International Workshop on Geospatial and Cartographic education: Contemporary Challenges and Opportunities 2019

Pre-conference workshop of the ICA Commission on Education and Training

Capital Normal University, Beijing, China

*10 – 12 July 2019*

Organisation: Dr Tao Wang, Capital Normal University; Dr David Fairbairn, Newcastle University, UK (chair of Commission on Education and Training, CET).

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The Commission was delighted to be invited to meet at Capital Normal University (CNU), Beijing, in mid-July 2019 prior to the main 29th International Cartographic Conference (ICC) in Tokyo. Preparation by Wang and Fairbairn, and responses from Commission members and others, ensured a balanced and lively set of sessions, organised with speakers and chair; whilst continuing support from the technical assistants and photographer, the students of Capital Normal University who helped with registration, guidance and serving of food and drink, and the staff of the International Culture House of CNU who served excellent meals. Administrative and travel support was also supplied by staff in the CNU College of Geospatial Information Science and Technology, including Meng Jia and Dong’Ge.

Thursday 11 July

**Session 1: Education in GIS and Cartography**

*Session Chair: Tao Wang*

Presentation S1-1: Welcome and introduction to CET 2019

**David Fairbairn**, Newcastle University UK, presented an overview of the work of the CET, particularly its activities in the 2015-2019 period. This gave the audience an introduction to the terms of reference of the commission, the meetings it has held and contributed to, and possible future work of a renewed commission.

Presentation S1-2: Welcome and introduction to CNU GIS

**Xiaojuan Li**, Vice President of CNU, China, introduced the organisation and work of Capital Normal University, particularly in the fields of GIS and geomatics. Cartography is an integral part of undergraduate and Master’s level education, with a unique provision for students from overseas countries. The history of the university and its contributions to education of teachers were also described.

**Session 2: Programme Development and Experiences**

*Session Chair: David Fairbairn*

This highly varied session included presentations from an international Master’s student course, online education for those in work, and geo-technologies for middle school pupils.

Presentation S2-1: Experiences of a new English language MSc programme in cartography

**Laszlo Zentai**, Eötvös Loránd University, Hungary (co-author Gábor Gercsák) explained how the new international MSc programme was developed as a translation of the Hungarian program directly. A key issue was recruitment of overseas students from countries such as Syria and Palestine, who had no opportunity to visit Budapest, so had to take a special entrance examination online. Students from the Science without Borders project of the Brazilian government had also been targeted.

Presentation S2-2: Online geospatial education in American public schools

**Yongqin Zhang**, Delta State University, USA, showed that a flexible course could be developed to meet the needs of those mature students already in employment. This required an online management system, including a virtual learning environment through the Blackboard tool, whilst also giving the students access to library resources of the university. Thesis writing is also an integral part of the course, which can prove challenging to students, and use is made of the long running Penn State GIS Capstone project as an example to follow.

Presentation S2-3: Application of geographic information technology in regional geography teaching practice of middle school

**Zhihong Gu**, Beijing Academy of Educational Science, China (co-author Yanmei Li) gave us his experiences as a teacher in an average middle school, trying to introduce students to digital techniques. Starting with hand drawn world maps and analogue representations, students were encouraged to engage with digital techniques using SuperMap software, GPS fieldwork, and remote sensing images. The speaker’s enthusiasm extended to encouraging his colleagues and other teachers to participate.

**Session 3: Working with the Real World**

*Session Chair: Haowen Yan*

This set of presentations examined how cartographers and cartographic students engage with the real world, either through professional bodies, employers, or differing working environments.

Presentation S3-1: Accreditation of cartographic education

**David Fairbairn**, Newcastle University, UK, explored the complex landscape of accreditation (of courses and institutions), certification (of individuals), and licencing (of the overall process). There are many problems with accrediting courses of study, including a perception of ‘setting the discipline in stone’ and blocking innovation, the resources required to operate accreditation schemes, and the possible legal issues. The example of ICA recognition of nautical cartography courses around the world was highlighted.

Presentation S3-2: Ensuring relevance of geospatial and cartographic education for industry – what do employers want form graduates in cartography and GIS?

**Shaojun Li**, SuperMap Software Co., China, is a senior manager at the premier Chinese GIS and mapping software firm, and explained the mission and work of this international company. Their links with educational establishments, from middle schools to university research departments are longstanding. In particular, the extensive program of internships for university students was highlighted.

Presentation S3-3: The international MSc in cartography

**Georg Gartner**, Technical University of Vienna, Austria, presented an overview of the only international Master’s course titled ‘Cartography’ in Europe. Using a useful triangle of ‘Data, Design, Media’, he explored the philosophy of the course which keeps a contemporary approach to the discipline (for example covering ‘service-oriented’ approaches, rather than ‘artefact thinking’). 25 students per year are recruited from >400 applicants. With four separate institutions contributing, quality control is effective and innovation is encouraged.

