Representations of Internationalisation in Statistics Education

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Abstract

Internationalisation is an important but contentious issue in higher education. For some it means the facilitation of student mobility and an important source of funding for universities, while for others it forms a philosophy of teaching and student engagement, highlighting issues of global inequality. In this study, the papers from a recent statistics education conference, the 7th International Conference on Teaching Statistics, are subjected to a critical discourse analysis against a theoretical frame derived from research describing different ways of understanding and working with internationalisation. The analysis demonstrates how a specific discipline-based community – the statistics education community – involves itself with issues of internationalisation.

1. Introduction

Over the previous decade, internationalisation has developed as an important dimension of higher education (Volet & Ang, 1998; Rizvi, 2000; Buenfil-Burgos, 2000; Haigh, 2002; Leask, 2003; Jackson, 2003; Ninnes & Hellstén, 2005; Atweh *et al*., 2007). On the positive side, there is increasing student mobility between countries, and an increase in the international flavour of curricula and pedagogical approaches. Larger numbers of students are obtaining an international experience of education and are preparing themselves for positions in the global economy. However, internationalisation may have negative as well as positive effects. Movement of students is generally from less to more developed (ie wealthier) countries, and is often seen by the (richer) host country as a source of funds. International curriculum becomes the standardised curriculum of developed countries, supported by powerful textbook

interests (Sowey, 1998). And such curriculum can cause a 'language problem' for students who do not have fluent levels of English, although it may be their second (or later) language.

In Australia, the national spotlight has turned towards the quality of the internationalised curriculum, subject to audit through the Australian Universities Quality Agency. Internationalisation in that context is seen as a high risk activity, requiring (from a marketing perspective) a steady stream of students to ensure the continuing viability of institutions, and (from a student perspective) the continuing support of students to prepare them to take professional positions around the world. However, Reid and Loxton (2004) critiqued this risk assessment view and suggested in its place a view of internationalisation as an orientation to learning. From this viewpoint, students' programs of study support their future development through a pedagogy fostering diversity and inclusivity and a curriculum that adopts a global perspective. Student mobility contributes to students' views of the world and the relation between their studies and professional work.

In Europe, internationalisation has become a key theme in the Bologna Declaration (European Commission, 1999). This document is a pledge by 29 countries to reform the structures of their higher education systems in a convergent way to facilitate student mobility. Indeed, internationalisation in education is interpreted in terms of ease of international mobility of students, with the underlying assumption that proximity to other cultures will develop knowledge and awareness of those cultures in professional contexts. However, there are individual European educators who profess a broader interpretation: *"The key aim of higher education in a growing and globalised world, is to respect and recognise students' backgrounds in order to foster the most fruitful dialogue among cultures, in this particular case with scientific culture, and to help them fully develop their cognitive and emotional potential."* (Sancho, 2008, p.218)

In the United States, policy documents from government and other national organisations alert educators to issues and development activities associated with internationalisation. For instance, the Office of Communications and Outreach (2007, pp.118–135) seems to equate internationalisation with language study and student mobility, yet funds projects intended to support internationalisation within the curriculum. This funding is built upon an earlier recognition that while it was difficult to measure what internationalisation actually was, US graduates seemed to be poorly informed about world events and cultural diversity:

"Effectively measuring the international content of college and university courses is difficult. For instance, while language, area study, and other such classes are widely understood to be international in nature, reaching consensus on what constitutes international content and how it should be measured has proven elusive. Despite differences in interpretation, research suggests there is much room for improvement: Broad curricular internationalization is lacking; postsecondary graduates are poorly informed about other countries, people, and events; and offerings by institutional type are uneven … Competency represents an even more pressing concern – one study indicates that less than 7 percent of all higher education students meet even basic standards of 'global preparedness'." (American Council on Education, 2000, pp.1–2)

The previous paragraphs indicate the increasing importance of the notion of internationalisation from three developed-world perspectives. The developing nations are also cognisant of the importance of internationalisation for empowering their citizens for participation in the global world of the 21st Century. For example, in the general area of mathematics and science education, Atweh et al. (2007) provide perspectives from a variety of countries including Singapore, Colombia, South Africa and the People's Republic of China where they emphasise the importance of scientific learning for a globalised world. This context paves the way for an analysis of the nature of internationalisation within statistics education. A feature of statistics is that it is one of the few subject areas that has close associations with a wide

variety of different disciplines, such as psychology, education, engineering and health. Many more students study statistics as a 'service' course than as a major area of study (see Wild's ICOTS 7 plenary paper), and hence statistics educators have a more diverse potential audience than educators in many other disciplines.

