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Enhancing the Learning Experience: Learning for the Unknown Future

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Stream: Diversity of the learner experience

Title: Empowering student learning through knowledge '*production'*.

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In this presentation the effects of an altered teaching methodology, in which the '*student as producer*' approach was adopted, are outlined. Currently, many students exist as knowledge consumers; however, Neary and Winn (2009) have suggested the positive effect on students learning through the inclusion of research-like activities at the core of the undergraduate curriculum; the students act as '*producers*' of knowledge.

In this presentation a third year pharmaceutical technology class were the case study group for this teaching approach, and the module focussed on pharmaceutical manufacture quality systems and legislation. Group work formed an integral part of class time as part of the altered teaching methodology. This presentation will describe the engaging and creative activities which allowed reduction in class notes and minimal didactic teaching. Students investigated individual learning styles and individualised their learning experience based on suggested techniques suitable to their style. The epistemic process of wondering, critiquing, collaboration, visualisation and connection in both class activities and the aligned continual assessments will be discussed. Finally, examples of terminal exam questions focussing on the higher order skills of analysis, evaluation and creation, which reflected the teaching methodology followed through the module, will be explored.

Pedagogic evaluation took the form of written student reflection and a student discussion forum. Students commented that the pedagogical change effectively improved their interaction, engagement and participation both in and outside class; however the initial period was difficult as they students struggled with the concept. This approach is, however, applicable to any module which currently applies a didactic teaching model.

Introduction:

Student engagement can be defined as a "*student's willingness, need, desire and compulsion to participate in, and be successful in, the learning process*" (Bomia et. al, 1997, p.294). An engaged student is more likely to achieve the required learning outcomes, to develop their social and cognitive skill sets, nonetheless it is common for many students within any student cohort to become disengaged. Reasons for disengagement are varied, but poor instructional and pedagogical practices are commonplace (Marks, 2000). Efforts to maintain and improve student engagement are common themes within all educational intuitions; changes can range from altering the physical teaching environment to changing fundamental pedagogical practices. In more recent times, increasing class size and the diversification of the student population highlight the need to ensure all students are engaged and motivated. High level engagement can be achieved through higher order thinking processes such as theorising, applying and relating; this simultaneously transforms the student from a passive member of the audience (i.e. a '*consumer'* of knowledge) to an active participant (i.e. a '*producer'* of knowledge; Biggs, 1999, a). This concept aligns to Nearys' (2009) concept of introducing research-like activities into the class room. In this case study the students worked both in small groups and individually to address challenging activities. The activities were designed to allow not only for the extraction and development of knowledge through discussion, prediction and theorising; but also creativity and imagination were fostered and supported.

Student learning styles in any one classroom can be diverse and, as such, altering teaching styles significantly to appeal to all learning styles can be counter productive as students struggle to "*identify*" with the content. Furthermore, additional variables such as student motivation, gender and cultural differences can also influence learning (McKeachie, 1995). However, student understanding of learning style is beneficial to them; it enhances learning and promotes an appreciation of the pedagogical theories employed in the learning environment (Randall, 1995). Students are empowered to take ownership of their learning; each student can study effectively and efficiently through a unique approach which was most conducive to their style (Carver et al., 1999). Empowered students are likely to become engaged students; engaged students are likely to be active "*producing*" students.

Student orientated group work formed an integral part of this case-study. Group work can be a valuable tool in teaching and learning at all educational levels, particularly in higher education. In the Sciences, group work is effective in promoting greater academic achievement, more favourable attitudes toward learning, and increased persistence through undergraduate courses (Springer et al, 1999). The reasons for including group work in this case-study are diverse, but can be summarised into three key areas:

1. Peer learning can improve the overall quality of student learning.

If given the correct environment students can learn from each other through social constructivism. Group work requires engagement; not only with the other members of the group, but also with the content. By facilitating a group discussion, the lecturer can allow the students to clarify and refine their understanding of the content through discussion and debate amongst their peers (McInnis & Devlin, 2002).

2. Group work can help develop specific generic skills sought by employers.

Students will develop life-long skills that will not only enhance their academic careers but also their career post-graduation. Students develop interpersonal skills, such as communication, as they articulate their ideas and views to the group. Furthermore, skills such as teamwork, collaboration and organisation are all developed in the safe environment of the classroom (McInnis & Devlin, 2002).

3. Group work may reduce the work load involved in assessing, grading and providing feedback for students.

Employing group work can benefit the student as the academic's time, both inside and outside the classroom, can be more effectively utilised. Once the students engage in the group task the lecturer/facilitator has sufficient time to provide feedback (and feed forward) and guide the class activities in the desired direction. Additionally, the academics outside class time can be focussed on preparation; prior planning is essential to ensure that the class time group work is suitably stimulating and challenging to the students (McInnis & Devlin, 2002).