**Session 4: Body of Knowledge**

*Session Chair: Georg Gartner*

This session was intended to stimulate an active discussion about the nature of a BoK for cartography, how it might be achieved, and what its content should be. After an initial thought-provoking presentation, the participants were encouraged to reflect on their own experiences and give their own views.

Presentation S4-1: Strategies to achieve a balanced body of knowledge for cartography

**Hal Moellering**, Ohio State University, USA, started this session with an extensive exploration of the nature of a ‘Body of Knowledge’ and how cartographers could develop such a document. This needs to be based on a specific tranche of cartographic science, which is unique to our discipline. Hal presented a ‘three paradigm’ approach to defining cartography incorporating ‘communication and perception’, ‘mapping and visualisation’, and ‘analytical cartography’. A further categorisation of cartographic products – real and virtual, the roles of ‘surface structure’ (representation) and ‘deep structure’ (data), and the role of transformations among and within all of these, were all highlighted, along with the need for a balanced approach.

Discussion: the audience contributed to the wider exploration of these and other concepts. The role of semantic web structures, the concept of a ‘self-learning BoK, the relationship with the ICA Research Agenda, and potential applications of a BoK were discussed. The problems encountered so far in the slow progress towards a BoK for Cartography were mentioned, but the participants were, in general, quite optimistic about the development of this project under the auspices of the ICA.

Friday 12 July

**Session 5: Classroom Content and Methods**

*Session Chair: Wei Luo*

How cartography and GIS are actually taught in the classroom is important to the work f the commission, so this session gave some wide-ranging examples of classroom practices.

Presentation S5-1: Teaching orienteering maps: a perfect example of user-driven cartography

**Laszlo Zentai**, Eötvös Loránd University, Hungary, introduced the audience (for many of whom this category of mapping was new) to orienteering maps, as excellent tools for teaching cartography in the classroom. The idea of mapping to a common international specification, the fact that ‘amateur’ users themselves prepare these maps, and the role of generalisation and feature inclusion, are all relevant to this activity.

Presentation S5-2: Realization and promotion of geography core literacy in GIS teaching practice

**Yungqian Chen**, Beijing National Day School, China (co-author Sheng Chang, Beijing Etown Academy, China) concentrated on the possibilities of introducing ‘reverse classroom mode’ – or ‘student centred learning’ – to encourage rational thinking and stimulate student imagination. GIS promotes spatial information, geography knowledge and comprehensive thinking, especially when problem-oriented learning is undertaken. The impact of flooding on a student’s own school, and the use of satellite imagery to measure urban growth of a student’s own city are examples.

Presentation S5-3: Let the students do it – strategies used in teaching cartography

**Haowen Yan**, Lanzhou Jiaotong University, China, encourages his students to become problem solvers by adopting a rigorous teaching and assessment strategy. The innovative element is the application of a bonus mark of up to 10% additional, if the student shows that sources outside the textbooks and lecture notes have been explored and can be applied. Less than 5% of students achieve this distinction. Further, students have to show imagination in researching a topic of their own choice from outside the standard curriculum and making an oral presentation on this (20% of the total mark)

**Sesssion 6: Educational Concepts**

*Session chair: Laszlo Zentai*

The methods of delivery were the focus for this final session, with examples ranging across geotechnical, civil engineering, and human geography specializations.

Presentation S6-1: The value of ‘paper and pencil’ in the digital era

**Wei Luo**, Northern Illinois University, USA, demonstrated the basic nature of a paper exercise in raster overlay, and indicated how the mechanics and the analysis of such a GIS operation can be explored in an analogue way. Then the digital equivalent is used to determine if the results are the same. Wei Luo points out that paper-based, field-based, and digital-based methods are equally valuable in teaching geospatial issues.

Presentation S6-2: Development of an OBE-based practical and innovative GIS talent training system incorporating both science and engineering

**Jianghong Zhao**, Beijing University of Civil Engineering and Architecture, China, concentrated on applications of GIS for civil engineering. The problems highlighted are that it is interdisciplinary, it is scientific (not overtly engineering), it is difficult to evaluate students’ work, and it is difficult to achieve quality control (it is taught rather than learned). Outcome-Based Education is suggested as the way in which civil engineering students can be encouraged to work well at GIS: specific outcomes are needed, products, learning outcomes, and skills.

Presentation S6-3: A GIS approach to teaching human geography

**Richard Greene**, Capital Normal University, China (co-author Ran Liu), showed how GIS exercises are used to gather, manipulate and present data related to human geography. Exercises in creating migration maps, in assessing urban expansion, and in monitoring land use change, are each undertaken in a digital GIS environment, using standard tools, but with interesting results for the students.

**Session 7: Technical Visit**

Participants in the workshop were invited to the Land Satellite Remote Sensing Application Center, Ministry of Natural Resources of the Peoples Republic of China, where enthusiastic demonstrations of modern visualisation of satellite orbits, remote data collection by specific Chinese satellite missions, and subsequent data and image processing, were made. Participants enjoyed this insight into the satellite remote sensing programs of the Ministry.