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# Evaluating Moodle In Undergraduate Obstetrics and Gynaecology.

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*Royal College of Surgeons in Ireland*

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Evaluating Moodle  
In Undergraduate Obstetrics and Gynaecology

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In Undergraduate Obstetrics and Gynaecology



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**RCSI**

### Declaration

I declare that this thesis, which I submit to RCSI for examination in consideration of the award of a higher degree Doctor of Medicine, is my own personal effort. Where any of the content presented is the result of input or data from a related collaborative research programme this is duly acknowledged in the text such that it is possible to ascertain how much of the work is my own. I have not already obtained a degree in RCSI or elsewhere on the basis of this work. Furthermore, I took reasonable care to ensure that the work is original, and, to the best of my knowledge, does not breach copyright law, and has not been taken from other sources except where such work has been cited and acknowledged within the text.

Signed \_\_\_\_\_

*Raichoi Muey*

RCSI Student Number \_\_\_\_\_ 96014 \_\_\_\_\_

Date \_\_\_\_\_ 3 December 2013 \_\_\_\_\_

## **Acknowledgements**

I thank my dear wife Yvonne, who has supported me throughout all my professional endeavours, and without whose constant presence this thesis would still be in draft form.

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Finally, to my parents, whose unfaltering love, support and presence continue to mold me into a more fulfilled doctor, husband, father, son, brother and friend.

## Abbreviations

APH:	Antepartum Haemorrhage
BMJ:	British Medical Journal
CAL:	Computer assisted learning
CMC:	Computer-mediated communication (CMC)
FY:	Foundation Year
GEP:	Graduate Entry Programme
IC:	Intermediate Cycle
IMC:	Irish Medical Council
IT:	Information technology
JC:	Junior Cycle
LCMS:	Learning content management system
LMS:	Course management system
LP:	Learning platform
LSS:	Learning support system
MCQ:	Multiple Choice Question
MLE:	Managed learning environment
Moodle:	Modular Object-Oriented Dynamic Learning Environment
OBGYN:	Obstetrics and Gynaecology
OSCE:	Objective Structured Clinical Examination
RCSI:	Royal College of Surgeons in Ireland
SC:	Senior Cycle
SC1:	Senior Cycle 1
SC2:	Senior Cycle 2

VLE: Virtual Learning Environment  
WFME: World Federation of Medical Education  
WHO: World Health Organization

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## **Hypothesis**

Moodle can be successfully introduced into a clinical undergraduate obstetrics and gynaecology curriculum with the aim to replace all large group didactic lectures.

Moodle may be used as an adjunct in the evaluation of student knowledge in undergraduate obstetrics and gynaecology.

Moodle [Modular Object-Oriented Dynamic Learning Environment] can be used to identify underperforming students.

## **Abstract**

*'Medical education is a national strategic asset that reflects well on the country, attracts the brightest and best school leavers from home and abroad and caters for our health needs. We have not, alas, looked after medical education in a manner that allows us to reassure the public that all is well.'*

*Irish Medical Council, 2003*

In 1989, Tim Berners-Lee invented the World Wide Web, and within 10 years it had become a valuable learning resource for the field of medicine.

With the aim of improving the undergraduate student experience, educators have experimented with a variety of information technologies for the delivery of medical education. Web 2.0 is helping students to ascertain their learning goals effectively.

Little evidence is available for the implementation of Moodle, a virtual learning environment, into an undergraduate obstetrics and gynaecology curriculum. This thesis demonstrates the integration of Moodle into the course, and the added value as it developed. Moodle was used to deliver a comprehensive online undergraduate curriculum in obstetrics and gynecology, in a multi-site Irish medical school setting in order to optimize clinical exposure for students. There is a paucity of evidence on reliably identifying medical students who are academically underperforming prior to high stakes examinations. Moodle has consistently demonstrated the ability to identify these struggling students through comprehensive data analysis.

This body of work informs and empowers educators and students to develop their teaching and learning. This thesis provides a point from which future work may examine the learning styles and behaviors of underperforming students with a view to effective remediation.



The implementation and evaluation of Moodle was deemed not to require formal Ethics Board approval.

## **Chapter One**

### **1.1 Introduction**

The purpose of this thesis is to examine and document the implementation and use of a Virtual Learning Environment [VLE], Moodle, in an undergraduate blended learning environment at the Department of Obstetrics and Gynaecology [OBGYN] at the Royal College of Surgeons in Ireland [RCSI]. It demonstrates how the use of Moodle facilitated the reduction in duration of the OBGYN course from ten weeks to six weeks. It further aims to address the following questions:

1. Can Moodle be used to replace all traditional large group didactic lectures in the setting of an undergraduate obstetrics and gynaecology curriculum?
2. Can Moodle be successfully introduced as an adjunct in the assessment of students in obstetrics and gynaecology?
3. Can Moodle be used to identify poorly performing students prior to high stakes final professional examination in obstetrics and gynaecology?

### **1.2 Why and How?**

Obstetrics & Gynecology is that branch of medicine concerned with the study of women's health and reproduction. The specialty encompasses medical, surgical, obstetrical and gynecologic knowledge and skills for the prevention,

diagnosis and management of a broad range of conditions affecting women's general and reproductive health.<sup>1</sup>

The time available to teach the medical curriculum in general and specifically OBGYN is shortened due to expanding knowledge, and incorporation of new educational modules aiming to a broader competence. As part of semesterisation of undergraduate medical education at the RCSI, introduced in 2005, the OBGYN clinical course attachment was reduced in duration from ten weeks [including two weeks of formal large group didactic lectures, one week of hospital orientation, and one week of revision] to six weeks in total. A novel approach to ensuring students attained maximum benefit from the hospital based teaching is described. Emphasis is placed on interactive, student-centered E-learning.<sup>2</sup>

### **1.2.1 The Irish Medical Education Context**

The RCSI is one of five medical schools in Ireland that confers the degrees of MB (Bachelor of Medicine) BCh (Bachelor in Surgery) and BAO (Bachelor in the Art of Obstetrics).

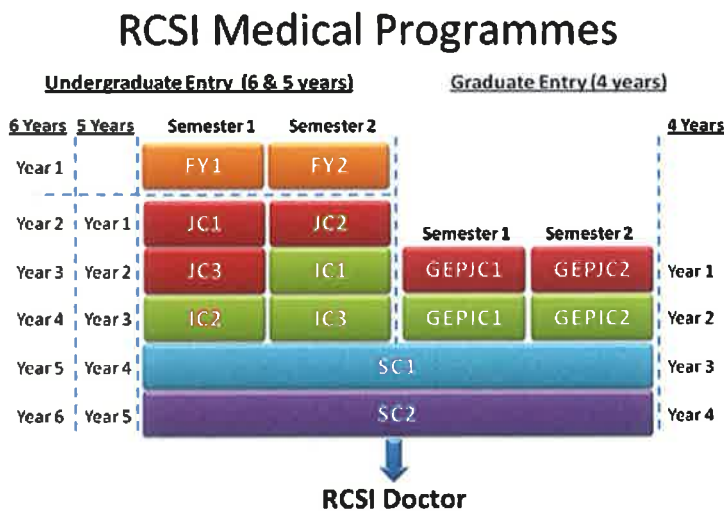
RCSI runs four, five and six year medical degree programmes. The five & six year programmes are primarily for school-leavers and the four-year Graduate Entry Programme (GEP) is for those who already hold a degree in another subject.

## 1.2.2 The RCSI Medical School Curriculum Structure

The curriculum is divided into cycles called Foundation Year (FY), Junior Cycle (JC), Intermediate Cycle (IC) and Senior Cycle (SC). [FIGURE 1] The Graduate Entry Programme condenses the three years and six semesters of the five / six year Junior & Intermediate Cycles into two years and four semesters (GEPJC1/2 & GEPIC1/2). Each cycle is taught over one, two or three semesters with the Senior Cycle being delivered over two years, Senior Cycle 1 (SC1) and Senior Cycle 2 (SC2).

### Figure 1:

*This figure graphically represents the RCSI Medical Programme outline [available from [www.rcsi.ie](http://www.rcsi.ie)]. It demonstrates the positioning of the Senior Cycle Semester 1 portion of the course in the context of the six, five and four year medical school programs.*



Within each cycle, the content is delivered as modules which are largely based on the systems of the human body (systems-based). Each module integrates the biomedical and clinical sciences (integrated) and is defined by a series of learning outcomes (outcomes-focussed).<sup>3</sup>

### **1.2.2.1 Senior Cycle - Obstetrics and Gynaecology**

During the Senior Cycle<sup>4</sup> the development of integrated systems based modules is supported by the Curriculum and Assessment Board. This development was in line with the Bologna Process which focuses on the outcomes and facilitates movement within the European Higher Education Area [EHEA]<sup>°</sup>. Disciplines covered in the current Senior Cycle comprise:

- Medicine and Surgery
- Medicine and Surgery of Childhood
- Obstetrics & Gynaecology
- Neonatal medicine
- Psychiatry
- Family Practice
- Ophthalmology
- Oto-rhino-laryngology

During Senior Cycle One, the penultimate year of medical school, the

<sup>°</sup> Details on the Bologna Process and the 1999 Bologna Declaration within the Irish Higher Education and the European Higher Education Area contexts are available from <http://www.eurireland.ie> See Appendix I.

Department of OBGYN provides a 6-week core clinical rotation in OBGYN. Students participate in a variety of outpatient and inpatient women's health care activities at one of the eight affiliated teaching units. [The Rotunda Hospital, National Maternity Hospital, Waterford Regional Hospital, St Luke's Hospital Kilkenny, Beaumont Hospital, Connolly Hospital, Mullingar Regional Hospital, The SIMS Clinic]

RCSI medical students join the Department of OBGYN for a six-week intensive educational experience at one of two Dublin maternity hospitals or regional obstetric centers. The undergraduate experience in OBGYN for SC1 RCSI medical students includes dedicated time in the delivery suite, community obstetrics, gynaecologic surgery and neonatology.<sup>5</sup> The Department of OBGYN acknowledges that the delivery of high quality healthcare is dependent on high quality medical education.<sup>6</sup> There is in excess of 563 medical student graduates annually in Ireland.<sup>7</sup> The RCSI currently produces approximately 250 doctors from its medical school in Dublin each year. The student body comprises a culturally diverse mix of Irish, European Union and Non European Union students, from both undergraduate and graduate educational backgrounds.

The Department of OBGYN at RCSI comprises two major Dublin Maternity units as well as six smaller regional units. It is supported by seven permanent academic faculty, 8 honorary academic consultants, Head of Department, 7 full time clinical tutors (trainee doctors), administrative staff and the dedicated

support of the patients and general hospital staff who facilitate the learning of the student body.

### **1.3 Thesis Outline**

This thesis brings the reader on a five-year journey, on the implementation, evaluation and delivery of a comprehensive undergraduate online curriculum for obstetrics and gynaecology. The writer will demonstrate how Moodle has informed the delivery of the course and how the virtual learning environment has evolved.

Each chapter in this work builds upon the previous one, adding to the evidence that Moodle is a useful adjunct in the education and training of undergraduates in the field of obstetrics and gynaecology.

### **Chapter 2**

A national and international literature review is discussed and relates the project to the Irish medical education context, the international standards as directed by the World Federation of Medical Education and World Health Organization and in the context of the Bologna Process. [See Appendix 1] It also addresses the learners' context, education/ learning theory and briefly illustrates the challenges in identifying the underperforming student. It outlines E-learning and explains what Moodle is in the setting of advanced Internet technologies.

### **Chapter 3**

This chapter demonstrates how Moodle was initially implemented and defines the possibility of its use as an adjunct in the education of undergraduate obstetrics and gynaecology course. A brief explanation of learning theory as it relates to the implementation of a VLE is given. A proof of concept observational pilot study is undertaken to demonstrate that Moodle can be integrated into the OBGYN course. The potential to identify underperforming students via Moodle is revealed. Moodle generated statistics are correlated with end-of-year examination results.

### **Chapter 4**

Chapter 4 outlines the redevelopment of the course to facilitate the online delivery of the undergraduate curriculum by topic and associated quizzes. The outcome of the quiz and the Moodle online student activity is analyzed and related to end-of-year examination results.

### **Chapter 5**

A pre-clinical attachment tutorial series of 11 topics was developed. The background and outcome of this is discussed. Results are correlated with the view to identifying poorly performing students in advance of final professional examinations.



## **Chapter 6**

In an effort to blend online learning with clinical bedside experiences an E-Portfolio was developed. The replacement of a paper-based logbook is outlined in chapter 6. Student participation and reflection on clinical interactions is correlated with end-of-year examination results.

## **Chapter 7**

The final chapter attempts to answer the research questions and the overall bigger question “Can Moodle be used in Undergraduate Obstetrics and Gynecology?”. It draws on all the data previously discussed in chapters 3-6 in the context of a student feedback questionnaire. Future research areas are outlined and the limitations of the project are examined.

## **Chapter TWO - Literature Review**

### **2.1 Search Strategy:**

The following electronic databases up to October 26 2007 were searched: MEDLINE (1946-), EMBASE (1976-), ERIC (1982-). In MEDLINE the search consisted of a combination of Medical Subject Headings (MeSH; e.g. E-Learning, medical education) 'or' keywords (e.g. Moodle, course management system, distance learning) for disease. These were combined using 'and' with MeSH (e.g. undergraduate) 'or' keywords (e.g. educat\*, teach\* learn\*) for intervention. This search strategy was adapted for use in the other electronic databases. A comprehensive database was constructed using Endnote X 4.0. No language restrictions were applied. Additional studies were identified by reviewing a) the bibliographies of studies and reviews found in the electronic databases, and b) Government Agency publications in Ireland and UK. [Details of the strategy are available in appendix 2] There is an absence of clear evidence for the introduction of a Moodle based VLE into an undergraduate OBGYN course. Comparisons were drawn from other healthcare care and educational fields.

### **2.2 The Irish Context**

Medical education in Ireland should conform to international best practice.<sup>8</sup> The advantages and disadvantages of merging technology and traditional learning methods, "blended learning" are well established. Blended learning's potential to support and enhance meaningful educational experiences is well documented<sup>9</sup>.

In a 2004 report<sup>6</sup> the Irish Medical Council [IMC] drew attention to the fact that the teaching of medicine to undergraduates was often delivered by part-time and occasional teaching staff and that permanent staff relied for support on part-time and occasional teachers who themselves have many conflicting demands on their time. In the 2003 IMC visits to Irish medical schools, 30% 'no-show' rates for clinical teaching sessions were widely reported, predominantly due to simultaneous clinical commitments.<sup>6</sup> It further reported that the increase in absolute numbers of medical students and the numbers of countries represented poses novel problems for medical schools. The pressures on part-time or unfunded clinician teachers are growing and contribute to this capacity problem.

The IMC expressed significant reservations regarding medical education in Ireland, stating that Irish medical schools are 'struggling with standards'. The IMC determined that teaching methods were disorganized with insufficient interaction and lack of student-centered learning. It provided a series of recommendations to medical schools, including the provision of integrated planning and delivery of education, and further development of electronic teaching and learning. The IMC urged the schools to introduce a menu of formative and summative assessment methods that more fairly and reliably tests student abilities and learning.<sup>6</sup>

### 2.2.1 The International Context

The World Federation of Medical Education [WFME] is the global organization concerned with the education and training of medical students and medical doctors at all levels.<sup>10</sup> By 2003 the WFME published its findings on medical education,<sup>11,12</sup> stating that ‘the criticism has become commonplace that medical education has adjusted inadequately both to changing conditions in the health care delivery system, and to the needs and expectations of societies’.<sup>12</sup>

Public reports<sup>11,13</sup> have described the necessity for radical changes and innovations in the structure and process of international medical education at all levels.

The World Health Organization [WHO] has long advocated the need for change in medical education.<sup>14</sup> There is also increasing consensus globally that the education of health professionals is failing to keep pace with the scientific, social and economic changes transforming the healthcare environment.<sup>15</sup> As a component of the WHO recommendation of ‘continuous process of renewal’<sup>14</sup> in medical education, the introduction of the new VLE-supported OBGYN programme was closely scrutinized.<sup>16</sup> The WFME also feels that colleges should have “a mechanism of quality improvement in medical education....and...in the quality improvement of medical education, indispensable components are institutional self-evaluation...”.<sup>11</sup> In their Global Standards in Medical Education they state, “the medical school must establish a mechanism for programme evaluation that monitors curriculum and student progress and ensures that concerns are identified and addressed”.<sup>11</sup> They

also suggest, “that student performance must be analyzed in relation to curriculum”. This is integral to this project.<sup>14</sup>

Professional bodies such as the IMC, the Health Education Authority [the Irish statutory bodies] and the WFME [which has produced voluntary international guidelines on medical education delivery], act as watchdogs over Irish medical education. These bodies have explicitly stated the need for appraisal of teaching in medicine. The writer proposes that through self-assessment and through other already existing avenues of review that a department can truly evaluate, integrate, plan and deliver its curriculum.<sup>17</sup>

### **2.3 The Student Context**

The evolution of technology and its integration with the lives of so-called ‘Digital Natives’ was recognized. The majority of students currently attending college consist of a generation whose lives are intricately connected to technology - the NET generation. Medical schools need to adapt, develop and innovate in the interest of student learning.<sup>18,19</sup>

It is increasingly difficult to deliver a satisfactory level of instruction to increasing numbers of medical students within the traditional system<sup>20</sup>.

Individual instruction would be ideal but is unrealistic and not cost effective.

The evolution of WEB 2.0 (explained in detail below) technology and rising student expectation means that embracing E- learning is a necessity.

Information technology (IT) adoption and diffusion has been studied in great detail by researchers in the information system area.<sup>21,22</sup> IT is being

incorporated into the teaching/learning process, not only through the availability of online courses, but also to support and assist student learning.<sup>23-25</sup> The purpose of undergraduate education is to prepare the student for the practice of medicine.

Calls for reform in medical education are not new and have occurred regularly since the 1910 Flexner Report.<sup>26,27</sup> Intelligence and expertise are acquired through a process of accomplishment, rather than being a matter of self-possession,<sup>28</sup> yet clinical teaching and learning has been historically unplanned, haphazard<sup>29</sup> and without structure.<sup>6</sup> The reasons for this are indeed numerous, relating to the student, the clinical teacher and to the learning environment. Despite these and the setting of a busy hospital, it remains a unique learning forum.<sup>29</sup> It is necessary to evolve away from the age-old apprenticeship model and toward the teaching of skills in a systematic and logical fashion.<sup>30</sup> The traditional basis of medical student clinical education is based on formal large group didactic lectures followed by bedside demonstration of the skills involved in history taking and physical examination. It is not often possible to deliver these important facets within a timely fashion, in particular as student numbers continue to increase.<sup>20</sup> Furthermore the geographic distribution of students may make it challenging to group them together in a single location. This results in a failure of students to grasp subtle concepts essential for the effective delivery of medical care. The absence of regular reinforcement results in the loss of many recently acquired skills. Patients may be unavailable for teaching purposes, especially in an era where procedures are carried out on a day

case basis<sup>31,32</sup>. The implementation of the European Working Time Directive<sup>33</sup> has placed constraints on the number of hours doctors can work thus curtailing their availability for student teaching.

## **2.4 What is Web 2.0?**

Web 2.0 is a difficult term to clearly define. It refers collectively to a range of interactive Internet based activities cautiously centred on the notion that two heads are better than one.<sup>34</sup> Giustini determined that *“Web 2.0 brings people together in a more dynamic, interactive space. A user-centric design that encourages collaboration and personal interaction”*.<sup>35</sup> The premise of Web 2.0 is that the more we use, share, and exchange information on the web *“in a continual loop of analysis and refinement, the more open and creative the platform becomes”*.<sup>35</sup>

*“Social media use is on the rise, affecting all aspects of mainstream society”*.<sup>36</sup> Worldwide, a number of emergency physicians use Twitter, the online social media network. Educators in all specialties of medicine are increasingly *“studying Web 2.0 technologies to maximize medical education”*, and that *“Web 2.0 and advanced informatics resources will be part of physician lifelong learning”*.<sup>37</sup> The Mayo Clinic (New York, USA.) found there was high-level interest in educating staff about Web 2.0. They acknowledged the enormous undertaking, requiring the *“support of high-level administration”*.<sup>38</sup>

### 2.4.1 What is E-Learning?

E-learning is now an accepted part of mainstream third level education.<sup>39-43</sup>

Medical students and trainees are familiar with using computers and other technologies as part of their day-to-day life. E-learning can be defined as instruction delivered in a digital format via a computer that is intended to promote learning or facilitate teaching.<sup>44,45</sup> This definition covers the use of technologies to supplement face-to-face teaching through to distance teaching opportunities in which teacher and student may never meet face-to-face such as with British Medical Journal (BMJ) Learning.<sup>46,47</sup>

Besides the fact that the Internet is a vast source of information, there are some specific web-based applications that are conceived for use as a teaching resource. These applications (E-Learning platforms)<sup>24</sup> allow educators to provide students with a variety of resources, as well as enabling interaction with them in real-time. They also allow teachers to follow the evolution of the learning process and to know the performance of each student in specific tasks. More and more students think of computers as standard tools for learning.<sup>48</sup>

E-learning has much to offer the learner in any educational system and has huge potential. It is important that this creativity has a perceived usefulness, and is not implemented for the sake of innovation.<sup>47</sup> There is little point in introducing a technology just because it is available.<sup>47,49</sup> 'The novelty<sup>50</sup> factor can often cause us to be tempted to implement the latest and greatest



technology, sometimes without thinking carefully enough about whether or not this is actually going to result in meaningful learning'.<sup>47,51,52</sup>

In 1995 Bates<sup>53</sup> said

*"newer technologies such as computers...are not necessarily better (or worse) for teaching or learning than older technologies ... they are just different ... the choice of technology should be driven by the needs of the learners and the context in which we are working, not by its novelty."*

A straightforward way to judge the potential value of a technology is to consider the Seven Principles of good teaching practice<sup>54</sup> (explained in detail below) and to ask how the technologies might help in adding value, realizing the principles in practice and achieving educational outcomes that would not otherwise have been possible. Many clinical teachers are also responsible for simultaneously running a busy clinical practice.<sup>6</sup> Putting these principles into practice may be more difficult in clinical settings than in a university setting where teaching sessions for groups of learners are clearly timetabled. Looking for answers to educational challenges will be more likely to result in the appropriate use of technologies.<sup>55</sup> Appropriate utilization of E-learning may facilitate the necessary modernization of medical education.<sup>6</sup>

#### **2.4.1 What is Moodle?**

Moodle (Modular Object Oriented Developmental Learning Environment), is synonymous with the term Virtual Learning Environment (VLE)<sup>56</sup>. It is a

computer program that facilitates teaching and the so-called E-learning.<sup>44,45</sup>

Such E-learning systems are sometimes also called learning management system (LMS), course management system (CMS), learning content management system (LCMS), managed learning environment (MLE), learning support system (LSS) or learning platform (LP); it is education via computer-mediated communication (CMC) or online education.<sup>24</sup>

Blackboard and WebCT [taken over by Blackboard in 2006] are examples of commercial VLE<sup>57</sup> while Moodle,<sup>58</sup> Ilias,<sup>59</sup> Sakai<sup>60</sup> and Claroline<sup>61</sup> are open source systems and free to download.