Central to this case study was the '*constructive alignment'* philosophy of teaching; where assessment is aligned to teaching and learning activities, which are in turn aligned to intended learning objectives (Biggs, 2003). Biggs (1999, b) outlines the principles of a constructively aligned curriculum; suggesting that the learner "*constructs meaning through the learning activities*" in an environment, fostered by

the teacher. Biggs (1999, b) further suggests that if this arrangement is correctly incorporated into the curriculum design, the learner is "*trapped*" within the learning circle and cannot escape without reaching the learning outcomes. Although the analogy is a little over-dramatic, Biggs' point is easily understood. Once the student buys into the learning activities and follows the guided path suggested by the environment put into place by the teacher, the learning outcomes should be the natural direction and progression. One of the main learning outcomes should be to "*turn declarative into functional knowledge*"; teachers must make clear what levels of understanding are required from their students (Biggs, 2003). To help with this transformation Fink (2003) suggests several criteria. Critical to these criteria is employing active and varied forms of learning; coupled with regular, timely and constructive feedback. Furthermore, Barnett and Coates (2005) note that students must be actively engaged in the curriculum in order to obtain the appropriate learning outcomes. This is most effectively achieved by incorporating the students as integral parts of the curriculum; not only as a knowledge base but also as key producers within the "*living curriculum*" (Barnett and Coates, p.2, 2005).

Methodological Overview.

Case study group selection:

The student group were selected based on their participation in a suitable modules lectured at Dublin Institute of Technology, School of Food Science and Environmental Health; Quality Control and Quality Assurance, DIT Module Code: TFQM3001 and Pharmaceutical Legislation and Environmental Management, DIT Module Code: TFME3003. These modules aim to provide the student with an understanding of the role of Quality Control, Quality Assurance and Legislation within the pharmaceutical industry. These were suitable modules as there were no pre-requisites; all students were assumed to have little knowledge of the area. Each class/period lasted for one hour, twice a week for 12 weeks. The class size was 12 students, all under the age of 30. No supplementary tutorials were provided.

In Class activities:

Engaging and creative in-class activities, such as role-play, mind-mapping, and discussion forums supplemented sparse lecture notes and minimal didactic teaching. Each group activity was structured; group sizes, time and outcomes were all given to

the students before the activity commenced. The lecturer circled the room during the activity to make sure the students stayed on topic, and also to play '*devils advocate*' to stimulate the participants discussion.

Outside class activities and aligned continual assessments:

The epistemic processes of wondering, critiquing, collaboration, visualisation and connection were noted in both the class activities and, more evidently, in the aligned outside class continual assessments using blogs and reflective writing. Each student posted four individual blog entries per module per semester. The students were free to choose their own entry topic, so long as it had some relevance to the module. Abstract connections were encouraged. The students received written feedback on each blog within one week of submission. The blogs, reflective writing and associated feedback were administered through the institutes' virtual learning environment, *Webcourses.* In both modules, continual assessments contributed 40% of the final overall grade.

Terminal Assessment.

Terminal exam questions focused on the higher order skills of analysis, evaluation and creation, which reflected the teaching methodology followed throughout the module. In both modules, terminal assessment contributed 60% of the final overall grade. Each terminal exam consisted of a choice of written questions to be completed within three hours.

Pedagogical evaluation.

Pedagogical evaluation took the form of anonymous written feedback (n=12) and informal discussions with the participating students. Evaluation took place before the terminal exam and also before the continual assessment scores were released.

Examples of activities used in class:

1. **Discussion activity example:**
   Discuss the following question:
   Why do we need to have Pharmaceutical Legislation in place?
   It may be helpful to initially start with a broader query; such as:
   Why to we need to have legislation in society in general?
   Think about other concepts also, such as:
   Is it best to have local, national or international legislation?

   Group Size: 2-3
   Time: 10 mins
   Note: Nominate one speaker from each group to convey the outcomes of the discussion.

2. **Class work to outside class activity:**
   Generate a time-line highlighting the development of Pharmaceutical Legislation over the last 170 years.
   You should produce separate time lines to compare US and EU development. Where there are gaps in the timeline, you should fill them in yourself when you have access to the internet.
   Use colour and images to creatively convey the data.

   Group Size : 2-3
   Time: 10 mins + Outside Class time
   Note: Nominate one speaker from each group to present the groups timeline next class.

