

Discussion Paper

Education and Skills Formation Project Plan

Introduction

The current ANZLIC Industry Development Standing Committee (IDSC) work plan outlines five key areas of focus for work in the coming year. One of the areas the IDSC will focus on is the Spatial Information Industry Action Agenda recommendations relating to education and awareness.

As stated in the IDSC work plan:

There are three levels of education and awareness required:

- *building spatial information into primary and secondary level education,*
- *reviewing spatial education at a tertiary level, and*
- *making the private and public sectors more aware of the spatial information available.*

A key requirement is a consistent national industry education policy for curriculum development and improved skills formation at a tertiary level.

This Project Plan is in response to Task 3 of the IDSC Work Plan to:

1. Work with ASIBA, the professional associations and academia to identify priority areas for education and skills development, and support communication channels to enable the priority development areas to be addressed in the curriculum, and
2. Develop case studies for public view which demonstrate applications of spatial information in a variety of working environments.

This project plan is provided by ANZLIC in the form of a discussion paper to assist in preparation of a comprehensive national policy. Further work will need to involve stakeholders at national and jurisdictional level.

Recommendations

1. That an advisory committee, consisting of ASIBA, SSC, and ANZLIC members, and an educator, is created. The role of the advisory committee will be to develop a national spatial information education and skills formation policy.
2. The Terms of Reference for the advisory committee will include:
 - That the advisory committee reviews existing education and skills formation initiatives and standards (such as the Spatial Sciences Assessment and Accreditation Standards created by Spatial Sciences Accreditation Australia) and identifies further initiatives and resources necessary to implement the policy.
 - That the advisory committee monitor outcomes from the proposed SII Capability Survey to identify skill formation needs.
 - That the Spatial Sciences Coalition in partnership with the academic sector takes on the role of coordinating education and skills formation programs nationally.
3. ANZLIC will collate case studies suitable for use by the industry to demonstrate the use of spatial information in decision-making.

These will begin to address SIIAA Recommendations:

- 8.1. Industry and professional bodies will survey and evaluate the skills required for industry and work with government and educational institutions to develop a consistent national industry education policy, with greater involvement of industry and professional organisations in curriculum development.
- 8.3. Industry and professional bodies will work with government to encourage the teaching of basic spatial information concepts at the high school level.
- 8.8. Industry and professional bodies to work with government to establish a national mechanism to ensure the continued relevance of all tertiary and secondary courses.

The approach proposed in this paper, especially the work of the advisory committee, can potentially drive the reform agenda envisaged in all of the SIIAA recommendations on education and skills formation (see attachment A).

Background

Across Australia there are several organisations and associations working on education and skills development in the spatial sciences. Projects often have success within a jurisdiction, or local area, but are not extended nationally. Coordination and/or central, and readily available, documentation of spatial information education projects should be established, such that coordination of efforts resulting in a consistent approach, and a reduction in duplication of effort, can be achieved. The difficulties in discovering projects underway within each jurisdiction, especially through agencies not directly associated with the spatial information industry, and the progress of these projects will need to be overcome if implementation of SIIAA Recommendations is to be a success.

Successful management and direction of the education and skills formation issue is dependant on each category of education and skills formation being addressed within each jurisdiction. The key areas of education and skills formation are:

- Primary and Secondary Education,
- Competency Standards, and Tertiary and Further Education (TAFE),
- University, and
- Professional Development.

The preliminary research findings are not an exclusive list of all spatial information related education and skills formation activities within the ANZLIC jurisdictions, but are an initial resource for developing a comprehensive list of all spatial information education and skills formation activities.

Preliminary Research Findings

Primary and Secondary Education

National Programs

The Australian Geography Teachers Association (AGTA) represents primary and secondary school Geography teachers around Australia. Through the association teachers can be involved in a variety of activities including Geography Week and the Australian Geography competition.

During Geography Week, students investigate a theme selected by AGTA. A variety of worksheets relevant to the theme are developed by Geography teachers from around Australia and published on the AGTA website. These sheets can then be downloaded and used within the classroom. National Geographic Channel sponsors Geography Week. <http://www.agta.asn.au/ggweek02/ggweek02.htm>

The Australian Geography Competition is a joint initiative of AGTA and the Royal Geographical Society of Queensland. Each year about 50,000 students enter the competition from all States and Territories in Australia. Students under the age of 16 answer a series of 40 questions. These questions are then marked and the winner from each State or Territory then moves onto a national final. Every student that participates receives a certificate of presentation and prizes are also awarded for outstanding students. <http://www.rgsq.gil.com.au/agc.htm>

AGTA has formed a committee to look at introducing GIS to the classroom. This committee has expressed their willingness to work with the Spatial Sciences Institute on the issues of spatial education in secondary schools.