The most frequently used of all of these is the Moodle platform; it is easy to use, and offers a wide range of Web 2.0-enabled capabilities (chat, forums, questionnaires, etc).<sup>62</sup>

Moodle is a VLE enabling the creation of flexible and engaging online courses and experiences.<sup>63</sup> Moodle has been installed at universities and institutions all over the world.<sup>58</sup> The original developer of Moodle was Martin Dougiamas as part of a PhD project in 2002.<sup>64</sup> Current development of Moodle is undertaken by a global network of commercial and non-commercial users, led by the Moodle Company based in Perth, Western Australia<sup>64</sup>. As of September 2012, 67,523 sites registered, in 220 countries, with 60 million users.<sup>58</sup>

Moodle was implemented at the Department of OBGYN at RCSI in 2005 with the intention to support the delivery of a uniformly high standard of OBGYN

training within the confines of a multi-site clinical environment and expanding numbers of medical students. E-Learning was employed to 'scaffold'<sup>65,66</sup> students' learning, through providing a common set of learning materials, links to library resources or by enabling group collaboration to occur without the need for teacher and learners to be in the same location, or work at the same time. Learners and teachers can work independently and communicate asynchronously through forums or email.<sup>64,67</sup> Alternatively, teachers and/or learners may communicate in real time through instant messaging.

Opportunistic teaching<sup>6</sup> and learning, which relies entirely on unpredicted clinical situations as they arise, may leave gaps in trainee's experience and areas of overlap. Trainees, however, consistently rate bedside teaching highly.<sup>68</sup> The challenge, therefore, is to maximise the traditional bedside learning experience with a comprehensive supportive learning environment.<sup>69</sup>

## **2.5 The Learning Context**

How a teacher views learning affects how they teach. There is an accepted theory that students learn by integrating existing and new knowledge;<sup>66,70,71</sup> however the unique context of the clinical learning environment is also acknowledged.<sup>29,69</sup> There is good evidence demonstrating<sup>72</sup> that the use of newer technology enhances learning.<sup>73</sup> Appropriate use of technology,<sup>74</sup> blended<sup>75</sup> with a comprehensive approach to learning, can be beneficial for both student and teacher alike. Technology must take second place to good practice in education, hovering 'shyly in the wings, ready to lend its power, but only as needed'.<sup>55</sup>

The introduction of a VLE may be aligned with Chickering & Gamson's<sup>54</sup>

Seven Principles of good teaching practice, the result of which

1. Encourages contact between students and faculty
2. Develops reciprocity and cooperation among students
3. Encourages active learning
4. Gives prompt feedback
5. Emphasizes time on task
6. Communicates high expectations
7. Respects diverse talents and ways of learning.

Moodle addresses each of the seven items either wholly or in part.

Communication<sup>29,76</sup> between faculty and staff is facilitated regardless of geography. Students may engage<sup>76</sup> and reflect with the material at their own pace and on their terms.<sup>63</sup> Feedback may be delivered privately and in a timely fashion. The Moodle platform provides a scaffold<sup>66</sup> from which students with different learning styles and abilities can draw on.

In September 2005, the RCSI launched its new VLE, Moodle, for the undergraduate school of Medicine in conjunction with a new, more fully integrated<sup>77</sup> undergraduate Medical curriculum. Adoption of E-learning platforms have transformed teaching and learning in undergraduate settings.<sup>78</sup> The Moodle platform places greater emphasis on the student as an active participant in learning rather than as a passive recipient of teaching.<sup>58</sup>

The Moodle site facilitated the provision of a baseline uniform standard of

academic teaching, providing support to clinical sites that had been described as 'less impressive'.<sup>6</sup>

It has been noted that in spite of the rapid expansion of computer-mediated learning technology, technological tools are being used inappropriately rather than in ways that will increase student achievement.<sup>79</sup> There is limited published evidence on the implementation of a VLE within medical undergraduate programmes. The efficacy of this new technology must be formally addressed prior to its widespread implementation if the high standard of trained doctors is to be maintained.

### **2.5.1 E Learning and Learning Styles**

Learning is described as the process whereby knowledge is created through the transformation of experience.<sup>80</sup> Learning style theory and its application has received considerable attention in the empirical literature. Many theories purport to better understand learning processes.<sup>81,82</sup>

Information processing as a learning theory considers personality theories and suggests four sequential stages during the learning process. These are based on *Lewin's Cycle of Adult Learning*.<sup>80,83,84</sup> Lewin's cycle describes a four-stage sequential cycle, commencing with a concrete experience, which is followed by personal reflection on the experience. This is then combined with previous knowledge (abstract conceptualization), and finally new ways of adjusting to experiences are explored (active experimentation).<sup>83,85,86</sup>

Kolb's *Experiential Learning Cycle* is one theory based on Lewin's work and is the most commonly applied theory for health professionals.<sup>83,87</sup> Kolb supports the concept of personality traits influencing learning style. Questionnaires to capture the learning style of individuals have been in existence for over 25 years. The pioneers associated with them are David Kolb<sup>83</sup> Peter Honey and Alan Mumford.<sup>88</sup> They identified that each individual has preferred ways of learning and learn better from some activities than others.

Kolb's learning style model which is based on Experiential Learning Theory<sup>83</sup> looked at grasping experience as well as transforming experience. From this he devised four learning styles [Converger, Diverger, Assimilator and Accommodator]. Problems with the model have been identified ranging from the stages not reflecting reality to minimizing the complexity of knowledge and process.<sup>86</sup>

Honey and Mumford adapted Kolb's format for use with adult learners.<sup>89</sup> Their learning stages include: having an experience, reviewing the experience, concluding from the experience and finally planning the next steps. These stages were aligned with learning styles directly as Activist, Reflector, Theorist and Pragmatist. A significant body of evidence suggests that these theories are persistently flawed. There is debate on basis for the use of learning theory debating the evidence was 'highly variable'.<sup>90</sup>

Though there have been some studies on the relationship between learning styles and the use of E-learning, evidence remains contradictory. Some findings suggest there is a strong relationship between student learning styles and attitudes to E-learning,<sup>91,92</sup> whilst others suggest that no such relationship

exists.<sup>93</sup>

E-Learning is seen as a new way of teaching and instruction that aims to educate graduates who are innovative, flexible, creative and effective problem solvers. It is also viewed as cost effective.<sup>80</sup> In a 2009 review by Bird et al, they emphasize the lack of a conceptual framework for both learning style theory and measurement and conclude that medical educators should aim to teach a broad range of learning styles.<sup>94</sup> There is no conclusive evidence to support the formal adaptation of learning material and teaching strategies to students learning styles in the medical education setting.<sup>75</sup>

Nilsson<sup>75</sup> [2007] found no evidence supporting that students' learning styles influence the choice to use their web-based programme in a blended learning setting. This result is in accordance with those of Cook et al who found no association between scores and different web-based format preferences in medical residents.<sup>95</sup>

Hall et al [2005] conclude that an impact of learning style theory on teaching and learning efficiency is unproven.<sup>95</sup> However, they recognise that the learning styles theories may still be of importance to pedagogy; personalized education and students' self-awareness (learning to learn).

Nilsson concludes that educators need not take learning styles into account for instructional adaptations of web-based learning and that web-based learning is a suitable learning tool for most medical students, regardless of

learning style or other characteristics.<sup>75</sup>

## **2.6 Identifying The Failing Medical Student**

There is a dearth of evidence in the literature on the early detection of under-performing medical students using a VLE. There is scant research on the prognostic possibilities of formative assessment.<sup>96</sup> There are also limited data available on the effects of pre-assessment learning on final barrier examination results [summative assessment], albeit acknowledging that assessment drives learning.<sup>97</sup> A correlation between medical students' mean scores on formative and summative assessment has previously been described.<sup>98</sup> However, no study has looked at this in OBGYN undergraduate students' formative assessments in an attempt to identify potential failing students in subsequent summative assessments.

It is acknowledged that failing students contribute to "wastage" not only to themselves but to the medical school and society.<sup>15</sup> Yates et al identified 10-15% of students, described as 'strugglers', i.e. those students who experienced difficulties with progression through the course.<sup>99,100</sup> These authors looked at references, academic performance prior to medical school, race and age. However, no prospective assessment attempt was made to identify such students via a VLE.

In a systematic review from 2002,<sup>101</sup> prior academic performance accounted for 23% of the variance in undergraduate performance. A further review in



2011 focused on the underperformance of ethnic minorities during medical school.<sup>102</sup> The lack of documented evidence on how to objectively identify these underperforming students is addressed in this body of work.

## 2.7 Summary

There is a scarcity of literature documenting the use of Moodle<sup>58,103</sup> in undergraduate obstetrics and gynaecology. While Moodle has been used in other specialties,<sup>103-107</sup> evidence tends to focus on discreet small student numbers and specific course topics rather than an entire subject curriculum. Medical education in Ireland is undergoing a process of reform, driven by national reports<sup>2,6</sup> and international standards.<sup>12</sup> Internationally, calls for reform are not new.<sup>26,27</sup> Medical education has historically been unplanned and haphazard. The IMC has outlined significant improvements made and opportunities for development of Internet based educational technology.<sup>2,6</sup> The WHO has advocated a continuous process of renewal in terms of medical education.<sup>108</sup>

A millennial student body has high expectations of their educational experience. Technology is integral to their lives, and Web 2.0<sup>38</sup> is an anticipated component of their medical education.

Moodle, a virtual learning environment can help to address many of the deficits highlighted by national<sup>2,6</sup> and international assessments of Irish medical education.<sup>109</sup> E-learning, learning facilitated through use of technology, has been shown to be at least equivalent to traditional methods of teaching.<sup>35,73</sup> It is grounded in learning theory,<sup>110</sup> and promotes active student participation facilitating deep learning.<sup>50,111</sup> Moodle, provides an opportunity to objectively identify the failing medical student prior to landmark final examinations.

## **CHAPTER THREE - Pilot Study**

### **3.1 Aim:**

To demonstrate that Moodle is a useful adjunct in the provision of an undergraduate obstetrics and gynaecology course.

**3.2 Hypothesis** Moodle [Modular Object-Oriented Dynamic Learning Environment] can be successfully introduced into a clinical undergraduate obstetrics and gynaecology curriculum with the aim to replace all large-group didactic lectures

### **3.3 Abstract**

To determine the potential usefulness of a virtual learning environment (Moodle) as an adjunct in the delivery of an undergraduate OBGYN curriculum, and to determine its potential ability to identify undergraduate students who are struggling with course material prior to formal barrier examinations.

In implementing Moodle version 1.6, the writer provides initial evidence that the Moodle platform can be used deliver a didactic lecture series to undergraduate medical students. Student activity within Moodle was monitored, and that online activity correlated well with end-of-course examinations results. The data were prospectively collected through the virtual learning environment, Moodle, for the Senior Cycle Semester 1, OBGYN group from 2005 to 2006. This data-set was correlated with the

formal examination results as determined by the end-of-clinical attachment OSCE (objective structured clinical examination) and final examination.

The Department of Obstetrics & Gynaecology at the Royal College of Surgeons Ireland (RCSI) has undertaken an assessment of its innovative Virtual Learning Environment (VLE), Moodle, and observed the correlation between online student activity and end of year final examinations. A positive correlation was noted between the students' use of the Moodle based course formative assessments and the end of year final professional examination in obstetrics and gynaecology. This project provided the foundation for a more rigorous assessment of its use as an adjunct to the traditional course and an opportunity to exploit the development of exciting new technologies, in the delivery of consistent high quality healthcare education.

### 3.4 Background

Good evidence exists to suggest at least equivalence between traditional medical teaching and computer assisted learning across medical specialties.<sup>19,112-114</sup> There has been no evidence to date for the replacement of traditional didactic lectures with a virtual course.<sup>115</sup> Many studies suggest that the best use of computer assisted learning [CAL] involves integration or blending with existing traditional models of teaching.<sup>116,117</sup> Undergraduate medical students perceive CAL to be useful and effective as a component of their undergraduate training.<sup>42</sup> Some studies, while objectively suggesting equivalence in terms of knowledge acquisition, report that students perceive the learning experience to be inferior when compared to face-to-face learning.<sup>116,117</sup> CAL and highly structured teaching sessions have been shown to be superior to lecture based teaching in terms of students subsequent performance outcomes.<sup>12,19,118</sup> The modular nature of Moodle facilitates a structured CAL process.

International standards<sup>12</sup> and national recommendations<sup>2,6</sup> dictate that medical schools strive to provide a equally high standard of education to students across pre-clinical and clinical years. This needs to be provided irrespective of geographical location of their hospital rotations and using modern technologies that are founded in educational theory.

The delivery of education to students is increasingly determined by external factors. In the 2005-2006 academic year at RCSI the process of curricular reform<sup>119</sup> was well under way. The time available to teach the medical

curriculum was shortened due to the incorporation of new educational modules aiming to a broader competence. The OBGYN course was actively being reorganized at that time; both the Irish Medical Council (IMC)<sup>2</sup> and The World Federation of Medical Education (WFME)<sup>120</sup> recommendations had driven the course duration from 10 weeks to 8 weeks, with the goal being compression the current 6 weeks<sup>5</sup> in the subsequent year. These timeframes included incorporation of Neonatology teaching throughout the module. Students underwent a clinical rotation through affiliated teaching hospitals, encompassing gynaecology, obstetrics and neonatology. The curriculum requires that medical students have a large factual knowledge base, and as such teaching had previously been through lectures and rote memorization.<sup>121</sup>

At the Department of OBGYN, students historically undertook a two-week didactic lecture course at the beginning of the academic year and subsequently were assigned into one of three groups. Each group of students would in turn rotate in series across at least two of five locations. This process was becoming a logistical challenge and curricular reform<sup>119</sup> determined that the course was required to evolve into a more compact course in subsequent years. The intranet being used by the medical school at that time was incapable of meeting the needs of a technology literate student body.

The final professional examination for the degree of Bachelor in the Art of Obstetrics [BAO] is awarded after satisfactory completion of a nationally standardized examination that occurs at the end of the penultimate year of study in medical school. The Final Professional Examination is comprised of a

ten station [5 Gynaecological, 5 Obstetrics] Objective Structured Clinical Examination (OCSE) held on the last day of the six-week clinical rotation. The total maximum mark is 200. The 10 station OCSE accounts for 60 of these marks. A subsequent written examination, held at the end of the academic year comprises a 160 question Multiple Choice Questions paper, which accounts for 80 of these marks. This is followed by a Clinical Viva examination that was in and of itself a barrier examination, marked out of 60. The pass mark was 50%, however students could not compensate for a mark lower than 50% in the Clinical Viva examination.

There are no published data detailing the implementation or evaluation of Moodle in the setting of an undergraduate OBGYN curriculum. There is good evidence to suggest objective equivalence between CAL and traditional face-to-face learning experiences in terms of learner knowledge.<sup>42,116,117</sup> Moodle and other CAL programs has been used across healthcare domains at undergraduate and postgraduate levels.<sup>107,122,123</sup> The accessibility of CAL technology, an IT literate student body and international medical education standards mean that adoption of effective E-learning strategies is a necessity. CAL use and dissemination has been studied in detail.<sup>21,22</sup> IT is being incorporated into the teaching/learning process to support and assist student learning.<sup>24,25,124</sup>

### **3.5 Moodle Nuts and Bolts**

Moodle<sup>58,124</sup> has an adaptable array of methods for presenting educational resources to students [Appendices 3 and 4]. Moodle Resources and Moodle

Activities [Appendix 3] refer to a wide array of functions and features combining Web 2.0-enabled interactive functionality as well as static traditional components.<sup>63</sup> These components are limited only by the concepts of the administrators adopting the software, as all users are free to develop and reconfigure the source code to meet their needs.<sup>125</sup>

Moodle automatically records the activity of every logged in user within a given site as a component of a report system.<sup>63</sup> The system records each user click within the site software and allows administrators and teachers to access the log files of each participant. These files can be exported as plain text files or as Microsoft Excel files. The logs files can be sorted by participant, activity or time. Teachers and administrators can filter the log file data to determine activity within a given time frame, on a particular activity, and even to the level of discriminatory and non-discriminatory questions within a quiz. The data may be represented as a bar chart or a Microsoft Excel file time stamping specific activities.<sup>126</sup>



### 3.5.1 Moodle Data

Moodle collects a vast amount of data about students' usage of the platform.

This information can be obtained for a single person, for an entire group of people or even for all the students at a global level.

On an individual basis, the teacher can determine all the activity carried out within the platform: number of visits, time spent doing quizzes and their scores. Quantitative data can be retrieved directly via the Moodle application itself or downloaded in a file suitable to be used with a spreadsheet application (e.g. Microsoft Excel, Redmond, Washington). This feature allows the teacher to extract useful information about the course. The facility exists to demonstrate activity for different days or given periods of time. Each user log is easily identified as the site is password protected and users have to log in to get access [User authentication]. All user sessions are identified to a particular user. This minimizes the amount of preprocessing usually associated with large databases.<sup>126</sup>

Quizzes are a useful tool for students to test their level of knowledge.<sup>24</sup>

Moodle provides a variety of quiz types.<sup>58</sup> For our first introduction to Moodle we adopted the simplest type of question: true – false. While the ability existed to impose deadlines and limitations on the number of attempts, we initially elected to leave the quizzes without any time restrictions to encourage maximum student involvement. The feed-back settings were adjusted to provide immediate results and allow repeated attempts. A list of True – False statements in a plain text format were imported into Moodle to form the two quizzes. The instructions are available within the Moodle site [Moodle.com],

with explanatory notes for each technical step.

### **3.6 Purpose**

The purpose of this chapter is to demonstrate the initial setup and analysis of a Moodle-based course for an entire course in a medical school.

### **3.7 Study population**

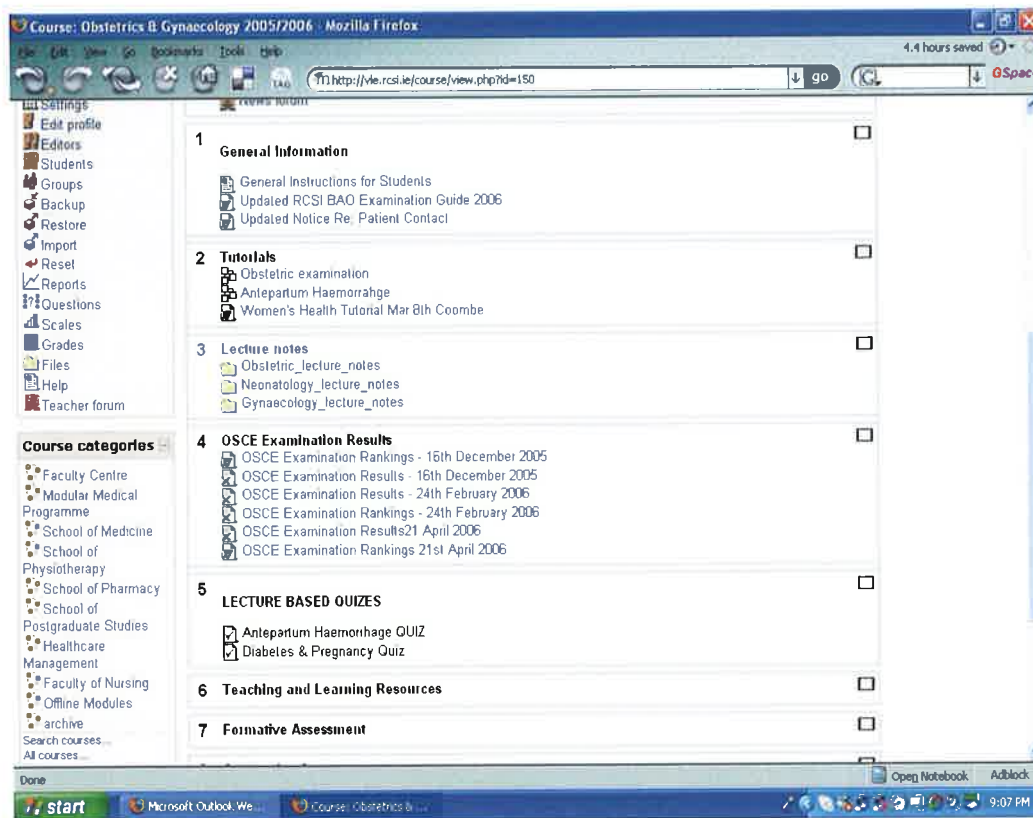
All Students enrolled in the OBGYN course 2005-2006 had access to the on-line course and associated quizzes.

### **3.8 Methods**

#### **3.8.1 Setting up Moodle**

The RCSI Departments of Medical Informatics and Information Technology supported the institutional setup of Moodle. The institutional Moodle site was hosted through the Higher Education Authority. Each individual course was assigned a catalogue number. Students were mass-enrolled at the Department of Medical Informatics administrative level. Uploading a Microsoft Excel™ [Redmond, Washington] spreadsheet of participant data enrolled in the course facilitated rapid course population. Statistical analysis was performed using SPSS [Statistical Package for the Social Sciences] version 15.0.1. One-way ANOVA and Student's t test for independent samples were used for data analyses. Pearson correlation coefficients ( $r$ ) were also used to describe associations between continuous variables.

OBGYN Department faculty administered the VLE component of the OBGYN course with technical support from the Department of Medical Informatics.



**FIGURE 2:** Department of Obstetrics and Gynecology 2006 Moodle website front page. This demonstrates the Gynaecology and Obstetrics topic folders, the instructions for students and an outline of the types of resources available.

As a component of a wider institutional review using the WFME standards,<sup>11</sup> the OBGYN curriculum was mapped to the medical graduate profile. Interactive, Microsoft PowerPoint™ [Redmond, Washington] tutorials were agreed upon and produced by faculty members. This resulted in mapping

each didactic lecture topics being covered by an individual Moodle-hosted tutorial. The aim was to support all topics in the curriculum through the VLE. Each of these tutorials was made available via the new Moodle platform. The content was divided into two separate folders, one each for obstetrics and gynaecology. Initially there was no absolute requirement for students to access or use these resources, but instead students were strongly encouraged to avail of their obvious benefits.

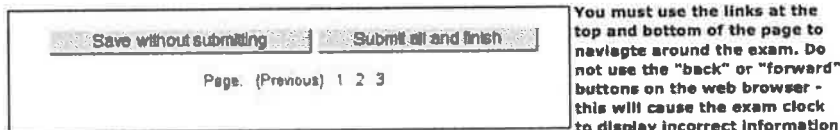
Each student was provided by email, with an enrolment key, which facilitated access to the password-protected site. Initially two associated quizzes were developed. These matched the knowledge outcomes for the associated online lecture material for two particular tutorials (Antepartum Haemorrhage and Diabetes in Pregnancy). These quizzes comprised of True – False statements, with non-negative marking, using the Moodle QUIZ platform. The questions were taken from the content pages of the two tutorials directly. A time limit of 60 minutes was arbitrarily allowed, multiple attempts were allowed, and there was no lock out time between attempts. Students were provided with instructions on how to take a quiz. [FIGURE 3]

## Taking Online MCQs in Moodle

Please ensure that you have read and understand the instructions below. If you have any comments or questions please email - [eclarke@rcsi.ie](mailto:eclarke@rcsi.ie)

### General

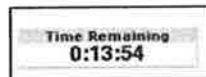
- To navigate between the pages in an exam students must click on either 'next' or the next page number at the bottom of the screen
- Do not use the "back" or "forward" buttons on the web browser - this will cause the exam clock to display incorrect information
- At the end of the exam, before the time runs out, the student must click on "submit all and finish" to end the exam and then follow the on screen instructions.



The screenshot shows two buttons: "Save without submitting" and "Submit all and finish". Below them is a page navigation bar with "Page. (Previous) 1 2 3". To the right of the buttons is a text box with the following warning: "You must use the links at the top and bottom of the page to navigate around the exam. Do not use the 'back' or 'forward' buttons on the web browser - this will cause the exam clock to display incorrect information".

### Timing

- Depending on the exam, the MCQ will be available for for a limited time only.
- Students MUST complete the exam within the time frame allocated.
- Once a student starts the exam a clock will appear on screen indicating the time left to complete the exam.
- Starting an exam late will place students at a disadvantage as the exam will close automatically when time is up
- Online exams are timed by the server, not by the users computer.
- If a student runs out of time (is timed out) they will not be allowed to resit the exam on that day.
- Students who submit their answers after the time period has elapsed will be awarded 0 by the system SO STUDENT MUST KEEP AN EYE ON TIME



A clock will appear on each page letting you know how much time is left in the exam.

