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An Educational Durian?  
Issues in Teacher Education in International Collaboration

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Abstract

This paper looks at an international collaborative project in teacher education between Malaysian Institutes of teacher training and an Australian university from the perspectives of four of the participants. Two of the stories are from participants who are co-ordinating aspects of the collaboration, and two stories come from participants who were involved closely in the curriculum and teaching aspects of the program. These personal stories reveal that international collaborative projects are indeed like the durian: there are both good and bad aspects. Our differing roles in the program allow us to provide rich insights into such an international collaboration that we believe will be of benefit to others attempting similar projects.

Keywords: teacher education, collaboration, internationalization, mathematics

Background

In mid-2005, when the Malaysian Ministry of Education sought expressions of interest from foreign universities in developing new teacher-education degree courses for primary teachers in mathematics, science and design technology, the Faculty of Education at Deakin University, Australia, was one of the four successful tenderers to take up the challenge. In January 2006, the four-year Bachelor of Primary Education (Mathematics), commenced at the Institut Perguruan Persekutuan Pulau Pinang (IPPPP). A parallel Deakin University degree, the Bachelor of Primary Education (Science) commenced at the same time at Institut Perguruan Persekutuan Tuanku Bainum (lPTB) and Institut Perguruan Persekutuan Tunku Abdul Raman (IPTAR). Although both degrees have a common first year, the stories here mainly refer to experiences with the Bachelor of Primary Education (Mathematics) at IPPPP.

This is not the first international collaboration undertaken by Deakin University's Faculty of Education. However, it has many unique features. Students are being prepared to teach in Malaysian primary schools, specialising in mathematics, but also needing to be able to teach in other areas such as health and physical education, and Islamic studies. They are being taught (and will themselves teach) mathematics and science in English, not Bahasa Melayu. It is also the first time that primary teachers in Malaysia are undertaking a four-year undergraduate degree course. While some of the units in the degree are similar to those studied by students in Australian-based courses, the program and the units have been specifically designed for this program.

The major study in mathematics in the 32 credit point Bachelor of Primary Education (Mathematics) degree consists of nine one-semester units, each with one credit point: six in mathematics, and three in mathematics education. In 2006, during the first year of the course, both units in the major were in mathematics. The Deakin staff member responsible for each of the two units (referred to here as the Unit Chair) prepared student materials including:

- an extensive Study Guide that assists students to study the content;
- a Reader that contains a selection of appropriate support readings; and
- a Unit Guide that included an outline of the unit, a week-by-week teaching plan, assessment details, and explains student responsibilities and Deakin University regulations;

In order to assist the Malaysian staff for teaching these new units, a one week induction program was conducted for each unit prior to the beginning of the semester in which the unit was to be taught. During the semester, the Deakin Unit Chair visited IPPPP to help with any issues raised by students and staff. This pattern of support, for students through course materials, and for staff at IPPPP through regular
meetings with Deakin University's Australian-based staff, is employed for all units of the degree course with the exception of those units comprising the six credit points allocated to complementary Malaysian University Requirements.

The authors of this paper are all intimately involved in the Deakin program at IPPPP, either as teacher-educators, or as co-ordinators of the program.

**Susie's story: Developing a mathematics major**

Unlike in Australian primary schools, where teachers are normally generalists who are expected to teach across almost all areas of the curriculum, Malaysian primary teachers are expected to specialise in only a few areas. This allows the opportunity for students in a primary degree course specialising in mathematics to undertake a substantial major study in mathematics (as well as, of course, substantial studies in pedagogy related to the teaching of mathematics – i.e. mathematics education). This raises the important question of what such a mathematics major should look like.

The issue of teachers' subject knowledge has been seen as critically important for some time (see, for example, Hill, Schilling & Ball, 2004). There is a growing concern that the emphasis, particularly for a primary teacher, should be on the knowledge required for teaching the curriculum rather than the knowledge of advanced topics that a mathematician might require. In her highly acclaimed book *Knowing and Teaching Elementary Mathematics: Teachers’ Understanding of Fundamental Mathematics in China and the United States*, Liping Ma states that “elementary mathematics is not a simple collection of disconnected number facts and calculational algorithms ... [but rather] an intellectually demanding, challenging and exciting field – a foundation on which much can be built” (Ma, 1999, p. 116). She speaks of the need for primary teachers to have a profound understanding of fundamental mathematics and argues that such profound understanding requires depth, breadth and thoroughness, and defines “understanding a topic in depth as connecting it with more conceptually powerful ideas of the subject” (p. 121). In his foreword to Ma’s book, Lee Shulman states that, at least in the US, “undergraduate programs seem to have no place for teaching fundamental mathematics for profound understanding” (p. xii).

