

So what for my lesson planning?

VK

The ILO for this journal:

- 1. Locate yourself in your discipline, your department, your University and wide national and international contexts.**
- 2. Explore the relationship between research, scholarship, related professional activities and teaching and learning as relevant to your own teaching practice.**

This is my final journal for Module 1. The aim of this journal is to synthesise my reflections from the previous journals to try and understand what I think it all means with regards to my lesson planning going forward through PUCTL and ultimately my teaching career.

The immediate benefit I gained from the three day workshop was the importance of lesson planning [2]. In the past the most planning I would undertake was to simply match the teaching notes to the syllabus. I plan on thinking about ILOs in all future classes I teach. This is not only due to the ILOs of this particular PCUTL module but also because it enables me to better structure the lessons I plan on teaching. I'll return to the use of ILOs when it comes to lesson planning towards the end of this journal.

In my first journal I spent a while reflecting on "what makes studying mathematics at Cardiff special". Being part of the Operational Research (OR) group made that a relatively simple task. At Cardiff the undergraduate programme contains more OR modules than other programmes in the UK and as such places it well on the agenda of employability.

In my second journal I concentrated on my scores from the various tests I undertook at the beginning of this module. I of course understand that these tests come with a major health warning and are simply meant to be indicative. As such I tried to look at them in a critical fashion trying to identify the sort of learning and teacher I was whilst being guided by the tests. The main thing I take from that journal is that I've realised that I am a very student structured learner. I was also able to localise myself on the Kolb cycle [5] and using [4] my corresponding mathematical learning style: an Analyzer and a Synthesizer.

I'll come back to what both of these conclusions mean with respect to my lesson planning and my students after thinking a bit more about "classic" methods of teaching in Mathematics.

In line with the Mathematical Subject Board indicators [6] most teaching of Mathematics is done through lectures and assessed through exams. I am obviously making a wide generalisation and stereotyping a lot of Mathematicians who are excellent teachers and for whom I have a lot of respect but my reasons for doing so will hopefully become clear. I think that when someone starts critiquing this as a methodology they are (potentially) in danger of trying to "fix something

that is not broken". This of course does not mean that one shouldn't be open to critique and importantly potential improvement, indeed the above methodology might actually be broken (who knows?). With regards to assessment of mathematics for example in [3] a discussion is given of various other techniques that can be used to assess mathematics (group projects, coursework) however I still believe that examination is often the most appropriate method (although there are of course natural exceptions).

With regards to teaching methodologies, lecturing is by far the classic methodology and it was the way I learnt. As I say in journal 2 this is also (by the time they get to University) what a lot of students are used to. Having said that upon reflection I think a big reason for this is that the people who lecture are the people for whom that system worked. As such there is a major risk that this methodology does not work for everybody. It is ultimately very important to ensure that all learning style are catered for. In particular the lecture based approach runs a risk of encouraging surface learning as mentioned in [1].

One of the major benefits (as far as personal development is concerned) of this module was the fact that I was reviewed by my mentor. I have always enjoyed being as open as possible with my performances so as to ensure they are as good as they can be (this goes by to the way young kids are taught to play rugby I believe, we're taught that feedback is never a negative thing no matter the form). I have started trying to keep this in mind with regards to my research for example where I've started putting my research code online (whilst I'm working on it and when it's possible) and discuss it openly on social networks. This is a growing trend in mathematics and one that I think is to be commended. I've already had one or two helpful comments with regards to some code I've been writing (the comments in fact pointed out embarrassing mistakes but this was of obvious benefit). So I was very much looking forward to having my mentor sit in on one of my lectures.