In this article, the published records of the recent international discipline-based conference – the 7th International Conference on Teaching Statistics (ICOTS 7) – are used to investigate the extent and representation of notions of internationalisation among a specific discipline-based group of educators – the statistics education community, including statistics education researchers. A critical discourse analysis (CDA) approach is utilised, looking at published papers as artefacts encapsulating internationalisation. At any conference not all papers engage with any one particular theme and this was true at ICOTS 7. Yet, taken as a whole, this investigation yields a fascinating picture of the role of the concept of internationalisation amongst the statistics education community, and one that could be of interest to members of other discipline-based communities of educators.

The International Conference on Teaching Statistics (ICOTS) is a major conference in statistics education held every four years under the aegis of the International Statistical Institute (ISI) and the International Association for Statistics Education (IASE). The conference has an international outlook, international participation in terms of planning and organisation, contributions and attendance, and a history of supporting some delegates from less-developed countries with travel and registration grants. ICOTS has a history of being held in a different country (and even continent) each time, to some extent as a technique for developing statistics education in different places: previous conferences have been held in Sheffield, UK; Vancouver, Canada; Dunedin, New Zealand; Marrakech, Morocco; Singapore; Capetown, South Africa; and the latest – ICOTS 7 – in Salvador, Brazil. An essential characteristic of an international conference is that it brings together participants from a range of countries, and as such, ICOTS 7 has an obvious international dimension. But looking at the next level of detail, it is interesting to see how and to what extent the participants at the conference engaged with the notion of internationalisation.

2. A Model of Internationalisation

The model of internationalisation used in this investigation has its genesis in previous research carried out by two of the authors into lecturers' understanding of sustainability (Reid & Petocz, 2006,) and its expression in curriculum (e.g., Petocz & Reid, 2003). Lecturers of postgraduate (post-undergraduate) courses were interviewed about their conceptions of the notion of sustainability in the context of their teaching, and the interviews were analysed using a phenomenographic methodology (Marton & Booth, 1997). An underlying assumption of environmental declarations such as the report of the 2002 Johannesburg World Summit on Sustainable Development (United Nations, 2002) is that people understand terms such as 'sustainable development' unproblematically. This explains statements such as "Education is critical for promoting sustainable development" (paragraph 116) and recommendations such as "Integrate sustainable development into educational systems at all levels of education in order to promote education as a key agent for change" (paragraph 121). However, the interviews undertaken showed that lecturers had a range of conceptions about sustainability, from the narrowest view that it involved "keeping themselves going" to the broadest view that it involved notions of intra- and inter-generational justice. In the same way, researchers, teachers and writers in the area of statistics education are likely to have a range of conceptions about internationalisation in the context of their teaching.

It is the authors' contention that internationalisation can be viewed as a value – one of a cluster of higher-level graduate dispositions, along with concepts such as ethics, sustainability and creativity – and these dispositions can be fostered through carefully aligned curriculum objectives and activities. Previously, the pedagogical aspects of such dispositions have been investigated separately (Jebeile & Reid, 2002;

Reid & Petocz, 2004, 2006), with only preliminary investigations of the relationships between them. A more recent project (Reid, Petocz, Braddock, Taylor, & McLean, 2006) is investigating students' views of the relationships between these ideas.

Considering sustainability as a component of internationalisation led to a hypothesis of a model of conceptions of internationalisation that was analogous to the model of conceptions of sustainability; in Reid and Petocz (2007) the consequences of these speculations were explored. It was found that the hypothesis was supported by published studies, also using a phenomenographic methodology, that had investigated teachers' and students' conceptions of internationalisation in the context of a Swedish nursing course (Wihlborg, 2003, 2004). For instance, three levels of students' conceptions were identified: firstly, 'competition, formal validity' (nursing is an internationally recognised qualification that can be used to get jobs in other countries); secondly, a 'Swedish perspective on the nurse education program' (inserting international content into the Swedish nursing curriculum so that nurses can better deal with people from other national backgrounds); thirdly, 'socio-cultural knowledge' (of the similarities and differences between cultures, going far beyond the current syllabus in nursing). Further, reports in mathematics and statistics education lend support for the existence of the broadest level of internationalisation that was hypothesised in the model. For instance, Atweh (2004) makes explicit reference to the notion of fairness in international cooperations in mathematics education research, while Lesser (2007) outlines an approach to statistics education that makes explicit use of notions of social justice.

