

## HOW ONLINE COURSEWORK IMPROVES THE EDUCATIONAL ATTAINMENTS IN CLINICAL TRANSPLANTATION

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### **ABSTRACT**

**Introduction:** Distance education is not yet popular in clinical medicine due to the strongly ingrained belief among medical professionals that face-to-face and bedside teaching is a pre-requisite to learning clinical medicine. Transplantation Science is a challenging subspecialty to teach and we demonstrate how our educational approach can be effective in improving the attainment of the postgraduate students.

**Methods:** This online course was designed in the UK by an international board of academic and clinical experts and attracted international students (n=28) from 12 countries.

The diversity of the student demographics presents inherent challenges mainly due to a fundamental disparity between perception and implementation of the knowledge. We employed multi-disciplinary coursework as the main strategy to improve the attainment of these students to overcome these challenges.

**Results:** The significant attainment changes noted by implementing multi-disciplinary coursework-based pedagogy is exemplified by qualitative and quantitative improvement in performance in the final assessment marks when compared to the first assignment ( $66\% \pm 3.2$  vs  $56\% \pm 5.1$ ,  $P < 0.05$ ). This improvement is reflected in 'habitual use' of critically reflective practice and implementation of evidence-based medicine.

**Conclusions:** Well-designed, multi-disciplinary formative coursework is a valuable tool to develop the attainment of postgraduate sub-specialty trainees perusing a career in clinical medicine.

**Keywords:** coursework, transplantation, attainment, online course and distance learning.

### **Introduction**

As an undergraduate medical student, we all have had anxious moments in the period leading up to examinations. Many of us thought that education, without examinations, would be an enjoyable experience. Unfortunately, because of the requirements of educational bodies, peer pressure and expectations from parents, examination scores become a surrogate marker of the knowledge achieved and success in doctors' future medical careers. In this kind of culture, the aim of examinations is to nominate "who is the best performer", rather than establishing 'who has virtues of being an effective doctor', where doctors should be endowed with knowledge, attitudes and behaviours commensurate with life-long learning appropriate to a safe doctor (GMC, 2013). Critical reflection on, and appraisal of, one's own practice have not been on the medical educational agenda until recently. Traditional didactic approaches to learning are not geared up to implement the ethos of continuing education as a way of life. Traditional medical education was neither designed nor subsequently perceived as the driver of continuing life-long education. Focus on examination-based rather than coursework-based education leads to "patchy" patterns of learning. Such focus leads to 'surface learning' where students learn to regurgitate information in the examinations leading to a situation that undermines 'deep learning' by missing on key areas of medical curriculum that remain un-assessed (Newble and Enwistle, 1986). Surface learning has an untoward effect on patient management, increases the incidence of adverse events and jeopardizes the patient safety, which goes against the grain of modern healthcare as suggested by Durani *et al* (2013).

As more mature students, we realised that the nature of assessment in general and coursework in particular, could drive the learning process and change the behavior as suggested by Gibbs (1999) and Wass *et al* (2001), where

medical education should have a positive impact on medical practice as suggested by Carr et al (2014). We appreciated the concept that medical education is not just a passive knowledge transfer, which works well with the student at the receiving end (Lavis et al, 2003). Rather, we strongly believe that the opposite is true, where assessment signals the beginning rather than the end of education (Cumming and Maxwell, 1999).

The skills learned from coursework can be, if properly blueprinted, implemented in day-to-day working life. Evidence-based, reflection-driven, critical appraisal of evidence, academic honesty, meeting deadlines and many other principles enforced by well-designed, formative coursework all are behavioural attitudes required to succeed in medical careers.

A well-designed education system has many drivers that work together in harmony leading to one goal, a successful medical career. It is a “package deal” where a well-designed curriculum, robust assessment strategy supported by high quality, research-led teaching and technology drives education to improve student learning (Sireci, 2007). In fact, a quality education is the product of continuous interaction between curriculum, instruction and assessment as suggested by Hamblton and Pitoniak (2006) (figure 1).

