Case Study

Title: 'Narrowing the Gap' – Chemistry Tutorials for non A-level students of Pharmacy and Pharmaceutical Biosciences

Summary:

This Case Study describes the implementation of extra Chemistry Tutorials to first year students of MPharm Pharmacy and MSci Pharmaceutical Biosciences in the School of Pharmacy and Pharmaceutical Sciences.

What was done:

These tutorials were started in response to a need based on exam results and feedback from students. Students who had not covered A level Chemistry struggled with a lot of the Chemistry content in the first semester of first year. This was reflected in the exam results for the first semester module. This affected students who had entered the course on the non-traditional route of A levels, ie Leaving certificate, Access Courses, BTEC or an international qualification where the same depth of Chemistry had not been covered.

The Ulster University's Five and Fifty Strategic Plan - Vision & Mission states:
"As Northern Ireland's civic university, Ulster University will deliver outstanding research and teaching that encourages the innovation, leadership and vision needed to help our community thrive" (https://www.ulster.ac.uk/fiveandfifty/home). This includes "Grounded in the heart of the community Ulster University will: encourage a diverse university community".

Within the four priorities and objectives within five and fifty, this case study relates to:

- Civic Contribution: Employment & Widening Access
- Global Vision: Diverse University Community
- Academic excellence: Teaching Excellence and Student Experience

The Ulster University Learning and Teaching (UU L & T) Strategy is also closely aligned with key strategies including internalisation and widening participation, with the strategic intent "…to enhance the student experience through the provision of well-designed, flexible, inclusive, relevant and accessible programmes and curricula that promote student engagement and success".
(https://www.ulster.ac.uk/__data/assets/pdf_file/0006/132396/Learning_TeachingStrategyGraphicVersion.pdf

I feel that the implementation of the extra Chemistry Tutorials endeavours and strives to meet these goals. More specifically, this Case Study encompasses "flexible learning provision and communities in order to respond to student diversity and preferences, and the needs and expectations of practising professionals".

This Case Study is therefore an example of enhancing practice in Ulster University and is also an innovative practice within the School of Pharmacy and Pharmaceutical Sciences.

Motivation and Aim:

Motivation:

The examination results of a first year, first semester module (PHA106) on the MPharm Pharmacy and MSci Pharmaceutical Biosciences programmes indicated that students were struggling with the chemistry component. Table 1 summarises the results for this Module from 2013-2018. It can be seen clearly that the fail rate has increased significantly each year. This was attributed to the increase in numbers of students entering on an alternative route than A levels and therefore would not have covered the same depth of Chemistry as a student entering on A level. In the academic year 2018-2019, 71% of the cohort entered on qualifications other than A levels for the MPharm programme.

Table 1. % Fail rate for first year, first semester Module PHA106 2013-2018.

Academic year	Fail rate for Module PHA106 (%)
2013-2014	10
2014-2015	12.8
2015-2016	13.9
2016-2017	16
2017-2018	21.3

This is a first year Module run in the first semester, therefore student retention and transition needed to be considered through teaching and in supporting the students through their studies (Tinto, 1993). It has been reported that students are more likely to stay in an environment with academic, social and personal support (Tinto, 2003).

A lack of self-management and study skills is a common reason for younger students to drop out (Yorke, 1999; Yorke and Longden, 2004) and a lack of academic skills is a reason for mature students dropping out (McGivney, 1996). Transitioning into University for 'interrupted' first year students can be difficult (Henderson et al, 2009). Other factors may include ability to adapt to social environments and peer pressures (Goff, 2011). More contact time and student engagement with opportunities for lecturer-student interaction should help encourage and foster skills lacking in students. A move away from the lecture style delivery is required where they feel more comfortable in asking questions and can get to know their cohort. This was the main reason for a more relaxed tutorial type environment with the aim of having a PhD tutor to take them.

Aim:

The main aim of this Case Study was to implement extra Chemistry Tutorials for students struggling with the Chemistry component of a first semester first year Module (PHA106), with a view to ensuring they get the help and support required for them to succeed in the first year and to provide them with the confidence to continue through their degree programme.

Implementation:

My aim for the Chemistry Tutorials was to make the content specific and applicable to the first year curriculum and also to 'narrow the gap' between students who had previously studied A level Chemistry and those who had taken an alternative route.

Since I have started teaching at university level, the student cohort and types of learners have changed significantly. Currently 40% of school leavers now go to university compared to only 15% in the 1990s (Biggs and Tang, 2011). This change in student cohort drives a change in university teaching to account for this range in abilities.

In order to fully implement and determine the real problem areas for students and to align the tutorials with the Chemistry content of PHA106 module and what was being taught, a questionnaire was designed to be completed by the students to determine what the needs were.

Subject areas/Modules within the A level syllabus were identified and aligned with the first year, first semester module (PHA106) chemistry components. The CCEA A level syllabus was chosen based on the fact that this is the main syllabus used in schools in Northern Ireland and the main syllabus taken by students entering on A level to the MPharm and MSci programmes. (https://www.rewardinglearning.org.uk/microsites/chemistry/revised_gce/specification/).

The questionnaire was devised and distributed to all first year students at the start of semester. Based on feedback from the questionnaire, tutorials were timetabled on a Wednesday at 1.30pm for one hour every week. Attendance at the tutorials was voluntary.