**FIGURE 3:** This demonstrates the explanation provided to students on how to take an online Quiz.

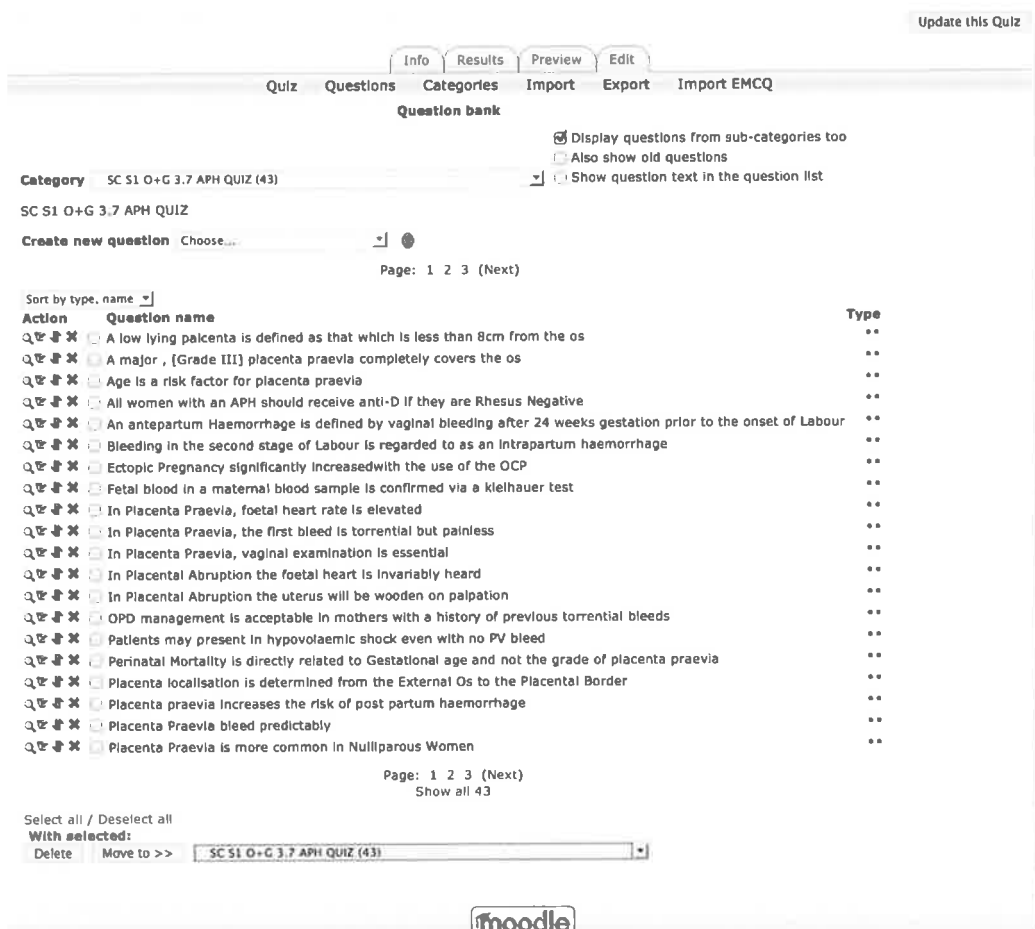
A pilot project of these two sample course topics was assessed on line via multiple-choice questions (MCQ's). Marks from these two MCQ's were correlated with subsequent end-of-year examination results. The student on-line activity [number of logins, resource reviews, MCQ attempts, timing of activity] and MCQ results were also correlated with the end-of-course OSCE<sup>127</sup> and overall final professional examination results. The details of

students' online activity were not available to the examiners prior to the final examination.

Course notifications were distributed via the Moodle-based OBGYN forum. The online course documentation provided tutorial topics covered in standard small group teaching. Students were informed about the availability of the two support quizzes via the forum and by e-mail. Students were automatically notified if any additional information was placed into the OBGYN course site as the default setting within Moodle automatically forwards a copy of the forum post directly to the students' medical school email addresses.

### **3.8.2 Quizzes**

The two sample trial quizzes comprised of the salient facts taken directly from the tutorials available on-line. The two topics Diabetes in Pregnancy and Antepartum Haemorrhage were chosen ad hoc. [See Figure 4]



**FIGURE 4:** Screen capture of the teacher view of the Moodle Quiz Engine

A Teacher view of the question bank and the Moodle function that allows teacher editors to create, edit and allocate questions to question banks within a particular Moodle course site. This demonstrates a question bank of 43 True – False questions, associated with the OBGYN Antepartum Haemorrhage tutorial (No. 3.7).

The quizzes were comprised of statements taken directly from the Microsoft PowerPoint™ Interactive Tutorials versions available to students. Students could mark these question statements as either true or false. The marks

resulting from the QUIZ were displayed immediately after the QUIZ was completed. MCQ 1 Antepartum Haemorrhage consisted of 40 true – false questions and MCQ 2 Diabetes and Pregnancy QUIZ consisted of 55 true – false questions.

The student Moodle login, obstetrics and gynaecology course view data, and QUIZ results were recorded and compared to end-of-year final examination results.

The display of the Quiz may be altered, [FIGURE 5] including number of questions per page view, whether questions are shuffled and for multiple-choice whether answers within questions are shuffled.



Settings Locally assigned roles

Updating Quiz In topic 4

**General**

Name\* Antepartum Haemorrhage Lecture Quiz

Introduction

Trebuchet 1 (8 pt) Lang

**Students should attempt this quiz after studying the relevant course material.**

Path:

**Timing**

Open the quiz 12 November 2006 19 20  Disable

Close the quiz 12 November 2006 19 20  Disable

Time limit (minutes) 60  Enable

Time delay between first and second attempt None

Time delay between later attempts None

**Display**

Questions per page Unlimited

Shuffle questions Yes

Shuffle within questions Yes

**Attempts**

Attempts allowed Unlimited

Each attempt builds on the last No

Adaptive mode No

**Grades**

Grading method Highest grade

Apply penalties No

Decimal digits in grades 2

**FIGURE 5: Teacher View QUIZ Settings 1** This screen shot demonstrates the potential settings as seen by a course editor. A general introduction and QUIZ instruction may be provided. Details on allocation of time for the QUIZ along with specific timeframes and limits for students, as well as a time delay between subsequent attempts may all be tailored.

**Review options**

<b>Immediately after the attempt</b>	<b>Later, while the quiz is still open</b>	<b>After the quiz is closed</b>
<input checked="" type="checkbox"/> Responses <input type="checkbox"/> Answers <input type="checkbox"/> Feedback <input type="checkbox"/> General feedback <input checked="" type="checkbox"/> Scores <input type="checkbox"/> Overall feedback	<input checked="" type="checkbox"/> Responses <input type="checkbox"/> Answers <input checked="" type="checkbox"/> Feedback <input checked="" type="checkbox"/> General feedback <input checked="" type="checkbox"/> Scores <input checked="" type="checkbox"/> Overall feedback	<input type="checkbox"/> Responses <input type="checkbox"/> Answers <input type="checkbox"/> Feedback <input type="checkbox"/> General feedback <input type="checkbox"/> Scores <input type="checkbox"/> Overall feedback

**Security**

Browser security  None

Require password   Unmask

Require network address

**Common module settings** Show Advanced

Group mode  No groups

Visible  Show

ID number

Grade category 3. Fetal Medicine

**Overall feedback**

Grade boundary 100%  
Feedback WELL DONE

Grade boundary 80%  
Feedback A LITTLE MORE WORK IS REQUIRED

Grade boundary 70%  
Feedback YOU NEED TO REVIEW THE MATERIAL BEFORE ATTEMPTING THE QI

Grade boundary 50%  
Feedback PERHAPS MEET WITH YOUR TUTOR TO SEE WHAT CONCEPTS YOU ,

Grade boundary  
Feedback

Grade boundary  
Feedback

Grade boundary 0%  
Add 3 more feedback fields

Save and return to course Save and display Cancel

There are required fields in this form marked\*



**FIGURE 6: Teacher View QUIZ Settings 2**

*This screen shot image demonstrates the remaining QUIZ editing options available to teacher editors. The review options facilitated students determining their results immediately and reviewing the QUIZ at a later date to check answers.*


The ability to shuffle questions reduces the potential for students memorizing question and answer pairings. Images were also facilitated within the quiz settings. [FIGURE 7]

Time Remaining  
0:14:34

localisation is determined from the External Os to the Placental Border

Answer:  True  
 False


---

21  Placental Abruption has an Incidence of 1 In 150 deliveries , with a recurrence risk of 5 -15%


Marks: 1

Answer:  True  
 False

---


22  In Placental Abruption the uterus will be wooden on palpation

Marks: 1



Answer:  True  
 False

Save without submitting   Submit all and finish



**Figure 7: Question Appearance**

Screen Image demonstrating the appearance of questions relating to QUIZ 1, Antepartum Haemorrhage. It also illustrates the ability of the quiz engine to document the time taken to complete a quiz.

In this study, students were allowed unlimited attempts which facilitated measurement of the highest-grade mark being registered by Moodle. Additional settings, such as feedback, and student access were also set as per figures 5 and 6 Moodle records each grade and attempt in a separate database. The yellow question-mark icon denotes a hyper-link to a Moodle explanation of that particular feature. [Appendix 4]

### **3.8.3 Evaluation**

Moodle user activity logs: Moodle logs information on individual student participants as each participant is given a unique Moodle identifier number. Each page viewed within the OBGYN course is tracked and stored automatically within the Moodle interface. Designated faculty staffs are allocated 'teacher' privileges within the site. These logs correspond to page views within the OBGYN site. The activity logs are made available as a Microsoft Excel™ [Redmond, Washington] file generated by Moodle.

Final Examination Scores: All students were required to sit the examination in order to progress to the subsequent year of medical school. The examination is a standard format overseen by the National University of Ireland, and an examiner external to the RCSI. The end-of-year final examination is marked out of 200 and comprised of end-of-clinical placement OSCE (60 marks), written MCQ paper (80 marks), and clinical-viva (60 marks). The clinical-viva component was a barrier in itself that students had to pass, as there was no provision to compensate with marks from other components of the examination

Two True-False style quiz results were analyzed and results correlated with number of Logins and Resource views. Quiz 1 refers to Antepartum Haemorrhage Quiz, comprising of 40 questions.

Quiz 2 refers to Diabetes and Pregnancy Quiz, and is composed of 55 questions. The student Quiz results were divided by the total number of

questions in each Quiz, in order to ensure both had the same scale (Quiz 1 was graded out of 40, Quiz 2 was graded out of 55).

The questions were shuffled from question banks of 43 and 60 questions for Quiz 1 and 2 respectively. The top left corner demonstrates a countdown clock that followed the student as he/she progresses through the questions. This was set at one hour for the purposes of the study and no student took more than 30mins to complete the quizzes. Images were placed into the QUIZ to provide interest for the students but no questions specifically asked for answers directly relating to the image.

Quiz errors were noticed by students and reported to the faculty. These were corrected promptly, and the Moodle software automatically adjusted the scores.

### **3.9 Results**

#### **3.9.1 Moodle data**

Raw data recorded by Moodle, exported in Excel file 119,010 data points relating to user activity in the new site. Details regarding each user ID, course ID, course views, Moodle views, forum views, QUIZ attempts and results were all exported to a Microsoft Excel™ file. The data was compared to the end-of-year final professional examination results. Student identities were excluded; a course ID number was cross-referenced with Moodle ID number.

The numbers of student Moodle logins were calculated by accessing the Moodle 'Reports' function; these were subdivided into Moodle logins and

OBGYN Tutorial Resource views. The latter determined the activity of students within the resources of the obstetrics and gynaecology course site.

201 students sat the final professional examination in June 2006. [see table 3.1] The final results ranged from 158 /200 to 82 /200 with a mean of 124. 162 students achieved at least a passing grade while 39 students failed the first sitting of the examination. Eleven students failed both the first sitting and the repeat examination.

153 students [76%] of the total 201-student group logged into the OBGYN Moodle site. The total number of Logins was 15,563. The maximum number of logins for a single student was 759, while 48 students failed to log in once. Of the students who did log into the site [n=153], the mean number of logins was 97 [Range 0-759], and the mean number of resource views was 14, [Range 0-113]. A total of 134 students [67%], attempted QUIZ 1, while 123 students [61%] attempted QUIZ 2. The mean result for QUIZ 1 was 33/55 [60%], range 4 -51, and 33/40 [82%], range 3-37 for QUIZ 2.

Of the students who failed the first sitting of the examination, only 43.6% [n=17], p=0.039, didn't use the site once, while 50% [n=11], p=0.021, attempted QUIZ 1 and 4 attempted QUIZ 2, p<.0001]. The mean result for the failing group in both Quiz 1 and Quiz 2, was significantly lower than that of those students who passed. [31.18/55 v 38.23/55, p=0.015 and 32.76/40 v 31/40, p<.001].

**Table 3.1**

	<b>TOTAL Number of Students</b>	<b>Students Who At Least Passed First Attempt</b>	<b>Students Who Failed First Attempt</b>	p values for [At least passed ] v Fail
Total Number Students	201	162	39	
Number of Students who Logged IN	153	131	22	
Total Number of Logins	15563	13149	2414	
Mean Number of Logins per Student [of those who logged in]	101.7189	100.3740	109.7272	.127
Mean number of logins by group	77.4278	81.1666	61.8974	.169
Login Range by student	0-759	0-454	0-759	
Number of Students with ZERO Logins	48	31	17	.039*
% Of group w ZERO Logins	23.8805	19.1358	43.5897	.045*
Number of Students who viewed Resource Content [%]	151 [98%]	131 [100%]	20 [90.91%]	
Total number of student views of Resource Content	2220	1920	280	
Mean Views of Resource Content per Student	14.7019	14.6564	14	.017*
....BY GROUP	11.0447	11.8518	7.1794	
Views Range by Student	0-113	0-113	0-47	
Number of Students with ZERO Resource content Views	50	31	19	.045*
Number of Students who Attempted QUIZ 1	134	123	11	.019*
% of Logged In				

% of Total Group	88.7417	93.8931	50	.021*
	66.6666	75.9259	28.2051	.032*
Mean Result of QUIZ 1 [/55] who attempted QUIZ 1	35.77	38.23	31.18	.015*
Mean Result of QUIZ 1 [/55] for Group	16.087	19.89	8.79	.026*
Range of Results for QUIZ 1	4 - 51	4 - 51	8 - 37	
Number of Students who did not attempt QUIZ 1	67	39	28	.049*
Number of Students who Attempted QUIZ 2	123	119	4	.000*
Mean Result of QUIZ 2 [/40] who attempted QUIZ 2	33.12	32.76	31.00	.000*
Mean Result of QUIZ 2 [/40] for Group	18.87	17.56	4.1	.000*
Range of Results for QUIZ 2	4 - 37	4 - 37	28 - 34	
Number of Students who did not attempt QUIZ 2	78	43	35	.013*

**Table 3.1:** 201 students sat the final professional examination in June 2006. The final results ranged from 158 /200 to 82 /200 with a mean of 124.



### **3.9.2 Failing students' activity on Moodle.**

Students who failed the repeat examination accessed the OBGYN Moodle site in a particular manner. They logged in more frequently but accessed the online course resources more infrequently. Only one student out of these eleven failing students undertook any quiz and even the mark attained in QUIZ 2 was below the average of those who passed the final examination on the first attempt. Of the ten students who failed the final examination and accessed the OBGYN site on more than 100 occasions they accessed the course resources on less than 7% of the time.

Data analysis suggests that the amount of usage of our E-learning resource, Moodle, correlated significantly with the in-course quiz results and with final examination scores. [SEE TABLE 3.2] We found a significant correlation between on-line resource [course views] participation and the on-line MCQ results as well as end-of-year result raw score. ( $F = 3.97$ ,  $r^2 = 0.513$ ,  $p > 0.05$ ). [SEE TABLE 3.3 for explanation of F]

**Table 3.2**

*Correlation table demonstrating the stronger relationship between the MCQ results and Moodle resource views than between logins and MCQ results.*

**Correlations**

		MCQ1AGAI	MCQ2AGAI	LOGINS	VIEWS
MCQ1AGAI	Pearson Correlation	1	.722**	.282**	.313**
	Sig. (2-tailed)	.	.000	.009	.004
	N	84	84	84	84
MCQ2AGAI	Pearson Correlation	.722**	1	.460**	.513**
	Sig. (2-tailed)	.000	.	.000	.000
	N	84	84	84	84
LOGINS	Pearson Correlation	.282**	.460**	1	.484**
	Sig. (2-tailed)	.009	.000	.	.000
	N	84	84	84	84
VIEWS	Pearson Correlation	.313**	.513**	.484**	1
	Sig. (2-tailed)	.004	.000	.000	.
	N	84	84	84	84

\*\* . Correlation is significant at the 0.01 level (2-tailed).

### **Table 3.3**

F Test: The test statistic for ANOVA is called F. F is the ratio of Between Group variation to within group variation as follows

$$F = \frac{\text{Between Group Variance}}{\text{Within group variance}} = \frac{\text{Chance} + \text{possible difference between Means}}{\text{Chance}}$$

The concept behind the F test is that if the Null hypothesis is true and all means are the same, between groups variance and within groups variance should both be almost the same. However if a difference between the means does exist, between groups variance will be larger as it includes possible differences between the means as well as chance variation, and therefore between groups variance will be a lot higher than the population variance. F will therefore be greater than one.

134 students attempted the online quizzes. Of the 39 students who failed the first sitting of the final Obstetrics & Gynaecology exam, only 28% (n=11) completed at least one of the optional interactive online MCQ quizzes. This is compared with 83 % (n=100) of the Honors group who attempted the quizzes (F=6.38, p= 0.013).

134 attempted the APH QUIZ [1], the mean mark was 33, [60%] [range 7-92%]. 123 students attempted the GDM QUIZ [2], the mean mark was 83%, [range 10-93%].

Students who achieved an honors grade in the final exam [n=120] averaged consistently higher grades in the APH and GDM Quizzes (77% and 93% respectively). Students who failed the final examination, [n=39] averaged 48% & 81% in the APH and GDM quizzes respectively [F= 3.97, p=0.01]. Of the students who subsequently failed the repeat examinations [n=11], only one student had attempted the APH or GDM quizzes prior to the Final Examination

There was a correlation of 0.513, p=0.01 between the results of QUIZ 2 and the number of course views per student. There was a correlation of 0.46, p=0.01 between the results of Diabetes MCQ and the number of Moodle logins.

There was weak but significant correlation between the results of the APH MCQ and both the amount of course views (r=0.313, p=0.01) and the amount of Moodle logins (r=0.28, p=0.01).

Considering all those who failed the final exam and comparing their course Resource Views with those who passed the exam, using AVOVA, there was a significant difference in their course viewing activity. [F= 3.97, p=0.01] A

further ANOVA analysis was undertaken to compare the three student groups:

1. Those who passed the end-of-year exam.
2. Those failed initial exam but passed the repeat exam.
3. Those who also failed the repeat exam.

There was a statistically significant difference between the number of course views between each group [F= 3.12, p=0.04].

An ANOVA was performed comparing gender of participants with number of logins, and resource view, but no differences were observed [p> 0.66].

Nationality did not correlate with logins and resource views [p>0.95] See Table 3.4 and 3.5]

**Table 3.4:** ANOVA: FAIL FIRST TIME + PASS v Views

This Table shows the relationship between those students who failed the examination on the first sitting and those who passed first time and compares their respective total moodle views.

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Column 1	38	254	6.68421053	98.9786629
Column 2	35	462	13.2	145.4

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	773.504542	1	773.504542	6.38159791	0.01376267	3.97581346
Within Groups	8605.81053	71	121.208599			
Total	9379.31507	72				

**Table 3.5: ANOVA: FAIL/ FAIL TWICE /HONOURS v Views**

*This Table shows the relationship between those students who failed the examination on the repeat sitting and those who achieved an honours grade first time and compares their respective total moodle views*

**SUMMARY**

<i>Groups</i>	<i>Count</i>	<i>Sum</i>	<i>Average</i>	<i>Variance</i>
Column 1	28	188	6.71428571	114.285714
Column 2	10	66	6.6	64.0444444
Column 3	35	462	13.2	145.4

**ANOVA**

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Between Groups	773.600783	2	386.800391	3.14628472	0.04915333	3.12768123
Within Groups	8605.71429	70	122.938776			
Total	9379.31507	72				

### 3.10 Discussion

The Buttimer Report<sup>128</sup> has provided a number of recommendations regarding undergraduate medical training stating that, “...Ireland must ensure that doctors are trained to a high standard” and that “... Innovations in the delivery of medical education and training ... are needed.” Evidence suggests the implementation of Moodle at the Department of Obstetrics and Gynaecology lives up to these recommendations.

Those using the Moodle platform regularly throughout the academic year seem to get better grades than those who rarely or never used it.<sup>24</sup> This pilot study demonstrates that different student groups, as determined by their success or failure in the Final Professional Examination for Obstetrics and Gynaecology, may be evaluated through Moodle data. We have been able to differentiate between students who fail the examination first time and those who pass. Students were able to determine a sense of how well they recalled the lecture material, but the true goal of competency still appeared to be beyond the reach of the VLE.

Moodle logins as described above, however, do include students who just login to the system and for example check their instant messages as opposed to logging into their course. Course views may be a better estimate of actual logins to Moodle for study purposes as demonstrated by the better correlation between course views and final results compared to the correlation with the overall system login. MCQ2 demonstrated a stronger relationship with course

view (and Moodle logins) than MCQ1. It is possible that MCQ2 was more dependent on information in the course content in Moodle. Additionally students could have drawn on previous knowledge associated with MCQ1.

It can be said that the number of course views in each grouping is 'significantly' different to the others. There is a difference in the means of these groups, which was expected, i.e. students with lower numbers of course views will probably be grouped together.

The opportunity exists to identify failing students ahead of actual barrier exams, facilitating remedial action accordingly. As demonstrated in the analysis of the students who had significantly larger numbers of logins, but whose end-of-year marks were among the bottom 10%, purposeless surfing of the net does not improve learning outcomes.<sup>129</sup> While interacting with our Moodle site can hardly be described as 'open surfing on the Internet', we acknowledge that some structure may be required for students to maximize its potential benefits. What is needed is a framework for instruction in such environments. As an instructional approach cognitive apprenticeship in a blended learning environment frames this research.<sup>25</sup>

### **3.10.1 Limitations**

The writer acknowledges a number of limitations to the study. Firstly this was the first year of the introduction of the Moodle platform to RCSI. Students may not have been sufficiently knowledgeable with the IT infrastructure to feel comfortable with using the on-line course material, given that the same



material was available from lecturers, and may have been distributed off-line among students, thereby eliminating the necessity for accessing the Moodle site. The quizzes were not mandatory; evidence suggests that students engage more with curriculum aspects that are part of a formal evaluation. Diligent students may naturally gravitate towards a novel on-line system and its additional methods of formative evaluation.<sup>130</sup> Students were able to determine a sense of how well they recalled the lecture material. The data raises questions regarding what to do with students who do not perform to prescribed standards. The MCQs test predominantly knowledge recall and superficial learning; however this is an important part of medical education. Learning is a patchwork of both deep and superficial learning.<sup>111</sup>

Some students may have had insufficient Internet access and no account was made for potential failures in internet connection that may have resulted in lower marks, but this effect should have been equal for all students.

It is recognized that only two quizzes were available and that the better correlation between QUIZ 2 and end-of-year marks is potentially due to a number of potential confounding factors. These include quizzes with unequal numbers of questions, potential differences in new and existing knowledge in topics and the accompanying tutorials were not standardized in any predetermined way. Notwithstanding these deficiencies there is a clear correlation between levels of engagement, QUIZ results and the end-of-year exam, which requires further exploration.