Each year the Australasian Urban and Rural Information Systems Association (AURISA) runs the GIS in Schools competition. The competition aims to be challenging and informative, it should spark the project team into wanting to use the GIS to analyse data in ways that they did not consider before the GIS in Schools competition.

The GIS in Schools competition has large participation rates in Queensland, and also in South Australia. The participation rate in other jurisdictions is limited. There is potential to increase numbers of schools involved in the competition. For further information: <http://www.aurisa.asn.au/education/GISschoolsComp.htm>

Victoria

The following is extracted from the "GIRG Schools Initiative – Recommendations", May 2000.

The Curriculum Standards Framework (CSF), which was introduced in Victoria in 1995, has provided the basis for curriculum planning in schools from Preparatory-Year 10 (ages 5 – 16) and for reporting on student achievement. An updated version of the framework, CSF II is being implemented in 2000. In Years 11 and 12, separate Study Designs for each VCE subject are provided by the Board of Studies.

While 'geography' is still recognised within Victoria's education system as a subject area in its own right, it now falls under the Studies of Society and Environment (SOSE) Key Learning Areas (KLA). SOSE also encompasses studies such as history and commerce and is not always taught in our schools by teachers who have method training in any of the particular subject areas.

In some schools, more commonly those in the State education system, the time dedicated to the teaching of geography as a separate subject in the early years of secondary school has diminished. Many state schools for example, divide the timetable in such a way that similar blocks of time are allocated to each of the eight KLAs. In this situation, geography has to compete with history and commerce subjects as well as civics education and a number of other subjects that are difficult to pigeonhole such as traffic safety and drugs education.

The situation is not as clear cut in many private sector schools where geography still exists as a subject in its own right. It has been restricted nevertheless, by the same timetabling pressures as are present in other sectors. Geography remains as a VCE subject in both Years 11 and 12 although numbers have decreased in recent years.

In May 2000 the Geospatial Information Reference Group (GIRG) had discussions with the Geography Teachers Association of Victoria (GTAV) about education of GIS and spatial information in schools. The discussions outlined issues teachers have with teaching GIS and spatial information and what they would like the government to do to help them. The top three requests from the GTAV to government are as follows:

1. Promoting and supplying mentors to support the existing curriculum and programs in schools. This will help support pre-arranged professional development and provide ongoing support for those undertaking GIS projects.
2. Easier access to, promotion of, and support for digital data resources in schools. After developing the necessary technological skills the next step is producing a project using real data. There was agreement after the 1999 GIS competition that the data supplied was not adequate or 'user friendly'.
3. Support for promotional videos on GIS & spatial information projects relevant to specific targeted levels and curriculum and KLAs. Would help teachers illustrate the use of GIS in industry. A good way of introducing GIS and encouraging student interest.

The needs in Victoria are very real and conversations with teachers at the annual GTAV Conference 2000 and 2001 emphasised the needs that teachers have in teaching GIS and spatial information.

In Victoria, under the VGIS Awareness Strategy, the needs stated by teachers will be addressed. The GIS Teachers Network already exists, and Land Victoria plans to expand upon this through establishing a mentoring program for teachers, by developing 3-4 week GIS/Spatial Information curriculum packages for teachers for each of the CSF levels, and by providing Vicmap data for free through the new Internet site, Land Channel Sales.

South Australia

The South Australian Spatial Information Industry Cluster (known as Spatial Australia) is a group of competing, collaborating and interdependent companies, based in Adelaide South Australia, engaged in the spatial information industry. Spatial Australia is an industry initiative supported by the government of South Australia. Spatial Education Australia (SEdA) is one area of expertise within Spatial Australia and is a consortium of providers of spatial information (SI) education and training product and services in South Australia.

One initiative of SEdA is the creation of a GIS resource kit for classrooms, with all systems and resources to be made available for the 2003 teaching year. The creation of this resource kit is supported by Flinders, Adelaide, and South Australia universities, South Australia TAFE, ESRI, and South Australia Geography Teachers Association (SAGTA). The resource kit is currently in its planning stages, but the intention is to include a CD or access to a website, exercises for geography and GIS in the classroom, and to cover topics ranging from global to local issues. The SEdA GIS resource kit will be released in two stages: Stage 1 for Year 11's, and Stage 2 for Year 12's.

Previous support to teachers was through SEdA providing free GIS teacher training. An impediment to this process was that a percentage of the teachers attending the courses has little or no IT skills. DETE was not providing IT training for teachers even though they were supporting the introduction of computers and other technology into schools. Further to this, there was a lack of classroom GIS applications and resources.

