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A Multilevel Approach to Student Empowerment: Examples from Biomedical Science

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Abstract

Here we describe our multi-leveled approach to empower students and teaching staff in an undergraduate Biomedical Science Program. Empowerment has been described as a process of creating intrinsic task motivation by providing an environment and tasks which increase feelings of self-efficacy and energy. This environment is created in the Biomedical Science program using four interrelated strategies: 1. In a first year core course, the development of meta-cognitive skills is facilitated using the blank page technique for learning anatomy which provides students with the power to regulate their own learning. 2. In another core course, students develop competence and mastery in synthesizing information and applying knowledge using real life case studies within a directed framework. After inclusion of directed case studies in the curriculum, students are able to perform better on assessment that requires synthesis and analysis of information. 3. Empowerment of laboratory tutors through discipline-specific peer observation professional development program to provide a better learning environment in which to empower students. This program supports reflective practice and situated learning, and creates a community of practice for these junior staff members. Tutors report increased self-efficacy after taking part in the program. 4. At the program level, a flexible model of course and program delivery has been developed providing options for remediation, mid-year entry, online learning, intensive learning and non-traditional class-room learning. This has empowered students in the digital age by providing flexibility in the way that they engage with the Biomedical Science curriculum without sacrificing laboratory skills and other key graduate outcomes. These multilevel changes have empowered students and staff towards creating capable, highly skilled Biomedical Science graduates.

Keywords: Empowerment, metacognition, case-study, reflection, flexibility;

1. Introduction

In this manuscript, we describe the components of a four levelled approach to empower students and teaching staff in an undergraduate Biomedical Science Program. An essential feature of empowerment is intrinsic task motivation, a behaviour that is driven by internal rewards. For specific tasks to foster intrinsic motivation, they may be assessed by individuals based on several dimensions, which are considered to have additive motivational effects [1.] These include impact, competence, meaningfulness and perceived choice. Herein we describe how we have embedded these dimensions into an undergraduate Bachelor's degree program to promote student empowerment.

2. The Blank Page Technique

Anatomy & Physiology are core courses in the Biomedical Science program. Most first year students have had very little exposure to the discipline of Anatomy & Physiology, which requires specific learning strategies, and an acute awareness of their cognition. Metacognition has become known as a learner's awareness of the processes by which they learn or an ability to self-regulate and self-manage their learning [2]. New students often feel overwhelmed by the content in anatomy & physiology which, without appropriate learning strategies, can lead to student failure and subsequent attrition [3]. In order to develop learning competence and intrinsic motivation among first year students, we developed an exercise to promote metacognitive skills in the anatomy laboratory called 'The Blank Page Technique' [4]. This technique is totally transferable to other disciplines because the outcome of improved metacognitive skills depends on the same process of making students aware of their learning deficiencies, and providing opportunities for them to rectify the deficiencies.

The blank page technique involves (i) active learning: drawing and plasticine modelling and (ii) metacognition: planning, monitoring, reaction to errors and reflection. We evaluated it effectiveness in 2016 [4], and the procedure is outlined as follows. During anatomy sessions, we created a "blank

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page" room which was devoid of all resources and visual cues. Students were given white board markers and plasticine and asked to recreate a variety of anatomical structures without referring to resources. They were asked to persist for 5-10 minutes during which time, the students became acutely aware of their knowledge deficiencies. They were then allowed to refer to resources briefly and return to the task. After the session, students were asked to respond to a questionnaire and indicate from a number of descriptive phrases, the most accurate description of their experience of the "blank page" session. Students most frequently indicated that it "made them think".

To evaluate its effectiveness we divided the students into groups. One group entered the "blank page" session and the other group entered a separate room and were instructed to completed standard review questions. Their performance on the quiz was compared and we found students who completed the active metacognitive activity performed better on the quiz than those students who completed review questions.

Empowering students by impacting their own consciousness is an essential step for developing learning competence. Teaching metacognitive skills is easy to implement into any first year program and a cost effective way of improving student engagement and success.

3. Case studies

Students appreciate meaning when learning tasks that are relevant, realistic, and authentic, and represent the natural complexities of the 'real world' are provided [5]. In the first year foundational genetics course, Genes and Disease, guided case studies have been included in the curriculum. Case studies empower students by helping them develop mastery in applying knowledge to real-world problems. Students become competent in synthesising information, such as molecules and human disease, and develop analytical and diagnostic thinking skills [6]. Importantly, students themselves acknowledge the learning gains from case studies [7]. In this first year course, authenticity is important to connect molecular subcellular information to the complexities of real life. The case studies have been sourced and adapted from the literature and integrated into the curriculum, with a number of directed questions and clear assessable learning outcomes.

