and one larger discipline.
Outcomes	<ul style="list-style-type: none"> • A Final Report for ALTC and EA • Discipline Graduate Outcomes Guides for each of the two participating disciplines (published and provided to Engineering Schools in Australia and the relevant Engineers Australia Colleges) • A Consultation Guidebook: The guidebook will describe the processes used to consult the stakeholders and to analyse and synthesis the data, including online survey data. It will also include templates for the documents used in the process and the guides (dissemination through ALTCexchange)

g. Carl Reidsema Design based Curriculum Reform	
http://www.altc.edu.au/project-design-based-curriculum-reform-within-unsw-2008 http://aee-scholar.pbworks.com/	
Institutions	The University of New South Wales (Lead), Queensland University of Technology, The University of Melbourne, The University of Sydney
Funded	2008
Status	Now in its 14th month – Due to complete August 2010
Summary	A detailed comparative study of engineering curricula involving four Australian Engineering Faculties to inform renewal of Australian engineering curriculum. A community of practice supported by AaeE, EA and ACED, provides the strategic and political support necessary to develop and sustain the critical mass required in advancing much needed curriculum reform.
Outcomes	<ul style="list-style-type: none"> • Production of the learning materials to support design project-based learning and their online placement (UMelb/QUT) <ul style="list-style-type: none"> - BOK – Eng. Basics @ http://aee-scholar.pbworks.com - CDIO – PBL @ http://aee-scholar.pbworks.com/CDIO-PBL • CDIO framework applied to K12 pathways and preparatory proficiencies (QUT) <ul style="list-style-type: none"> - The CDIO workshop at AaeE will focus on three of the CDIO standards to engage participants through workshops on design-build experiences, student workspaces and academic development as agents for curriculum and cultural reform.

	<ul style="list-style-type: none"> • Implementation of the new Year 1 engineering curriculum (USyd) • Curriculum mapping and Structured Interviews at 4 institutions: snapshot of current practice & examples of best practice (still underway) led by UNSW • Regional Forum at UNSW in April 2009 (presented in AaeE paper session) <ul style="list-style-type: none"> - Consensus around desired Graduate Attributes - clearly expressed willingness by industry to become more involved in UG engineering education (5 industry participants engaged in UNSW 4th year design course) • 3. Dissemination
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h. Tim McCarthy Pro-active Approach to Student Learning in Engineering Mechanics	
http://www.altc.edu.au/project-proactive-approach-addressing-uow-2008	
Institutions	University of Wollongong (Lead), University of Tasmania, University of Technology, Sydney, Australian Maritime College
Funded	2008
Status	Ongoing – completion due 2010 (website available next session)
Summary	To address increasing diversity in engineering students' prior learning, learning styles, personal interests and other factors that may be affecting learning in Engineering Mechanics. The project will develop a process and tools to support a pro-active approach to addressing factors that cause difficulties for students.
Outcomes	<ul style="list-style-type: none"> • Design and implement an online 'toolbox' to assist educators in providing supplementary learning activities to suit students' individual needs (examined available resources (commercial and free to use) – catalogued by learning styles, design and topics) • Determine aspects of factors that may predict poor performance in engineering mechanics which need to be addressed by supplementary education or intervention. • Studied when students disengage and then re-engage with a topic • Identify the specific learning areas to be addressed by learning resources. • Research and determine approaches to address each of the identified learning areas. • Develop requirements for learning resources. • Identify and collect existing learning resources that are currently publicly available. • Establish requirements for the development of new learning resources that existing resources do not meet. • Develop required learning resources where possible. • Design process for selecting and implementing learning resources.