The focus has now changed. Through the DETE initiative, Technology Schools of the Future (TSoF), teachers are now being provided with both IT and GIS training. The training is no longer free, but is subsidised by DETE. DETE has incorporated GIS into the curriculum and is supporting teacher training. In the first quarter of 2002, 98 teachers completed GIS training through TSoF.

SEdA is creating a CD of government digital datasets as a component of the GIS resource kit. Initially the CD will contain 12-14 data layers of one LGA. It is planned that eventually the CD will contain 12-14 data layers for all LGAs in South Australia. The proposed data layers are: roads, contours, land use, land cover, aerial imagery, drainage, public transport, public services, cadastral with selected valuations, ABS CCD boundaries, some Census fields, metropolitan open space system, and some retail information. The range of data to be included is still to be finalised. Spatial Australia provides the funding for the data.

Further information on Spatial Australia can be found at <http://www.spatial.org.au/>.

Further information on Technology Schools of the Future, GIS Teacher Support can be found at <http://www.tsof.edu.au/curriculum/gis/>.

Queensland

The Queensland Spatial Information Infrastructure Council (QSIIC), of which Education Queensland is a member, is responsible for development and promotion of the spatial information industry in Queensland, with the objective of achieving benefits in the social and economic well-being of Queensland and Queenslanders. QSIIC has established a Capacity Committee to encourage the availability of the required capacity to fully utilise spatial information. The focus of this committee is on community understanding of the applicability of spatial information, existence of courses (formal or informal) to support increased capabilities and encouraging the availability of appropriate physical infrastructure to allow spatial information to be used. Further information can be obtained from the QSIIC web site at <http://www.qsiis.qld.gov.au/>.

The Geography Teachers Association Queensland (GTAQ) has, in recent years, been a major promoter and supporter of the use of GIS in schools, through conferences, workshops and competitions, and also by participation in government and private sector forums such as QSIIC. GTAQ also works closely with the Australasian Urban and Regional Information Systems Association (AURISA) in promoting the annual competitions *GIS in Schools* and *Map Week*.

Private suppliers of GIS systems and data have also been active in this area in Queensland, and Australia, for at least two years. One of those builds on considerable previous experience in the United States and has released a CD of courses and instructional guides with Australian content, intended for use in schools.

Schools have been using, and realising the benefits of, Geographic Information Systems (GIS), particularly in the "old" Geography subject area, on an ad hoc basis. Time, budget constraints and lack of readily available datasets have, however, limited its use in most schools. New syllabuses developed by the Queensland Schools Curriculum Council and Board of Secondary School Studies for SOSE and Geography allow greater flexibility in the area of technological innovation, including GIS.

Requests for subsets of Education Queensland's spatial information are increasingly coming from schools (for GIS projects and for facilities management purposes), vendors such as the above, intergovernmental and interagency projects such as regional growth study 'Wide Bay 2020', and private developers of educational course materials, typically for internet delivery. GIS has been used more extensively in Education Queensland to support central facility planning and strategic management of non-current physical assets such as land and buildings, but has potential to support a range of planning and management activities ranging from strategic catchment and "market share" analysis, through network planning, to determination and management of travel and living away from home allowances.

The QSIIC endorsed *GIS in Schools Project* commenced in March 2001 to pilot the development of a GIS system that is accessible and affordable for schools, together with GIS-based curriculum content that facilitates the achievement of specific educational outcomes by students. QSIIC involved Education Queensland in facilitating the proposed project. The project also contributed to the broader "Smart State" agenda by fostering a coordinated and cost-effective approach to the use of spatial information and systems in the curriculum.

The pilot was conducted at the Centenary State High School, which is a new school developed in close consultation with the local community. The whole development process was considered innovative, and the school is keen to continue to be a leader in the provision of innovative and relevant learning experiences for its students.

One of the ways in which the school hopes to achieve this is through the use of appropriate real world technology, such as the use of GIS and relevant spatial data across the various learning areas.

ACT

The use of GIS, and the teaching of spatial information, is currently limited within ACT secondary schools. Canberra Institute of Technology is investigating possibilities for encouraging spatial information education in secondary schools.

CIT is running a pilot program at a local secondary college. This program is investigating the feasibility of introducing ABS data into classrooms. The program is aimed not only at geography teachers but also at science, commerce and marketing teachers, and is looking at using ABS data not currently freely available over the Internet. In conjunction with this project CIT is researching the possibility of developing a "lite" version of MapInfo that can be used easily by teachers and students within a classroom environment.

Commonwealth

Geoscience Australia has an Education Centre for school visits and a webpage <http://www.ga.gov.au/education/>.

