This Teaching Cycle of the PGCTHE portfolio has been submitted to CADAIR with the permission of the author detailed above. It is to be used as a resource for future PGCTHE candidates and other staff as part of their professional development at Aberystwyth University. It remains the property of the author and Aberystwyth University. If you wish to cite this work then please contact the author. Contact details can be found at http://www.aber.ac.uk/en/directory/.
4. Teaching Development Reports

The teaching development reports are presented as action cycles. Action cycles are a formalised approach to: (i) reflecting, (ii) planning, (iii) acting and (iv) evaluating, and here I apply them to iteratively solving learning and teaching problems. Some people call stage (i) “identifying the problem”. The processes should be repeated ad infinitum, as long as there is the need for improvement. Much of the terminology I use here is drawn from a course I attended called, “Action Research: Understanding and Uses, a UWA staff development seminar” (see Section 5.1).

From my work over the last few years, I have chosen three examples of teaching development via action cycles. They are chosen because they illustrate particularly clearly how action cycles have helped me make advances in my teaching. These were the cycles that taught me the most about things I was doing well, and the things that I was doing badly. I also hope to show that I could measure that progress using various metrics. Two of the three action cycles presented here are discursive, with the third review taking the form of an academic paper.

This is followed by an analysis of my teaching assessments (assessment of my teaching quality, and an assessment by me of a peer’s teaching) and, as a result of the material in action cycles and teaching assessments, the chapter concludes with a discussion of teaching initiatives that I would like to introduce.

4.1. Action Cycle 1 – CS26210, Redesigning a Course

Identification of the Problem / Reflecting

I was assigned to teach CS26210 (Artificial Intelligence) in October 2002. The course had been taught by several people over the years, and it became apparent that each of them had added their favourite bit of AI to the lecture notes, no doubt because it is good for the students to hear from an expert in the field. Unfortunately, there seemed to be several problems with the existing syllabus and lecture notes: the course had become fractured and inconsistent. There was no theme to tie it all together. There was little attempt to make it relevant, and motivational, to a class of 19 year olds. And it was, in any case, out of date. In short, it needed redesigning. I defined success, to this end, as increased student interest, interaction and assessment scores.

Planning

The planning stage began with the poster that was presented in Chapter 2, however it actually drew on experience from two previous years in which I had taught 4 lectures of the course. In those lectures I also set out to be more relevant and focused than was common on that course. As a result, several students emailed me to say that they had enjoyed my approach better than that of the main course lecturer. This gave me confidence that I might be able to repeat the success on the whole course.

The main aim of the cycle was to redesign the module so that it was more accessible and relevant; changing what was taught, planning the delivery and material, and introducing a means of giving students feedback during the course. The poster in Section 3.3 was
created during the planning stage of this action cycle. Luckily, since I was allocated to teach the whole course, it was easier to achieve these goals that if I had only been teaching part of the course.

To complicate matters, I wanted to be able to re-use as much of the course material and style as possible for other AI courses that I knew I would be teaching, ranging from Level 1 (CS16010) to Master level both here in the UK (CSM6010), and in Singapore (COM6010). Clearly, the differences in background, and stage of the students would mean that they would have very different needs.

By breaking the course into segments, led by learning objectives and course topics, it would be possible to create segments of the course that were almost independent. This approach is not always appropriate, because a holistic approach to learning is often a better way to help students to see the connections that exist between the topics, but in this case the course naturally fell into blocks that could be taught in more or less detail, as required by the level of the course and the student’s needs. Each segment has a TLA.

Finally, the students needed some sort of formative assessment. I decided to set three assignments that would be completed in practical sessions. This not only meant that they would get feedback on a more personal level, it also meant that they would not have to wait for me to mark two of their three assignments - the last one would be handed in and marked by me, with the mark and comments being returned before the examination.

Given the identification of the problem, and the plan to solve that problem, I still needed some way of assessing the degree of success in solving the problem. Here I decided to get the help of the class. Since they were the recipients of the new form of lectures, I made them part of the evaluation process: they would assess how relevant and interesting they found the lectures. If they agreed that the lectures had engaged their attention more than usual, and if they could demonstrate unusual levels of understanding in the exam (relative to previous years), then coupled with the support from my few lectures in previous years, I would count this action cycle a success.