i. Roger Hadgraft ALTC Discipline Scholar in Engineering and (Information) Technology: 2009-2010	
Discipline Scholars	Ian Cameron, University of Queensland, (itc@uq.edu.au), Phone: 07 3365 4261 Roger Hadgraft, University of Melbourne, (roger.hadgraft@unimelb.edu.au), Phone: 03 8344 4226
http://aeee-scholar.pbworks.com/	
Funded	2008
Status	Ongoing
Summary	The focus of the discipline scholars has shifted in 2009 from enable shared use of expertise across the sector to assisting the disciplines to set standards. They are connecting a range of best-practice activities that are currently underway within Engineering and IT, with a special focus on current and recent ALTC projects. Through this process, a Discipline Network will emerge that can be carried forward by A2E2 and by the Australasian Computing Education Conference (ACEC) ¹ . They are also working on national issues of academic standards within our disciplines and across disciplines. This addresses the current ALTC focus on the future impact of TEQSA (Tertiary Education Quality and Standards Agency) within the higher education sector. They are seeking stronger links to the ITC community, researching the key leaders and bodies,

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4. Roundtable – each university represented to highlight (in 1 minute) their activities and emerging issues in teaching and learning

Deb Bunker *USyd*

- Sees same issues with regards relevancy seen in teaching Business Information Systems i.e. overcoming students perception of information systems relevancy and its place in industry with practical example to overcome theoretical constructs
- Same research vs teaching issues seen

Gerard Rowe *Uni Auckland*

Asked to identify high priority initiatives with regard to T&L, in engineering they identified 3 projects:

Year one - attrition

- Have identified evidence of conceptual misunderstandings in physics based subject.
- seeking to improve diagnostic testing to identify these errors before they take hold
- redesigning questions in tutorials to unearth misconceptions and strengthening existing support structures i.e. staff particularly skilled teasing out and dealing with conceptual misconceptions

Year two-attrition

- Two year pilot study to identify students at risk of failing (diagnostic testing and analysis of course reports)
- Further tutorials (not mandatory) given to weaker cohort – attendances incentive based i.e. receive further course marks for a peer based marking exercise (attendance 60%)
- Next year seeking to improve training of tutors responsible for supplemental instruction
- Seeking to distribute learning style questionnaires thus allowing for individual tailoring

Curricula enhancement

- Looking to restructure to treat systems thinking in a more harmonious way

Tony Koppi *UoW*

- Articulation with TAFE and VET and the government thrust to make us take more students without any say in the preparation of those students (park for working groups)

Philip Ogunbona *UoW*

- Are we treating academic profession as a further segment of *industry*? – i.e. is curricula designed to train the next generation of teachers
- Robin – academic profession should be treated as part of *industry* - research being undertaken jointly by Universities Australia and Professionals Australia to scope demographics
- Tim – highlighted that traditional pathway (PhD – postdoc) excludes industry members from moving to academia – (part of Philip and Tony’s industry nexus research)

Anna Carew *UTas*

- Highlighted different agendas from Engineering honours (strong industry and service) and suggested assessment of honours as a prelude to the exit debate
- Roger Hadgraft – more relevant to ICT, as the honours year is a choice rather than embedded in that discipline
- Janice – NZ – degree with honours vs honours degree (must contain research component), must differentiate on marks and whether it has a research component
- Robin – Washington accord standard- graduate must engage in research
- David Dowling – 2004 Associate Deans did a study of all the honours programs

Wageeh Boles

Sees following issues:

- transference of scholarship to practical application
- moving beyond 'the usual subjects' to identify all key people involved in teaching and learning
- what do we know about academics as teachers (their backgrounds, philosophies)
- how we might facilitate sharing of resources to stop reinventing the wheel

Alex Mazzouni *Swinburne*

- Putting on a Project Officer to track retention (various cohorts from various backgrounds)
- Alignment courses for outcome based education
- Reflection – portfolio of scholarship
- Scholarship – support structure to advance T&L
- Industry engagement – broaden way to engage with industry

Tim Aubrey *UTS*

- How to utilise space and models of teaching units
- Raise profile of teaching and learning

George Banky *Swinburne*

- have teachers consider their everyday job as a potential area for research i.e. getting lecturers to investigate and question new teaching methods and publish them
- Wageeh – guides for reflection available

Janet Verbyla *USQ*

- need to improve sharing of resources and enhance network eg. communities of practice at each discipline
- need to look at TEQSA now– institutions have same marking and grading systems – need to look at same grading systems not only for honours but everything