There is a variety of information available on the website for both teachers and students, including Facts Sheets, lists of resources available, and online activities.

Online activities include:

Make Your own Map of Australia <http://www.auslig.gov.au/facts/map.htm#globalmap>

Remote Sensing Image Processing http://www.ga.gov.au/map/tweed_heads/

Minerals Downunder <http://www.ga.gov.au/education/minerals/> and

Fab Facts <http://www.auslig.gov.au/facts/>

National maps can be downloaded from http://www.ga.gov.au/general/technotes/20011023_32.jsp

GA also conducts various ad-hoc competitions for school children to create an interest in the geosciences.

The Education Contact at Geoscience Australia is:

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AUSLIG has produced a HOW TO USE TOPOGRAPHIC MAPS MAP READING GUIDE for users

http://www.auslig.gov.au/corpinfo/publications/products/docs/mapreadguide_lowres.pdf

Tasmania

In Tasmania, good collaboration has been established between the State Education Department, the Department of Primary Industries, Water and Environment, AURISA and the University of Tasmania. A meeting of 20 representatives from the different sectors was recently conducted. Some of the key issues to emerge from the meeting included:

- Training for teachers and localised data were seen as the most important issues.
- The inclusion of land information into teaching needed to be framed in terms of enhancing learning outcomes and not simply as a GIS exercise, and so included into learning objectives, assessment criteria and curriculum.
- Awareness was a key inhibitor.
- Web speed and the cost of software licences are major inhibitors to uptake at the moment.
- Obtaining a GPS to load data to GIS software was also seen as an inhibitor due to the cost of GPS.

A mini-LIST (Land Information System Tasmania) was discussed that could have localised data and some of the data layers on a CD with the same software/program as the LIST. However, before this product is developed it would be useful to survey schools to determine level of interest and web speed. Each of the attendees identified

some action that would be taken in their particular area. Progress is being monitored and updates will be provided to ANZLIC.

A GIS Information and demonstration day for Tasmanian secondary school educators was held in June at the Centre for Spatial Information Science, University of Tasmania. The day was organised in conjunction with the Tasmanian Geography Teachers Association (TGTA), and directed at the Studies of Society and the Environment (SOCE) curricula. Fifteen TGTA members attended the day, together with representatives from both the Mathematics and Information Technology curricula. Teachers indicated a strong interest in progressing with GIS and integrating it into classes and curricula. A teacher training session is subsequently being planned with a view to incorporating into the teachers' professional development program.

The Centre for Spatial Information Science also recently conducted a workshop and demonstration at the Australian Science Teachers Association Conference. Year 8-12 teachers from a variety of subject areas (including physics, biology, chemistry, and geology) and a variety of States attended. The main message from the workshop was that these teachers were not fully aware of GIS capabilities and were uncertain of how to approach its incorporation into their courses, including issues related to software, data, applications and their own GIS skills.

The Centre for Spatial Science has developed a "Surveying and Mapping" school mathematics program. This program is designed for Year 10-12 secondary school mathematics students and involves three areas of the spatial sciences:

- plain surveying
- GPS, and
- photogrammetry.

The program is tailored to the State mathematics syllabus, and includes practical exercises, student worksheets and teacher notes. The teacher notes include assessment criteria matched to the syllabus. Students acquire "hands on" experience with theodolites, GPS, and photogrammetry equipment so collaboration with a university or industry organisation is required. The program has been redeveloped for the Victorian grade 10-12 syllabus, through ISA funding.

WA

GIS is being trialed at Australind SHS through the use of the Gateway to Bali (commercial product), the Geographical Analysis 1 from the GIS training Centre and the Arc View GIS Tutorial, written by former Australind SHS student Bethwyn McCaughan, who is completing her Honours degree in cartography at Curtin University.

Bethwyn has developed a tutorial package as part of her studies. These take about three to four hours to complete and are for students in Years 9-12. They enable them to become competent in a GIS software package (Arc View) to a stage where they can create up-to-date demographic maps for the greater Bunbury region using 1996 census. This then allows the Year 12 geography students to analyse the maps for their study of Bunbury as a part of their TEE course. http://www.mappingsciences.org.au/downloads/wanews_spring2001.pdf

The Geographical Analysis 1 CD was developed by the GIS Training Centre in WA. The CD is sponsored by the WA State Government, Ministry for Planning, MSIA, AURISA, and Central TAFE. The CD includes:

- GIS Data Viewer, Arc Explorer, which runs from the CD
- Detailed exercises and student activity worksheets which address sections of the WA geography curriculum
- Extensive range of digital mapping data and associated databases for WA, Australia, and the World
- Full documentation on the data, exercises and the software.