### **3.10.2 Study Significance.**

This pilot/feasibility study is the first step in producing evidence for the use of Moodle at the undergraduate OBGYN level. This pilot project demonstrates the potential for the implementation of Moodle as an integral component in the delivery of an undergraduate OBGYN curriculum. The study also identifies the potential of the Moodle software in the identification of the poorly performing student early in the course of the OBGYN clinical rotation. It provides a potential map for the implementation of Moodle across other specialties, adds to the empirical body of knowledge on the implementation, and use of Moodle in undergraduate medical education.

### **Opportunities for Future Investigation**

As expected, students who logged into the site and viewed the material more frequently, achieved higher scores in the on-line quizzes. This correlation was stronger for resource views. Chapter 4 looks at defining the feasibility of producing an entire OBGYN undergraduate course material on-line, ultimately replacing the didactic lecture course. While in this initial project quiz results compared favorably with end-of-year examination scores, they were not predictive. Chapter 4 looks at clarifying the ability of Moodle to evaluate students and reliably identify those students struggling with the curriculum, in advance of the final examination.

### 3.10.3 Conclusions

*"The quality service provided to Irish patients is strongly influenced by the quality of education and training of the doctors delivering that service."*<sup>128</sup> The institution's [RCSI] 2006 internal review, benchmarked against WFME standards demonstrated areas of weakness including matching curriculum content with its delivery, assessment and evaluation. *'The lack of technical expertise in the construction and implementation of valid, reliable, and efficient assessments was also highlighted.'*<sup>76</sup> The Department of OBGYN determined that Moodle could prove a valuable tool in addressing these deficits.

Preliminary evidence of the potential of Moodle in the context of an expanding technologically literate student body, multi-site provision of high quality teaching is demonstrated here. E-learning complements more traditional methods of teaching and training in medical education.<sup>2</sup> The use of Moodle was positively correlated with the results of the Final Professional Examinations in Obstetrics & Gynaecology. Moodle has a role in the development of *'interactive student centered clinical learning in an organized manner.'*<sup>131</sup>

The ability to reproduce an interactive course with the aim of delivering a consistently high standard of medical education regardless of an individual student's clinical attachment location<sup>6</sup> is an attractive prospect for both learner and educator alike. Moodle has the potential to 'monitor the OBGYN curriculum and student progress to ensure that concerns are identified.'<sup>6</sup> This study demonstrates that Moodle has the potential to facilitate the replacement

of large group didactic lectures with an interactive on-line program, blended<sup>9,40,132-134</sup> with a traditional clinical bedside learning experience.<sup>69</sup>

There is a need for a suitably assessed, maintained and developed electronic learning platform. As the numbers of medical students continues to expand so too will there be a need to expand and develop our VLE for obstetrics and gynaecology. This preliminary investigation goes some way towards bridging the gap between understanding the capabilities of Moodle and the implementation of novel strategies for its optimal use. There is merit in maintaining efforts in an on-line programme with a view to identifying struggling students early, providing feedback for students and facilitating self directed learning.

## **Presentations**

### **'Innovations in the assessment of undergraduate medical education at the RCSI'**

Seoige DM, McVey AD, McVey RM, Hill ADK.

Oral Presentation: ASME June 2007

### **'The use of a virtual learning environment by medical students and its impact on Final Professional examination scores in Obstetrics & Gynaecology: a prospective evaluation'**

McVey RM, Clarke E, Malone FM

Oral Presentation: Eighth Annual Irish Educational Technology Conference; EDTECH March 2007

### **'The use of a virtual learning environment by medical students and its impact on final professional examination scores in Obstetrics and Gynaecology: a prospective evaluation.'**

McVey RM, McVey AD, Clarke E, Breathnach F, Said S, Malone F  
Poster Presentation: Junior Obstetrics and Gynaecological Society  
November. 2006

***Poster Presentation: International perspectives on Teaching and Learning in Higher Education, NAIRTL [National Academy for integration of Research & Teaching & Learning] 2007***

## **CHAPTER FOUR- Bye-Bye Didactic Lectures!**

### **4.1 Aims:**

To effectively replace a didactic lecture series with on-line virtual tutorials and associated quizzes.

To determine if students on-line activity relates to final examination scores.

To demonstrate the feasibility of providing an on-line tutorial series for an obstetrics and gynecology undergraduate curriculum.

### **4.2 Abstract**

A large body of evidence exists in the literature about the feasibility of a virtual learning environment [VLE] in delivering aspects of an undergraduate medical curriculum on-line. There is little published evidence on delivering an entire course's tutorial lecture material via a VLE, and replacing a didactic lecture course altogether.

The feasibility of replacing an entire didactic lecture series with an on-line programme delivered via Moodle, a VLE, is demonstrated in this chapter.

This study lends further weight to the contention that Moodle can support an undergraduate OBGYN curriculum, and replace traditional didactic lectures.

The student Moodle-based activity is correlated with final examination scores.

Students that pass or fail undergraduate barrier examinations can be differentiated using their activity on the obstetrics and gynecology VLE.

However the Moodle-based course, based on quizzes alone cannot reliably predict those students who fail the final end of year examinations.

### **4.3 Background**

The Department of OBGYN committed to reforming its delivery of the OBGYN curriculum, actively engaged in a World Federation of Medical Education [WFME] review process and the novel implementation of Moodle. The pilot project from the previous academic year [Chapter 3] provided data suggesting the potential for Moodle to support the student body as an integral component of a blended learning environment.<sup>9,40,132-134</sup> The increasing student numbers as well as the integration of graduate entry program students, required that the faculty be able to support students with a broad range of backgrounds, spread geographically throughout the affiliated hospitals. This blended learning approach acknowledges that higher learning is not achieved in isolation,<sup>19</sup> and the need to develop a scholarly community of learning. The pressure on the health services had diluted the enthusiasm of voluntary teaching staff in affiliated hospitals.<sup>6</sup> Successful implementation of VLE has been described in other medical specialty settings,<sup>135</sup> but has yet to be described in undergraduate obstetrics and gynecology.

### **4.3.1 Blended Learning**

“Blended learning” refers to the incorporation of various teaching modalities for the same endpoint. “Blended learning describes learning activities that involve a systematic combination of co-present (face-to-face) interactions and technologically mediated interactions between students, teachers and learning resources.”<sup>9,40,132-134</sup>

Previous research has found support for the use of blended learning.<sup>136</sup> It has been demonstrated to be effective in terms of learning outcomes and uses a socio-constructivist approach to learning. This principle allows learners to engage at time when it suits them best,<sup>19,134</sup> with comparable knowledge outcomes<sup>137</sup> in a shortened face-to-face learning context.<sup>75,137</sup> There is no statistically significant difference between student satisfactions of face-to-face learning versus blended learning.<sup>117</sup> There is evidence to suggest that undue emphasis on individual learning styles is not warranted in the blended learning environment of a medical school.<sup>75</sup>

### **4.3.2 Learning Theory**

Learning episodes may be described as intended purposeful learning activities - always purposefully undertaken by the learner. Purposeful learning comes from a sense of need; needs are externally identified, while wanting is internally identified.<sup>138</sup> Motivation is described as a compulsion that keeps a person within the learning situation, and while it may be extrinsic, most adult learning is intrinsically driven by inner pressures.<sup>72</sup> Prepotency refers to a concept where one need must be met prior to the successful integration of the



next.<sup>72</sup> Motivation has been described as being more complex and goal-orientated, requiring that students or participants need to clearly identify with immediate goals.<sup>139</sup> The implementation of a virtual learning environment for students allows these adult learners to control their own learning pace. The online quizzes provide both external and internal motivators for the students. Students can prepare for subsequent bedside learning using the structured on-line course material, thus fulfilling the need to have a basic preparation and virtual briefing<sup>140,141</sup> prior to applying it to a clinical setting.

#### **4.3.3 Study Population**

All students enrolled in the OBGYN academic years 2006-2007 had access to the on-line course and quizzes. A further analysis was conducted amalgamating the four academic years 2006-10.

#### **4.3.4 Methods**

The existing Department of Obstetrics and Gynaecology Moodle site was duplicated to allow a new academic year site be formed. The existing undergraduate didactic lecture series was modified and mapped to the Medical Graduate Profile.<sup>142</sup> The 50 tutorials were catalogued and grouped to facilitate easy manipulation and reference within the new on-line site. The tutorials were grouped into similar topics, with each topic having 4 -8 individual tutorials.

Tutorial Groups:

- OG 1. Obstetrics Introductory Lectures
- OG 2. Gynaecology Introductory Lectures
- OG 3. Fetal Medicine
- OG 4. Maternal Medicine
- OG 5. Intra-partum and Post-partum Care
- OG 6. Early Pregnancy Problems
- OG 7. Benign Gynaecology
- OG 8. Gynaecological Oncology
- OG 9. Human Reproduction

Each tutorial was developed using Microsoft PowerPoint, [Redmond, Washington]. The presentation and layout of each tutorial were standardized.

[See FIGURE 8]



# OG 1.1 OBSTETRIC HISTORY

Department of Obstetrics &  
Gynaecology  
The Royal College of  
Surgeons in Ireland



**Figure 8**

*Each tutorial's layout was standardized to facilitate easy navigation for students. Tutorials were also catalogued to allow easy manufacture of their associated quiz. A tutorial OG number was developed to allow easy cataloging and to facilitate development of an associated MCQ bank.*

In order to standardize the education experience for our students and to provide a common structure and familiarity with the VLE, all tutorials had the same format. Each tutorial was presented with a similar layout with initial sides outlining: Skills and Knowledge Objectives, Introduction. All tutorials concluded with a summary. Each tutorial was designated an individual webpage [FIGURE 9].




### OG 4.5 Infectious Diseases in Pregnancy:

Knowledge Objectives

- OG 4.5 KO1 To understand the hazards of prescribing medications to women at different stages of pregnancy
- OG 4.5 KO2 To understand the possible teratogenic effects of drugs in pregnancy
- OG 4.5 KO3 To be aware of examples in which the benefits of using certain medications to treat medical conditions during pregnancy outweigh the risks of medication use
- OG 4.5 KO4 To understand the maternal and perinatal impact of substance abuse during pregnancy and during breastfeeding

Skills Objectives

- OG 4.5 SO1 To participate in the counseling of at least one patient regarding medication use during pregnancy and at least one patient regarding substance abuse during pregnancy
- OG 4.5 SO2 To review Appendix 4 of the BNF Manual and list the medications that are absolutely contraindicated during pregnancy
- OG 4.5 SO3 To review Appendix 5 of the BNF Manual and list the medications that are also likely contraindicated drugs during breast feeding

	<p>Take the MCQ</p> 
<p>Articles Of Interest</p> <p><a href="#">Salmonella in Pregnancy</a></p>	

Name	Size	Modified
2005_JCOG2_Checkbook.pdf	146.4KB	5 August 2008, 09:19 AM
2010_JCOG2_HIV_Pregnancy.pdf	373.4KB	11 January 2011, 09:21 PM
2011_JCO2_HIV_Guidelines.pdf	484KB	11 August 2011, 03:02 PM
OG_4.5_Infectious_Diseases_in_Pregnancy.pdf	6.5MB	18 August 2011, 09:46 PM

ImageBr

moodle

**Figure 9**  
Each tutorial was designated an individual webpage. This figure demonstrates the catalogue number for a tutorial, the layout of the tutorial webpage, links to the tutorial, additional resource material, links to additional national and international published guidelines, and the associated quiz. Knowledge Objectives and Skills Objectives are clearly outlined.

Each topic quiz [See Appendix 5 for a complete List of course topics and associated quizzes] was presented in the same format described in Chapter Three. The adjustable parameters such as time allowed and interval lock out, were set as per Chapter three. The number of attempts was limited to 5, based on data from Chapter 3 indicating that 99% [n=200] of students attempted the quizzes no more than five times. The highest grade was used for analysis.

#### **4.3.5 Developing the Quiz Question Bank**

Questions were manufactured in the same manner as described in Chapter three. A substantial course question bank evolved, which was subdivided by topic to facilitate randomization within quizzes. Questions were assigned randomly, using the Moodle random question sampler, within a particular topic question bank. [See Figure 10 and 11]

Info Results Preview Edit

Quiz Questions Categories Import Export Import EMCQ

Attempts: 160

You cannot add or remove questions because there are attempts.

Order	Question name	Type	Grade	Action
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↓	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑
↑	Random Question (SC SI O+G 1.6 POSTNATAL HX & EXAM QUIZ)	?	1	🗑

Total: 20  
Maximum grade: 100

Save changes

- Show page breaks
- Show the reordering tool
- Go

**Figure 10**  
*Screen grab demonstrating the random question population engine for OG 1.6 Postnatal History and Examination QUIZ*

Update this Quiz

Info Results Preview Edit

---

Quiz Questions Categories Import Export Import EMCQ

Question bank

Display questions from sub-categories too  
 Also show old questions  
 Show question text in the question list

Category SC 51 O+G 3.6 Preterm Labour & PPROM QUIZ (76)

SC 51 O+G 3.6 Preterm Labour & PPROM QUIZ

Create new question Choose

Page: 1 2 3 4 (Next)

Sort by type, name	Action	Question name	Type
	<input type="checkbox"/>	Aetiology of PROM: staph aureus, chlamydia, GBS, bacteroides.	..
	<input type="checkbox"/>	Antenatal cortico steroids should be administered with PPROM at	..
	<input type="checkbox"/>	Betamethasone may be preferable to Dexamethasone because of reduction in incidence of PVLH.	..
	<input type="checkbox"/>	Calcium Channel Blockers - Nifedipine- relaxes smooth muscle by decreasing intracellular calcium.	..
	<input type="checkbox"/>	Glucose level, White cell count, Gram stain / culture are al markers of Infection that can be measured in the amniotic fluid.	..
	<input type="checkbox"/>	Intrauterine Fetal Growth Restriction is not associated with prematurity.	..
	<input type="checkbox"/>	Mid trimester PPROM (16-25 wks), in absence of infection overall survival is 50-75%.	..
	<input type="checkbox"/>	Mid trimester PPROM (16-25 wks), 57% deliver within a week, 22% continue for over a month.	..
	<input type="checkbox"/>	Mid trimester PPROM (6-12 wks), 57% deliver within a week, 22% continue for over a month.	..
	<input type="checkbox"/>	Myometrium is smooth muscle.	..
	<input type="checkbox"/>	Myometrium is striated muscle.	..
	<input type="checkbox"/>	Neonatal complications of pre term labour Include : Intraventricular haemorrhage.	..
	<input type="checkbox"/>	Neonatal complications of pre term labour Include : Necrotising enterocolitis.	..
	<input type="checkbox"/>	Neonatal complications of pre term labour Include : Patent ductus arteriosus.	..
	<input type="checkbox"/>	Neonatal complications of pre term labour Include : Periventricular leukomalacia.	..
	<input type="checkbox"/>	Neonatal complications of pre term labour Include : Respiratory distress syndrome.	..
	<input type="checkbox"/>	Oxytocin responsiveness depends on receptor concentration and increases with gestation.	..
	<input type="checkbox"/>	Oxytocin responsiveness is independent of receptor concentration but increases with gestation.	..
	<input type="checkbox"/>	PPROM between 26 weeks and 34 weeks results in Increase incidence of abruption.	..
	<input type="checkbox"/>	PPROM between 26 weeks and 34 weeks results in Increased caesarean section rates.	..

Page: 1 2 3 4 (Next)  
Show all 76

Select all / Deselect all

With selected:

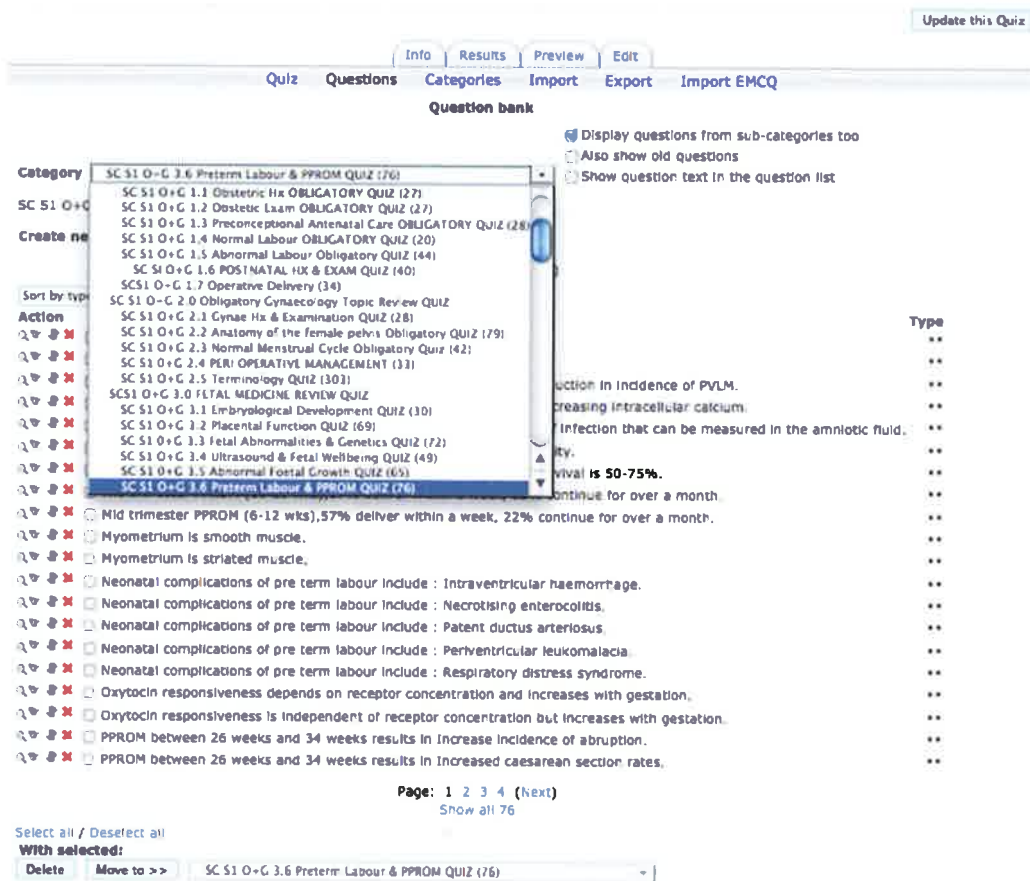
Delete Move to >> SC 51 O+G 3.6 Preterm Labour & PPROM QUIZ (76)

### Figure 11

*This demonstrates the question sub-titles within the question bank, the nature of the questions (True-False), and the total number [n=76] of questions in the OG 3.6 Preterm Labour and PPROM Quiz.*

Figure 12 demonstrates the ability to add additional random questions from different categories, if required. The course question bank totaled 3,066

individual questions, taken directly from the tutorials. The quiz questions focused on core knowledge, with the view that applied knowledge was to be tested later in the OSCE and written examination settings.



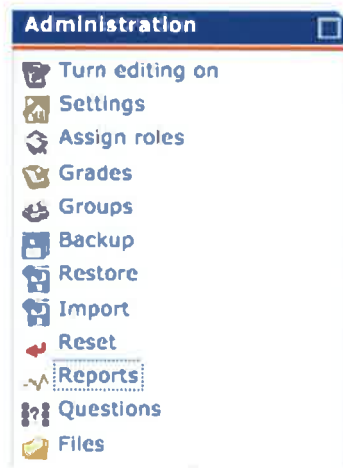
**FIGURE 12** demonstrates the organization of individual quiz questions and the ability to add additional random questions from different quiz categories, if required.

Each student is instructed to complete the online tutorials, and the associated quizzes. The student activity is measured through Moodle and their knowledge is quantified via a multiple choice / true-false online exam [MCQ]. Up to 5 MCQ attempts were facilitated.

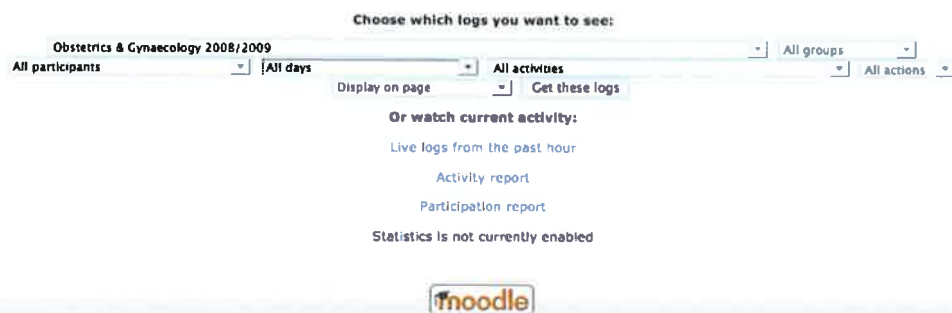


#### **4.3.6 Data available through Moodle**

The Moodle software package automatically collected data relating to student logins, individual resource views, number of quiz attempts, grade of quiz attempts, and time taken for quiz attempts. These data were related to a unique Moodle identifier and were exported using the Moodle export reports function. [See Figures 13, 14] Means and standard errors are reported for all of the grouped data. One-way ANOVA and Student's t test for independent samples were used for data analyses. Pearson correlation coefficients ( $r$ ) were also used to describe associations between continuous variables.



**Figure 13** demonstrates the administration access point where the reports function is embedded in Moodle. This is only visible to participants with teacher privileges.



**Figure 14** demonstrates the Reports function available to teachers. This function allows teachers trace the logs of individuals, student groups or evaluate the activity for a given resource or activity.

#### 4.4 Results

Statistical analysis was performed using SPSS [Statistical Package for the Social Sciences] version 15.0.1. Final scores relate to Final Professional Examination 2007, and a combination of scores for 2007 – 2010. End-of-year final examination scores were marked out of 200 and comprised of end-of-clinical placement OSCE (60 marks), end-of-year written MCQ (80 marks), and end-of-year clinical-viva (60 marks). The clinical-viva component was a barrier in itself and students had to pass this component, with no provision to compensate with marks from other components of the examination. An honours final score was defined as >60%, Pass > 50%, and Fail <50% in the final professional examination.

For the 2007 academic year 188 students completed the final examination, 42.5% Male, [n=85] 51.5% Female [n=103]. 24 Nationalities were represented, with Norway [11% n=22], Canada [13.5%, n=27], Ireland [21%, n=42], Kuwait [10%, n=20] and Malaysia [14.5%, n=29] representing 70% of the student group. 85 Students achieved an honors final score, 77 students achieved a pass mark, and 31 students failed the first sitting of the exam.

All but one student accessed the Moodle site, with the total number of accesses being 551,830. All students who logged into the site accessed the course material, with the total number of resource views being 203,073. Regarding logins, there was no difference between those students who achieved honors scores [n=85] and those who achieved passing scores

[n=77], with 2907 [Range: 472-10290] and 2926 [Range: 1040-4869] logins respectively,  $p > 0.05$ ). However, there was a statistically significant difference ( $p=0.025$ ), between the students who passed and those who failed [n=37] the exam. The fail group had an average number of logins of 2280 [Range 523-5357]. The number of logins and resource views positively correlated with the final examination scores.

All of the 44 quizzes were specifically analyzed to determine whether the students who failed the exam could be differentiated from those who passed the exam. [See Table 4.1] 25 of the 44 quizzes distinguished between the students who achieved a pass grade [excluding those who achieved an honors grade] from those who failed the examination. [ $p < 0.05$ ]

45% [n=19] of the students who achieved an honors grade attempted all of the available 44 quizzes. 31% [n=13] of those who failed the final exam attempted all the available 44 quizzes. None of the students who failed the repeat examination attempted all of the available quizzes.

Students were divided into four groups in relation to their mark achieved in the final examination; those who achieved an honours grade 'Honours', those who passed 'Pass', those who initially failed the first sitting of the final exam but who passed the repeat exam 'Fail', and finally those who failed the initial sitting of the exam and the repeat sitting 'Fail Repeat'

There was no difference between the four student groups [Honors, Pass, Fail and Fail Repeat] in the mean time taken to complete the online quizzes.