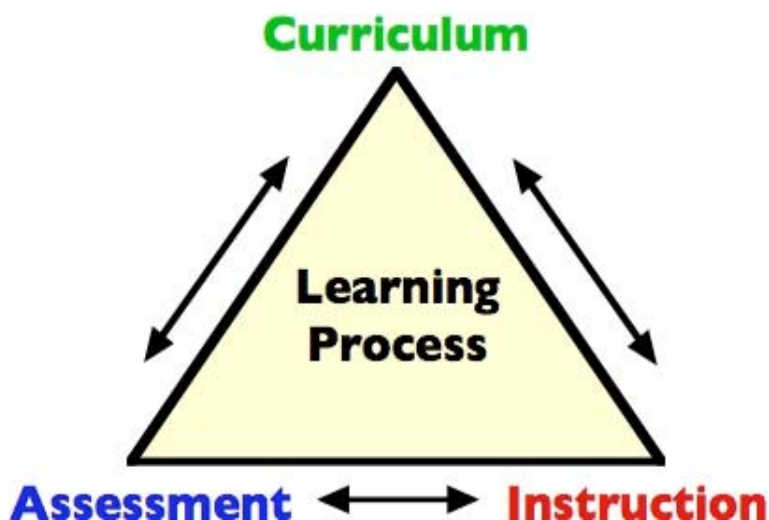


Figure1. The Curriculum-Instruction-Assessment Cycle

In this article, we illustrate our experience in conducting a 30-credit postgraduate online modules (level 7, formerly Masters level) in transplantation science. The modules were designed to deliver up-to-date, research-led knowledge to support state-of-the-art clinical experience in transplantation reflecting the clinical practice of many UK as well as well-known international transplant centres. The modules run over a 26-week period, with 300 hours of student effort expected for a 30-credit module. Twenty eight doctors (surgeons and nephrologists) were recruited from 12 countries. Some students are experienced consultants in related sub-specialties and were keen to expand their experience in transplantation science. Activities include interactive online lectures/tutorials, clinical case scenarios, journal club, MCQs/quizzes, discussion fora, formative and summative assessment. All materials to support these activities are released online in a 10-day cycle. Formative and summative assessments are phased to ensure students are afforded feedback to enhance their performance as the module progresses. A variety of formative coursework formats were offered, some were visible to the entire group (multi-disciplinary clinical scenarios and critical appraisal of current/leading scientific papers to promote reflective learning) to facilitate peer support; whilst others were only visible to the individual students (notably MCQs with ideal answers reflecting on the national and international guidelines, feedback on draft assignments and constructive specific feedback on individuals contribution to discussion fora). The underpinning philosophy was the implementation of knowledge into clinical practice to traverse the theory to practice interface. Consequently, the needs of a diverse geographic group of international students were integrated into the design during the planning phase. It is challenging to teach the implementation of evidence-based medicine in transplantation science remotely under different sky and on different soil, mainly due to the fundamental disparity between perception and implantation of the knowledge where the knowledge is not translated into behavioural changes (Miller, 1990). Difference in the local resources, which has a strong influence on the medical practice, was a further challenge. Many of these international students work in an environment suffering from limited resource, absence of local guidelines and lack of awareness of international guidelines.

The learning style of these mature international students has been an educational challenge for the faculty. A common theme emerged early in the delivery of the module notably that these students had little experience of self-directed learning and placed too much reliance on the tutor to feed the knowledge. We adopted the formative coursework strategies to cross these virtual barriers and bridge these gaps.

### Coursework strategies

In our opinion, performing well on a particular assessment task is not the same as achieving the learning outcomes. The educational institution may focus on improving the student's performance using a particular test instrument, for example, practicing MCQ may lead to mastery of the instrument itself rather than focusing on testing knowledge and its application. The Universities and Colleges Admissions Service (UCAS) in the UK focuses mainly on students' acceptance in higher education. It indicates the performance of the individual student rather than reflecting school performance. These types of tests also are not designed to test the retained concepts and they do not promote behavioural development. Additionally, they do not encourage reflection and foster evidence-based practice as a way of life. For these reasons, they do not have a long-lasting educational outcome, rather they test only how good the student is in mastering the test instrument.