The tutorials involved covering a GCE A level Chemistry Factfile each week and was placed on Blackboard learn one week before the tutorial to allow students to attempt the questions within. The Factfile consisted of learning objectives for the subject, theory of the subject area, worked examples and some questions.

A PhD student who had previously completed the MPharm or MSci programme took the tutorials. I met with the PhD student at least twice a week to discuss material to be covered and any feedback from students. I also called in periodically to tutorials to ensure everything was running smoothly. I also worked closely with students both in lectures/tutorials and in the Chemistry Tutorials themselves to understand the problem areas and what needed to be covered next. This was done by informal discussions, minute papers at the end of each of the tutorials and teaching assessment questionnaires at the end of semester.

Successes and lessons learnt:

The Chemistry Tutorials worked very well and based on the feedback from students and the PhD tutor (see testimonials in further information) and the exam results for Module PHA106, the Chemistry Tutorials were deemed a success. The fail rate for the Module PHA106 decreased significantly from 21.3% to 6.1% in the academic year after implementation (see Table 2 below).

Table 2. % Fail rate for first year, first semester Module PHA106 2013-2019.

Academic year	Fail rate for Module PHA106 (%)
2013-2014	10
2014-2015	12.8
2015-2016	13.9
2016-2017	16
2017-2018	21.3
2018-2019	6.1

The feedback from students indicated that the use of a PhD student as tutor was key to the success. The fact that the PhD student had completed the Module and degree programme of the students made a huge difference as students felt that they could 'relate' to them. The tutorials provided students with the confidence to succeed in a daunting position and added support both academically and pastorally. Team work, self-reliance and time management and confidence in oral and written communication have all shown to be factors for success with first year students (Goldfinch and Hughes, 2007). This was particularly important for mature students entering back into study after a long period out of an educational environment.

Tinto, 1993 developed a model of student departure which considers and interlinks pre-entry attributes, institutional experiences and integration and relates it to whether a student will leave or continue with their studies at University. The model indicates that social engagement is very important for student retention alongside academic engagement.

The tutorials also forced the students to "put their knowledge to work", 'to demonstrate their understanding" and to "reflect, hypothesise, solve" (Biggs and Tang, 2011). This also increases their confidence both in their knowledge and in their ability to "speak out" in class and ask questions and be part of the discussion. Confidence in the long term planning of time management for students has been correlated with success for first year students (Trueman and Hartley, 1996). It is the student who needs to engage in their own learning and it is the role of a lecturer to challenge the students and be challenged by them in turn (Hake, 1998).

Transferability:

This practice is transferrable albeit for Chemistry Tutorials within another School or as a completely different subject area such as Mathematics (Anderton et al, 2017) which is frequently seen as a challenge in teaching first year students across numerous disciplines (Nuffield Foundation, 2011). My advice to anyone planning to implement a similar model includes:

- Know your students – what do they want from these tutorials? Design a questionnaire which includes possible areas to cover and get as much information as possible from the students as to what their background is and what their needs are.

- Align content/material of the tutorials with the problem Module/subject area, e.g. for the Chemistry Tutorials, A level Modules were aligned with subject areas covered in the first year, first semester Module.

- Provide support for the PhD tutor and develop a strong relationship with tutor. The relationship with the tutor is key to success. Recruiting them and developing their role is critical for the success of the tutorials. Keep a close eye on content, attendance, academic needs, etc. Students seem to respond well to a postgraduate student who has previously done the degree programmes – knows the tricky subject areas, the lecturers they struggle with, etc. (Arco-Tirado et al, 2019).

- Allow the tutorials to also be an opportunity for social support for students both by peers and the PhD tutor (Tinto, 1997). This is particularly important for 'interrupted' and 'mature' learners (Henderson et al, 2009) and their perceptions of 'belonging' (Goff, 2011).

- Take on feedback and be open to suggestions from the students. Let the students lead the content of the tutorials, be flexible with content and offer up opportunities to cover other problem areas.

Further information: Testimonials, References and Bibliography

PhD Tutor Testimonial

"I felt that the tutorials provided an informal environment for students to improve their chemistry knowledge base on their terms. The students were allowed to suggest topic areas they felt less confident in and we would then cover those subjects throughout the sessions. The students seemed to engage well with myself and I could tell they were improving as the weeks went on. They seemed to appreciate being able to learn with someone who had previously completed the course."

Student Testimonials

"The extra Chemistry Tutorials are very helpful and are well executed. There are topics I was not too sure of before that have been covered in the tutorials and I now have a greater understanding of them".

"I find the Chemistry Tutorials extremely helpful and always feel a lot more confident about the topics covered when I leave the class. The PhD Student is a fantastic teacher also. I really appreciate the help".

"The extra Chemistry Tutorials are great. The topics are related to the content we study. These tutorials help to breakdown certain lecture content to ascertain what is being asked in the Class Tests and exam. I am aware that lecturers do not always have time to speak to us individually. The PhD Student is enthusiastic and tries to help us with different scenarios".

"*They are very useful as everything is explained in a clear way, including any questions we have. I would like to see the Chemistry Tutorials continue and I would be attending them*".

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