[0:07:07, 0:09:40, 0:07:54, 0:09:12,  $p > 0.05$ ]

The average number of times students attempted the quizzes did not distinguish between those who achieved Honors, Pass, Fail and Failed the Repeat, grades in the final examination. [1.2, 1.5, 1.3, 1.2,  $p > 0.05$ ]

Combining the data from 2007 – 2010, 49.7% of those who achieved an Honors degree completed all of the quizzes [n=44], compared to 45.9% of those who achieved a pass grade, and 41.1% and 39.4% of those who achieved a fail grade in the first sitting of the final exam and those who failed the repeat examination. There was no difference between the groups as regards the number of attempts or time taken to complete the quizzes. A logistic regression analysis was performed on the quiz result data from 2007-2010. The online quiz results did not reliably predict final exam scores ( $R^2=0.04$ ,  $p>0.05$ ).

#### **4.5 Discussion**

The Department of OBGYN was determined to facilitate change in curriculum delivery, although challenging and difficult on many levels.<sup>142</sup> The Department acknowledged the higher expectations<sup>118</sup> of the student body, compared with previous generations of students. In line with WFME and IMC recommendations we sought to ensure assessment methods were linked to defined learning outcomes.<sup>139</sup> Each topic within the course was carefully mapped to the broader Medical Graduate Profile<sup>142</sup> as part of a wider curriculum reform process at the institution.

The 99.5% rate of student login and resource view demonstrates the ability to deliver the course lecture material electronically as on-line tutorials<sup>78</sup> in a technologically advanced<sup>140</sup> manner.

While many publications emphasize students' satisfaction and enjoyment with a blended learning environment<sup>140</sup> it is not possible to determine whether this is as a result of the educators' enthusiasm, the particular way the material is presented, the course itself or any combination of these facets. Many reports<sup>116, 140, 141</sup> focus on particular skills or knowledge sets rather than an entire course evaluation.

The systematic presentation of the course material, in a standardized manner allowed consistent navigation through the on-line course. Each tutorial had clearly defined learning knowledge and skills objectives. These objectives help define the end-point of the learning process which is a critical part of the quality improvement process.<sup>103</sup> E-learning has found favour because it offers many advantages in educational settings. This is not only because of its 'reach' but also because of its inherent capability for non-linear interaction.<sup>121,143</sup> Students can control the pace and sequence of their instruction and make personally meaningful choices which should help them in their understanding.<sup>(144)</sup>

E-learning is a component of, but not a substitute for, other forms of teaching.<sup>145</sup> The use of VLE-based tutorials means that students can cover the basics of the course, as an 'advance primer'<sup>121</sup> before attending small

group teaching sessions and can engage in the more interactive elements of courses when they physically attend. Following the course, further exercises and self-assessments can be made available online. This is deemed to be a more efficient and educationally superior approach to delivering education.<sup>146</sup>

The writer sought to demonstrate that the VLE delivered course was not detrimental to education and in fact was valuable.(139, 147, 148) In line with Irish Medical Council recommendation R.33,<sup>6</sup> it was necessary to make E-learning available across all clinical teaching sites and informed its implementation from international developments in medical education.<sup>149</sup>

This chapter demonstrates the feasibility of using Moodle to manage a large question bank successfully. Online quizzes are a useful tool for students to test their level of knowledge.

Moodle provides a wide range of quiz types. In this course we have chosen questions that can be of two types: true/false and multiple-choice questions. Moodle facilitated the adaptation of the quizzes: the date and time when a quiz is available, the time available to complete it, the number of attempts, score specific feedback. Students may receive immediate or delayed feedback. Each time the students try to solve one of them the questions are automatically shuffled to appear in different order.<sup>142</sup> Figure 3 demonstrates students' view of a true/false quiz item.

The on-line quizzes promote practice testing and distributed practice<sup>143</sup> believed to benefit learners. The term distributed-practice effect refers to the that distributing learning over time (either within a single study session or across sessions) typically benefits long-term retention more than does massing learning opportunities back-to-back or in relatively close succession.<sup>144,145</sup> It is considered a high utility learning aide. The availability of the tutorial material, and the subsequent quizzes blended with face-to-face bedside teaching affords a learning environment that maximizes students learning opportunities. The distributed-practice effect refers to better learning when learning episodes are spread out in time compared with when they occur in close succession. Distributed practice testing is better than distributed study<sup>146</sup> as would be expected from the large literature on the benefits of practice testing.

Practice testing can also improve learning and later performance, even when the practice test [Quizzes] doesn't match the criterion test [Final Exam].<sup>147</sup> Evidence also demonstrates that multiple practice tests positively influence performance.<sup>148</sup> Our study demonstrated a correlation between the students who accessed the site more frequently and final scores. Our study was also able to differentiate between students with a pass grade [50-59%] and those who failed [>49.9%] in 26 out of 44 quizzes.

The theory behind the implementation of an online tutorial course is firmly grounded in evidence and provides a foundation for future refining of the quiz delivery and reduction in non-discriminatory questions.



It is important to acknowledge the limitations of our study. A randomized controlled trial would better address the issue of CAL vs didactic teaching. However, in the context where students perceive the usefulness of CAL,<sup>40,42,43</sup> and the high stakes that directly relates to degree awarded, ethical approval for such a randomized study would be unlikely.

While the quiz questions were taken directly from the material contained within the associated tutorials, there was no formal standardization of the questions, or measure of difficulty of the quiz. Thus, it is premature to draw conclusions about the quizzes as they relate to final examination performance. Student perception was not addressed in this chapter. Chapter seven will address the student perceptions of the online course. Finally while we infer that the efficiencies afforded by the Moodle course allowed instructors to engage their students more deeply during bedside teaching,<sup>24</sup> this was not measured in this study.

## **4.6 Conclusions**

Moodle has successfully replaced the didactic lecture format at the RCSI Department of Obstetrics and Gynecology, in favor of a user-centered, semi-structured, self-directed blended learning environment. Our adult learners have the opportunity to prepare ahead of bedside clinical teaching session. Moodle has evolved to be a great way for faculty to organize, manage and deliver course materials, over multiple sites, and more importantly build on the

experiences of the previous academic year. Studies have demonstrated that a considerable proportion of students want E-Learning platforms to serve as adjuncts to face-to-face teaching environments.<sup>149</sup> This is addressed in Chapter seven. The students who used Moodle regularly during the semester have obtained higher scores than the students who did not.

Medical educational and regulatory bodies have placed a lot of emphasis on using E-Learning. This is because it fits with the distributed nature of today's learning society and it can support the increasing size of the student population.<sup>121</sup> We must take care to evaluate the introduction of new technology. Great care must be taken when drawing inferences from the vast amounts of data on students' on-line usage available to teachers. The true challenge will be to find the balance between the 'the razzmatazz of the latest technology'<sup>121</sup> and the judicious use of technological advances that support deep learning.<sup>111</sup>

The relationship between students' on-line activity within an undergraduate obstetrics and gynecology curriculum is complex. On-line-based course activity or assessment results should not replace formal assessments without further validity and reliability evaluation. The next step is defining the usefulness of the pre-clinical course preparation using Moodle. E-Learning is a worthwhile supplement to traditional teaching,<sup>69</sup> and defining its optimal use is vital.

## **Presentations**

### **Moodle: Facilitating a more productive clinical teaching programme in undergraduate Obstetrics & Gynaecology**

McVey RM, Doody C, Clarke E, Malone FD

Oral Presentation: RCOG 7<sup>th</sup> International Scientific Meeting, September 2008, Montreal

### **Moodle: Time to meet the challenge of undergraduate Obstetrics & Gynaecology training?**

McVey RM, Doody C, Clarke E, Malone FD

Scientific Exhibit, American College of Surgeons 2008 Clinical Congress, San Francisco, October 2008

### **“Moodle: a new era in Undergraduate Obstetrics & Gynaecology training”**

Oral Presentation

McVey RM, Clarke E, Doody C, Malone FD

Registrars Prize Presentation, Royal Academy of Medicine.  
February 2008

## Chapter 4 Tables

**TABLE 4.1**  
*All 44 2007 Quiz results comparing those students who passed the Final Exam with those students who failed the Final Exam*

<b>Quiz Number</b>	<b>Pass Grade v</b>	<b>All Fail grades</b>	<b>p value</b>
Quiz 1:	86.12 [Range 44-100] v	81.10, [Range 54-100]	p=0.41
Quiz 2:	83.7 [Range 61-100] v	77.65, [Range 48-96]	p=0.49
<b>Quiz 3:</b>	87.85 [Range 43-100] v	85.4 Range 65-95]	p=0.12
Quiz 4:	86.89 [Range 70-97] v	80.82 [Range 53-100]	p=0.32
Quiz 5:	84.78 [Range 34-100] v	79.24 [Range 59-100]	p=0.004
Quiz 6:	87.30 [Range 78-100] v	82.47 Range 53-100]	p=0.046
<b>Quiz 7</b>	85.66 [Range 13-100] v	81.25 [Range 66-100]	p=0.81
Quiz 8	85.06 [Range 13-100] v	76.66 [Range 52-96]	p=0.043
Quiz 9	86.74 [Range 60-100] v	77.65 [Range43-100]	p=0.021
<b>Quiz 10</b>	91.86 [Range 70-100] v	83.34 [Range 56-100]	p=0.057
<b>Quiz 11</b>	86.133 [Range 60-100] v	86 [Range 40-100]	p=0.23
Quiz 12	95.15 [Range 65-100] v	89.01 [Range 60-100]	p=0.20
Quiz 13	89.448 [Range 37.5-100] v	78.32 [Range 52-100]	p=0.041
Quiz 14	86.61 [Range 55-100] v	82.75 [Range 35-100]	p=0.022
Quiz 15	86.73 Range 50-100] v	82.94 [Range 55-100]	p=0.035
Quiz 16	87.19 [Range 60-100] v	81.65 Range 60-100]	p=0.03
<b>Quiz 17</b>	85.34 [Range 62-100] v	80.58 [Range 52-96]	p=0.069
Quiz 18	80.93 [Range 0-100] v	71.0 [Range 44-96]	p= 0.001
<b>Quiz 19</b>	94.23 [Range 50-100] v	91.2 [Range 80-100]	p= 0.088
<b>Quiz 20</b>	86.31 [Range 41-100] v	79.02 [Range 50-96]	p=0.52
Quiz 21	86.31 [Range 41-100] v	77.92 [Range 49-100]	p=0.012
<b>Quiz 22</b>	93.84 [Range 44-100] v	82.81 [Range 45-100]	p=0.14
Quiz 23	90.39 [Range 67-100] v	80.94 [Range 50-100]	p=0.001
Quiz 24	86.65 [Range 66-100] v	76.35 [Range 50-100]	p=0.034
<b>Quiz 25</b>	88.80 [Range 60-100] v	90.37 [Range 55-100]	p=0.80
<b>Quiz 26</b>	89.96 [Range 50-100] v	93.25 [Range 55-100]	p=0.9
Quiz 27	91.96 [Range 47-100] v	79.3 [Range 55-100]	p= 0.026
<b>Quiz 28</b>	95.44 [Range 80-100] v	92.18 [Range 60-100]	p= 0.92

Quiz 29	91.14 [Range 63-100] v	80.80 [Range 45-100]	p=0.035
Quiz 30	87.69 [Range 45-100] v	78.77 [Range 40-100]	p= 0.021
<b>Quiz 31</b>	88.49 [Range 34-100] v	84.59 [Range 65-100]	p= 0.089
<b>Quiz 32</b>	90.01 [Range 80-100] v	82.96 [Range 70-100]	p= 0.19
<b>Quiz 33</b>	92.79 [Range 50-100] v	89.61 [Range 60-100]	p=0.32
<b>Quiz 34</b>	91.77 [Range 47-100] v	88.59 [Range 55-100]	p=0.46
Quiz 35	85.41 [Range 41-100] v	74.41 [Range 50-98]	p=0.043
<b>Quiz 36</b>	86.25 [Range 45-100] v	84.27 [Range 55-100]	p=0.14
<b>Quiz 37</b>	85.69 [Range 55-100] v	88.63 [Range 60-100]	p=0.31
<b>Quiz 38</b>	86.61 [Range 40-100] v	81.95 [Range 33-100]	p=0.23
Quiz 39	92.26 [Range 30-100] v	75.55 [Range 32-100]	p=0.015
<b>Quiz 40</b>	88.60 [Range 70-100] v	86.52 [Range 50-100]	p=0.18
Quiz 41	86.14 [Range 61-100] v	78.46 [Range 60-100]	p=0.039
Quiz 42	88.08 [Range 66-100] v	73.56 [Range 59-100]	p=0.004
Quiz 43	87.71 [Range 58-100] v	72.07 [Range 52-100]	p=0.023
Quiz 44	83.39 [Range 60-100] v	69.75 [Range 35-100]	p=0.048

## **CHAPTER FIVE - Pre-placement Tutorials**

### **5.1 Aim**

To determine whether an on-line undergraduate obstetrics and gynaecology pre-clinical attachment tutorial series can be implemented using a Moodle format.

### **5.2 Hypothesis**

Moodle [Modular Object-Oriented Dynamic Learning Environment] can deliver a pre-clinical attachment tutorial series to undergraduate obstetrics and gynaecology students.

### **5.3 Abstract**

Medical education undergoes a continuous process of renewal in terms of medical education.<sup>121</sup> The RCSI Department of Obstetrics and Gynaecology sought to determine ways to maximize the effectiveness of clinical attachment experience for students.<sup>108</sup> An on-line pre-clinical attachment series of eleven tutorials and associated quizzes was developed and made available to students through Moodle.

The relationship between the pre-course tutorial series quiz results, resource activity and the end-of-year exam was examined. A positive overall correlation was identified between the quiz results and final examinations. However, results, number of attempts, and time taken to complete the quizzes

did not predict whether or not students would pass or fail the end-of-year examination in obstetrics and gynaecology.

## 5.4 Introduction

In Chapters Three and Four the writer outlined the challenges<sup>69</sup> of the medical education environment in Ireland and specifically within the Department of Obstetrics and Gynaecology at RCSI – increasing student numbers, decreased clinical attachment time, increasing medical knowledge requirements, and a multi-site clinical environment.<sup>150</sup> While not unique to a particular medical school they nonetheless pose significant challenges. We work from the premise that new knowledge is linked to existing knowledge<sup>142</sup> and that bedside tutorials are more beneficial if they are based upon links with existing knowledge.<sup>83</sup> This study attempted to deliver a pre-clinical attachment tutorial series using Moodle. This would facilitate focused bedside instruction. We later correlate these findings with final professional examination results.

## 5.5 Background

Experiential Learning Theory<sup>83</sup> determines that drawing on students' prior knowledge and experiences facilitate bedside learning.<sup>69,151</sup> Engaging the student unlocks prior learning in advance of bedside clinical experiences and facilitates deep learning.<sup>69,111</sup> Accepting that much of our clinical learning occurs during unscheduled, incidental encounters with unintended patient sources, the investigator wanted to prepare the students for the rich learning environments that exist within maternity units. The pre-course tutorial series emphasizes 'purposeful' learning<sup>152</sup> – learning with the imminent clinical rotation in mind.



The development of a knowledge society, with an emphasis on how to apply knowledge, requires a deeper conceptual understanding that is complimented by Moodle. Students actively participate in their own learning.<sup>153</sup> The pre-course tutorial series allows students prepare for the upcoming clinical environment and allows tutors know what prior knowledge<sup>154</sup> the student group has, in order to facilitate meaningful learning.<sup>155</sup>

In order to build on existing knowledge, teaching must engage prior knowledge.<sup>152</sup> Educators are faced with an array of students with different levels of knowledge. Relying on one-on-one, face-to-face learning<sup>156</sup> is neither practical nor feasible in the Irish medical education context. Thus the investigator conceived of a pre-course on-line programme which would allow students prepare for bedside teaching, and provide a reference point for educators from which they could build on a student's existing knowledge. This concept was instigated based on evidence that computer assisted learning was at least equivalent to traditional teaching methods.<sup>156-159</sup>

The development of a pre-course tutorial series facilitates the acquisition of verbal information, and intellectual skills in preparation for their application in cognitive strategies and assimilation of attitudes.<sup>160</sup>

Cognitive explanations for learning lead to the concepts of surface learning versus meaningful learning.<sup>111</sup> Meaningful learning occurs when links are made with new and existing knowledge. To understand new knowledge the learner examines and activates prior knowledge. This process is called deep learning.<sup>111</sup> The most important key is to establish what student already knows and teach accordingly. The pre-course tutorial series ensures that all students have been exposed to a basic knowledge level. The purpose of this chapter is to demonstrate how Moodle may be considered as an advance organizer with a structured preparatory work-book with interactive exercises prior to a clinical attachment. All participants were familiar with Moodle prior to commencing the OBGYN course.

#### **5.5.1 Study Population:**

All students' participation in the 2007, 2009 and 2010 academic years for obstetrics and gynecology was examined.

#### **5.6 Methods**

All participants were familiar with Moodle prior to commencing the OBGYN course. All students were instructed to complete a pre-specified list of eleven tutorials and linked quiz assessments prior to commencement of their clinical attachment, using the established Moodle platform. Students were enrolled in the course via the Department of Medical Informatics as described in Chapter three.

An Introductory tutorial series covering eleven topics in total was developed as described in Chapter 4. Six topics covered basic obstetrics and five topics

covered basic gynaecology. [See Table 5.1] The tutorial material and quizzes were developed as previously described.

***Table 5.1: List of Pre-Course Tutorials***

**OG 1.0 Introductory Tutorials Obstetrics**

- OG 1.1 Obstetric History QUIZ
- OG 1.2 Obstetric Examination QUIZ
- OG 1.3 Antenatal & Pre-Conceptional Care QUIZ
- OG 1.4 Normal Labour & Delivery QUIZ
- OG 1.5 Abnormal Labour & Delivery QUIZ
- OG 1.6 Postnatal History & Examination QUIZ

**OG 2.0 Introductory Tutorials Gynaecology**

- OG 2.1 Gynaecological History & Exam QUIZ
- OG 2.2 Anatomy of the Female Pelvis QUIZ
- OG 2.3 Normal Menstrual Cycle QUIZ
- OG 2.4 Peri-operative Care QUIZ
- OG 2.5 Essential Obstetric & Gynaecologic Terminology QUIZ

Students could access the tutorial material and quizzes four weeks prior to commencement of the academic year. Students were mandated to achieve a pass mark of 80% on each quiz. No explicit sanction was imposed on those students who failed to achieve the arbitrary minimum grade. Students who failed to complete the 11 linked quizzes were not allowed to commence their clinical rotation. The number of quiz attempts was limited to five, [based on data from Chapter 3] and the highest mark was recorded for statistical analysis. SPSS 15.1 was used for analysis. A model was built to attempt to predict whether a student will fail the course based on the results of the pre-course

quizzes. Logistic regression was chosen as a suitable technique in predicting a binary outcome such as pass or fail, i.e. 1 or 0. The statistical computer package used for this analysis was MINITAB. The variable 'PassOrNot' was used as the outcome. An outcome variable, in this case is one that has two possible values, 1 or 0. 'PassOrNot' represents whether or not a student passes the course or not. Means and standard errors are reported for all of the grouped data. One-way ANOVA and Student's t test for independent samples were used for data analyses. Pearson correlation coefficients ( $r$ ) were also used to describe associations between continuous variables.

## 5.7 Results

201 students were enrolled in the 2007 academic year, 199 student final examination results were examined in relation to their pre-course tutorial quiz activity. Two students' data were incomplete and so were omitted. After initial 2007 analysis, a further group analysis was completed on a combination of the 2007, 2009, and 2010 data, comprising 681 students.

For the 2007 group, all but one student participated in the quizzes. Considering the mean results of all 11 pre-course quizzes, there was a statistically significant difference between the students who passed the final exam and those who failed it, 84.3 percent compared to 77.0 percent,  $p=.028$ ]. The mean number of quiz-attempts for the pass group was 1.33, which was not significantly different from the fail group at 1.36 attempts [ $p=0.58$ ]. The mean time taken was also insignificantly different between the two groups at 0:08min:25sec and 0:08min:36sec respectively,  $p=0.692$ . The range of attempts for both groups was 1-5 attempts.

Table 5.2 demonstrates the relationship of the quiz scores with the final examination scores. All but two of the eleven quiz results correlated with the final examination scores [ $p<0.001$ ]. Neither the average time taken to complete a quiz [ $F=0.003$ ,  $p>0.05$ ], nor the number of attempts [ $F=0.006$ ,  $p>0.05$ ] correlated with final scores. Neither the Gynecological History Quiz nor the Obstetrics and Gynecology Terminology Quiz were able to differentiate between high scoring and low scoring students. Overall the quiz grade correlated with final examination scores [ $F=0.422$ ,  $p<0.001$ ].

**Table 5.2**

This demonstrates the relationship of the quiz scores with the final examination scores. All but two of the eleven quiz results correlated with the final examination scores [ $p < 0.001$ ].

Variables for correlation:

1. Grade: First Class Honours, Second Class Honours, Pass and Fail
2. Pass or Fail

Moodle and Quiz variables:

1. Average quiz grade for the 11 quizzes
2. Average number of attempts of the 11 quizzes
3. Average time taken for the 11 quizzes
4. Average time taken for the 11 quizzes rounded to the nearest minute
5. Students who took longer than average to complete quizzes or not
6. Average number of attempts to achieve the 80% pass mark

Quiz	QUIZ Number	Quiz Result Correlation with Final Scores	Quiz Result Correlation with Pass or Fail	Quiz Attempts Correlation with Final Score
Obstetric History	1	0.224*	0.16	0.017
Obstetric Examination	2	0.246*	0.134	0.036
Normal Labour and Delivery	3	0.253*	0.125	0.072
Abnormal Labour and Delivery	4	0.288*	0.244*	-0.019
Antenatal and Pre-conceptual Care	5	0.226*	0.245	-0.065
Postnatal History And Examination	6	0.311*	0.161	0.006
Gynaecological History and Examination	7	0.124	0.071	0.15
Normal Menstrual Cycle	8	0.23*	0.248*	0.076
Peri-Operative Care	9	0.337*	0.266*	0.114
Anatomy of the Female Pelvis	10	0.289*	0.235*	0.008
Obstetrics and Gynaecology Terminology	11	0.165	0.151	0.006
* Denotes significant correlation, where $p < 0.001$ .				

**Table 5.2.1**

Correlations with Final Score

	<b>Final Score</b>
<i>Avg Quiz Grade</i>	<i>0.422</i>
Avg No Of Attempts	0.003
Avg Time Taken	-0.09

There is a significant positive relationship between Average QUIZ Grade and Final Score: The higher the students average QUIZ grades the higher the Final Score.

**Table 5.2.2**

Correlations with Pass or Fail

	<b>Pass Or Not</b>
<i>Avg Quiz Grade</i>	<i>0.336</i>
Avg No Of Attempts	-0.044
Avg Time Taken	-0.006

The higher the students' average quiz grades the higher the final exam scores. A univariate logistic regression was conducted [See Table 5.3], however as before, quiz results significantly predicted final exam scores ( $R^2=0.01$ ,  $p<0.05$ ). For every one-unit increase in quiz results, we expect a 0.046 increase in the log-odds of final exam scores

**Table 5.3**  
**Univariate logistic regression**

A logistic regression was run with each of the variables *singly* to discover the variables, which discriminated between the two categories, 'Passes' and 'Fails'. If a variable matched the criteria given below, it was deemed as statistically *insignificant*.

- Odds ratio of approximately one;
- Confidence Interval that includes one;
- P value of greater than 0.05

Unfortunately the variables, which were hoped would prove significant in the model all proved statistically insignificant.