The Bachelor of Primary Education (Mathematics) provides a unique opportunity to develop units that address teachers' profound understanding of fundamental mathematics. Such units need to have a strong conceptual basis, rather than be aimed at procedural skills, as well be related to the future teaching that students will undertake, as represented in national curriculum documents. This is no easy task, requiring “a more comprehensive understanding of the relationship between fundamental mathematics and new advanced branches of the discipline” (Ma, 1999, p. 149).

The rationale underpinning the choice of the six-unit (three year) mathematics major sequence in the Bachelor of Primary Education (Mathematics) is to provide students with both breadth and depth in their understanding of mathematics, as well as to focus on topics that provide them with a deep understanding of the content of primary school mathematics. Content has been designed to allow students to become acquainted with a broad range of classical and modern mathematical topics, while developing an understanding of the nature of mathematics and its current applications, as well as an awareness of mathematics as an ongoing cultural activity. At the same time, content is designed to provide connections between some of the big ideas of mathematics and to develop students’ ability to “think mathematically”.

The pedagogy for the mathematics major is based on the use, where appropriate, of an investigational approach, with a focus on the development of skills associated with deep thinking, reasoning and dialogue. Learning is supported through the use of appropriate software and on-line technologies, as well as print-based materials and other resources. In particular, extensive use is made of *Geometer's Sketchpad* (Key Curriculum Press, 2001), for which the Malaysian Government has purchased an all inclusive national license that allows it to be used in all public educational institutions from primary school through to university. While this resource is available in Malaysia, its full potential has yet to be reached in schools or teacher education. A brief summary of some of the key features and inter-relationships between the units is given below.

*Exploring number and space* treats two fundamental areas underpinning primary mathematics – number and space – from an advanced standpoint. It uses *Geometer's Sketchpad* and makes links with art and
design (including Islamic art). It also offers an introduction to an important area of modern mathematics – group theory – and a taste of contemporary uses of number theory in cryptography, which is revisited in final unit of the major.

**Problem solving and mathematical modeling** allows students to work collaboratively on extended problem solving and mathematical modelling tasks in order to develop skills and confidence in tackling non-routine problems and to become aware of the application of mathematics in traditional and non-traditional areas. Effective communication and mathematical explanation are major foci – and the cause of many student complaints such as "it hurts my head to have to think this hard!" However, as Golding, Rowland and Barber (2002) point out, "mathematical proof ... is about convincing mathematical argument ... If students do not experience these enquiries themselves, how can they hope to encourage mathematical questioning in pupils?" (p. 702).

**Functions and graphs** focuses on developing a deep understanding of a range of functions, their graphs, and their use in modeling real world situations. It also aims to deepen students' understandings of some of the key concepts of calculus, by revisiting limits, continuity, differentiation and integration from a rigorous standpoint, with the aid of the graphic calculator capabilities of Geometer's Sketchpad. It also underpins part of final unit on the applications of mathematics.

**Exploring data: An investigational approach** aims to build students' expertise in designing small-scale research projects for a range of settings, reporting the results of their research to a range of audiences, including the general public, and in reading and interpreting the research of others. While students will develop competence in using appropriate statistical strategies, techniques and software to conduct research, the focus is on conceptual understanding rather than computational techniques.

**Linear and abstract algebra** builds on the introduction to group theory in first unit and provides exposure to a "modern" branch of mathematics. It requires a significant increase in mathematical sophistication from students and underpins a significant portion of the final unit on applications of mathematics.

**Applications of mathematics** draws on earlier units and demonstrates their use in a range of contemporary contexts such as: secure storage and transmission of electronic data; population growth in predator-prey situations; predicting safe and effective drug dosages; and modelling the spread of diseases such as AIDS.

Content, pedagogy and assessment vary considerably across the different units. As the co-ordinator for the mathematics major in this course, I have been responsible for designing the overall structure of the six-unit mathematics sequence described above, as well as being the Unit Chair for four of these units, including the two taught in 2006. I also undertook a four-week attachment at IPPPP during second semester.