The GIS Training Centre (a business unit within Central TAFE) is providing high-tech training in geographical information systems (GIS) software for WA's school students and their teachers. The software is used widely by a broad range of State and local governments and private industry, for applications which include environmental, geological and demographic mapping, as well as asset management. The free training is part of the GIS in Schools Competition organised by AURISA. <http://www.gistc.net/>

Northern Territory

GIS is being used in some primary and secondary schools due to the initiative of individual teachers. A Schools Competition focussed on applied geography and mapping, was run successfully for a number of years. A Secondary School "Geography Teachers Network" has also operated in the past, again initiated by individual

teachers rather than being established as a formal program. As a result of requests from various schools to the Department of Infrastructure, Planning and Environment for spatial data for teaching purposes the Education agency will be approached with regard to establishing a more formal network of support.

Competency Standards and TAFE

National

In the early 1990s it was recognised that Australia's vocational education training was severely fragmented with State and Territory training courses varying greatly and, in many cases, training was not meeting the needs of industry or business. Reform resulted in the national training framework and the Australian National Training Authority (ANTA) was formed.

ANTA works with industry to ensure that training meets the industry's needs. ANTA created the Industry Training Advisory Boards (ITABs). Property Services Training is one of these national ITABs serving the property services industry sector of which the spatial industry is part.

The national training framework envisaged a new system of training based on competency standards, in training packages, national qualification recognition, payment of skills, progression of performance, enterprise focus and workplace training. National training packages are developed by ITABs in consultation with Industry Advisory Committees. These training packages are endorsed by the Australian National Training Quality Council.

The Mapping Sciences Institute of Australia, the Institution of Mining and Engineering Surveyors and the Institution of Surveyors Australia have together established Spatial Sciences Accreditation Australia (SSAA). The mission of SSAA is to provide a framework of standards, policies and guidelines to enable assessment and accreditation of individuals, organisations and institutions working in the fields of Spatial Sciences. The SSAA have been developing competency standards for spatial science assessment and accreditation in Australia. The Association of Surveying and Mapping Lecturers Australia (ASMLA) has close links with the SSAA and also has an important role to play in achieving the goals and actions set out in this chapter. This work could serve as a starting point for a broader exercise to survey and evaluate the skills required by the industry.

The Spatial Information Services competency standards are part of the Property Development and Management package. They have been developed by the Property Services Training Association in conjunction with the Australian National Training Authority, were endorsed in January 2002. Further information on this training package is available through the National Training Information Service www.ntis.gov.au. The standards relate to vocational training in the following fields:

- Mapping science
- Remote sensing
- Surveying
- Cartography
- Town Planning
- Geographic Information Services

Key benefits of competency-based training:

- A consistent standard of training and assessment throughout Australia;
- A well-defined career path for industry employees; and
- A more efficient, effective workforce.

Completing programs using these standards results in the following qualifications for the Spatial Information Services Sector:

- PRD30101: Certificate III in Spatial Information Services
- PRD50301: Diploma of Spatial Information Services
- PRD60301: Advanced Diploma of Spatial Information Services

Currently spatial units from this training package are only listed as offered, via the National Training Information Service website, in NSW.

However, further search revealed that most jurisdictions offered either spatial information, GIS, or surveying and mapping courses through their TAFE system.

Queensland

The Queensland Spatial Information Infrastructure Council (QSIIS) discussion paper titled, 'Increasing Community Capabilities', provides an overview of various initiatives and programs, including:

- Centres of Excellence;

- Local Government activities;
- Education - Primary & Secondary Schools;
- Education - Tertiary Institutions; and,
- Selected initiatives including, the Herbert Resource Information Centre program of introducing GIS in Queensland Schools.

The discussion paper is available at:

http://www.qsiis.qld.gov.au/documents/disc_paper_comcap/disc_paper_comcap.pdf

There is also a Queensland Spatial Information Infrastructure Council (QSIIS) report titled, 'Current Trends in Web Atlases: A Desktop Audit'. This report provides an overview of how different types of web atlas applications provide electronic views of spatial information to clients, thus increasing the use and understanding of spatial information and associated technologies. There appears to be some applications for this type of application in education and skills formation. The report is available at:

http://www.qsiis.qld.gov.au/documents/web_atlas_audit/web_atlas_audit.pdf

There is a Spatial Information Workforce Training Survey Report (October 2001) which outlines training and education needed by the surveying industry to access opportunities afforded by the wider spatial information industry. This report may be a useful starting point for a broader 'capabilities survey'.