**Acting**

Before the course began, I gave out assessment forms at the beginning of the course with the aim of assessing what the students could already articulate about the course to come. I took care to do this without making the assessment exercise a negative experience by saying, from the outset, that “the average student will only know one or two things in this assessment, the aim is to find what (if any) those things are.”

The first change I made was the teaching language (that is the computer programming language) from LISP to Prolog. This is because Prolog is more often used in AI, and because it is an example of a “logic programming” language, which allowed me to teach computer logic more easily, and therefore make for greater consistency across the course.

Next, I arranged the course material so that it, “told a story”. We began with logic because it is fundamental to artificial intelligence, and because I could demonstrate it, by writing Prolog on the data projector, in real time, during the lectures. They could actually see the computer becoming more “intelligent” as I added clauses or rules, facts and questions.
This led to material on knowledge representation (KR). What’s the best way of representing a problem to a computer? Since we’d done logic I could show them that already, but I made it clear that there were other ways, and that we’d always return to the KR issue. I illustrated the KR issue with a fun internet Flash animation (Weebl and Bob, episode “Bull”: http://www.weebls-stuff.com/wab/bull/), and asked them how they would represent the cartoon in a computer. There were many answers, and more importantly, it engendered a lot of interaction in the class, and changed the tone of lectures from then onwards. At the same time, they did Prolog practicals, which were demonstrated by a lady who used Prolog every day in her research.

Thirdly, I build on their existing knowledge of “search” (from CS16010) to show how logic and knowledge representation could be used in “advanced search”. I got them to write a Prolog program to search for a route from any London Underground station to any other (I gave them a list of the connections between the stations).

Having shown how AI works, it was time to be a bit more honest about some of the problems, and to build on existing knowledge. One of the biggest is called “uncertainly”, the probable that some events don’t happen with absolute certainty; for example, if someone has spots then what illness has caused it? This then motivated the need for learning, so that the AI program can adapt to unknown situations, and improve its performance over time, like a human.

Finally, I demonstrated a program that I had written in my research that used all the elements of the course: it was written in Prolog, it required careful though about the knowledge representation, it performed a massive search for an optimal answer, in the face of uncertainty, and it learned from its mistakes to become more efficient. I then tested the class again for their attitude to the lectures, and how much they could articulate. I also did in-class formative assessments to help them learn, and to show me what they were having trouble understanding.

There were two types of formative assessment: (i) feedback from demonstrators during ‘Prolog’ practical sessions, designed to help students experience not just a new computer language, but also to help them understand the computational logic underlying it. (ii) assignment feedback, which showed them how they were doing as they progressed. I didn’t (and still don’t) like assignments because they are quite unwieldy for large class sizes, and take away a lot of lecturer time to write the same comments again and again on each script, but they are important for providing that one-to-one feedback that is hard to deliver any other way.

Returning to in-class tests, previous experience has shown that some students don’t/can’t do in-class tests well due to disabilities (dyspraxia/dyslexia). Moreover, unless I make the in-class test a formal, marked exercise (which was not always practical, and is too heavy-handed for my aims), some students would refuse to complete them. Furthermore, I was only able to see what the edges of the class were doing (upto four or five students in from the edge), which was not a complete evaluation.

To back up the in-class tests, I used what might be called ‘informal-but-deliberate’ chats with students as they arrived and left lectures. This was a form of class sampling that allowed me to have one-to-one feedback from the students on the standard of the material and the problems they were having.
Evaluating and Repeating

The pre- and post-evaluation showed a significant general improvement in the attitude of the students to the lectures. There were, however, three students who reported that they hated the interactive style of the lectures, and complained they just wanted to be taught, “without any funny business”, as one of them put it. Overall, though, the class responded well to the experiment, assessment results were comparatively good, and the department's own feedback exercise showed that attitudes were much more positive than had been the case in previous years.

One thing I had not fully appreciated arose from this: people really do learn in different ways! I had always known this in theory, but to be faced with some people who wanted to learn in a different way, even though much of the rest of the class liked it (to a greater or lesser degree), was quite sobering. How should I teach to everyone’s style? I read up on this point, and the approach that seems best to me is to try to have different styles in each lecture. Some parts are interactive, some parts are formal, some parts use visual learning, and others use interactive learning, and so on. This has the added advantage that lectures are varied and dynamic, but the danger that it might become muddled from a stylistic point of view. This is a matter of teaching skill, and I am still learning to refine this approach.