3. **Role play activity example:**
   Develop a role play for the following situation: *You are a Pharmaceutical Scientist working for EMEA. You have been asked to give a short talk (5 mins) on the development of pharmaceutical legislation and outline the needs and future objectives of the legislation.*
   All members of the group will help with drafting the role-play. One member will take the role of the Pharmaceutical Scientist. The other members will take the role of the audience members. The Pharmaceutical Scientist must address at least one (pre-prepared!) question from each of the audience members.

   Group: 3-4
   Time: 45 mins

4. **Open ended compare and contrast example:**
   Compare and contrast the different European licensing application procedures.
   Each group should decide their own column heading titles.
   All members of the group will help with developing the table.

   Group: 2-3.
   Time: 10 mins.

Note: One member will present their groups table to the rest of the class.

5. **Aligned imagination/creativity activity example:**
   Marketing Authorisation Review/Example.
   Read through the following sample *Marketing Authorisation Form*.
   Fill in the form for an imaginary drug your imaginary company has just completed R+D work on.

   Groups 3-4.
   Time 20 mins.
   Note: Nominate one speaker from the group to describe the form to the class.

6. **Conceptualistaton and Visualisation activity example:**
   Review the first five objectives for the latest EU Pharmaceutical Legislation.
   Conceptualise and visualise the key points from the objectives.
   Convert the words from each objective into a simple image.

   Groups: 3-4.
   Time: 20 mins.
   Note: Nominate one speaker from the group to describe the images to the class.

Examples of aligned terminal exam questions:

Sample Question One:

The European Medicines Agency (EMEA; the European agency for the evaluation of medicinal products) was set up in 1995 in an attempt to harmonize (but not replace) the work of existing national medicine regulatory bodies. You are a Legislation Specialist working for EMEA. You have been asked to give a short talk on European pharmaceutical legislation and market authorisations to a group of visiting third level pharmaceutical manufacturing students.

In your short talk (discussion) you should; compare and contrast the current marketing authorisation methods available to pharmaceutical manufacturing companies, highlighting the timeframe and requirements for each application procedure. Discuss the advantages and disadvantages of the current authorisation application procedures, and also examine any recent legislative developments and the potential consequences of such legislation.

Sample Question Two:

You are employed as an R+D Scientist in medium sized pharmaceutical company and you have been assigned the job of discovering the company's new blockbuster drug (the choice of drug is up to you). Outline your decision making process as part of your initial discovery.

Discussion.

Assessment is an inescapable fact of third level (and indeed first and second level) education. Although it cannot be removed entirely from a curriculum, subtle changes can result in positive outcomes not only for the student, but also for the lecturer. For example; correct alignment of class activities, feedback and learning outcomes with the assessment can have a large effect on the overall perception of assessments by students. The common view of students is often "*what do I have to do to pass the assessment*", or "*is this topic/concept on the exam*", which correlates well with Bouds (1998) and Gibbs and Simpsons (2004) comments on assessments:

> "*Assessment methods and requirements probably have a greater influence on how and what students learn than any other single factor. This influence may well be of greater importance than the impact of teaching materials*" – Boud (1998).

> *"What influenced students most was not the teaching but the assessment"* – Gibbs and Simpson (2004).

These comments are both worrying and true; however, it is up to the academic staff to address these issues by careful selection of appropriate and aligned assessments that correctly, and fairly, appraise a student's attainment of the learning outcomes. In this case study, the aligned in-class tasks both activated and engaged the student. It changed the individuals within the group from passive consumers to purposeful producers.

> "*While in the groups, I could give my own opinion and suggestions as well as learning about other ideas from my fellow classmates which I wouldn't have thought about myself*".

Boud (2001) highlights that in everyday life people continually learn from each other, so why should the classroom be any different? Students can learn a lot from explaining their view on a concept or question. Indeed, a student will often ask another classmate for help before seeking academic advice. This intrinsic kinship can be harnessed and directed through appropriate group activities, which simultaneously question and engage the participants. If the assessment is aligned to the in-class activities, as in this case study, the innate dislike of assessment can be

reduced. Instead the student continues with group discussion, imagination, theorising and, ultimately, development of their own "*production*" space within their personal learning environment. The student becomes more confident in their role as a source of support for others within their group and the progression towards knowledge producer continues.

> "*Blogs were the talk around the coffee table among my classmates. We would tend to discuss ideas for new blogs or share some ideas from the blogs in which we had learned while researching the topics for them*".