As this is a first year course, we believe that it is important to use a directed approach instead of an open-ended approach in which students provide a solution to a complex problem [8]. The directed approach involves a story or scenario and students are asked specific leading questions that prime them to apply the information just learned. Further problems can be added to encourage analytical thinking, and prepare students for more complex open-ended cases.

Since the addition of directed case studies into the curriculum, students have performed better on higher order thinking questions and we have been able to increase the amount of these types of questions in exams without any reduction in student grades. This suggests that the inclusion of case studies is helping students develop mastery in more complex questions that require analysis of multi-layered information. Furthermore, student feedback has been extremely positive, showing that students appreciate meaning as provided in the case study curriculum inclusions. An example of the comments from anonymous student feedback is as follows.

"Case studies, and examples were really interesting and comprehensive. It allowed me to really understand the content, and at the same time relate it back to the real world."

"Case studies presented at the end of lecture content highlighted the relevance/ application of our learning."

"The case studies were interesting and were a "treat" at the end of a lecture."

4. Tutor Peer Observation Program

Bioscience laboratories are specialised and tightly regulated learning environments which encourage kinaesthetic learning. In addition, these learning environments have health & safety considerations and guidelines that must be implemented. As undergraduate allied health programs continue to expand there is an increased reliance on laboratory tutors to engage, mentor and teach students. Laboratory tutors (often postgraduate students), working closely with students in the laboratory have the potential to make a strong impact on student learning. Conversely, inadequately trained laboratory tutors, can make a negative impact on student learning outcomes.

In our Biomedical Science program we identified a need for a specialized profession training program for laboratory tutors. In response to this need, we developed (i) a framework listing the professional qualities of a laboratory tutor (3P's matrix) and, (ii) an efficient on-the-job training program based on peer observation and situated learning [9]. The program was piloted in 2015 [10] and consequently embedded into our tutor training/induction process.

Briefly the program involved participant tutors to register two available sessions to either be observed or observe another tutor (peer). Course convenors also made themselves available to observe and give feedback. The observee would prepare a brief summary of the learning outcomes and aims of the session and observers would make notes and provide feedback. Feedback sessions would take place in a coffee shop on campus and were designed to be informal and supportive.

After the program was piloted, participant tutors gave overwhelming positive feedback for the program. They particularly liked the 3P's framework which acted as a guide for their professional conduct enabling them to learn "on-the-job" and form new practices to improve their teaching ; a demonstrable outcome of situated learning [9].

Since the implementation of the professional development program for laboratory tutors we have observed a growing community of practice among the tutors and an improved learning environment for the students. While the ultimate aim of this program was to empower students, it satisfied the aim indirectly via the empowerment of tutors.

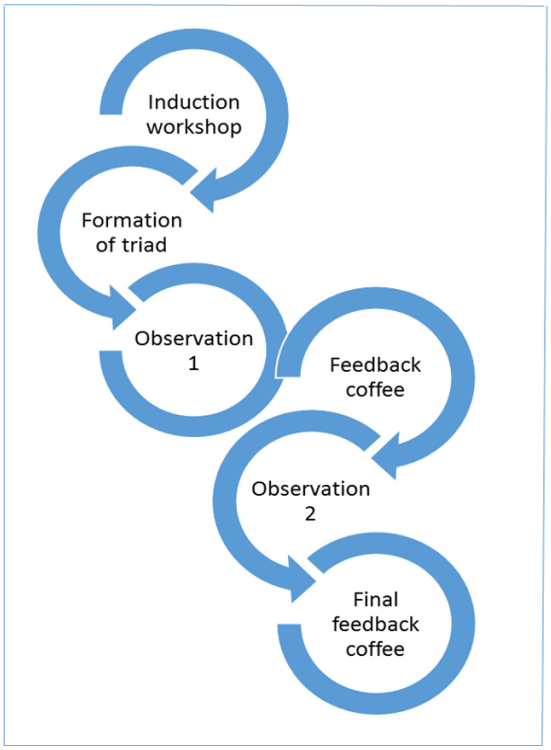

Figure 1. Process for the peer observation program for laboratory tutors.

5. Flexible delivery

The fluid and fast-moving nature of contemporary society is creating new opportunities for responsive and innovative practices that provide more choice in the way that students engage in their programs in higher education. In the Bachelor of Biomedical Science program we have developed flexible quality learning opportunities to meet the growing heterogeneity and varied needs of the student population. Specifically, we have developed a transferrable model of delivery of 8 core courses over a trimester first year, allowing students the flexibility to study courses in intensive, flexible or standard on-campus mode. This model allows trimester 2 entry and 'catch-up'; remediation and catch-up, or the ability to spread courses over 3 trimesters without the need to extend beyond the usual term of the program.