Nevertheless, based as it is on interview studies and analogical argument, this model of internationalisation is simply a model that retains a speculative nature. A widely accepted point of view is that 'all models are wrong, but some are useful' (often attributed to George Box). In this paper, the authors will test the usefulness of their model by applying it to an analysis of the representations of internationalisation shown in the programme of a large, international conference in statistics education.

The model of internationalisation (see Table 1) combines two related dimensions. Internationalisation (in the context of teaching) gives the 'referential dimension' (Marton & Booth, 1997), since it focuses on ideas or thinking – what internationalisation actually *means*, rather than the actions that comprise it. There are three qualitatively different conceptions: 'distance', relying on a view, correct or incorrect, that the discipline itself is already 'international' (for instance, people may say this about International Law due to its subject material, or Mathematics as its symbols and content are not tied to any specific country) and perhaps already leads to an internationally recognised degree (for instance, people might say this about Accounting); 'curriculum', where the notion of internationalisation is approached through subject content, pedagogical methods and characteristics of the students; and 'justice', where the underlying concern is a focus on the 'fairness' of contacts between educators and students in different countries. Teaching (in the context of internationalisation) represents a 'structural dimension' (again using the terminology of Marton & Booth, 1997), since it describes aspects that academics have control over, i.e. themselves. Here, again, there are three qualitatively distinct conceptions: 'disparate', where teaching and internationalisation are seen as completely unrelated ideas; 'overlapping', where ideas of internationalisation can be incorporated by means of appropriate examples when the teaching context allows it; and 'integrated', where notions of internationalisation are viewed as an essential component of the pedagogic process.

It is a common feature of the phenomenographic approach that conceptions are most commonly ordinal and hierarchical. In the present case, based on the evidence from the research interviews about sustainability (Reid & Petocz, 2006) and nursing (Wihlborg, 2003, 2004), this seems to be true in each dimension. A teacher who holds the broadest 'justice' view of internationalisation is also aware of and able to use the 'curriculum' view and is able to give the sorts of definitions that might be used by teachers with the narrowest 'distance' view. However, this does not happen in the other direction: so a teacher who holds the narrowest 'disparate' view of teaching sustainability will not easily understand or have

sympathy with the broader 'overlapping' view and may have no idea at all about the 'integrated' conception.

In the following sections, this model is applied to the papers published in the proceedings of a large international conference in statistics education (ICOTS 7). In each case, the extent to which the authors incorporate the concept of internationalisation into their writing, both in terms of content and pedagogy implied, is evaluated. In a related vein, Ottaviani (2002) has carried out a textual data analysis, including correspondence analysis, of the corpora formed by the *titles* of earlier ICOTS papers (i.e., those from ICOTS 1 to ICOTS 5) to investigate the development of the scientific content of the conferences, including the international background of the authors and the topics that they presented. Her analysis was predicated on "the fundamental assumption that the title of each ICOTS paper may be considered as the authors' reply to the open question: *What is your contribution to teaching statistics?*" (p.2).

Internationalisation (in the context of teaching)		Teaching (in the context of internationalisation)	
(a) Distance	The discipline (whatever it is) is already international. Focusing on related marketing aspects (eg international qualification) ensures that internationalisation is of only peripheral concern.	(i) Disparate	Teaching and internationalisation are seen as unrelated ideas. Teaching focuses on the course content and "covering" a syllabus, internationalisation is the job of marketers and administrators.
(b) Curriculum	Internationalisation can be approached via content (examples, issues, subject matter), methods (pedagogy, epistemology) and the characteristics of the student body (experience, mobility, heterogeneity).	(ii) Overlapping	The notion of internationalisation overlaps with the activity of teaching. Teaching is seen as ensuring that students understand course content. Ideas of internationalisation can be incorporated (as examples, etc) to the extent that the situation allows.
(c) Justice	Internationalisation is approached by focusing on the notion of "fairness" of contacts between educators and students in different countries, and can essentially only occur under such conditions.	(iii) Integrated	Internationalisation is an essential component of teaching. Teaching is seen as encouraging students to make a personal commitment to the area represented by course content, including internationalisation as part of that.