Blogs were a natural progression from the in-class activities, and provide a medium through which the students could continue to be both creative and productive. Blogs are known to promote independent thinking and reflection which is crucial for "*deep*" learning (Kim and Bonk, 2006). Even though the blogs were assessed and graded, the case study students had now moved towards independent research on relevant topics that interested them, and therefore the general dislike of assessment was removed. Furthermore, the students could blog at anytime, anywhere, removing the dreaded submission deadline. Ultimately, blogging makes learning flat, not hierarchical; the lecturer acts as facilitator rather than the unique source of information and interpretation (Segesten, 2011).

> *"The reflective blogs were a huge part of the module and highlighted the importance of individual research. I found myself researching articles, papers and books in order to gain more information on the topic on which I was blogging. I found this of great interest as I was reading newspapers and watching television programmes with a scientific view. I found the blogs an interesting method of learning as the research I carried out for each blog stayed in my head making the lectures on the topics more interesting and understandable*"

When setting an assessment it is crucial that it is aligned to the learning outcomes of the module; for example, if the learning outcomes require development of critical thinking skills, then the assessment must include some evaluation of the student's critical thinking skills. Without correct alignment the student will question the need for

certain topics/group work/assignments within the lecture course as they will not be assessed correctly on developing the '*required*' skill(s). This questioning could lead to disinterest, lack of motivation and, ultimately, disengagement. In this case study, the terminal exam questions echoed previous group activities, although worded differently to probe the individual students higher order thinking skills. These questions also allowed for creativity on the students part.

Assessment should not exist without feedback. Typically, feedback can be summative or formative. In this case study, formative on-line feedback allowed students to take on board suggestions, comments and constructive criticisms that improved future blog submissions. Informal feedback on group work took place during and after class time discussion. Reduced didactic teaching permitted more class time to discuss group comments and give feedback (and feed forward).

Reduced didactic teaching was achieved by providing lecture content and additional directed reading prior to class, via the institutes' virtual learning environment. The students were required to prepare, in their own time, by reviewing the topics to be discussed in the upcoming class. In order to support the students' personal preparation and self-study, each student undertook an on-line VARK learning style evaluation (Shannon Consortium, 2011). By empowering the students to self-learn and prepare, more class time could be dedicated to engaging activities and discussion of the topic rather than didactic teaching. Students were central to these class activities and drove the discussion; the lecturer instead acted as a discussion facilitator.

> *"I also became aware of my learning style. I was not surprised to learn that I was a visual, verbal, sensing and intuitive learner. However, when the lecturer later introduced a group activity involving concept mapping I was astonished as to how I was capable of understanding, and remembering, so much material".*

Although a powerful teaching approach, group work is often resisted by students. Reasons for this are diverse; however, one of the most common problems, inequality of grade distribution, was avoided in this case study as group work was not graded. It is interesting to note that the fair allocation of the group's marks at an individual

level is a major problem for students. Students can become frustrated by improperly assigned scores based on perceived levels of commitment/performance as part of a group. Grade adjustments are one way to achieve a sensible individual grade within a group assessment, although this is also subject to continued debate (McInnis & Devlin, 2002).

In this case study the fear of change was observed as the main barrier to initial student uptake. Students become familiar and comfortable with the prevalent teaching style within an institution. Oftentimes this is a passive environment for the student; they sit and consume. By flipping the classroom, to create an active and productive learning environment, students are removed from their comfort zone and this can lead to tension between the class and the lecturer. Initially in this case study, this was the biggest problem:

> *"The lecturer outlined how there was going to be a lot of group work throughout the course; the whole class cringed at that idea, including myself. I don't know what it was that I really didn't like about it, whether it was just that we had never done anything like that before and the thoughts of it seemed kind of stupid".*

Prior planning is also essential to ensure that the group work is suitably stimulating and challenging to the students. Furthermore, by providing the correct support and environment for group learning the students quickly became engaged and productive.

> *"I believe I have learned more through discussing and evaluating questions and topics with my classmates during group work in our lectures than a 'regular' lecture".*

CONCLUSION.

As children we all learn by doing; we develop our knowledge through experience. Creating knowledge as such comes readily to young children; however, as we progress through the educational system the space to create this knowledge is quickly reduced until it is finally removed. Currently, many students exist as knowledge consumers; the core skill of learning how to learn is often times a burden in their time deficient lifestyle. In this case study the effects of an altered teaching

methodology, in which students became knowledge “*producers*” through research-like activities were investigated. Students were empowered with personalised learning skills and time was dedicated, both in class and during student self-study, to creative and engaging tasks. These tasks were carried out in student centred groups and also individually. Following evaluations students commented that the pedagogical change effectively improved their interaction, engagement and participation both in and outside class; however the initial period was difficult as they students struggled with the concept.

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