Such strategies provide important opportunities for students, particularly those in first year, who are transitioning into higher education. The curriculum continues to offer key learning experiences including those that develop important skills and competencies in the form of practical laboratory sessions, delivered in a collaborative environment, but with more flexible opportunities for students to participate. Our model offers three modes of course delivery:

1. Standard mode, offered in all trimesters, where courses are delivered over 12 weeks in a traditional lecture style format.
2. Flexi-mode, offered in all trimesters, where courses are delivered over 12 weeks in a flipped style.
3. Intensive mode, offered in trimesters 2 and 3 where courses are delivered over 6 weeks in a flipped style.

A visual representation of the Foundation Year Health Flexible Learning Model is in Figure 2.

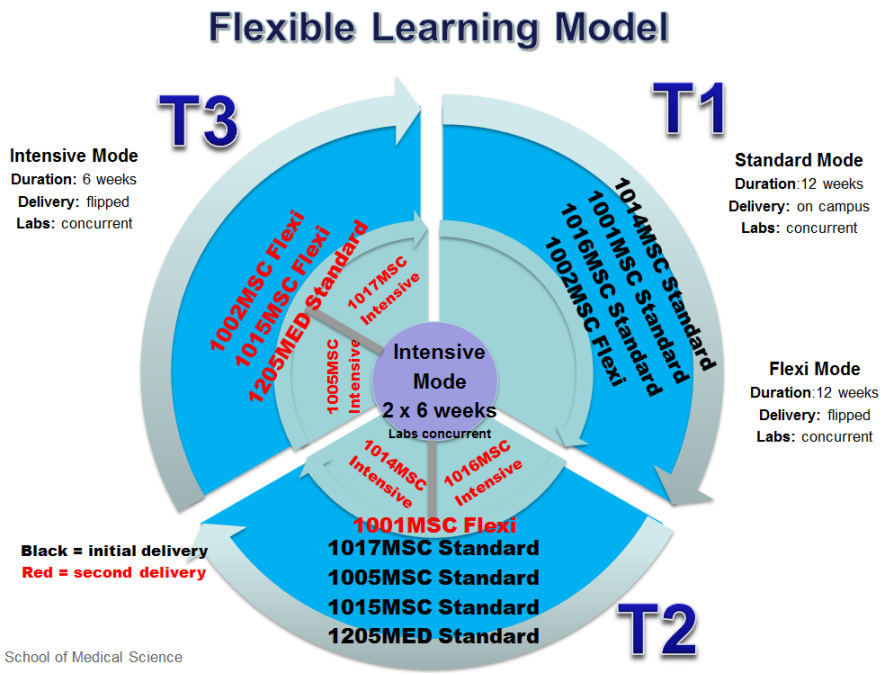

Figure 2. The flexible learning model

1001MSC: Chemistry 1; 1002MSC: Biostatistics; 1014MSC: Cells Tissues & Regulation; 1016MSC: Anatomy and Physiology 1; 1005MSC: Genes and Disease; 1015MSC: Chemistry 2; 1017MSC: Anatomy & Physiology 2; 1205MED: Health Challenges of the 21st Century

Integral to the success of this approach has been innovative student-centred content delivery and assessment. For the 12 week flexi and 6 week intensive mode deliveries, we developed a flipped learning experience with provision of custom lecture recordings along with a range of carefully curated additional resources. Additionally, appropriate welcome, introductory and topical videos were developed to achieve learner engagement and support. Class contact time then focused on integration and application of knowledge, via a range of student-centred activities. Such an approach has been shown to provide more authentic, collaborative, engaging and higher-level learning experiences [11]. We developed innovative student focussed formative and summative assessment strategies within the new model. These included early online 'diagnostic' assessment, less weighting on final exams, and flexi-level and adaptive testing strategies.

While the literature shows that students prefer more flexibility in their education [12], the potential challenges to this approach must be acknowledged and addressed. Allowing students greater choice and independence may also lead to less face-to-face interaction with peers and teachers for students who choose more off-campus learning activities. To avoid pedagogical solitude and disengagement, we embedded a strong pedagogical relationship throughout each course, including encouragement of student-student and student-teacher interaction, timely and relevant feedback, innovative formative

and summative assessments with expectations clearly articulated, and strong student support. Our flexible model of course and program delivery has been running for 12 months and we have had strong enrolments in each of the course deliveries, similar student performance in each of the course deliveries, and increased student satisfaction evidenced by anonymous student feedback and focus group interviews along the themes of greater choice and flexibility making it easy to balance work and study, and making university less stressful. Our flexible model of course and program delivery has empowered students in the digital age by providing flexibility in the way that they engage with the curriculum without sacrificing important skills and other key learning outcomes.

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