These variables include:-

- 'More than One attempt' i.e. whether the student requires more than one attempt to complete the QUIZ.
- 'Time Greater than Average', i.e. whether or not the student spends more or less than the average time doing the QUIZ



## Logistic Regression

	Parameter Estimate	SE	Wald	df	p	Exp(B)
Intercept	2.180	2.239	.948	1	.330	8.846
Quiz Results	.046	.028	4.685	1	.049*	.955
Cox and Snell R2	.019					
Nagelkerke R2	.031					

The table shows the parameter estimates for the logistic regression model. In this study, the equation is as follows:

$$\text{Log (odds of passing final exam)} = 1.000 + .046 \text{ Quiz Results}$$

where odds=  $p / (1-p)$  and  $p$  is the probability.

Combining all the complete 2007-2010 data sets, 679 students are represented [549 passes and 130 failing the first sitting of the final exam]. There was no significant difference between the mean result of the quizzes for the pass group, (84.6 percent and 73.06 percent) and for the fail group,  $p=0.72$ . [See Table 5.4]

**Table 5.4**

Combining all the complete 2007-2010 data sets, 679 students are represented [549 passes and 130 failing the first sitting of the final exam]. There was no significant difference between the mean result of the quizzes for the pass group, (84.6 percent and 73.06 percent) and for the fail group,  $p=0.72$ .

	<b>Students Who at least passed</b>	<b>Students Who Failed</b>	<b>p-value for pass v fail</b>
Total Number Students	549	130	
% of students for whom we have complete data	100%	100%	
Total number of students for whom we have complete data	549	130	
Mean Result of All 11 Quizzes	84.65522	73.06042	.072
Range of Results for All 11 quizzes	0-100	4-100	
Std Dev of results for all quizzes	12.27215	13.49528	

## 5.8 Discussion

Practice testing enhances learning and retention.<sup>144</sup> The importance of learning to a criterion level is well-documented<sup>144,145</sup> in this case an arbitrary 80% pass mark was instituted. There is clear evidence that increasing the criterion level or prescribed benchmark for initial learning has a positive impact on knowledge retention.<sup>144</sup> A Moodle-based pre-course learning module facilitates conditions that theoretically promote durable and efficient learning. Re-testing has been identified as a learning method that promotes information retention.<sup>161</sup>

Distributed practice – practice spaced out over time, has also been identified as a learning approach that improves knowledge retention. Students who undertake a pre-course tutorial series are required to complete the tutorials and associated quizzes in advance of the clinical setting. Students therefore cover the material on subsequent occasions during the clinical attachment, thus facilitating distributed practice and learning, leading to higher knowledge recall.<sup>145</sup> These learning strategies are aligned with the self-directed nature of adult learning theory.<sup>144</sup>

This study demonstrates the feasibility of providing a pre-course on-line tutorial series in undergraduate obstetrics and gynaecology. Previous researchers have demonstrated that students with lower pre-knowledge benefitted more from face-to-face teaching, while students with higher pre-knowledge benefitted more from an on-line teaching model.<sup>162</sup> This study identified students with lower knowledge as determined by the pre-course quizzes. Nine of eleven quizzes identified students that would later go on to fail the final examination. They also differentiated between students who achieved honours grades and passing grades. This pre-course of 11 tutorials serves to standardize the

baseline knowledge of students as well as identifying students with lower pre-course knowledge. Pre-course quiz series acts as a motivator<sup>117</sup> and a building block toward a higher level of knowledge comprehension and application.<sup>139</sup>

Quiz number eleven results had the weakest relationship with the final examination score. The quiz “Essential Obstetric and Gynaecology Terminology” was the least interactive and essentially composed a list of terms with explanations. Student short-term memories would have fared better in the associated quiz that only tested declarative knowledge.<sup>72</sup>

The quiz on Gynaecological History and Examination did not correlate with end-of-year results. This may be explained either because it demonstrates that a multiple choice question is not the most appropriate way to examine the understanding of the material, students were sufficiently able to draw on prior knowledge to pass the quiz.

There are a number of limitations in this study which are recognized.

The time of the year at which the quizzes were undertaken in relation to the final exam was not included in the analysis. The closer the time between the quiz and the final exam could logically explain the results. The content of the individual quizzes, in the context of the broader OBGYN curriculum, was not evaluated. Neither the lead-time between each quiz nor the access to the related lecture were evaluated. While each of the quizzes were based directly on their associated PowerPoint presentation, no formal evaluation of level of difficulty was established. Future work may examine these limitations in the analysis. Students’ perception of the pre-course work is addressed in Chapter seven.

Based on these data relating to the pre-course quizzes, a reliable model cannot be produced that could predict with a useful level of statistical accuracy whether or not a student will pass or fail the course. This may be because other variables come into play which impact on whether a student passes or fails the course that are not provided for here, such as the number of clinical tutorials attended, time spent studying, learning style etc. The scores relating to the pre-course quizzes do however predict the overall final result in the course.

A relationship between online activity and final examination performance exists. However, this relationship is complex and attempting to quantify the relationship based on arbitrarily manufactured true-false quizzes, and gross login data appears to be overly simplistic in terms of contributing to a summative assessment. What may be more relevant is how this data interact with other more patient orientated assignments. Alternatively the opportunity exists to raise awareness of potentially struggling students early in their clinical attachment.

### **5.9 Conclusions:**

It is feasible to develop a pre-course on-line module using Moodle in an undergraduate OBGYN curriculum. In this study there was a positive correlation between end-of-year examination results and a pre-course assessment based on self-directed learning. However, there are insufficient data to reliably predict students' performance in end-of-year formal examinations based on a pre-course assessment of a self-directed on-line learning course in OBGYN. This is consistent with the intensive nature and rich learning environment that exists in the hospital ward. It highlights the

importance of the clinical learning environment and of clinical interactions for students, such that computerized learning cannot replace traditional bedside teaching. Rather, CAL has an important role to play in the provision of foundation or basic knowledge for students in addition to bedside teaching. The interaction data may be used to identify those students who may fail the end-of-year examination, and allows these students potential for remediation.

## **Presentations**

**“Using a student directed pre-course tutorial series in undergraduate  
Obstetrics & Gynaecology: towards Moodle’s full potential”.**

Oral Presentation

McVey RM, Clarke E, Doody C, Malone FD Irish Network of Medical Educators  
(INMED) Inaugural Annual Scientific Meeting

Medical Education in Ireland: New Frontiers Programme *7- 8 February 2008*

## Chapter 5 Additional Table Information

**Table 5.1:** List of Pre-Course Tutorials

**Table 5.2**

This demonstrates the relationship of the quiz scores with the final examination scores. All but two of the eleven quiz results correlated with the final examination scores [ $p < 0.001$ ].

### Explanation of Correlation Analysis

In order to determine the strength of the relationship between the variables, for both analytical purposes and also as a precursor to more in depth statistical analysis it was decided to conduct a Pearson-Product moment correlation analysis in which the correlation is measured by the metric “r”.

Correlation is a ‘measure of association between two variables’. Variables may be:

- > Perfectly correlated (e.g. move in perfect unison)
- > Partly correlated (some interrelationship but not exact)
- > Uncorrelated (no relationship)

Values for correlation can range from “perfect negative correlation” with a value for “r” of  $-1$ , that is as Y increases X decreases, to  $r = 1$  indicating a “perfect positive correlation”, that is as Y increases, X increases. A correlation in which “r” is zero means there is no linear relationship present between the two variables.

All of the variables discussed were entered into the statistical software package SPSS. Using the function ANALYSE >> CORRELATE >> BIVARIATE all variables listed were correlated against one another. The next step was to select all relationships between two variables that were of interest. The criteria chosen for inclusion were variables that SPSS had highlighted as being statistically significant at the 99.9% significance level.



These tables show a number of variables correlated with 'Final Score', that is the score achieved by the student in the final exam and 'PassOrNot', which is whether or not a student passes the course.

### Table 5.3

#### Univariate logistic regression

A logistic regression was run with each of the variables *singly* to discover the variables, which discriminated between the two categories, 'Passes' and 'Fails'. If a variable matched the criteria given below, it was deemed as statistically *insignificant*.

- Odds ratio of approximately one;
- Confidence Interval that includes one;
- P value of greater than 0.05

Unfortunately the variables, which were hoped would prove significant in the model all proved statistically insignificant.

These variables include:-

- 'More than One attempt' i.e. whether the student requires more than one attempt to complete the QUIZ.
- 'Time Greater than Average', i.e. whether or not the student spends more or less than the average time doing the QUIZ

**Table 5.4**

Combining all the complete 2007-2010 data sets, 679 students are represented [549 passes and 130 failing the first sitting of the final exam]. There was no significant difference between the mean result of the quizzes for the pass group, (84.6 percent and 73.06 percent) and for the fail group,  $p=0.72$ .

## **CHAPTER SIX – Case Uploads**

### **6.1 Aim**

To demonstrate the feasibility of establishing a case-based e-portfolio in an undergraduate obstetrics and gynecology curriculum.

To determine the relationship between students' participation and end-of-year examination results.

To develop an e-portfolio-based objective structured clinical examination [OCSE] question station.

### **6.2 Abstract**

A clinical log of student activity has been a longstanding component of the undergraduate obstetric and gynecology curriculum at our institution.

Technological advances have facilitated the measurement of this student activity. We integrated this student activity into existing summative assessments with a view to correlating student activity to end-of-year final examination scores.

The subsequent implementation and development of a novel case-based reflection portfolio for undergraduate obstetrics and gynaecology is demonstrated. The writer set about to develop a complimentary clinical case-based reflective diary for students and to embed this into the summative assessment process. The detail of the project's progress from initiation in 2007

to 2010 is outlined. The novel incorporation of the case-based uploads into the existing objective structured clinical examination is outlined. The correlation with end-of-year final examination results is discussed. Looking at the word counts of the uploaded cases and specifically the reflection word counts [ where students considered the learning points of cases encountered ] the pass group had an average word count of 105.4 [ Range 35-738, SD 113.6] while the fail group had an average word count of 62 [Range 0-297.8, SD 75],  $p=0.028$ , which is statistically significant.

This project moves medical educators closer to the Holy Grail of objectively identifying struggling medical students in advance of high stakes final examinations and better meeting their educational needs.

### **6.3 Background**

The importance of undergraduate medical students maximizing the benefits from the clinical environment in which they are rotating is well described.<sup>163</sup> So too have been the merits of computer assisted learning, however all too often these two facets have an uncomfortable relationship.

Computer assisted learning has long been suggested as an alternative to clinical interaction between student and patient.<sup>69</sup> There can be no replacement for the skills gained from an interaction with a real patient in the clinical environment.<sup>164</sup> However, the challenges of sicker patients being not suitable for teaching purposes, shorter inpatient hospital stays, increasing medical student numbers, and reduced clinical exposure time all result in an increased pressure on tutor and student alike to maximize the benefits of this clinical

exposure.<sup>165</sup> The specific role of clinical portfolios in the undergraduate obstetrics and gynaecology curriculum remains unclear.<sup>166</sup>

The Irish Medical Council,<sup>2</sup> as well as supporting literature,<sup>119,133,167-170</sup> emphasize reflection as a key element of learning. Reflection, a meta-cognitive process that involves awareness of experience, analysis of experience and planning of future actions, has been identified as an important attribute to deal with complex professional personal development.<sup>171</sup> Reflection is a key ingredient of personal development and learning.<sup>172</sup> Its definition and therefore characteristics will depend on its intended purpose.<sup>47</sup> Clinical portfolios have developed from paper-based logbooks to comprehensive electronic platforms with inherent benefits and drawbacks.<sup>173</sup> One of the key factors in securing success is defining the purpose of the portfolio and making the process for students straightforward.<sup>173</sup> The introduction of e-logbooks has already been seen as successful by students and staff, who acknowledged the opportunities to reflect and draw on the data collected.<sup>174</sup> Problems with additional time required for their successful implementation are well documented.<sup>173,175,176</sup>

Adult learning theory<sup>80,173</sup> underpins the theoretical basis for the use of portfolios in medical education. Portfolio preparation can help to nurture and develop these adult learning strategies.<sup>177</sup> The portfolio approach is based on experiential learning<sup>177</sup> where the learner is actively involved in their own learning.<sup>83</sup> This allows students build on existing knowledge, and engage prior

knowledge through a process of reflection.<sup>71</sup> Reflection gives the students opportunities to analyze the state of their knowledge in a safe environment that allows optimal academic engagement.<sup>119</sup>

Portfolios are used in the assessment of medical students<sup>69</sup> and their learning outcomes.<sup>178</sup> Murrell et al<sup>179</sup> found that not only did portfolios enable theory and practice to be brought closer together, but that they could lead to improvements in practice and facilitate students taking control over their own learning.

Criticism of E-portfolios include cost, increased time required for tutors, and students' perceived lack of benefit.<sup>180,181</sup> These benefits and challenges have been to the forefront of the development of this learning resource.<sup>174</sup>

### **6.3.1 Learning Theory**

An E-portfolio may be used as a catalyst for self-reflection and to facilitate change from passive to active learning.<sup>182</sup> Attempting to apply lessons learned in classrooms is difficult in the context of the complexity of clinical practice.<sup>183</sup> The context specificity<sup>71,76</sup> of some learning points is an important factor in clinical education. The case upload resource attempts to merge the bed-side learning events with declarative knowledge in an attempt to reach a deeper learning.<sup>76,169,172,184,185</sup> A reflective practitioner is the essence of epistemology of professional practice.<sup>165,177,178</sup> Reflection is a key ingredient of personal development and learning<sup>125</sup> The concept of building a bridge between theory and practice both in action and on action is the key stone of reflection.

### **6.3.2 Case Uploads**

In an effort to maximize the benefit of student–patient interactions and blend more traditional bedside teaching with newer e-learning techniques we developed a weekly clinical electronic case upload assignment. Students were asked to reflect on clinical scenarios from their attachment. This replaced the existing paper-based student logbook. These cases may be graded and feedback given through Moodle. An arbitrary minimum number of case uploads [one per week of clinical attachment] was agreed by faculty. Once again students' participation has been overwhelming, with students consistently exceeding the minimum requirements in term of cases uploaded. A deadline for submission was set at 7am each Monday. These clinical scenarios are further examined as a formal Objective Structured Clinical Examination (OSCE) station in a face-to-face viva setting. The OSCE <sup>186,187</sup> is a reliable method of assessing clinical competence, and uses a series of standardized tasks assessed using structured score sheets.

### **6.3.3 Methods**

All students were enrolled in the course as described in Chapter 3. All students since 2007 were directed to document clinical cases that they had encountered and had presented to a tutor, similarly to what they would have done using a written logbook. A recommended list of 11 cases that needed to be encountered and documented was provided through the Moodle site. In addition, using Moodle, additional instructions for using the 'assignment' task were provided. A standardized Microsoft Word [Redmond, Washington, USA]

template was provided for students. [See Appendix 6] Students were instructed to compose a summary of each of their cases for submission. Students were asked to submit at least one case per week, and a nominal deadline of seven o'clock Monday morning was implemented, although students were not prevented from uploading after the deadline. The hospital-based clinical tutors could provide feedback either face-to-face or electronically through the Moodle assignment resource, (see Figure 6.1). The total word count of the cases uploaded was evaluated. A subsection within the case upload was developed, where students were encouraged to reflect on the learning points of the case encountered was specifically evaluated. This is referred to as Reflection Word Count below.

ID number	First name / Surname	Grade	Comment	Last modified (Student)	Last modified (Editor)
2239281	AFWAN ABDUL WAHAB	No grade			
3240780	Anuar Zaim Ashraf	80 / 100	Excellent. Nothing else to say	Case_Upload.doc Saturday, 20 January 2007, 11:33 PM	Monday, 22 January 2007, 09:57 PM
3308499	Brian Corley	67 / 100	Very good as usual. That is	Case_Upload_Week_4.doc Saturday, 20 January 2007, 12:22 PM	Monday, 22 January 2007, 06:02 PM
2240521	EDIA DA COSTA	No grade	Can not open your case...	week-1_case Sunday, 21 January 2007, 04:07 PM	Monday, 22 January 2007, 06:03 PM
2237161	Ahmid Dredar	30 / 100	<p>You should be able to do really	ad.doc Sunday, 21 January 2007, 06:20 PM	Monday, 22 January 2007, 06:25 PM
2238268	Susan Fletcher-Jones	72 / 100	Very good job. About case 2 how	Case_Upload_4.doc Sunday, 21 January 2007, 08:50 PM	Monday, 22 January 2007, 06:35 PM
2239311	Al Khaten Hamad	25 / 100	<p>You need to spend some time on	Case_Upload.doc Friday, 19 January 2007, 08:35 AM	Friday, 19 January 2007, 02:57 PM

**Figure 6.1**

*Demonstrates the screen that examiners see when grading the students' case uploads within the moodle platform.*



All students undergo an Objective Structured Clinical Examination (OSCE) at the end of the OBGYN attachment. This OSCE contains clinical skills stations, including one assessing cases uploaded by students as part of their E-portfolio. All OSCE examiners undergo general training in examination technique. Faculty used a standardized institutional OSCE scoring system. This allowed the group to decide on a score required to achieve a pass standard and to ensure a reliable assessment of each student.

In 2009 an institutionally developed E-portfolio [See Appendix 7] replaced the MS Word based upload template. This was embedded in the OBGYN Moodle website page. Students entered the case information directly into this template. In addition to the case upload fields outlined in Appendix 6 a drop down menu was created where professionalism issues and clinical skills encountered were listed. These were outlined by an interdisciplinary faculty group within the medical school. These are detailed in Appendix 7.

Students were required to print off their uploaded cases and bring them with them to the end-of-clinical attachment OSCE. A designated OSCE station [one of ten] examined the students on one of the aforementioned recommended obstetric or gynaecologic topics. This topic was pre-determined by the faculty examination committee at the time of setting the examination questions.

Examiners for this station were instructed to examine in a structured format the concept underpinning that particular clinical theme, but were free to explore the examination topic as it pertained to the particular case that the student had written up.

All data relating to the case uploads were down-loaded from the Moodle website. Data were manually recorded from the 2007 cases and electronically exported from the 2009 and 2010 cases. [The 2008 datasets were incomplete and so omitted for the purpose of this evaluation] These results were correlated with the end-of-rotation OSCE results and the end-of-year final examination results. Means and standard errors are reported for all of the grouped data. One-way ANOVA and Student's t test for independent samples were used for data analyses. Pearson correlation coefficients ( $r$ ) were also used to describe associations between continuous variables.

## 6.4 Results

A total of 197 students provided 2,743 case uploads in 2007. There was 99% participation over the time period examined. The mean number of uploads was 13.9, [Range 4-26]. Mean number of uploads for students that passed was 13.4, [Range= 4-27 SD=4.9] while the mean number of uploads for students that failed was 12.1, [Range= 4- 26, SD= 6.0]. The mean number of uploads for honors students was 16, [Range 5- 24, SD 4.0]. Considering just the students who passed, the mean number of was 14.15. The differences in numbers of uploads between the pass group and the fail group was not statistically significant  $p=0.072$ . The total word count between the passing students and the failing student groups was 1526 words [Range 438- 7763, SD 889.5] and 1240 words [Range 179 – 7763 words]. The differences between the groups did not reach statistical significance,  $p=0.072$ . Looking at the reflection word counts the pass group had an average word count of 105.4 [ Range 35-738, SD 113.6] while the fail group had an average word count of 62 [Range 0-297.8, SD 75],  $p=0.028$ , which is statistically significant. Table 6.1 shows that there is a positive correlation between average reflection word count and final score. Table 6.2 demonstrates a logistic regression analysis to determine if the average reflection word count significantly affects final examination scores. Average reflection word count significantly predicted final exam scores ( $R^2=.03$ ,  $p<.05$ ).

**Table 6.1**  
*Examines the relationship between the average word count from the reflection component of the case uploads and the final examination scores.*

Correlation Analysis

		Final Score	Average Reflection Word Count
Final Score	Pearson Correlation	1	.156
	Sig. (2-tailed)		.028
	N	199	199
Average Reflection Word Count	Pearson Correlation	.156 <sup>*</sup>	1
	Sig. (2-tailed)	.028	
	N	199	199

Table 6.1 shows that there is a positive correlation between average reflection word count and final score.

The researcher conducted a logistic regression analysis to test if average reflection word count significantly affects the final examination score

**Table 6.2**

*Examines the predictive value of the reflection word counts from the case uploads and the final examination scores.*

Logistic Regression

	Parameter Estimate	SE	Wald	df	p	Exp(B)
Intercept	1.019	.255	15.993	1	.000	.361
Average Reflection Word Count	.006	.003	4.684	1	.030*	.994
Cox and Snell R2	.03					
Nagelkerke R2	.05					

The table shows the parameter estimates for the logistic regression model. In this study, the equation is as follows:

$$\text{Log (odds of passing final exam)} = 1.000 + 0.006 \text{ Average Reflection Word Count}$$

where odds =  $p / (1 - p)$  and  $p$  is the probability.

These estimates explain the relationship between the independent variable and the dependent variable. In the study, the dependent variable is on the logit scale. Average reflection word count significantly predicted final exam scores ( $R^2 = 0.03$ ,  $p < 0.05$ ). For every one-unit increase in average reflection word count, we expect a 0.006 increase in the log-odds of final exam scores.

In 2009 and 2010, 387 students achieved at least a pass mark, while 93 students failed the first sitting of the final end-of-year examination. 2,490 cases were uploaded in 2009, while 2,699 cases were uploaded in 2010. There was no statistically significant difference in the numbers of cases uploaded between the students who passed and those that failed these particular final examinations [9.73 vs 9.70 respectively,  $p > 0.05$ ]. The students who passed the exam submitted on average 6.7 cases prior to the nominal deadline compared to 4.46 for the fail group,  $p = 0.007$ . The pass group submitted on average 67.8% of their cases prior to the nominal Monday morning deadline compared with 53.1% for the fail group,  $p = 0.002$ . They also submitted their cases earlier compared to the fail group, on average 43.9 hours prior to the deadline for passing students compared to 35.2 hours before the deadline for failing students,  $p = 0.042$ . The number of professional issues or clinical skills used per patient interaction was not significantly different between the groups 13.1 versus 15.0,  $p > 0.05$ , and 10.1 versus 10.7,  $p > 0.05$  respectively.

A correlation analysis was undertaken to test the relationship between the number of cases created before the time deadline, the percentage of cases created before this deadline, the number of clinical skills, the average number of hours created before the deadline, the number of professionalism issues, the average number of hours uploaded before the time deadline and the final examination scores, (both OSCE and Clinical/Oral results). [See TABLE 6.3]

**Table 6.3**

Examining the relationship between Professional issues , timing of case upload, clinical skill, % of cases uploaded before deadline and final scores and Clinical Oral scores.