Table 1. Views of internationalisation and teaching (after Reid & Petocz, 2007)

3. Method of Investigation

The 7th International Conference on Teaching Statistics (ICOTS 7) was held in Salvador, Bahia, Brazil from 2nd to 7th July 2006. The theme of the conference was "Working Cooperatively in Statistics Education". The *Proceedings* of ICOTS 7 were studied with a view to classifying the papers according to the model of internationalisation outlined in Section 2 (and summarised in Table 1) and identifying any themes related to the concepts of internationalisation.

ICOTS 7 comprised seven plenary sessions (of which 5 have supplied papers), nine topic areas consisting of 196 invited papers, and 104 contributed papers. (In addition, the *Proceedings* supply abstracts for 117 posters, though since these are much shorter than the papers, and give less evidence for conceptions of

internationalisation, they have not been included in the present analysis.) The nine topic areas were: (1) Working cooperatively in statistics education; (2) Statistics education at the school level; (3) Statistics education at the post-secondary level; (4) Statistics education/training and the workplace; (5) Statistics education and the wider society; (6) Research in statistics education; (7) Technology in statistics education; (8) Other determinants and developments in statistics education; and (9) An international perspective on statistics education.

Critical Discourse Analysis (CDA) formed the theoretical basis of our investigation: this is a way of interpreting texts that recognises that those texts have emerged from a social context. Kress (1990) suggests that the defined and delimited set of statements that constitute a discourse are themselves expressive of and organized by a specific ideology. Hence, the papers that comprise the *Proceedings* of ICOTS 7 are a part of the conversations of the statistics education community, and may be assumed in some aspects to be representative of them. Fairclough (1992) indicates that CDA melds language and social theory and emphasises the situational context that can be interpreted. More commonly, 'discourse' is used in linguistics to refer to extended samples of either spoken or written language: "... this sense of discourse emphasizes interaction between speaker and addressee or between writer and reader, and therefore processes of producing and interpreting speech and writing, as well as the situational context of language use" (Fairclough, 1992, p. 3). Jørgensen and Phillips (2002) further emphasise that what is critical is the juxtaposition and analysis of language and society within a text. They claim that: "through producing new discourses in this way, people function as agents of discursive and cultural change" (p. 17). The theoretical frame presented serves as an interface between the papers and the analysis which will enable an explication of the social spaces that constitute the professional practice of statistics educators.

Each paper – plenary, invited and contributed – contained in the *Proceedings* of ICOTS 7 was read using the critical discourse method described above. The aim was to understand how each paper contributed (or not) to notions of internationalisation using only what was provided in the texts themselves (including words, figures and tables). It was recognised that the examination was looking only at written artefacts that in themselves represent specific ways of dealing with internationalisation – from this it was not possible to say how the authors may more fully describe their views if, for instance, they were interviewed. The texts, placed as they are in a specific context by being presented at an international conference, provide a situated sample to explore using CDA. Broadening from CDA alone, the model of internationalisation was used as a means of interpreting the texts. While carrying out this process, it became apparent that the articles showed a further grouping that had not been previously described in the model – which will be referred to as 'level 0'. The need for this became apparent when it was found that a number of papers included no mention of internationalisation at all, aside from the fact that they had been presented at an international conference.

In practical terms, each paper was read in its entirety by the first author and assessed for its overall contextual meaning. A deeper linguistic analysis was then undertaken which involved looking for explicit mention of key words or topics that related to the model. On the basis of this, the level of engagement with concepts of internationalisation was categorised as the highest possible level on the following scale: level 0 indicating no mention of internationalisation, level 1 indicating a distance view of internationalisation (in the context of teaching) or disparate view of teaching (in the context of internationalisation), level 2 indicating a curriculum/overlapping view, or level 3 indicating a justice/integrated view. In particular, if a paper showed different levels for internationalisation in the context of teaching and teaching in the context of internationalisation, it was classified at the higher of the two levels. A randomly selected group of 52 papers was read independently by another of the authors, revealing 5 discrepancies in classification (i.e. 90% agreement): of these, four were found to be differences in shade of meaning, resolved by discussion, and the last was a clerical error. After this exercise, the second author looked at all the other (48) papers that had been classified as 2 or 3 to confirm the classification: after discussion, two further changes were made on the basis of this, reflecting changes

of opinion in marginal cases. Finally, for the purposes of the following discussion, papers were also grouped according to themes relating to the topic of internationalisation.