Consequently, we designed this transplantation module to be a dynamic pedagogy, a form of teaching that integrates assessment, curriculum and instruction in the service of learning. The constant adaptation of assessment, curriculum and instruction in response to both the potential and demonstrated learner behaviour adds a labile quality to the construct.

### Coursework format & monitoring the student's progress

The formative coursework was punctuated by summative assessments at 3 phased specific intervals over the 26-week period (weeks 12, 18, 26). Nature of summative assessment were written assignment, evidence based management planning and a poster presentation respectively. We designed these summative assessments to gauge the attained knowledge, monitor the progress of students and identify underperforming ones. The assignments were clinically oriented addressing the behavioural attitudes and clinical skills required to be gained as suggested by Miller (1990). Carr *et al* (2014) also supported this view where they demonstrated that academic performance has a strong impact on performance as a practicing clinician. The assessment strategy also required the consideration of employment skills required for continuing education including communication such as written, narrative, scientific, critical appraisal, evidence-based practice, synthesis and concise presentation. Students were encouraged to submit a draft prior to final submission and another feedback was provided promptly after final submission to "feed forward" into future assignments. Our objectives being to improve the cognitive skills "know" and "know how" as in Miller's taxonomy (figure 2) (1990). We designed clinical scenarios to address the behavioral skills "shows how" and "does" through the proper application of concept, sensible justification and reasoning and also by reflection on the student's local practice. We aimed to inspire the student with other unrecognized dimensions of the coursework such as copyright, referencing and meeting the deadlines to change their educational behaviors to improve their attainments (Taylor and Hamdy, 2013).

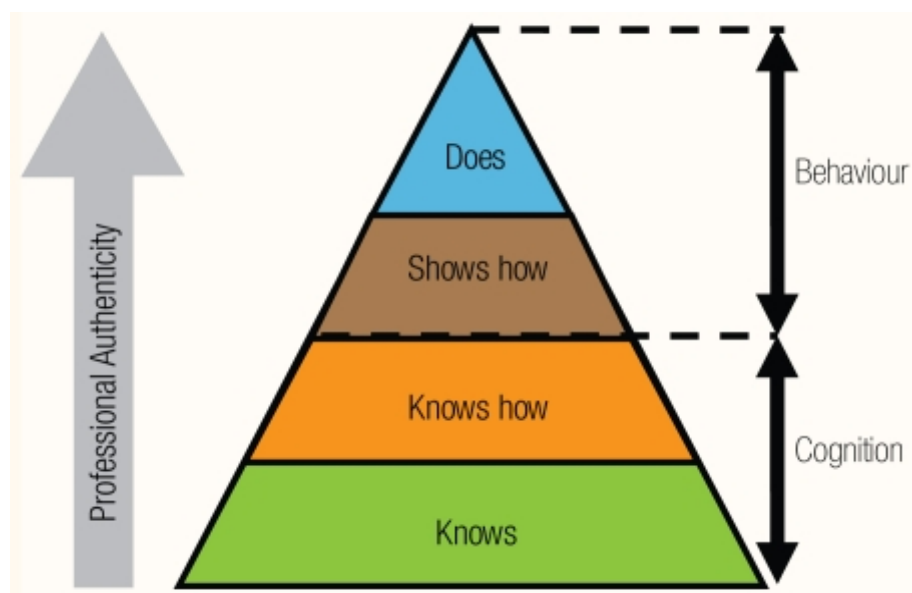


Figure 2. Simple model of competence (Miller, 1990)

### **General considerations**

The design of this module is based on the “backward design” as suggested by Wiggins & McTighe (1998). We tailored the assessment to ensure that the published module learning outcomes were assessed. We reshaped the knowledge attained in a format acceptable to the student’s local practice and culture; for example, the principle of brain death is not acceptable and donation after cardiac death constitutes an ethical dilemma due to religious reasons. Transplantation science involves many judgments calls, and the best answer often depends upon the precise context. We train the students to reason and justify their treatment plan based on the available resources at their work places supported by the up-to-date scientific and clinical evidence base. Indeed, this coursework-based formative and summative education strategy allows better exploration of the depth and breadth of knowledge, affording students the freedom to study a complex subject area from multiple angles and different perspectives.