The lecture we picked was one that lends itself very well to role playing and student participation. This is something I am particularly fond of and was very much looking forward to teaching the students. Interestingly the first thing I wrote on the board was a mistake, I immediately realised that I was nervous having my mentor there (which I think is normal). In a way it was good to realise that I was nervous so that I could "shake it off" and just teach in a normal fashion. The lecture went well I believe (see the review and response for further details) and in particular I was able to use a majority of methods such as videos which were at the same point humorous and instructive. I also used Sage (an open source mathematical package) when needed during the lecture, this is most certainly linked to the fact that I am a visual learner. Sage enabled me to quickly demonstrate/visualise mathematical concepts to the students (I will come back to the point about Sage being open source at the very end of this journal). Finally I also played various role playing games. This was a very natural and worthy exercise in the particular subject chosen (it caters well to the concrete experience part of the Kold cycle). Importantly these aspects were naturally embedded throughout a classic Mathematics lecture (i.e. lecture with white board and notes which ensured other parts of the cycle were met). I was glad to see that my mentor and I were in agreement that this catered to all learning styles.

The general format of the lecture I think was a good one. The thing I will be concentrating on is how to mainstream this methodology. Indeed with certain subjects there is no immediate role playing games that comes to mind. Further to this videos are not always useful during the actual lecture (notions of flipped classroom [8] is something I have explored in other modules and something I am a huge fan of). If I find a way to consistently mainstream these activities I think that this will lessen the risk of surface learning from the students. Indeed simply the fact that they have to stand up to play some of the games is a huge positive as it at least ensures that they are relatively awake! Today (12/10/2012) I have spent some time planning a role playing game of sorts for a subject matter that is perhaps not as easy to associate. I look forward to trying that on the 16/10/2012 to see if it works. I also believe that by concentrating on the ILOs for each lecture it should allow me to ensure that these extra-whiteboard activities are used correctly. If anything realising that that is something I want to do has been a huge benefit of this module.

Another topic that I am keen to develop is the use of a mathematical computer packages in teaching and learning. This is not straightforward. In general courses might be completely computational (numerical analysis, simulation) in which case the use of a computer package is straightforwardly implemented “by design”. The difficulty lies in using such packages to aid students to prepare for what will eventually be a “pen and paper” exam (which is an ideal assessment for certain ILOs). I recently had a conversation with some academics (who have much more experience than me in the use of the package considered) about how to best implement such packages in teaching [10]. My thoughts on the subject is that one must make the package useful to the student and I propose three phases of use:

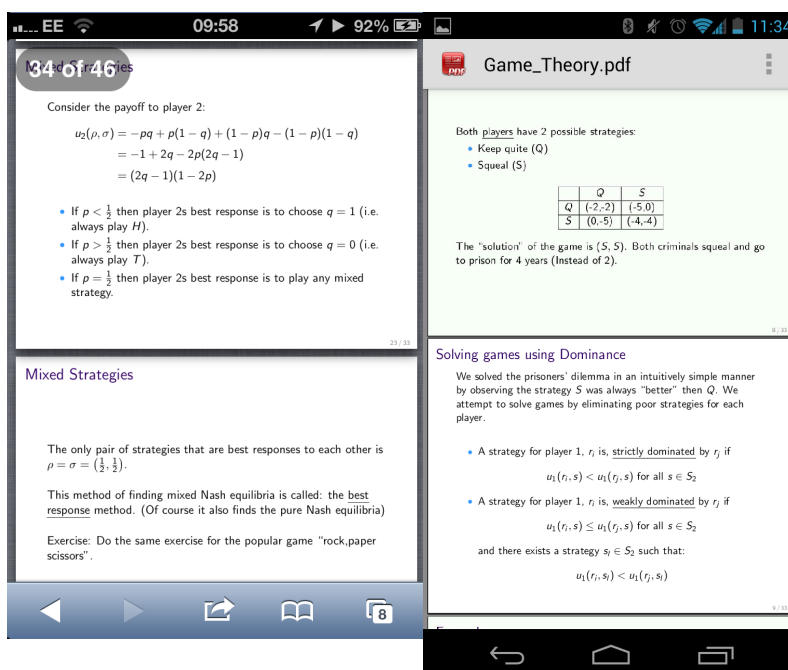
- Seeing
- Familiarising
- Using

During the first phase I make use of the package during lectures but not expecting the students to “know what I’m doing” i.e. I just want the students to see the benefit. The “Familiarising” phase corresponds to the students using the package but without needing much input and/or knowledge (the Sage interact website is ideal for this [7]). Finally the students are taught how to use the package. This format seems to have worked this year but I plan to spend more time thinking about this as I feel that the use of a computer package will be particularly suited to the Allegorizers and Synthesizers. It is also an important skill for students to gain as far as employability is concerned.