5. Working Groups

To brainstorm ideas on key issues, with focus on future projects that align with Discipline

Support Strategy. The following discussion groups were formed

1. Leadership

- ALTC distributed leadership model – identifying, building and supporting future of leaders
- Eng education does not adequately expose to industry eng practice or industry leaders – get industry leaders to buy into eng education
- Leadership and its development in a diverse team (different cultures and roles)– model to translate good leadership in research to good leadership in learning and teaching
- Perception, promotion and preparation of leaders, ACED and ACDICT, big problem perception:
 - o Perception of what leadership involves
 - o Perception of what management involves / perception by other university management
 - o Perception of career paths

2. Workforce

- Scoped issues in recruitment and the expectation that academics appointed to level B & C should have some demonstrable teaching experience which doesn't come from the doctorate progression pathway
- Enable staff to teach more effectively with communities of best practice (some undertake Graduate Certificate of Education)
- Not adequate flexibility amongst promotion criteria of teaching and research
- Need to scope what improved industry involvement would mean, i.e. what industry body accreditation influence it would have on curricula development, how much practical is required etc.
- How academic positions could be structured around working in industry i.e. could ERA points be awarded?
- Implications of student growth, more pressure on staff
- Eng education not drawing on educational expertise of other disciplines

3. Resources

- need to track knowledge transfer, i.e. how do new resources find out about available resources
- need to track what resources are available (repository - discipline scholars)
- dissemination of best practice – new grant to **write new academic induction package – 2** sets or resources: (1) – how to teach your subject; (2) how to teach
- need to form and nurture communities of practice (small groups around ENG fundamentals and IT fundamentals) to continue maintenance of resources
- links between institutions Associate Deans groups important

4. Articulation and Pathways

- Concern VET and TAFE heading their own way – do we try to collaborate?
- Questioned whether we could be involved in the *transition* pathways involved in accreditation
- Could be a project about how transitions link to standards eg. Who comes into uni from what VET background and their worth, evaluate progression pathways that exist

6. Future Focus and Activities of AD-TL (Eng) and AD-TL (ICT)

- Need to broaden network to include all 'Educational leaders' regardless of title to be inclusive of different institutional structures, eg. NZ faculties and schools do not have *Associate Deans of Teaching and Learning* and ICT does not follow the same nomenclature. The Discipline Support Strategy is for 'Educational leaders' in positions of responsible for implementation (change agent) as identified by the deans
- Need to focus on developing stronger network with ICT academics
- To encourage educational change leaders to attend will call future meetings ***Engineering and Technology Educational Leaders Forum***
- Need to build, support, help members to initiate change although they many not have to organisational power to achieve change
- AD group semi-support group which gives an opportunity to talk to those who do it
- ADs sometime meet across universities (eg. USQ's ADs meeting together for 15 yrs for an interchange of encouragement), some meeting appropriate for deans to attend but this is to discuss characteristics unique to the role of change agent
- Worth noting that not everyone that should be part of this community are not here for various reasons, one such is that the invitation, while being given to the dean was never passed to the appropriate person
- Action on the part of DSS to track down members absent from meeting

7. Issues from Stakeholder Organisations

AaeE

- 20yrs old – supported by ACED and AE, membership is free
- *Journal of Engineering Education (October) American Coming of Age* by Elizabeth Godfrey and Roger Hadgraft
- Last 5 yrs seen increase in AaeE activities, monthly journal – ERA ranked, conference also research creditable
- Need to improve our own levels of academic scholarship
- Try to encourage lecturers to do research around their own teaching, increased community as seen by increased number of conference attendees
- Sharing resources encouraged – aae.scholar – contains a huge range of resources

SIGCSE

- 3yrs – executive of 4 people
- Member base covers broad range of disciplines eg. IS, knowledge management etc
- Main meeting - Australasian Computing Education Conference now runs with Australasian Computer Science Week (Jan/Feb) each year
- Different meetings in each state
- 5 new projects – members
- International networks Innovation and Technology in Computer Science Education, SIGCSE conference (America), International and Computing Network
- Taken over management of teaching award in ICT education