### **Benefits of formative and summative assessment strategy**

Coursework was planned to address many other behavioural skills such as critical reflection and complex achievement (Linn & Miller, 2005). Our emphasis has been on how to integrate critical thinking and problem solving (behavioural changes), which is one of the major learning objectives of this module, thus encouraging students to design rather than regurgitate their response (Linn RL & Miller MD, 2005). This also allows direct assessment of other cognitive skills, critical analysis skills, information literacy and writing skills (Pangaro L& ten Cate O, 2013). All these “extras” match very well with state-of-art audio-lectures delivered by experts. We promoted peer assessment of formative coursework as an innovation in teaching and learning on this course to encourage team-based learning (TBL) as suggested by Parmelee and Michaelsen (2010). This educational approach provides “added value” to the student experience, enhancing active learning, critical reading/thinking and promoting engagement of the students.

We mirrored the coursework with high quality constructive feedback mechanism as suggested by Hesketh and Laidlaw (2002). Delivery of this extensive feedback was based on user-friendly and familiar instruments such as the university blackboard® e-mail (Curtis& Lawson, 2001), Viber®, Skype® and Facebook®, (Davidson-Shivers *et al.* 2001). Underperforming students were further supported with robust mentoring facilities and escalation of the level of communication between the course faculty and these students.

We were able to support 5 high quality coursework submissions to be published in peer-reviewed journals and presented at international meetings, reflective of the high level of student attainment in academic practice and promoting the principles of additional skills such as referencing, copyrights and academic integrity.

### **Performance indicators**

We employed Kirkpatrick algorithm (see figure 3) as a performance indicator aiming at moving the student up in Kirkpatrick pyramid (see below).

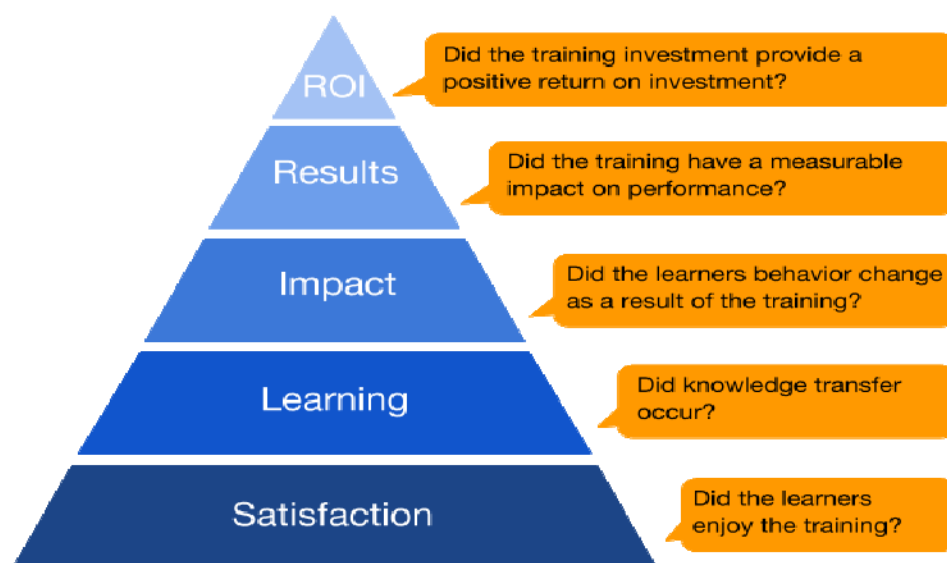


Figure 3: Kirkpatrick pyramid for programme evaluation (after Phillips 1996).

**Satisfaction (level 1):**

The university conducted an anonymised end of module evaluation online survey and data collection. 93% of the cohort documented excellent satisfaction in all domains addressing the organisation of the module, suitability of the teaching style, the communication and support provided by the faculty and the assessment tools used (80% strongly agreeing, 20% agreeing with satisfaction in each domain).

**Learning (level 2):**

Twenty-eight students commenced the module. Seven students re-sat one or more of the assignments. Five students failed assignment 1 (written assignment), one student failed assignment 2 (evidence based management plan), two students failed assignment 3 (poster presentation). At completion of the module, twenty-six students achieved a pass (93% success rate).