As much of the approach (and content) is unfamiliar to staff in the Institutes, induction of staff has been of paramount importance. Up to the time of writing, staff and students have been enthusiastic about most aspects of the mathematics units, although there is some student resistance to “having to think” and even "be creative" in mathematics rather than just carry out computations. Personally, it has been a tremendously rewarding and worthwhile (if exhausting) experience!

**Esther’s story: Teaching mathematics to Malaysian primary teacher trainees in English**

When the Teacher Education Division let it be known that Institut Perguruan Persekutuan Pulau Pinang (IPPPP) was selected to run the Deakin program, there was an air of elation and excitement, yet a feeling of uncertainty. The feeling of trepidation was somewhat abated when lecturers were informed that there would be induction and professional development sessions from the University before each Unit. At the time of writing, two mathematics units have been taught to our student teachers: **Exploring number and space** and **Problem solving and mathematical modelling**. As a member of the teaching staff, I thoroughly enjoyed teaching the content of these units as prepared by the Unit Chair. There were several reasons for this apparent enjoyment and enthusiasm.

Firstly, it was the approach by which these units were being taught to our student teachers. In **Exploring number and space**, which was taught in the first semester of 2006, the approach taken was one where learning was effected through understanding rather than rote learning. Students learnt about prime, real,
rational and irrational numbers in fun ways and saw the relationships between these sets of numbers. In the Space section of this unit, our students were introduced to Group Theory and shown how cyclic groups, dihedral groups and isometries can be found in everyday life. They extended their knowledge of basic geometric shapes to the making of nets, learning how polyhedra can be represented using the Schlafli symbol, and built models of Platonic, Archimedean and Kepler-Poinsot solids. Apart from using an age-old method like potato-printing, students also used the more advanced, electronic medium of Geometer's Sketchpad to explore the different isometries of translations, rotations, reflections and glide reflections. These opened their eyes to the relevance of mathematics in real life and to how interesting the teaching and learning of mathematics could be.

The unit climaxed with a presentation of a pop-up paper-engineering project. Students were introduced to the techniques of paper-engineering at the beginning of the unit and told to work in groups of not more than four to produce a pop-up paper engineering project based on a theme of their choice. It was very satisfying and fulfilling to see how the students laboriously collaborated and organised themselves outside of contact hours to successfully work on their projects. Some of the beautiful and skilfully produced work that came out of that project was beyond the expectations of many of us teaching the unit. The joy of teaching this unit also came from reading in their project journals about how they have triumphed over their difficulties to fully understand and appreciate the mathematics involved in creating the pop-ups in that project.

Teaching this unit has taught me a whole new way of teaching mathematics. This is totally different from the conventional way that I was taught in school and while I was teaching it, I remember wishfully thinking "How I wish I was taught about Numbers and Geometry in these ways". I dare say I was not the only lecturer in the unit who felt this way! The hands-on activity based approach that was used was not only enjoyable and exciting for the students but for me as well. I appreciated the fact that I was modelling a new and interesting approach for my student teachers to emulate when they eventually graduate to teach in the primary schools in Malaysia. To change the way mathematics is taught in primary and secondary schools in Malaysia requires that student teachers no longer be taught in the ways their lecturers were taught in the 1970s. I see this collaboration with Deakin University as a way forward to making mathematics teaching and learning more relevant and interesting for our student teachers as well as their future students. It is not until our student teachers are actually involved themselves in an exploratory and discovery-type of learning that they will be fully able to impart and implement that in their own classrooms.

However, I must add that although the other lecturers and I have taught mathematics for many years, there were times when we were rather overwhelmed and stressed by the unfamiliarity of the content and the preparation that came with it. It wasn't the "traditional" way we were taught or have been teaching in the previous teacher education programs, and many more hours of preparation were necessary to make it run the way it was meant to run. In the first unit, there were weekly assignments to be marked that constituted 40 percent of the final mark. Hence, it was a constant chasing after time before the next lot of assignments came in. Although we were given Unit Guides, which set forth clearly what was to be done, the interpretation of the instructions was somewhat varied between lecturers and further coordination was often required at the institute level. Fortunately, co-ordination and communication between IPPPP and Deakin staff was good and all queries and difficulties were quickly resolved.