Papers from ICOTS 7 mentioned in this article have been referenced using the notation of author(s) (Country/ies:ICOTS 7 topic – first digit – and session number, or contributed paper number – beginning with 'C'), and listed in full in the reference list. The plenary papers were read and evaluated (and listed in references), though not included in the numerical analyses of results due to their somewhat different function from the other papers.

4. Results

The 300 invited and contributed papers spanned a wide range of topics: some described specific methods of teaching or actual courses/subjects taught, some dealt with mathematical or statistical topics (in the context of teaching, for the most part), some described research projects in statistical pedagogy, while others focused on administrative aspects of running statistical courses, programs or collaborations. Of the 300 papers, the majority (248 or 83%) were classified as level 0, another 5 (2%) as level 1, a further 25 (8%) as level 2 and the final 22 (7%) as level 3. Of the invited papers, 152 (78%) were classified at level 0, compared to 96 (92%) of the contributed papers. There was a tendency for a higher proportion of invited rather than contributed papers to be at the higher levels (2 or 3) of the classification rather than the lower levels (0 or 1). The appropriate odds ratio is 3.0 with a 95% confidence interval of 1.3 to 6.6 (though this should be taken as indicative, since the data are not being considered as a sample from a larger population). Table 2 gives a summary of these results.

Level	0	1	2	3	Totals
Invited	152	5	20	19	196
Contributed	96	0	5	3	104
Totals	248	5	25	22	300

Table 2. Summary results from the analysis of the role of internationalisation in ICOTS 7 papers (a complete listing of the papers classified as level 1, 2 or 3 is given in Appendix A)

As explained earlier, the plenary papers and the posters were not included in the analysis above. For the record, however, of the 5 plenary papers, one was classified as level 0 (Shaughnessy, USA), two as level 2 (Garfield, USA; Manly, Brazil/USA) and the remaining two as level 3 (Cook, New Zealand; Wild, New Zealand). Only 7 (6%) of the 117 posters made any mention of internationalisation.

Level 0: A classification of 0 was given where there was no mention of internationalisation. In many cases, these papers concentrated on a specific topic area, and the notion of internationalisation did not arise. For example Habibullah (Pakistan:1B2) describes an internship program for Master of Science students which exposed students to the three largest data-collecting organisations in Pakistan. Such a program could well involve notions of internationalisation, but as no explicit mention was made of this aspect by the author, it was coded as 0. Some papers involving teaching focused on specific subject content, as in Manteiga and Bande (Spain:3F1) whose paper presents smoothing techniques in spatial statistics, or Cumming (Australia:C105) describing graphical methods for combining the results from separate studies. Another example of a paper with a classification of 0 was by Helenius (Finland:5C2), a summary of how the national statistics agency, *Statistics Finland*, has developed its services to the media, including training courses, and continues to study and monitor its public image.

Level 1: A classification of 1 was given where a paper referred to international qualifications or international background of students from a purely administrative point of view, with no specific comment on the effects on curriculum, teaching method or notions of fairness. Pfannkuch (New

Zealand:6A2) gives some information on the ethnic mix of students in an investigation of secondary school students' informal inferential reasoning. Verhoeven (Netherlands:3A4) describes the establishment of a number of Liberal Arts and Sciences Colleges in the Netherlands and Flanders and points out that one reason for this was to establish a better connection with existing Masters and PhD programs in Europe. Of course, it may be that the restrictions of the paper submitted for the conference did not allow authors to explore notions of internationalisation further, or that they were not wanting to focus on this aspect in their studies. While such papers are lower on the 'level of internationalisation', this does not represent any negative comment about them.

Categorisation of papers as 0 or 1 was essentially based on the absence of information to the contrary, whereas categorisation as 2 or 3 was based on the presence of indicators of the related concepts. For this reason the most interesting information for the purposes of this article can be found in those papers categorised as 2 or 3.