Although segmentation of the course was successful, and the units were re-usable in all the AI courses that I taught (both then and now) there were some problems. Having delivered and evaluated the material taught, it became clear to me that AI teaching across the department needed re-structuring. I found that, although the student’s response to the course was good, there was too much overlap with the first year AI course (CS16010) and further overlap in the 3rd year (CS36110). My pre-course assessment had picked up that the majority of students had had a background in AI; however, this had been designed on the assumption that any previous AI knowledge would have been from the student’s own reading/interest. I was not expecting to find that half the course had been covered before, only in less depth. This was due to a first-year lecturer diverging from the syllabus. This made it much harder to make the course interesting, although on reflection I could perhaps have emphasised the new elements, and prefixed each course segment with a revision section that covered the previously taught work, with a formative assessment at the end.

Since I chair the AI Teaching Subcommittee, I was able to raise the issue of course overlap, and since the Department had already decided to remove AI from the first year it was relatively easy to get agreement that we needed to re-plan our AI teaching from the ground up. As a result we now have an integrated AI teaching schedule that covers years 2 to M. My original CS26210 module is now split into two modules, running over two semesters of year 2, that teach AI in much the same way that I did, but with the space to teach in more detail and/or to address failing student’s needs.

A less fundamental point that I noted from evaluation was that the choice of programming language was slightly questionable, because it is still not a very common language. We decided to keep Prolog because of its usefulness in teaching logic, but it is under review. More importantly, the students reported that there was not enough time to get to grips with this language, and so, in later iterations of the module I increased the number of hours allocated to learning the computer language. This has, in subsequent
years, had the effect of helping them understand some of the theoretical aspects of the course, because they can see the practical needs of the theoretical concepts.

4.2. ACTION CYCLE 2 – CO21120, IN SINGAPORE, SIX TIMES

Identification of the Problem / Reflection

How can you teach a course six times, and not get bored – particularly if the course is intensive, and taught every six months? This section looks at several, repeating iterations of the action cycle for the CO21120 that I taught in Singapore. The course was a 15 day night-school-plus-weekends, with 55 student contact hours, and it was taught roughly every six months, over a two and half year period. Once the notes are written, and the pitfalls are noted, and removed, and the questions are anticipated, what can be done to keep the lecturer excited about the course? This was the problem to be solved because it would surely arise again and again in my lecturing career.

The material for this course was basically the same as the material that we’ll see in Section 4.3, so some of the comments are similar. However, problem addressed here is very different (avoiding boring teaching), and the students had very different needs. The successive student ‘cohorts’ (as they were called) were small groups (between 4 and 14), and they attended classes after a full day at work (Mon, Weds, Fri) or during their only time off (Sat p.m., Sun all day). Most people work Sat a.m. in Singapore. All students had a degree (this was a masters level course), and were generally motivated to gain a new qualification because they hated their jobs. Their hope was often to get a computer qualification at masters level to allow them to stand out from the competition, and they chose our course because it was validated by a UK university, again helping them to stand out from Singaporean or other Asian qualifications (they are unnecessarily disparaging about these qualifications!) All the students were paying large amounts of money to do the course, and were more like consumers than traditional students. For better or for worse, this attitude also appears to be increasing in today’s UK HE institutions, and is likely to become the norm here too.

Given this background, the course had to be particularly precise, clear, and simple – partly developed by me and partly by other lecturers. Although this is a good thing in many ways, I felt I could not change the course much because this was a polished business “product” that was being paid for by the students, and the night school. After the third iteration of the course I was finding it all overly business-like and rather clinical to teach – “Say A here. Then an exercise. Then say B.” As a result I was lacking in enthusiasm, and my teaching became stale.

Planning

Although it was not possible to vary the teaching material much, because the syllabus remained constant and was outside my control, there was one thing that inevitably changed in each class – the students! I realised that the small class sizes made it possible to use practical sessions to make a note of how each student was doing on each topic. Then I could do several things. First, I could change the emphasis on each slide to meet those needs. Second, I could insert new slides, just for this class, or even for a particular person, that dealt with their specific needs. Third, I could try out small-scale ideas, such as peer learning.