The electronic mail played a significant role in promoting such frequent and close communications. Although Deakin Studies Online [DSO], the Web-based platform from which lecturers and students can access learning resources and hold discussions, was in place and Malaysian staff and students were given access, it was infrequently used. One of the reasons was the Web server at the Institute was unreliable and constantly down. This eventually caused lecturers and students alike to stop accessing DSO. The other reason for this apparent non-usage of DSO was also because of the frequent face-to-face interactions and students were having on a weekly basis. It must, however, be conceded that DSO does present vast opportunities for teaching, learning and interaction between staff and students at all Institutes and this is an area for further exploration and investment.

Despite their obvious appreciation of how the units were run, students' poor command of English led to difficulties with the Readers. It did not help that we tried to ensure students read every article suggested in the Unit Guidel This stressed our student teachers tremendously and we had to withdraw that ruling after consultation with the Unit Chair. Readings for the subsequent unit were much more relaxed and more self-directed. Notwithstanding this hiccup, there was still the problem of English language
proficiency among the student teachers. There was often the temptation to correct every single grammatical mistake the students made in their assignments. For me, it was a real struggle because there was tension between correcting their mistakes so they can learn from it and not being overly critical as to cause discouragement as the mathematics (and not English) was more important! This dilemma, however, is not unique to the Deakin program but to all local teacher education programs because the teaching of mathematics and science in English had just begun in 2002 and student teachers had been taught mathematics and science in Bahasa Melayu, the national language of Malaysia. Given the backgrounds of the students, mathematics teacher educators need to be mindful of that disadvantage and work towards building a student community proficient first in mathematics, then in English, and not vice versa.

Choo's story: Co-ordinating an international collaboration in the Malaysian context

IPPPP saw it an honour to be selected by the Teacher Education Division (TED) to run the teacher education program from Deakin University. We saw it as an opportunity to enhance our professionalism and growth in the education sector. The TED, together with Deakin University, allocated time and funding for frequent visits by Deakin staff. For each semester, this included induction and professional development sessions, a mid-semester quality assurance visit, and a moderation and/or examination marking session. Staff and students at IPPPP were also professionally stimulated through the three weeks attachment of the Deakin Mathematics Unit Chair, and Physical and Health Education Unit Chair, to the Institute. TED saw these attachments as beneficial for all mathematics and physical education teacher educators in the division and consequently organised for capacity building sessions to be conducted at IPPPP. These frequent visits were very healthy for the well-being of the program and kept everyone involved updated and motivated.

There was also growth on the technological front, as all involved began to become proficient and adept at using the Internet to access electronic mail and much of whatever was supplied as learning resources came in electronic formats and was easily disseminated to all concerned. The mathematics unit saw revived used of Geometer's Sketchpad as a learning and teaching tool and the science units saw new equipments being bought and facilities upgraded.

Co-ordination between the three different institutes and Deakin University was of paramount importance as many of the units were common despite the fact that the other two Institutes were conducting a Bachelor of Primary Education (Science). As co-ordinator, it was imperative that I was clear about how the program was run and able to brief and update the management about the course. Much time was spent travelling to and from TED for meetings and for the different capacity building sessions conducted. Liaisons between TED, the local administrators and administrators of the other two Institutes were ongoing and were often needed more when secretariats and committees have to be formed for each of the Deakin visits.

Through the collaboration between our partner university and the Institute, the local lecturers involved in the program have shown tremendous changes. The sense of ownership is clearly tangible. Whereas in the past they have mostly followed instructions given by headquarters – that is, TED – they are now more innovative, proactive and exhibit more initiative. Through this collaboration, the local staffs are beginning to open up to new ideas and is trying different ways of teaching as suggested by Deakin. There is much more collegiality and collaboration going on. I also sense that the lecturers involved are beginning to take their given responsibilities more seriously. In many ways, working with people from outside the Institute has made them more answerable not only to the management, or TED, but also to Deakin University. As for me, working with Deakin as a co-ordinator has changed the way I work. Now I plan ahead and talk to my lecturers more. Consequently, my working relationships with staff in the department have improved. I see them not only as a supervisor but also as a colleague and a friend. The atmosphere of collegiality and comradeship among those involved in this program is obvious and this augurs well for the Institute as a whole.

Managing a cohort of 102 students and their lecturers and the constant liaison with Deakin staff and staff from TED is rewarding but not always a bed of roses. The going can be quite stressful at times especially when the unexpected happens and things do not turn out the way it was meant to be. Many times, my team and I over-plan and stress ourselves (perhaps unnecessarily!) trying to ensure things go well. Sometimes discussions and planning can be long and even continue over to our evening meals!
One certainly has to multi-task and delegate in order for the program to run smoothly. In many ways, this program has extended all of us and stretched our potential.