Level 2: Twenty invited and five contributed papers described content, methods or participants with an international dimension and on this basis were classified level 2, the 'curriculum' notion of internationalisation in the context of teaching or the 'overlapping' conception of teaching in the context of internationalisation. Examples given include use of different population pyramids (Kranendonk, USA:2C2), data on the Olympics (Langrall, Nisbet, & Mooney, USA/Australia:2A3) and the use of international examples from web-based public databases such as *Eurostat*, the Statistical Office of the European Communities (Grünewald & Mittag, Luxembourg:4F1). A particular initiative is *CensusAtSchool* (Townsend, Canada:9D1, and Kong & Harradine, Australia:9D2) which was the subject of Session 9D and was also mentioned in several other papers. According to the official website (http://www.censusatschool.org/), *CensusAtSchool* aims to:

- Encourage children to get involved with data handling and learn statistical skills;
- Provide real data for data handling activities;
- Increase awareness of what national censuses are and what they are for;
- Show how information and communication technology (ICT) can be used effectively to enhance teaching and learning especially in the area of data handling.

CensusAtSchool is currently running in the United Kingdom, Canada, New Zealand, South Africa and in the states of Queensland and South Australia in Australia. However, it is used as a teaching resource in a wider range of countries. Ben-Zvi (Israel:2D1) describes how students in Haifa collected data about themselves and compared these data to the UK *CensusAtSchool* data base.

Several papers in the level 2 classification describe a strong drive towards international uniformity of curriculum, particularly in the European Union, and a need for a focus on globalisation. Matis (USA:2C4) discusses the need for student 'soft-skills' such as teaming and communication, which are essential in a global problem-solving environment. Zafra and de Paz Cobo (Spain:5G3) state that the International Actuarial Association aims to "encourage the development of internationally oriented actuaries", and that a core syllabus for actuarial training in Europe has been designed. Some of the contributed papers describe an investigation or development in one country utilising ideas or developments from another: for example, Sharma (New Zealand:C129) reports on a study of Fijian students' understanding of probability using ideas about curriculum from Australia, New Zealand and the US, and contrasting results from Brazil.

As would be expected at such a conference, international cooperation among statistics educators and researchers was a strong theme. The second plenary address was titled "Collaboration in statistics education research..." (Garfield, USA), and the fourth was devoted to international case studies in environmental statistics (Manly, Brazil/USA). Sixteen of the invited (and three of the contributed) papers

were cross-country collaborations. Of the papers classified as level 2, a number stress the importance of international collaboration, with special mention being made of the International Association for Statistical Education (IASE). Schuyten and Ottaviani (Belgium/Italy:8D4) give an overview of 15 years of IASE, which at the time of the conference had approximately 500 members, and describe the International Statistical Literacy Project, whose mission is "to provide those interested in statistical literacy with information and resources and to aid them in the development of statistical literacy around the world" (p.5). A series of web pages has been developed to provide users with resources. Concentrated effort has been made to include more items in languages other than English, and also to give links to curriculum guidelines from a variety of countries.

Level 3: The predominance of English as the language of statistics education journals and other resources was raised as a problem in several papers which were classified as level 3. Romeu (USA:4A1) gives an overview of statistical resources available for engineers and raises the issue of equity: most material on the Web is in English, but the engineers and statisticians in the developing world who may most need these materials often do not have adequate English reading skills. Similarly, up-to-date computer hardware and software are necessary to take advantage of Web resources, but these are often not available in the developing world. This concern is echoed by Icaza, Bravo, Guiñez, and Muñoz (Chile:7B3) who note that up-to-date texts are not translated into Spanish in a timely manner. Salcedo (Venezuela:9A4) makes the point that the dominance of material in English not only restricts access by non-English speaking statisticians but also means that papers on statistics education issues written in Spanish or Portuguese tend to remain unknown and unpublished (though one journal, *Statistics Education Research Journal*, does publish articles in Spanish and French). He describes the activities of *Hipotesis Alternativa*, a Spanish-language electronic bulletin on statistics education.

The three papers mentioned above can be seen as fitting into the 'justice' conception of internationalisation and its 'integrated' role in teaching (level 3 in the categorisation). That is, they are essentially concerned about the notion of 'fairness' of contacts between educators and students in different countries. In total, 19 invited and three contributed papers presented at ICOTS 7 could be said to demonstrate the 'justice' concept of internationalisation, including the three mentioned earlier in this section which express concerns about the equity effect of the predominance of English. Several of these papers explicitly express a commitment to the notion of 'fairness' of contacts between educators and students in different countries. Mavrotheris and Meletiou-Mavrotheris (Cyprus:4B1) describe a new program funded by the European Union to provide web-based professional development in statistics to geographically-dispersed teachers across Europe. Course material will be produced in all partners' languages (Greek, Norwegian, Spanish) as well as in English. Other papers address the notion that statistics and statistical literacy empower students to become critical and active citizens in the contemporary world: César and Dias (Portugal:C412) use this idea to position their report of a program investigating the effective use of collaborative project work in learning statistics.