Correlation Analysis

		Clinical Oral	Final Score	Cases Created Before Deadline	% of Cases Created Before Deadline	Num Clinical Skills	Num Professionalism Issues	Average Num Hours Created Before Deadline
Clinical Oral	Pearson Correlation	1	.728**	.176 <sup>†</sup>	.179**	-.020	.013	.125 <sup>†</sup>
	Sig. (2-tailed)		.000	.010	.001	.702	.809	.017
Final Score	Pearson Correlation	.728**	1	.184**	.162**	-.036	-.053	.107 <sup>†</sup>
	Sig. (2-tailed)	.000		.007	.002	.497	.312	.042
# Cases Created Before Deadline	Pearson Correlation	.176 <sup>†</sup>	.184**	1	.837**	.201**	.092	.648 <sup>†</sup>
	Sig. (2-tailed)	.010	.007		.000	.003	.183	.000
% of Cases Created Before Deadline	Pearson Correlation	.179**	.162**	.837**	1	-.008	.147**	.732 <sup>†</sup>
	Sig. (2-tailed)	.001	.002	.000		.886	.005	.000
Num Clinical Skills	Pearson Correlation	-.020	-.036	.201**	-.008	1	.263**	.007
	Sig. (2-tailed)	.702	.497	.003	.886		.000	.898
Num Professionalism Issues	Pearson Correlation	.013	-.053	.092	.147**	.263**	1	.103 <sup>†</sup>
	Sig. (2-tailed)	.809	.312	.183	.005	.000		.049
Average Num Hours Created Before Deadline	Pearson Correlation	.125 <sup>†</sup>	.107 <sup>†</sup>	.648**	.732**	-.007	.103 <sup>†</sup>	1
	Sig. (2-tailed)	.017	.042	.000	.000	.898	.049	

## 6.5 Discussion

It is accepted that professional and personal development in the context of medical education are multi-faceted skills. These skills can be developed by critical reflection both while doing a task and after completion of the task; reflection in action and reflection on action, respectively.<sup>172</sup> Encouraging these skills within the clinical learning environment is recommended in the academic medical education literature.<sup>135,171,186</sup> This is the first reported project in undergraduate obstetrics and gynecology that merges traditional clinical case reports<sup>173</sup> with modern examination techniques, such as OSCE's in the context of a blended learning environment.<sup>117,186</sup> Our findings are consistent with existing evidence on the value of student portfolios in undergraduate clinical education.<sup>187</sup> Students who contributed more words in their individual cases, and those that submitted more cases overall, tended to perform better in the end-of-year final examination scores. While there was no statistically significant differences between the pass and failing groups [ $p=0.072$ ], when we looked specifically at the average word count of the reflective element of the case uploads there was a durable difference between the pass and fail student groups each year, [105.4 v 62 words,  $p=0.028$ ]. This potentially demonstrates the value of reflection on action as a learning tool.<sup>178</sup> The role of reflection in E-portfolios<sup>172</sup> is undeniable but difficult to objectively quantify. Its benefits may be similar to small group teaching,<sup>173</sup> in that there is an opportunity to critically evaluate one performance in a safe environment.<sup>188,189</sup>

The e-portfolio provides a mechanism for students to reflect on clinical interactions and feedback provided to them from tutors. Each case would have

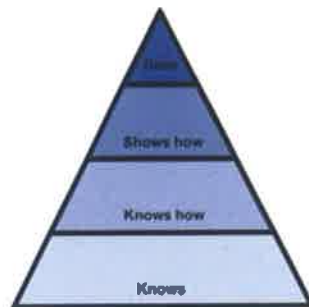


been already reviewed with a tutor or faculty member prior to on-line submission. It facilitates a period of deliberate practice<sup>143,147,161</sup> to engage in all aspects of the case. A major challenge for the integration of a portfolio into medical education is that its importance must be maintained in the eyes of assessment-driven students. This review suggests that it must be part of the institutional assessment procedures,<sup>69</sup> as learners need clear directions and guidance to support development and assessment.<sup>190</sup> The clinical cases uploaded by students represent a huge volume of work for both students and tutors, and their inclusion in a formal summative assessment gives recognition to this effort. This also facilitates repeated learning and re-testing which is known to assist with longer-term knowledge retention<sup>190</sup> and deep learning.<sup>111,145</sup> It also provides the necessary incentive for students to engage with the process.

The significant difference between the pass and fail groups in the gross numbers and overall percentages of cases submitted before the arbitrary deadline [ $p=0.007$  and  $p=0.002$  respectively] may demonstrate differences underlying attitudes towards professionalism. However, it is noted that when specifically subjectively measured there was no durable difference between the mean numbers of clinical skills encountered per case, or the mean number of professionalism issues encountered [ $p>0.05$ ]. This likely indicates that self-evaluation is unreliable in relation to these metrics. A VLE may assist with the development of practical skills, with virtual demonstrations of practices assisting trainees by preparing them for their first experience in clinical training<sup>50</sup>: the early stages of a learning process defined as 'knows' and 'knows how' in Miller's triangle<sup>191</sup> (Figure 6.0). This is especially accurate for the basic

skills a medical student is expected to be able to demonstrate at the end of their training. However, we have been unable to quantify this learning objectively in this study.

**Figure 6.0:** Miller's Triangle.<sup>191</sup> This illustrates the levels of knowledge understanding. Fundamentally a solid foundation of knowing, and knowing how to do something, facilitates deeper knowledge levels of showing and doing.



One of the major criticisms of E-Portfolios, as with small group teaching,<sup>173,192</sup> is the amount of time required by faculty to evaluate them. We circumnavigated this by ensuring that all cases were presented to a tutor prior to upload, so that the uploaded cases served primarily as a reflective tool for students. Students were made aware that uploaded cases would not individually be graded prior to the examining OSCE station.

A higher volume of cases submitted may just represent more motivated students<sup>182</sup> who would score better in final examinations regardless of what educational technology is used. However, we believe that the E-portfolio, in the context of a wider VLE, provides an effective way of maximizing the impact of obstetrics and gynecology by making the teaching more effective, promoting student-centered learning and enhancing clinical knowledge.<sup>178</sup>

These were examined in an OSCE scenario, covering the themes in the topic but related to the case upload. This builds on Miller's concept of demonstrating understanding, as evidence of deeper learning.<sup>111,119,155</sup>

Students are required to apply the knowledge gleaned from the resource material, associated quizzes and bedside tutorials, thereby indicating appropriate application of this new learning. The case uploads focused only on information that related to the individual cases and tried not to collect unnecessary information, in an effort to maximize engagement and simplify the experience for users.<sup>115</sup>

#### **6.5.1 Limitations**

There are a number of limitations with this study. The individual themes of reflection were not explicitly examined. There may be valuable information to assist in the understanding of how students approach student-patient interactions and the application of theoretical knowledge to clinical scenarios, which were not examined. This aspect is a recurring criticism of portfolio use, and should be examined in future evaluations of e-portfolios.<sup>193</sup> User feedback regarding the e-portfolio and Moodle platform is addressed in Chapter seven. E-portfolio implementation is time-consuming<sup>193</sup> but was not explicitly quantified in this study. Future portfolio research could focus on the user-friendliness of the system, and address time constraints in addition to the variety of cases covered by students. Word count was used as a surrogate for content but may not be reflective of quality or understanding. Future investigations may identify the optimal word counts for case uploads in the portfolio, and specifically the reflection component.<sup>169</sup>

## 6.6 Conclusions

We have examined the implementation of an E-portfolio within the context of a VLE, and attempted to quantify students' interaction with it. It is feasible to facilitate a clinical case-based E-portfolio in undergraduate obstetrics and gynecology<sup>187</sup>. The E-portfolio captured the student–patient clinical interactions and facilitated re-learning and re-testing for students. Students who use the E-portfolio tended to perform better in end-of-year examinations. Incorporating case upload scenarios into summative assessment is feasible, and avoids large volumes of on-line case grading activities for tutors. There may be a role in limiting the word count and number of case uploads to reduce unnecessary computer based activity for students. Self-reporting of professional issues encountered, or clinical skills used, during clinical case interactions do not correlate with final examination scores.

## **CHAPTER SEVEN – Conclusion, Questionnaire & Future Directions**

### **7.1 Introduction**

The Department of OBGYN at RCSI introduced a new VLE, (Moodle), in the 2005-2006 academic year as part of an institution-wide programme. This was done in the context of increasing medical student numbers at RCSI, as well as new recommendations from the Irish Medical Council,<sup>2</sup> and international standards produced by the WFME.<sup>6</sup> The Department of OBGYN tailored its undergraduate curriculum delivery to meet the ever-changing needs and expectations of a technology-literate student body,<sup>120</sup> with the goal being to meet and exceed national<sup>2</sup> and international standards, as well as leading the development of a virtual learning environment within the institution.

In the increasingly more competitive and demanding arena of medical education, self-assessment of teaching methods and their delivery has become an indispensable tool for institutions such as the RCSI to ensure that the training offered and the students produced are of the highest quality. There is little evidence on the integration of Moodle to undergraduate OBGYN. By careful appraisal and review the writer studied the use of Moodle and correlated it to the Final Professional Examination results. A Moodle-based portfolio is promoted as an active process involving collecting, synthesizing and organizing all possibly relevant educational items, which will reflect the best evidence of achievement of the module learning outcomes.<sup>12</sup>

By assessing how often Moodle is used, when it is used, where it is used, in what way it is used, what components of it are used and by which sections of

the student population we aimed to learn valuable lessons which could then be applied across the entire medical school in both undergraduate and postgraduate teaching and training.

By understanding what students gain from Moodle we can modify and streamline our on-line course components, making them more efficient, and more learner friendly. In this chapter the writer considers the feedback from the 2010 student group and places it in the context of the entire project. Finally, areas for future investigation are considered.

## **7.2 The Questionnaire**

Questionnaires allow feedback and student involvement in curriculum development and monitoring, more effective use of assessment strategies, and more effective use of instructional technology.<sup>194</sup> A 23-item Questionnaire [See Appendix 8] was open from 20<sup>th</sup> June 2010 to 10<sup>th</sup> July 2010 at the end of the teaching semester. All students from that academic year were asked to participate via the Moodle-based questionnaire. Students were contacted using the Moodle course forum. Students participated anonymously, without inducements or sanctions for non-participation. Grounded theory was the method used to guide the analysis of narrative data.<sup>195</sup> In grounded theory, hypotheses are not preconceived. Instead, the method is used to extract themes and patterns that are embedded, (“grounded in”), complex narrative data. This approach allowed us to discover course dynamics that could not be anticipated in our original design, but might affect outcomes. Narrative data are

broken down into individual comments. Similar comments are assigned a code. Coded statements are categorized into concepts or themes that were used to design subsequent course improvements. The process was repeated throughout the project and is ongoing.

### **7.3 Questionnaire Results**

177 students responded to the questionnaire giving a response rate of 77.0% [n=177]. 72% of responders [n=128] were aged 20-25 years, 24%, [n=43] were aged 26 – 30 years, 3%, [n=3] were aged 31 – 35 years and 1%, [n=1] was aged greater than 35 years. Twenty-five nationalities were represented, with Ireland [n=62], Canada [n=23], Malaysia [n=22], Kuwait [n=14], America [n=13] and United Arab Emirates [n=12] representing the majority of participants. For 63% [n=111] of students surveyed, this was their first third-level degree, while 38% [n=67] were formally enrolled in the recently established graduate entry programme. 32% used English as a non-native language.

[See Appendix 9]

No student disagreed with statement 7, ('Overall I found the on-line Moodle O & G program useful for my studies), with 98% [n=174] either agreeing or strongly agreeing with this statement. 96% [n=170] either agreed or strongly agreed that "Overall I found the 11 Precourse Tutorial series useful in my preparation for the O&G clinical attachment", with only 1% [n=2] disagreeing with the statement.



Regarding the MCQ's, only 11% [n=19] either disagreed or strongly disagreed with statement 11, "I find the MCQ Quizzes helpful with my studies". 10% [n=18] of respondents agreed with statement 12, "The MCQ's were a complete waste of my time". 87% [n=154] of students wanted more detailed feedback in explaining the answers to the quizzes.

Regarding the case uploads and E-Portfolio the following answers were obtained. Only 141 of a possible 177 students answered question 14, 'I found the E-Portfolio easy to use', and of these 66% [n=112] at least agreed that it was easy to use.

78% of students [n=134 /171] found the case uploads a useful way to review a particular topic. There was no consensus on whether the number of quizzes should be reduced or whether there should be a shortened version of the case uploads. 73% [n=129] believed the case upload OSCE station was a fair way to assess their understanding of a particular topic, with only 11% disagreeing [9%] or strongly disagreeing [3%].

There was general support for a formal continuous assessment process, based on a combination of Moodle-based MCQ results, with 61% [n=107] either agreeing or strongly agreeing with the concept, and 22% [n=39] either disagreeing or strongly disagreeing.

There was no strong support for a final landmark MCQ being run through the Moodle site, with 50% [n=87] either disagreeing or strongly disagreeing with the notion.

Question 21 asked the students: "Give one thing that you would change to the on-line delivery of the O & G course". Students' commentary [n=31 of 81], focused mainly on the quizzes ranging from correcting syntax, correcting spelling errors, to wanting more feedback. 15 comments suggested no changes were needed, while references to lecture material, case uploads and additional video presentations were referred to on 9, 8 and 8 occasions respectively.

Question 23 asked students what they wanted to see more of. Students liked the organization that the Moodle site provided, in particular the interactive nature of the quizzes and the case uploads. Question 22 asked students to: "List the poor aspects of the on-line delivery of the course that in your opinion need to be addressed. Give your suggestions for improvements where appropriate." Seven main themes were drawn from the questionnaire's free-text submissions. In order of frequency, these suggestions included a need for better quizzes, [n=56] either referring to minor corrections, changing format to EMQ (extended matching questions), or clinical vignettes.

Criticisms on content occurred on 28 occasions, either specific tutorial material requiring review or topics not covered that were subsequently examined in the final exam. Recommendations relating to the functionality of Moodle occurred on 27 occasions, referring to tracking the quizzes or the functionality of the case uploads. Insufficient multimedia [n=14], insufficient feedback [n= 13], recommendations for fewer quizzes [n=9] and fewer uploads [n=8] accounted

for the remaining negative commentary, while 25 comments recommended no changes be made.

Students were asked to “list the good aspects about the on-line delivery of the course that you would like to see more of next year”. The main theme of these answers revolved around the organization of the on-line programme [n=55], praise for the quizzes [n=36] and their content [n=33]. The remaining aspects of the course students liked were the case uploads [n=11], the multimedia aspects of the content delivery [n=10], the feedback [n=8] and the pre-course tutorial and quizzes [n=5]

#### **7.4 Discussion**

This survey represents a very high response rate [77.0%] when compared to similar evaluations previously studied.<sup>196-198</sup> As VLEs continue to evolve and gain popularity, further research is needed to assist educators and students in identifying the most effective ways to use these technologies.<sup>45,199,200</sup>

The questionnaire mechanism built into Moodle facilitates efficient feedback from users. This questionnaire is a demonstration of how research into education / assessment techniques is fed back into the program and informs how we change things.

Chapters 3 & 4 demonstrated the feasibility of implementing a comprehensive online program that supported the clinical education environment. When gender and age was analysed with respect to final examination results there was no meaningful data that correlated with end of year examination results. Here we demonstrated the feasibility of delivering an entire didactic course

through a virtual learning environment, Moodle. Ours is a “Net Generation” student population, with 96% of 2010 questionnaire responders being less than 30 years of age. The gender mix was reasonably balanced [44% male and 56% female] when compared to national data [IMC 2007], and with 24 different nationalities represented being similar to the 2006 [28 nationalities] and 2007 [25 nationalities] student groups. Interestingly 32% of respondents spoke English only as their second language. This may explain some of the site’s success. 63% of these adult learners,<sup>201</sup> had previously completed an undergraduate degree. 38% of these postgraduate learners were enrolled in the recently commenced [2006] Graduate Entry Program, a 4 year medical school program. This provided them with the opportunity to study at their own pace, in a self-directed manner. The resource material could be used as an advance organizer,<sup>111</sup> allowing preparation before clinical teaching and patient interaction. 98% of the respondents found the Moodle-based obstetrics and gynecology course useful for their studies. The initial evaluations of Moodle [Chapter 3 & 4] demonstrated a significant relationship between on-line activity, logins, resource views and quiz results and final examination scores, however this was not predictive of final examination scores. There are multiple confounders that explain why the results were not predictive. Students may have studied using traditional books, and may not have had access to broadband in this initial roll out phase. Broadband services in Ireland are only recently [2013] becoming reliable regardless of geographic location. We examined the potential value of a pre-course tutorial series for students. This was in the context of a known relationship between students’ activity and final examination scores, expanding medical knowledge, and shortened allocated

course time for obstetrics and gynecology. A significant correlation was identified between students pre-course quiz scores and final examination scores. There was no relevant relationship between the numbers of quiz attempts or time taken to complete individual quizzes. This may be explained by students pre-quiz study behaviors that were not established in this study. The pre-course quiz encouraged deliberative practice and re-testing among students, both established high value study techniques.<sup>145</sup> Moodle sets a benchmark for what is expected of students, and allows students distribute their learning over an extended period – a strategy that has been shown to improve knowledge recollection in the longer term. 80% of students found the MCQ quizzes helpful in their studies. This is consistent with the high rate of interaction of students with the site and specifically the quizzes. A consistent finding throughout the course of the project was students' intolerance of errors within the quizzes, whether these errors related to syntax, formatting or incorrect answers. 87% of respondents wanted more feedback on the quiz answers. There was limited feedback available at the quiz engine level. Users were required to revisit the relevant PowerPoint tutorial or supplementary material to check answers. Given the level of response, additional feedback at the quiz engine level is warranted. There were 44 quizzes analyzed from the 2007-2010 academic years. Additional quizzes were added in 2009 and 2010. The investigators wanted to determine the students' perception of the numbers of quizzes, and were conscious of the potential of overloading the students with unnecessary mandated quizzes. There was no consensus among the respondents on this topic. 47% wanted fewer quizzes in favor of combined topics being tested while 42% disagreed or strongly disagreed with this concept

and 17% were undecided. One potential solution would be to offer a list of mandatory quizzes and optional quizzes. Future analysis could determine the uptake of each quiz type. There was no majority in favor of running the final examination MCQ component through Moodle, [27% in favor, 23% undecided, and 50% opposed to Moodle hosting the final MCQ examination]. This may reflect students' concerns over question reliability and errors in the question syntax. It likely relates to errors in the copy of the course from the 2009 year which caused errors to appear in the quizzes. This "frustrated" students. The writer dealt with each case individually, and all quiz results were adjusted if necessary using the inbuilt Moodle manual quiz correcting function.

Chapter 6 examined the role of clinical case uploads within the Moodle environment. A recent publication by Hudson 2012<sup>202</sup>, described a similar approach. Our findings are consistent with this report. Our data highlight the importance of critical reflection for students. While there was a range of total number of cases uploaded and in the word count of those uploads, only the reflective word count correlated with final examination scores. 18% of users disagreed with the statement that the e-portfolio was easy to use. This is a considerable proportion of students and must be considered when reviewing the case upload data. Despite this finding, 77% of respondents found the case uploads a useful way to review a particular topic. This was the original intent of the case upload concept. Students reflecting on the clinical case histories provided the opportunity for them to gain a deeper understanding of the concepts behind the topic.<sup>111</sup> Regarding the length of the upload, the questionnaire findings were consistent with previous studies. Less is indeed

more. Students would prefer a shortened template. There is scope to at least omit the clinical skills and professionalism issues encountered. These fields added little in the determination of which students subsequently passed or failed the final examination.

Students were asked for one thing they would change in the on-line delivery of the OBGYN course. The majority of these answers related to the MCQs and the case uploads. Students wanted the standard of the questions improved, both in terms of their content and their delivery [syntax errors, duplicate questions]. Students also wanted more question-related feedback, both immediately after a quiz is completed and when reviewing their overall quiz grades. Students also complained that the case upload mechanism was cumbersome and time consuming. This is consistent with substantial existing literature on portfolios.<sup>174,203,204</sup>

Students were also asked to list the positive aspects of the online delivery of the OBGYN course. The organization of the course was highly complimented, as was the opportunity for students to test their knowledge using the online quizzes.

Despite the clear improvements that could be made to the delivery of the online course, specifically the quizzes and the uploads, 61% of the surveyed students were in favor [18% neither agreed nor disagreed, and 22% disagreed or strongly disagreed] of a continuous assessment mark being derived from a combination of the Moodle-based MCQs and the case uploads. This project specifically addresses this prospect but stops short of defining a reliable mechanism that would reward diligent students while at the same time

encouraging underperforming students, with the over-arching aim being to optimize the student blended learning experience.

## **7.5 Conclusion / Future Work**

This work demonstrates how consistent review of the on-line obstetrics and gynecology curriculum informs how students are instructed. It illustrates how the circle of research in education can impact an academic department. Moodle's modular design makes it easy to create new courses, adding content that will engage learners and it is designed to support a style of learning, referred to as social constructionist pedagogy.<sup>149</sup> This style of learning believes that students learn best when they interact with the learning material, construct new material for others, and interact with other students about the material. Moreover, our students have communicated us that their general feeling is that Moodle helps them to reinforce their abilities and knowledge. These results encourage us to continue with the improvement of our Moodle virtual space.<sup>63</sup>

This work illustrates the potential of a vibrant interactive modern learning environment, harnessing technology, not because of the novelty factor, but because it optimizes students' learning and helps educate better doctors.<sup>50,51</sup>

The potential for a continuous assessment process led through a Moodle-based system is clearly demonstrated. What is less obvious is determining a



rigorous and fair mechanism that rewards excellence in academic achievement and merits clinical knowledge while at the same time offering an optimal environment for those students who perform below what is expected. There is room for the development of a number of mechanisms to facilitate a better learning environment for students.

1. An algorithm that would reliably identify underperforming students early enough to facilitate remediation
2. Determining the optimal number of MCQs
3. Elimination of non-discriminatory MCQs
4. Greater emphasis on Extended Matching Questions (EMQs) and quiz-related feedback
5. A more streamlined E-portfolio, removing some fields and limiting word counts to uploads to minimize unnecessary online activity
6. Development of a course-specific algorithm that identifies students who would benefit from further academic supervision from a faculty member.

## **7.6 Summary**

This body of work is consistent with existing evidence that computer assisted learning is a viable alternative to traditional didactic teaching methods.<sup>50</sup> The adoption of Moodle as a platform for the delivery of key components in the undergraduate obstetrics and gynecology curriculum is grounded in reasoned theory, driven by necessity.

This VLE is more than simply PowerPoint slides made available on an intranet. It utilizes many interactive features of the Moodle software, and allows medical students engage in a self-directed, adult learning process.<sup>15,99,156</sup> This work

adds to existing knowledge by demonstrating a course-wide adoption of a VLE. After 1,051 students, almost 80,000 quiz attempts, and in excess of 8,000 clinical case-uploads the writer can contribute new knowledge to the use of a VLE in an undergraduate obstetrics and gynecology curriculum. Moodle offers an opportunity to identify “strugglers”,<sup>91,149</sup> students that underperform compared to their peers. However, it is likely that this identification process would better be done using a combination of prior formal examination scores in parallel with on-line activity in previous modules. It has the capacity to demonstrate patterns in student course participation. The decision on what remediation process should take place in the context of this student group is beyond the scope of this project.

This project demonstrates the importance of comprehensive course evaluation, particularly in the setting of innovative practice. In 2006 we were able to demonstrate a proof of concept that students would engage with on-line resource material and that measurement of this interaction would indicate students’ final examination scores. We were able to develop an entire on-line course and facilitate adult learning among our students. The Moodle platform facilitated students’ engaging in high utility study mechanisms: deliberate practice and re-testing. All students participated in the quizzes recording 16,327 quiz attempts in 2010, compared with 134 students attempting a quiz in 2006 recording 257 attempts.

The merging of clinical work with the on-line programme encouraged distributed practice and reflection in action. The clinical upload cases encouraged our medical learners to build mental representations of disease

processes, a library of patients that increases in number and depth over time.

This is a prime example of the constructivist theory of learning as an active process that uses facts in context to build knowledge.<sup>99</sup>

The feedback that this generation of students desire<sup>205,206</sup> may be tailored accordingly, while the organization's need to deliver a quality module is also simplified. Students' voluntarily feedback regarding the on-line delivery bolsters the Moodle delivery of the course and, while some problems were identified, the over-arching theme was positive. Students are well placed to contribute to the development of the module<sup>29</sup> in a constructive manner.

Moodle has promoted a culture of 'Continuous Renewal' where the Department's delivery of the curriculum is robustly evaluated.<sup>2</sup> Moodle has been demonstrated to be an integral component in maximizing the preparation students can have to complement their structured bedside learning events. It assists the medical school in developing systematic methods of obtaining feedback from students.<sup>2,6,13,131,207</sup>

It is important that there is no retreat from genuine face-to-face clinical encounters. Traditional bedside examinations, which evaluate students' history-taking capability and patient interaction skills, still have a major role to play.