New South Wales

Survey and Mapping Industry Council of NSW has successfully organised the re-activation of the Spatial Information Services Industry Sector Committee (SISISC) of the New South Wales Property Services Industry Training Advisory Body (PSITAB) after a long period of relative inactivity. The delegates to the Council form the basis of this Committee's membership, thus providing the necessary commitment from a major part of the Spatial Information Industry.

The Committee intends to undertake the following activities over the next 1 to 2 years:

1. Support and assisting in the development of curriculum to enable the implementation of qualifications in SIS developed as a part of the National Training Package.
2. Assist in the development of Vocational Training Orders (VTOs) to establish industry traineeships in NSW.
3. Investigate the possibility of making available the Certificate III in various SIS streams to HSC students in NSW and the possibility introducing a part-time traineeship into the secondary school system.
4. Undertake industry consultation and research to determine industry VET needs.
5. Undertake industry consultation to promote and market industry qualification and VET opportunities to industry stakeholders eg employers, schools, etc.
6. Liaise with State Training Authority to make available programs and funding to support industry VET requirements.

There may be other activities that the Committee may determine from time to time based on industry needs, but the above provides a general thrust of the committee's activities over the next few years.

TAFE in NSW is not currently developing any new courses in the Surveying & SIS area, as it has been waiting for the "national guidelines"(ANTA) to emerge.

Now that it has been established that "separate"(Surveying/GIS) and "local" courses can be developed under the guidelines, NSW TAFE may, through the NSW Property & Services ITAB and the Educational Services Division (ESD) of TAFE, begin to develop a Certificate 3 level course. In the meantime, courses now on offer are of 1600 hours (Diploma), 600 hours (Certificate 4) 300 hours (Certificate 3) and 200 hours (Certificate 2) in both Surveying and in GIS.

The TAFE Surveying courses have a quarter of the hours devoted to fieldwork. These courses will be due for review (of content) in the next twelve months.

The only surveying courses currently meeting enrolment quotas are the Diploma and the Certificate 2. The demand has been steady at (about 150 students State wide) over the past 4 years. Very few students take on the Certificates 3 and 4. In GIS the Diploma and Certificate 4 attract sufficient applicants to run courses but the numbers are not (as yet) encouraging. The bulk of the students are "upgrading" existing skills.

ACT

Canberra Institute of Technology is aware of the spatial information competency based training program- aimed at the VET sector and VET in schools program. They have been working with Australian National Training Authority (ANTA), Property Services Training (industry training board) in developing the delivery guide for this spatial training package.

Northern Territory

To illustrate one of the end results of the general decline in awareness of geography / spatial information in schools, there has been a reduction in further education options in the NT following closure of courses in cartography and basic Geomatics due to lack of numbers. Despite the best efforts of the MSIA it became too difficult to attract school leavers to these - the latter don't really understand these courses.

University

National

The spatial information industry makes regular comment on the lack of suitably educated people to employ. In the GIS sector of the industry, it is not uncommon for 50% of new employees to have no spatial training and to learn their spatial skills on the job. These comments raise important questions: is the material presented in the universities that teach spatial information completely appropriate? Are enough people studying in spatially based fields to satisfy industry demand?

At the university level, there appear to be two distinct schools of spatially based subjects: geography and surveying/cartography. In addition, general science and engineering degrees can have a spatial component, which cannot be identified from aggregate data. One important result of the SIIAA survey is that spatial studies, as defined by the participating universities, is much more broadly defined than Geomatics and surveying, in line with broader industry trends.

Industry often considers that there would be benefits from some rationalisation of the number of tertiary institutions offering spatial courses. An examination of the list of universities surveyed suggests that there would be considerable problems in rationalising the number of courses. Some of the smaller faculties are the only ones within a particular State, for example South Australia and Tasmania. Where a State has several institutions offering spatial subjects there is generally a difference in teaching approach that would make the merging of courses difficult. For example, Charles Sturt University has a very strong emphasis on Environmental and IT applications of spatial information, while the University of New South Wales is strongly focussed on geodesy and GPS, and Newcastle offers more of a focus on engineering.

The Action Agenda recommends that, rather than seeking to force rationalisation on the tertiary sector, it would be preferable to work with the existing institutions to align the content of tertiary courses more closely to industry needs.

Thirty-five Universities and TAFE's around Australia and New Zealand have courses that specialise in, or have a large component of, GIS or Spatial Information. These courses include Geomatics, GeoInformatics, Geography, GIS, Surveying, and Cartography (ASMLA Website).