Session 4B focused on "international cooperation in statistical training in the workplace", and all four papers in this session were classified at level 3. Evans (Australia:4B4) of the Australian Bureau of Statistics (ABS) states that, following the guidelines provided by Principle 10 of the United Nations Fundamental Principles of Official Statistics, "the aim of the ABS in providing assistance is to encourage developing countries to establish good statistical policies and methodologies through the transfer of ABS knowledge and practical skills." Assistance offered by the ABS, particularly in the Asia-Pacific region, includes ABS staff running training courses or undertaking consultancies in other countries, and staff from other countries visiting the ABS for training and study tours. Evans lists a number of practical factors that should be taken into account when training statisticians from the region, including cultural sensitivity and the ability of the trainer to consider the needs of the trainee.

Legler (USA:4D4) describes some project examples used by St. Olaf College, a US institution with a

Norwegian heritage. In addition, she describes a 'Biostatistics Interim' in Geneva, where students work on projects with the World Health Organisation: "Linking the growing interest in global health with what statisticians can offer provides a powerful message for quantitatively adept students who are looking for ways in which to apply their skill and transform their world." This would seem to be an ideal example of the 'integrated' concept of teaching in the context of internationalisation.

Several of these papers classified as demonstrating the 'justice' concept of internationalisation explicitly tackle the issue of teaching methods for classes from different backgrounds (which could be different countries, or different ethnic groups in a multi-ethnic country). Bangdiwala (USA:3C3) gives case studies of postgraduate students, two of whom were foreign students, and describes the mentoring required for students from different backgrounds. Porter, Cartwright and Snelgar (UK:3D1) report on research into how best to deal with a class composed of students from different educational backgrounds; and Berenson (USA:3D2) also gives an example of how to work with an academically diverse class while embodying the notion of fairness.

The fact that teaching diverse classes requires considerable thought and preparation is acknowledged in the paper by Mostert (South Africa:4F2). Mostert notes that the graduate skills as listed in the "The Profile of the Stellenbosch Doctor" include "the ability to communicate effectively with patients from different cultural groups in the process of diagnosis and management." Under the quota system, 50% of all students admitted to study medicine at South African universities should come from historically disadvantaged communities, but "the diverse composition of a class further hampers effective teaching". This paper recognises a need for special teaching techniques, and notes that Stellenbosch University is considering spreading first year over two years for less-able (or less-prepared) students.

A paper by Clark (New Zealand:1B1) of Victoria University which offers some practical suggestions has the informative title "A first year statistics programme for indigenous and migrant students arrived at by co-operating with local communities and the students themselves." The programme was undertaken at the request of the local elders in the Maori and Pacific communities and is described as an achievement model rather than a remedial model. It demonstrates a thorough awareness of the different needs of these groups, and includes the setting up of a special 'Tagata Pasifika' tutorial group where the students can feel more comfortable. Clark notes that many Pacific Islander students are more confident with a transmission model of teaching, and so this is used initially and a shift to a more independent style made later in the semester. There are many aspects to this programme but the basis is a thorough knowledge and understanding of cultural issues and the needs of the students. The programme has met so far with a considerable degree of success.

5. Conclusion

At the most evident level, ICOTS 7 was an international conference with over 500 delegates from some 50 countries (the list is available on the website at http://www.maths.otago.ac.nz/icots7/icots7.php). The conference was sponsored by an international organisation and had an international team of organisers. The very fact that the conference was held, and that ICOTS conferences are held every four years, indicates the international dimension of the statistical education community. Even if each individual presentation had been on topics that were based on specific pedagogical topics from the institutions or countries of the presenters, the conference would have had a strong international dimension.

Having said that, about one-sixth of papers (17%) addressed or included the specific topic of internationalisation, with the majority of these (15% of all papers) engaging with internationalisation at the broader 'curriculum/overlapping' or 'justice/integrated' levels. The statistics education community seems to take the notion of internationalisation seriously, not only in its organisation of a conference such as ICOTS 7, but also in terms of the individual papers that are presented there. Although the majority

(83%) of the papers did not make any mention of internationalisation, there is no *a priori* reason to expect them to. Indeed, many papers were on topics that may not admit any international dimension, such as techniques for teaching specific statistical topics, while others had a national focus, such as descriptions of courses in particular institutions.