**Impact (attainment) (level 3):**

There was significant improvement in the average mark between assignment 1 and the final mark ( $56\% \pm 5.1$  vs.  $66\% \pm 3.2$ ,  $P=0.0065$ ) (figure 4). Our scoring rubric was based on the behavioral characteristics such as academic writing skills, critical reflection and implementation of evidence-based medicine.

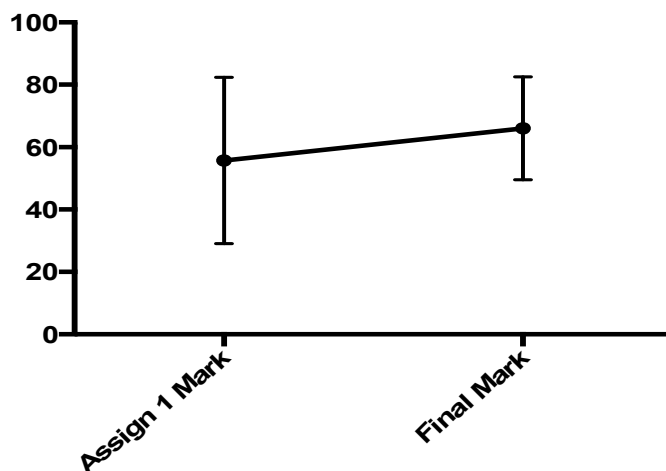


Figure 4: Significant improvement of students' marks ( $P=0.0065$ ).

The reasons for failure as expected were multifactorial. None of these were due to lack of knowledge, but poor academic writing and plagiarism were the main reasons for failure.

Deeper analysis of the engagement of students in the cyclical activities was directly related to the level of student attainment in summative assessment. The students who failed assignments have a common theme, which is the lack of engagement and poor communication with the course faculty. As a remedy for the relatively high failure rate in assignment one (18%) and to achieve our learning objective, we advised the students to submit a draft before the final submission through Turnitin® to reinforce their skills in copyright and academic integrity. We encouraged the students to reflect critically on their local practice whenever appropriate as the first step towards improving their local clinical practice based upon robust evidence, hereby enhancing patient care as well as promoting professional development.

**Return on investment (ROI)(level 5):**

We considered students enrollment to module 2 as a marker of ROI as suggested by Phillips (1996). Twenty-six of successful students subsequently enrolled (100%) on the second module.

**Conclusion**

In distance education, the advances in technology facilitated the delivery of knowledge, assessment and feedback. The structure of our formative and summative coursework assessment strategy in this distance-learning course in transplantation science is not much different from that found in many traditional face-to-face medical courses. However, it is the DELIVERY, which is different and needed more attention for online learning in a diverse international group. Indeed, distance education can reach clinicians deprived from education crossing both virtual and physical barriers and spreads widely compared to traditional education applying “anytime anywhere”



principle. The assessment strategy we implemented managed to reform the educational behavior and improve the attainment of international students with expected strong impact on their local health services and patient care/management. We ensured a high level of student mentoring and coaching to overcome the absence of face-to-face interaction and promote the team-based learning. We relied on structured qualitative feedback throughout to promote learning otherwise the coursework will lose its formative function. Feedback provides the foundation for reflection, hence promotes learning.

This work has many strong aspects. We followed Miller Taxonomy (1990) to achieve the learning objectives. It focuses mainly on the multidisciplinary formative and summative coursework strategy as the main pedagogy in transplantation science to reform the educational behavior of the students. We focused mainly on how to translate the attained knowledge into evidence based clinical behaviour (“shows how” and “does”). This was evident when we used clinically oriented summative assessments to monitor the students’ progress in the context of Kirkpatrick model as a performance indicator. Improvement in the students’ marks is a clear indication of our effective pedagogy. We explored the different formats of formative coursework in a reflective style gauging each format against the planned behavioural attitude required. This approach enabled the course faculty to structure a successful teaching strategy to achieve the learning objectives. The improvement in educational behaviour is reflected in better academic writing skills, ‘habitual use’ use of reflective practice and implementation of evidence-based medicine.

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