**Brian’s story: Co-ordinating the overall program for Deakin University**

Ensuring that Australian-based staffs are able to work with their Malaysian counterparts involves not only relatively trivial aspects, such as organizing travel and accommodation, but more importantly, aspects of working within a different culture. Sensitivity to general cultural differences is always important, but in this story it is not the issue: rather it is the awareness of, and sensitivity to, differences in the educational culture.

It was assumed that registering the Malaysian Institute staff as Deakin Staff members would be a straight-forward task, but this proved not to be the case. The Deakin University support staffs were faced with entering unfamiliar family and fore-names: for example, in the case of Chinese names, the reversal of fore- and family-name from the more familiar Western order. However, to their credit, adjustment was very rapid. A further unexpected adjustment, and one that continues still, is remembering that the academic year starts in early January in Malaysia (January 3 in 2007), and runs for about twenty weeks. Thus, the first semester commences while most of Deakin’s Australian staff is on summer holidays! Communication at this time of year is therefore problematic.

This difference in semester timing also causes a co-ordination difficulty in managing student progress during their course. As one would expect, the student management system is automated and geared to campuses with the same responsibilities. The effect of this mismatch is that student enrolment, examinations, and result posting for our Malaysian students tends to “fall through the cracks”; that is, a manual system has to be employed to over-ride the usual system. For example, unlike students in most courses, students in the Malaysian degree program have no optional units. This, one would think, would not to be an issue; but, because this is unusual, it is problematic as the student management system is designed for students to enrol in their choice of the next semester’s units. Thus, it was necessary to request and organize a mass, automated enrolment for all our Malaysian students for all units of all four years of the course. Fortunately for me, I have found that the very professional support staffs at Deakin Australia who are constantly warning me of new “cracks” are providing solutions for each of them. Also, since we have now completed the first year (2006) it is possible that we have now revealed all the “cracks” in the system, and it could be plain sailing for the next three years!

Of course, not all aspects of the two education cultures are different or problematic. For example, the invigilation of examinations and student script security, at both the Institute and at Deakin University are almost identical. Every Institute has an Examinations Officer who is responsible for the receipt and security of examination materials; Deakin has similar staff member on every one of its Australian campuses with the same responsibilities.

Deakin University, like many other universities, has a highly-developed Internet-based student support system. The system at Deakin, Deakin Studies Online (DSO) provides ready access to learning materials and spaces for student and staff discussion. Understandably, the development of the Malaysian degree program was founded to a large extent on DSO access, since the Malaysian staff would be registered Deakin University staff, and the students would be Deakin University students, and thus all would have DSO access. After some discussions with our Malaysian colleagues, it became apparent that Institute internet connections were unable to sustain access for the large number of staff and students involved in the program. The staff constructing units for the new degree program had to devise alternative means of providing support in Malaysia: in some cases printed materials were produced, in other cases, materials were burned onto Compact Discs for distribution through Institute local area networks.

Some of the issues we faced were directly related to the difference in educational cultures between teacher’s colleges and university: for example, the issue of students having to read and write in English. For some, English is a second language, while for others it may be the third or fourth! In the beginning, the large demands that working in English placed on the students was severe. Reading academic articles, writing assignments, and having to grapple with complex mathematical concepts presented in English, all placed a strain on students. However, Deakin staff ensured that the readings were fewer than for Australian-based students, and more assignments were group-based.
While sometimes exhausting and stressful, the experience of working across cultures, and collaborating with our Malaysian colleagues (now friends) has made this international collaborative program an extremely worthwhile experience for me.

**Conclusion**

The authors' differing roles in the program provide a range of rich insights into teaching mathematics to primary teacher trainees in collaboration with the Malaysian teacher-education staff. The benefits for all involved have far exceeded any problems. As a group, Malaysian and Australian staff are working in a very close and collegial manner, and it is clear that the academic and personal relationships will continue well beyond the life of the project.

Co-ordination of any program is likely to have issues, and Susie, Esther, Choo, and Brian have described some that affected them. It is worth noting though, that these issues were resolved successfully, as were all other issues encountered during 2006.

As indicated by the title of this paper, although there are many rewards in international collaborative ventures in teacher education, like the durian, there are also the less rewarding aspects. But as with durians, these negative aspects are far out-weighed by the positives.

**References**


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