The level 2 ('curriculum/overlapping') papers that did have an international component often focused on curriculum issues, especially the uniformity of curriculum across different countries (in the European Union, for example), and the nature of curriculum for international perspectives (such as the *CensusAtSchool* project). There were also several reports of international collaborations in statistics education: an international conference is an ideal forum for discussion of such issues. There seemed to be a tendency for papers from the more-developed countries to discuss international issues, while papers from less-developed countries were more likely to discuss specific national issues, such as Polaki (Lesotho:9B1) who raises the problem of mismatch in Lesotho between high school mathematics curriculum, including examinations, from Cambridge and locally developed texts. Given the location of the conference, it was understandable that a number of Brazilian presentations discussed local problems, for example, Pose, Fisberg, Lima, Ramos, and Araújo (Brazil, C101), who talked about the role of statistics in a school nutrition program in São Paulo. Further, the invited papers were more likely to include internationalisation as a theme than were the contributed papers. This can easily be explained by the fact that the invited speakers were more likely to be 'prominent' and experienced, and to come from more developed countries.

The level 3 ('justice/integrated') papers identified the specific problems of the domination of a single language – English – in the statistics education field, the more constrained opportunities available to statistics educators in less-developed countries, and the pedagogical approaches needed for working with diverse groups of students, including indigenous groups and different ethnic groups within a single country. It is heartening to see that these papers were not only raising problems, they were also reporting on solutions (such as the Spanish-language electronic bulletin *Hipotesis Alternativa*, and the 'Tagata Pasifika' tutorial group). The organising committee of ICOTS also contributes to such solutions, for instance, in the form of support that has been provided for delegates from less-developed countries to attend the conferences.

One aspect of internationalisation that has not been dealt with in this study is the comparative one. Was there a greater focus on internationalisation at ICOTS 7 than at the previous ICOTS conferences? How did ICOTS 7 compare to other statistical education conferences, or other pedagogical conferences in related areas, such as the 3rd International Conference on the Teaching of Mathematics at the Undergraduate Level held in Istanbul, Turkey in 2006 (website at http://www.tmd.org.tr/ictm3/), or Delta'05, the Fifth Southern Hemisphere Conference on Undergraduate Mathematics and Statistics Teaching and Learning held on Fraser Island, Queensland, Australia in 2005 (website at http://www.maths.uq.edu.au/delta05/)? And what about international pedagogical conferences in other disciplines? Is statistics education more or less internationalised than, say, accounting education or music education? Such comparative studies could yield useful information. In the meantime, using the model of internationalisation presented earlier, an indication has been given of the extent and depth of statistics educators' engagement with the notion of internationalisation, and the specific areas in which this engagement occurs: this could form a useful basis for comparative studies in other disciplines.

Finally, a comment on the model itself. This was developed to categorise possible responses to asking teachers about some aspect of internationalisation (by analogy with sustainability) and supported by teachers' (and students') views of internationalisation in nursing education. In such contexts, a teacher may show the 'distance/disparate' conception (level 1) as a specific response to a question. In this study, by contrast, writers' ideas about internationalisation have been investigated by examining their papers. The level 0 classification was added as a response to the fact that many authors did not mention, even by

implication, any aspect of internationalisation. Nevertheless, all the authors at ICOTS 7 wrote papers to deliver at an international conference, and this in itself implies participation in the internationalisation of statistics education.

Appendix A

Level 1	3A4, 3C1, 6A2, 6E4, 7B2
Level 2	1A1, 1E2, 2A3, 2C2, 2C4, 2D1, 2F1, 3E4, 3G1, 3G3, 4A4, 4F1, 5D3, 5F1, 5G3, 7A4, 8D4, 9B1, 9D1, 9D2; C129, C303, C307, C324, C329
Level 3	1B1, 3A1, 3C3, 3D1, 3D2, 4A1, 4B1, 4B2, 4B3, 4B4, 4D4, 4F2, 4F3, 5B1, 5B2, 5B3, 6C3, 7B3, 9A4; C205, C332, C412

Table 3. ICOTS 7 papers classified at levels 1, 2 and 3 (Full bibliographic details of all the papers are available online at http://www.stat.auckland.ac.nz/~iase/publications.php?show=17 .)

Acknowledgements

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Cumming, G. Meta-analysis: pictures that explain how experimental findings can be integrated. (C105)

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