It is expected that tertiary graduates in the spatial sciences have the minimum skills to be able to work a base level in the industry. Specialist training may be required for specific software packages or specialised skill areas however skills and competencies required to accomplish base tasks in the industry should be expected. Base skills and competencies of graduates will need to be identified and reported back to the education facilities such that the needs of industry can be met. Education and training providers also have a role, in partnership with industry associations, to address post tertiary training needs. These needs can be delivered through focussed professional development programs delivered through training institutions or in the workplace according to agreed competency standards developed by the industry.

With respect to industry influencing tertiary education in spatial information, there is at present no particular body representing the combined tertiary spatial information educational sector. The Australian Surveying and Mapping Lecturers Association (ASMLA) represents the key surveying institutions but has been reasonably inactive and lacking in purpose. It is proposed to change the name, responsibility and to broaden the membership to include other spatial information sectors of the tertiary industry. A proposal is expected to go to next AGM in November 2002. This new body may provide the appropriate linkage for SIIAA.

Commonwealth

Australia National University has a School of Environment, Resources and Society. This School offers undergraduate courses in Applied Geographic Information Systems as part of its Bachelor of Geography degree and its Bachelor of Science (Resources and Environmental Management) degree.

Queensland

The University of Southern Queensland (USQ) has courses in surveying and GIS, which are offered through both on campus and distance education, and also some offered fully online. It is the only university that offers three modes of study in GIS (i.e. on-campus, external, online). USQ also offers a number of short courses for industry in Introduction to GIS, GPS and Remote Sensing. For more details, see the web page at:

<http://www.usq.edu.au/engineering/Survey/default.htm>

New South Wales

Both the University of Newcastle and the University of New South Wales believe that they do not have any planned activities which will overlap with any national activities. Notwithstanding this, both the Universities and TAFE believe that the preparation of a strong national approach should include a thorough examination of existing courses at each institution so that common ground can be identified. Local institutions should then have the flexibility to add subjects, which address local needs, to the national standards: that is, where common ground cannot be identified.

Victoria

To ensure relevance of the course content in Victoria the Director of Land Information Group sits on the University of Melbourne, Department of Geomatics Curriculum Advisory Board, while the Deputy Director of Land Information Groups sits on the RMIT, Department of Geospatial Science Curriculum Advisory Board. This direct involvement of senior Land Victoria staff in the Curriculum Advisory Boards ensures that the content of the Geomatics and Geospatial Science degrees continually meets the requirements of the Victorian spatial information industry.

Tasmania

In Tasmania, the University is attempting to incorporate spatial information science across a range of science disciplines and not limit its attention to geography. This is because of the need to ensure that knowledge and interest in spatial information science is not restricted to a cohort of secondary school students who may be unlikely to pursue tertiary education in disciplines that require mathematical aptitude.

Northern Territory

The Northern Territory University has a variety of courses on offer in GIS and Remote Sensing. The courses are structured such that students in many other disciplines can study modules to obtain an understanding of spatial information management. There has recently been some extension by including basic Geomatics components.

Professional Development

AURISA

AURISA does not have a formal professional development program. However, conferences, seminars, and workshops are organised on demand to address issues deemed of concern to members. Attendance at these events is not compulsory but is recorded and points are then collected towards becoming an Associate Fellow or Fellow member of AURISA

Currently AURISA grants the postnominal of the Associate Fellow and Fellow to members if they can demonstrate service to the association over a number of years. Essentially, in this proposal points were awarded based on experience and qualification; training received in courses; attendance at particular workshops run by AURISA and by other associations; authorship of published papers; number of years of membership of the Association; serving on Chapter Committees; serving on executive or receiving some other AURISA award; member of another spatial information professional society; and attendances at conferences, etc.

The purpose of this is to award members who have served the Association over a number of years and to recognise that service. The Associate Fellowship is awarded for a ten year period, whereas, the Fellow status is awarded permanently.

Institute of Engineering and Mining Surveyors Australia

The objective of the Institutions Professional Development policy is to maintain a level of competency to fulfil the requirements of membership and industry. Under the Objects of the Institution, members accept responsibility to undertake continuing professional development to ensure that they remain up-to-date during their careers. Professional development is made up of two components: continuing education and professional experience.

The institutions professional development policy recommends a minimum of 20 units be attained in any one year. Through the Divisions the Institution conducts an active program of meetings, seminars and conferences to support members in meeting these requirements. Members should also take advantage of short courses offered by individual State educational institutions. http://www.home.aone.net.au/iemsaust/about_page.htm

Institute of Surveyors Australia

The ISA does not have a national approach to Professional Development. Professional Development is managed at a jurisdictional level. For example, in Victoria, activities consist of two broad categories: Continuing Education (CE) and Personal Endeavour (PE). CPD activity is concerned with any aspect of the theory and general practice of surveying, and those personal development activities which broaden professionally and encourage members to contribute to the community in general. In Victoria the CPD commitment is 30 credit points over a two year period.