My general plan of action so to speak with my lesson planning is to ensure I cater for all learning types. As discussed in my previous journal I am a very student centred learner. To reference [9] I feel that this implies that I naturally have a Learning centred orientation as opposed to a Teaching centred orientation. Classic mathematical teaching (Lecture + Whiteboard) is a Teaching centred approach and as such I feel that it will also be natural for me to use classic methods to cater for students who need more of a Teaching centred approach. I feel that I managed this quite well in the class my mentor reviewed. The difficulty will be ensuring I

mainstream these methodologies to further subjects as well as keep an open mind to future technologies that students will expect to be able to use. This is something I'll be concentrating on in future modules.

One final aspect that I have not considered directly anywhere else in my journals is the aspect of inclusion and diversity. The main consideration from the point of view of a lecturer is to ensure that students are able to access and understand teaching materials (notes etc). In mathematics this needs to be considered from the point of view of students with disabilities that might make reading of notes difficult. A further issue to consider is software, in this day and age of digital technologies I think it is important to ensure that we do not expect students to have to have any software that is not freely available to them. As such the primary source of delivery of my research materials is in portable document format (pdfs). This enabled students to zoom in as required to ensure that they can make the text as large as they need to be. With regards to software, pdfs are a uniform format (as opposed to Microsoft Word for example which requires the purchase of Microsoft Office) that can be opened with a variety of freely available software. Furthermore with mathematical texts distributing the notes in formats other than pdf would require compatibility of software (for example the particular version of Microsoft Word being used and/or Mathtype or other). Finally in this modern day and age with individuality of consumption of digital content through smart phones and other sources I think that I must ensure that I am using formats that can be accessed through any medium. Here is a screenshot of some of my notes being viewed on smartphones (note that this is not restricted to any particular smartphones as opposed to certain apps for example):



The color of text and background in my notes are chosen to be as basic as possible (black on white) but it is my understanding that some disabilities might make various colour combinations easier to read. As such I plan to also make available the LaTeX source code for all my notes

so that student might modify them if they wished to (note again that this doesn't require the purchase of any software).

Another point of view to be considered is that of international students whose English might be weak (recalling the fact that growing an international student base is high on the agenda of Cardiff University). In a subject like mathematics this is not as big a problem (mathematics is ultimately a universal language) however difficulties might arise during my lectures where students do not perhaps understand me. I plan on further exploring ideas linked to flipped classroom methodologies (I already have a few video clips that explain certain concepts). Being able to watch a video of lecture topics with subtitles that can be repeated as needed is something I believe would be useful to all students (not just those with weak levels of English).

I have a lot of things to think about with regards to the rest of PCUTL. I think this module has helped me understand what I'd like my lessons to contain, the question arises of just exactly how to make sure that I do this throughout all my courses.

Word Count: 2222

References:

- [1] Biggs and Tang 2011 Teaching for Quality Learning at University. McGraw-Hill and Open University Press, Maidenhead.
- [2] Hussey and Smith 2003 The Use of Learning Outcomes. *Teaching in Higher Education* 8 357-368
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- [5] Kolb DA 1984 Experiential learning: experience as the source of learning and development. Prentice Hall.
- [6] QAA 2007 The Quality Assurance Agency for Higher Education, Mathematics, Statistics and Operational Research.
- [7] Sage 2012 Interact Website <http://interact.sagemath.org/>
- [8] Salman Khan 2011 Ted Talk on Flipped Classrooms <http://www.youtube.com/watch?v=gM95HHI4gLk>
- [9] Samuelowicz and Bain 2001 Revisiting Academics' beliefs about teaching and learning *Higher Education* 41 299-325
- [10] Theron Hitchman 2012 G+ Discussion <http://goo.gl/iOCyB>