Mapping Sciences Institute of Australia

The program is aimed at encouraging members of the Institute to remain at the forefront of the mapping sciences, thus enhancing their ability to provide an efficient and effective service to their employer and community at large. Through participating in a range of professional development activities such as attending seminars, conferences, technical workshops/forums, publishing papers and undertaking further education, short courses and the like, members can gain accreditation towards becoming a Certified Practising Member of the Institute. Participation in Institute business such as committee also gains CPD points. All members, no matter what their grade, can and are encouraged to participate in the CPD program. The Mapping Sciences Institute, Australia, requires each member to undertake 70 points worth of CPD over the two year period. An overview of the credit points can be seen at: http://www.mappingsciences.org.au/prof_dev.html

Remote Sensing and Photogrammetry Association of Australasia

The RSPAA does not have formal Professional Development system. An annual conference is organised but no seminars or workshops. However, members are extended an invite to attend professional development activities organised by AURISA, IESMA, ISA, and MSIA. RPSAA members do not collect points for attending professional development activities organised by other associations.

References

Research for this project plan revealed several different spatial information education reports and projects, including:

- *ANZLIC Land Information Training Needs Analysis, 1996*
- *GIS in K – 12 Education*, ESRI, March 1998
- *“GIS in Schools” Pilot Project*, SA Government, 2000
- *GIRG Schools Initiative*, GIRG, March 2000
- *Geography’s Place – Promotion of Geography in Australia*, National Geography Support Group, 2001
- *The Development of an Assessment and Accreditation Strategy for Practitioners in Spatial Science*, Spatial Sciences Accreditation Australia Steering Group, March 1999
- *Increasing Community Capabilities*, QSIS Capabilities Committee, July 2001
- *Survey & Mapping: School Mathematics Programme*, University of Tasmania and Institute of Surveyors Australia, 2001
- Various websites and conversations with jurisdictional contacts

Contacts

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SIIAA Recommendations

The following is extracted from “Positioning for Growth” – September 2001

Evaluate and Reform Education and Skill Formation

- 8.1. Industry and professional bodies will survey and evaluate the skills required for industry and work with government and educational institutions to develop a consistent national industry education policy, with greater involvement of industry and professional organisations in curriculum development.
Responsibility: ASIBA, SSC and other agencies as appropriate.
- 8.2. ISR and DETYA to collaborate with industry in identifying initiatives announced in *Backing Australia's Ability* that could be used to benefit the industry through improved skills formation at the tertiary level.
Responsibility: ISR, DETYA, ASIBA, SSC and other agencies as appropriate.
- 8.3. Industry and professional bodies will work with government to encourage the teaching of basic spatial information concepts at the high school level.
Responsibility: State and Territory governments, ASIBA, SSC and other agencies as appropriate.
- 8.4. The industry can stimulate capability by allowing greater access to spatial information relevant to tertiary and secondary courses.
Responsibility: ASIBA, SSC and other agencies as appropriate.
- 8.5. Industry bodies can participate in helping to expand awards and scholarship schemes for tertiary and secondary students.
Responsibility: ASIBA, SSC and other agencies as appropriate.
- 8.6. Industry to develop an Internet-based resource for the dissemination of information for a non-technical audience.
Responsibility: ASIBA, SSC and other agencies as appropriate.
- 8.7. ISR and DETYA to collaborate in identifying ways to increase the penetration of GIS teaching into upper secondary school curricula and in identifying which of the initiatives announced in *Backing Australia's Ability* could be used for this.
Responsibility: ISR and DETYA
- 8.8. Industry and professional bodies to work with government to establish a national mechanism to ensure the continued relevance of all tertiary and secondary courses.
Responsibility: Commonwealth, State and Territory education departments, ASIBA, SSC and other agencies as appropriate.
- 8.9. Industry and professional bodies to monitor the impact of the revised visa application arrangements and report back in the Action Agenda implementation process
Responsibility: ASIBA, SSC and other agencies as appropriate.

Matrix of Involvement in Education and Skills Formation Activities

	Comm.	A.C.T.	QLD	N.S.W.	N.T.	N.Z.	S.A.	Tas.	Vic.	W.A.
Primary and Secondary Education	X	X	X				X	X	X	X
TAFE & Competency Standards	X	X	X	X			X	X	X	X
University Education			X	X		X	X	X	X	X
Professional Development	Dependant on policies of national professional organisations.									

Note: Information based primarily on responses by ANZLIC contact officer to email query and Internet searches.