Exposure to real patients remains crucial.

Growing numbers of medical students learning in major teaching hospitals are putting a strain on the hospital system. Moodle offers a balance between structured and self-directed learning, blended with the rich environment of the hospital bedside.

The level of VLE use is clearly associated with subsequent performance in end-of-year examinations, and is consistent with previous studies.<sup>2</sup> VLE use among students is variable, and its incorporation into summative assessment should only be encouraged after further rigorous validity testing.

### **7.6.1 Key recommendation to implementation of VLE**

1. Relentless communication
2. Evaluation
3. Act on problems identified
4. Absolute connection between developer and educator(196)
5. CAL is not intended to replace face to face learning nor should one try to make it. It's an additional mode of learning.
6. Know why something is being implemented. Theory, not just innovation for the sake of innovation.
7. Keep it simple
8. Be organized
9. Lead from the top
10. Content is Key

## **Presentations / Workshops**

### **"Teaching Gynecological Malignancy care to medical students; can a Virtual Learning Environment help?"**

McVey RM, Clarke E, Malone FD

Poster: 14th Biennial Meeting of the International Gynecologic Cancer Society  
Vancouver, Canada, October 13-16, 2012

### **The Obstetrics & Gynaecology Moodle site 'the poster-child for all of the Departments at RCSI'?**

McVey RM, Clarke E, MaloneFD

**Poster:** The National Academy for Integration of Research, Teaching and Learning (NAIRTL) and the Learning Innovation Network (LIN) Annual Conference, Dublin, October 2010

### **Moodle, a hands-on guide to using a virtual learning environment**

McVey RM, Clarke E

**Workshop:** The National Academy for Integration of Research, Teaching and Learning NAIRTL Annual Conference, Dublin, October 2010

### **'Making a virtual learning environment work in a clinical undergraduate setting'**

McVey RM, Doody C, Clarke E.

Slice of Life: Innovators in Medical Education 10th Annual Meeting. Salt Lake City, Utah, USA, June 2007.

**Moodle, A Freely Available Open Source Virtual Learning  
Environment....but What Are The Actual Costs?**

Eric D Clarke; Claire Doody; Ruaidhri McVey  
MedBiquitous Annual Conference 2008,  
May13-15, 2008, Baltimore, MD

**'Implementing Moodle'**

McVey RM, Clarke E, Doody C  
MedBiquitous Annual Conference 2008,  
May13-15, 2008, Baltimore, MA.

## APPENDICES

### Appendix 1 – The Bologna Process

**LINKS**

The official Bologna Process website 2007–2009:  
[www.bologna2007bologna.eu](http://www.bologna2007bologna.eu)

The gateway to academic and professional recognition:  
[www.enic-naric.net](http://www.enic-naric.net)

The European Quality Assurance Register for Higher Education:  
[www.eqar.eu](http://www.eqar.eu)

The Study In Europe portal:  
[www.study-in-europe.org](http://www.study-in-europe.org)

**The European Higher Education Area**

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#### The European Higher Education Area

„Building on our rich and diverse European cultural heritage, we are developing an EHEA based on institutional autonomy, academic freedom, equal opportunities and democratic principles that will facilitate mobility, increase employability and strengthen Europe's attractiveness and competitiveness.“

Ministers responsible for Higher Education in the countries participating in the Bologna Process,  
Louvain-la-Neuve, May 2001

#### The Bologna Process and the European Higher Education Area

The overarching aim of the Bologna Process is to create a European Higher Education Area (EHEA) that promotes mobility, attracts students and staff from Europe as well as from other parts of the world, and is internationally competitive. It aims to do this by facilitating greater comparability and compatibility between the diverse higher education systems and institutions across Europe and by enhancing their quality.

Today, 46 European countries participate in the Bologna Process. They are all party to the European Cultural Convention and committed to the goals of the European Higher Education Area. Starting from a non-binding agreement at European level (the 1999 Bologna Declaration), the Bologna Process has initiated sweeping reforms in higher education across Europe at system and institutional level.

An important characteristic of the Bologna Process – and key to its success – is the close cooperation between governments, higher education institutions, students, staff, employers and quality assurance agencies, supported by the relevant international organisations. A full list of members and consultative members of the Bologna Process can be found on pages 10 and 11.



## WHAT ARE THE REFORMS ALL ABOUT?

### Easily readable and comparable degrees: a qualifications framework of three cycles

The Bologna Process is probably best known for its objective to structure higher education along three cycles (Bachelor-Master-PhD), converging formerly very diverse higher education structures in Europe and bringing them in line with international standards. In 2005, Ministers adopted an overarching Framework for Qualifications in the European Higher Education Area comprising three cycles and they agreed to develop national qualifications frameworks that are compatible with this overarching framework.

National qualifications frameworks describe the qualifications of an education system and how they interlink. They describe what learners should know, understand, and be able to do on the basis of a given qualification, as well as how learners can move from one qualification to another within a system. The self-certification report, which is the final stage in the development of national frameworks, demonstrates how the national framework relates to the overarching Framework for Qualifications in the European Higher Education Area.

Access to the second cycle (Master) usually requires successful completion of first cycle studies (Bachelor), lasting a minimum of three years. The degree awarded after the first cycle should also be relevant to the European labour market as an appropriate level of qualification. Countries are currently defining learning outcomes for qualifications in each of the three cycles, using the Framework for Qualifications in the European Higher Education Area as a common reference point. Work to define learning outcomes is also a significant component in the broader move towards student-centred learning and teaching.

Doctoral education – generally corresponding to a workload of 3–4 years full time – was introduced to the Bologna Process as the third cycle by Ministers in 2003, when they agreed that:

- ★ The core component of doctoral training should be the advancement of knowledge through original research;
- ★ Doctoral programmes should promote interdisciplinary training and the development of transferable skills to meet the needs of the wider labour market;
- ★ Participants in third cycle programmes should be considered both students and early stage researchers; and
- ★ More doctoral candidates should be encouraged to take up research careers within the European Higher Education Area.

### Joint Degrees

The Bologna Process has paved the way for increasingly innovative, cooperative, cross-border study programmes and a growing number of joint degree programmes are being developed across Europe.

The following key features are usually associated with qualifications described as joint degrees:

- ★ the programmes leading to them are developed or approved jointly by several institutions;
- ★ students spend significant periods of time at partner institutions;
- ★ periods of study and exams passed at the partner institution(s) are recognised fully and automatically by all institutions involved;
- ★ teaching staff from each participating institution devise the curriculum together, form joint admissions and examinations bodies and participate in mobility for teaching purposes; and
- ★ students who have completed the full programme should obtain a degree which is awarded jointly by the participating institutions, and is fully recognised in all countries.

### Mobility

Mobility of staff, students and graduates is one of the core elements of the Bologna Process, creating opportunities for personal growth, developing international cooperation between individuals and institutions, enhancing the quality of higher education and research, and giving substance to the European dimension.

Ministerial Report for Higher Education in the Bologna Process, London (November 2004), p. 200

Facilitating mobility is one of the main objectives of the creation of a European Higher Education Area and much progress has been made. Intra-European and international student and staff mobility have become an essential part of European higher education culture. Efforts are being made to tackle the remaining challenges, especially regarding visas, residence and work permits as well as financial incentives (including portable loans and grants for students or detention arrangements for staff).

More than 5600 higher education institutions in Europe offer a great variety of degree programmes for domestic and international students. Europe provides a unique cultural experience in a dynamic, plurilingual and multinational environment with high-quality teaching and research for students and academic staff.

### Recognition of Qualifications

The purpose of recognition is to make it possible for learners to use their qualifications in another education system or country without losing the full value of these qualifications. Each country of the European Higher Education Area has a national information centre where students, academics, employers and others can obtain information about recognition.

The main international legal text that aims to further the fair recognition of qualifications is the Council of Europe/UNESCO Convention on the Recognition of Qualifications concerning Higher Education in the European Region (Lisbon Recognition Convention).

Tools that facilitate the recognition of qualifications are the European Credit Transfer and Accumulation System (ECTS) and the Diploma Supplement. The ECTS balances a programme's average workload with the learning outcomes and competences to be achieved. The Diploma Supplement describes the qualification in an easily understandable way, relating it to the higher education system in which it was earned and to the overarching qualifications framework.

### Quality Assurance

In higher education, the term quality assurance refers to all the policies, ongoing review processes and actions designed to ensure that institutions, programmes and qualifications meet specified standards of education, scholarship and infrastructure. Quality assurance relies on stakeholder engagement and aims to guarantee and further enhance the quality of higher education provision.

The Standards and Guidelines for Quality Assurance in the European Higher Education Area adopted by Ministers in 2005 and commonly referred to as European Standards and Guidelines (ESG) provide guidance on quality assurance to agencies and institutions.

The European Quality Assurance Register for Higher Education (EQAR) set up in 2008 is designed to list those agencies which operate in accordance with the European Standards and Guidelines and the appropriate national legal provisions. The Register aims to increase confidence and transparency regarding quality assurance – and ultimately qualifications – in higher education.

### The social dimension and equal opportunities

„We share the societal aspiration that the student body entering, participating in and completing higher education at all levels should reflect the diversity of our populations. We reaffirm the importance of students being able to complete their studies without obstacles related to their social and economic background. We therefore continue our efforts to provide adequate student services, create more flexible learning pathways into and within higher education, and to widen participation at all levels on the basis of equal opportunity.“

Ministerial meeting for Higher Education in the six-countries participating in the Bologna Process, London Communiqué, May 2001

The European Higher Education Area aims at providing learners with equal opportunities in higher education, fostering social cohesion and maximising the potential of individuals in terms of their personal development and their contribution to a sustainable and democratic knowledge-based society. By 2009, countries will report on their national strategies and policies for the social dimension, including action plans and measures to evaluate their effectiveness.

### Employability

In the context of the Bologna Process, employability is defined as the ability to gain initial employment, to maintain employment, and to be able to move around within the labour market. Employability has been one of the main objectives of the Bologna Process from the very start. Each cycle of higher education should be relevant to the labour market. Further dialogue is needed between public and private employers, students, academia, higher education institutions and governments, especially related to first cycle qualifications in order to realise this goal fully.

### Lifelong Learning

Lifelong learning has been recognised as an essential element of the European Higher Education Area since 2001. It is inherent in all aspects of the Bologna Process and is furthered by:

- ★ improving the recognition of prior learning, including non formal and informal learning;
- ★ creating more flexible, student-centred modes of delivery;
- ★ developing flexible learning paths, allowing learners, for instance, to alternate between work and study; and
- ★ widening access to higher education.

National qualifications frameworks are also an important tool in supporting lifelong learning.

### European Higher Education in a Global Context

The development of the European Higher Education Area is stimulating growing interest in other parts of the world and has promoted discussion between European and international partners on a range of policy issues. To develop a framework for cooperation at European, national and institutional level, Ministers adopted in 2007 the strategy "The European Higher Education Area in a Global Setting". The strategy encompasses the following priorities:

- ★ improving information on the European Higher Education Area;
- ★ promoting European Higher Education to enhance its worldwide attractiveness and competitiveness;
- ★ intensifying policy dialogue;
- ★ strengthening cooperation based on partnership; and
- ★ furthering the recognition of qualifications.

These five priorities provide a common strategic framework to which all stakeholders in the European Higher Education Area can make their full contribution, building on a wide variety of existing and new initiatives.

### COUNTRIES PARTICIPATING IN THE PROCESS OF CREATING THE EUROPEAN HIGHER EDUCATION AREA

Albania	Germany	Poland
Andorra	Greece	Portugal
Armenia	Holy See	Romania
Austria	Hungary	Russian Federation
Azerbaijan	Iceland	Serbia
Belgium	Ireland	Slovak Republic
Bosnia and Herzegovina	Italy	Slovenia
Bulgaria	Latvia	Spain
Croatia	Liechtenstein	Sweden
Cyprus	Lithuania	Switzerland
Czech Republic	Luxembourg	"the former Yugoslav Republic of Macedonia"
Denmark	Malta	Turkey
Estonia	Moldova	Ukraine
Finland	Montenegro	United Kingdom
France	Netherlands	
Georgia	Norway	

### ADDITIONAL MEMBER

European Commission

### CONSULTATIVE MEMBERS

- European University Association (EUA)
- European Association of Institutions in Higher Education (EURASHE)
- European Students' Union (ESU)
- Council of Europe
- UNESCO European Centre for Higher Education (UNESCO-CEPES)
- European Association for Quality Assurance in Higher Education (ENQA)
- BUSINESSEUROPE
- Education International Pan-European Structure (E)

European Higher Education Area

## Appendix 2 - Literature Search Strategy

The searches for your topic were run using the OvidSP search platform in the following databases: MEDLINE, EMBASE and Eric; ProQuest search platform in the following database Dissertations & Theses (PQDT. Search results include articles indexed as of the November 1, 2012 access date. We retrieved a total of 1,446 references. All references were saved in an EndNote library used to identify the 87 duplicates. The remaining 1,359 unique references can be reviewed against your inclusion criteria in addition to the articles identified searching the reference lists. The following tables record the search strategies and terms used in each of the databases.

### **MEDLINE:**

The search strategy for OvidSP MEDLINE (1946 to October Week 4 2012) retrieved 430 articles of which 420 were unique and not duplicated in other database search results. I used a combination of MeSH and free text terms for

Set	History	Results	Comments
1	exp Education, Medical, Undergraduate/	16984	Undergraduate Medical Program terms
2	gynecology/ or obstetrics/	21344	Specialty Terms
3	1 and 2	237	Base Clinical Set
4	Medical Informatics/ or Database Management Systems/ or programmed instruction as topic/ or computer-assisted instruction/ or ("learning management system*" or (learning adj2 management adj2 system*).ti,ab. or ("e-learning" or (electronic adj2 learning) or LMS or (course adj2 management adj2 system*) or CMS or LCMS or (managed adj2 learning adj2 environment*) or MLE or (learning adj2 support adj2 system*) or LSS or (learning adj2 platform*) or "education via computer-mediated communication" or ((educat* or train* or teach* or learn*) adj3 (computer* or mediated or assisted)) or "online education" or ((online or Blended) adj2 (learning or educat* or training))).ti,ab. or or (moodle or blackboard or "WebCT" or "top class" or "ilias" or claroline).ti,ab.	36265	Medical Informatics, LMS Moodle Terms
5	Program Development/ or program evaluation/ or educational measurement/ or ("clinical trial, all" or clinical trial).pt. or clinical trials as topic/ or clinical trial, phase i.pt. or clinical trials, phase i as topic/ or clinical trial, phase ii.pt. or clinical trials, phase ii as topic/ or clinical trial, phase iii.pt. or clinical trials, phase iii as topic/ or clinical trial, phase iv.pt. or clinical trials, phase iv as topic/ or controlled clinical trial.pt. or controlled clinical trials as topic/ or meta-analysis.pt. or meta-analysis as topic/ or multicenter study.pt. or multicenter studies as topic/ or randomized controlled trial.pt. or randomized controlled trials as topic/ or cohort studies/ or longitudinal studies/ or follow-up studies/ or prospective studies/ or case-control studies/ or retrospective studies/ or cross-sectional studies/	2219447	Study design methodology Terms
6	3 and 4 and 5 (3)	3	OBGYN specific Results
7	1 and 4 and 5 (430)	430	General Undergraduate Results

8	6 or 7 (430)	430	Final Results
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### EMBASE

The search strategy for OvidSP EMBASE (1974 to 2012 Week 43) retrieved 299 articles of which 253 were unique and not duplicated in other database search results. I used a combination of EMBASE and free text terms for

Set	History	Results	Comments
1	exp medical education/	230625	Undergraduate Medical Program terms
2	gynecology/ or exp obstetrics/	38892	Specialty Terms
3	1 and 2	3156	Base Clinical Set
4	((programmed adj2 (instruct* or teach* or learn* or educat* or train*)) or ("computer-assisted instruction" or (computer adj2 assist* adj2 (instruct* or teach* or learn* or educat* or train*))))).ti,ab. or ("learning management system*" or (learning adj2 management adj2 system*).ti,ab. or ("e-learning" or (electronic adj2 learning) or LMS or (course adj2 management adj2 system*) or CMS or LCMS or (managed adj2 learning adj2 environment*) or MLE or (learning adj2 support adj2 system*) or LSS or (learning adj2 platform*) or "education via computer-mediated communication" or ((educat* or train* or teach* or learn*) adj3 (computer* or mediated or assisted)) or "online education" or ((online or Blended) adj2 (learning or educat* or training))).ti,ab. (19548) or (moodle or blackboard or "WebCT" or "top class" or "ilias" or "claroline").ti,ab.	21121	Medical Informatics, LMS Moodle Terms
5	ct.fs. or clinical trial/ or phase 1 clinical trial/ or phase 2 clinical trial/ or phase 3 clinical trial/ or phase 4 clinical trial/ or controlled clinical trial/ or randomized controlled trial/ or multicenter study/ or meta analysis/ or cohort analysis/ or longitudinal study/ or prospective study/ or case control study/ or hospital based case control study/ or population based case control study/ or retrospective study/ or program development/ or ((educat* or program*) adj2 (eval* or measure* rating* or assess*)).ti,ab.	1672667	Study design methodology Terms
6	3 and 4 and 5	5	OBGYN specific Results
7	1 and 4 and 5	298	General Undergraduate Results
8	6 or 7	298	Final Results

### ERIC:

The search strategy for OvidSP EMBASE (ERIC 1965 to September 2012) retrieved 178 articles of which 145 were unique and not duplicated in other database search results. I used a combination of ERIC and free text terms for

Set	History	Results	Comments
1	medical education/ or medical school faculty/ or medical schools/ or medical students	14767	Undergraduate Medical Program

			terms
2	gynecology/ or obstetrics/	419	Specialty Terms
3	1 and 2	129	Base Clinical Set
4	integrated learning systems/ or computer assisted instruction/ or computer managed instruction/ or electronic learning/ or educational technology/ or web based instruction/ or computer uses in education/ or computer assisted instruction/ or computer assisted testing/ or integrated learning systems/ or online courses/ or blended learning/ or educational technology/ or database management systems/ or ("learning management system*" or (learning adj2 management adj2 system*) or ("e-learning" or (electronic adj2 learning) or LMS or (course adj2 management adj2 system*) or CMS or LCMS or (managed adj2 learning adj2 environment*) or MLE or (learning adj2 support adj2 system*) or LSS or (learning adj2 platform*) or "education via computer-mediated communication" or ((educat* or train* or teach* or learn*) adj3 (computer* or mediated or assisted)) or "online education" or ((online or Blended) adj2 (learning or educat* or training))))).ti,ab. or (moodle or blackboard or "WebCT" or "top class" or "ilias" or "claroline").ti,ab.	85863	Medical Informatics, LMS Moodle Terms
5	program effectiveness/ or educational assessment/ or educational research/ or excellence in education/ or instructional effectiveness/ or "outcomes of education"/ or pretests posttests/ or program development/ or program evaluation/ or program validation/ or success/ or summative evaluation/ or sustainability/ or validated programs/ or measurement techniques/ or evaluation methods/ or measurement/ or ((educat* or program*) adj2 (eval* or measure* rating* or assess*)).ti,ab.	288336	Study design methodology Terms
6	3 and 4 and 5	0	OBGYN specific Results
7	1 and 4 and 5	178	General Undergraduate Results
8	6 or 7	178	Final Results

### **Dissertations & Theses (PQDT)**

The search strategy for ProQuest Dissertations & Theses (PQDT) to November 1, 2012 retrieved 541 dissertations articles of which 541 were unique and not duplicated in other database search results. I used a combination of free text terms for

Set	History	Results	Comments
1	moodle	N/A	Software term
2	Medic*	N/A	Setting term
3	1 and 3	541	Final results

## APPENDIX 2 - Moodle Resource types<sup>150</sup>

Moodle supports a range of different resource types that allow you to insert almost any kind of web content into your courses.

### ***Text page***

This type of resource is a simple page written using plain text. A number of formatting types are available to help turn your plain text into nice-looking web pages.

More about these text formats.

This sort of resource makes it easy to develop a complete single web page within Moodle, especially when you are using Moodle's WYSIWYG HTML editor.

The page is stored in the database, not as a file, and you have a lot of freedom to do almost anything you like using HTML, including Javascript.

### ***Files and web pages***

This resource type allows you to link to any web page or other file on the public web. It also allows you to link to any web page or other file that you have uploaded into your course files area from your own desktop computer.

Normal web pages are simply displayed as they are, while multimedia files are dealt with more intelligently and may be embedded within a web page. For example, MP3 files will be displayed using a built-in streaming player, as will movie files, flash animations and so on. There are many options for displaying your content in popup windows, framed windows and so on.

In particular, if your resource is a web application or other type of content able to accept parameters, you can choose to send information to your resource such as the user's name, their email, the course they are currently in, and so on.

#### **Directory**

The directory resource can display a whole directory (and its subdirectories) from your course files area. Students can then browse and view all those files.

#### **IMS Content Packages**

IMS content packages can be created and edited using a variety of content-authoring software. Content is usually displayed over several pages, with navigation between the pages. The content-authoring software produces a zip file, which can then be uploaded to your course in Moodle.

The zip file is unzipped automatically in Moodle, and the content of the package displayed.

There are various options for displaying content in a popup window, with a navigation menu or buttons etc.

#### **Labels**

Labels are a little different from other resources because they are text and images that are actually embedded directly among the other activity links in the course page.

## **APPENDIX 3 - Moodle Activity Modules** <sup>56</sup>

Moodle contains a wide range of activity modules that can be used to build up any type of course.

### ***Assignments***

Assignments allow the teacher to specify a task that requires students to prepare digital content (any format) and submit it by uploading it to the server. Typical assignments include essays, projects, reports and so on. This module includes grading facilities.

### ***Books***

Book is a simple multipage study material

### ***Chats***

The Chat module allows participants to have a real-time synchronous discussion via the web. This is a useful way to get a different understanding of each other and the topic being discussed - the mode of using a chat room is quite different from the asynchronous forums. The Chat module contains a number of features for managing and reviewing chat discussions.

### ***Choices***

A choice activity is very simple - the teacher asks a question and specifies a choice of multiple responses. It can be useful as a quick poll to stimulate thinking about a topic; to allow the class to vote on a direction for the course; or to gather research consent.

### ***Database Activity***

The Database module allows the teacher and/or students to build, display and search a bank of record entries about any conceivable topic. The format and structure of these entries can be almost unlimited, including images, files, URLs, numbers and text amongst other things. You may be familiar with similar technology from building Microsoft Access or Filemaker databases.

### ***Forums***

This activity can be the most important - it is here that most discussion takes place. Forums can be structured in different ways, and can include peer rating of each posting. The postings can be viewed in a variety of formats, and can include attachments. By subscribing to a forum, participants will receive copies of each new posting in their email. A teacher can impose subscription on everyone if they want to.

### ***Glossary***

This activity allows participants to create and maintain a list of definitions, like a dictionary.

The entries can be searched or browsed in many different formats.

The glossary also allows teachers to export entries from one glossary to another (the main one) within the same course.

Finally, it is possible to automatically create links to these entries from throughout the course.

### ***Journals***

This module is a very important reflective activity. The teacher asks the student to reflect on a particular topic, and the student can edit and refine their answer over time. This answer is

private and can only be seen by the teacher, who can offer feedback and a grade on each journal entry. It's usually a good idea to have about one Journal activity per week.

### **Labels**

This is not a true activity - it is a "dummy" activity that allows you to insert text and graphics among the other activities on the course page.

### **Lesson**

A lesson delivers content in an interesting and flexible way. It consists of a number of pages. Each page normally ends with a question and a number of possible answers. Depending on the student's choice of answer they either progress to the next page or are taken back to a previous page. Navigation through the lesson can be straight forward or complex, depending largely on the structure of the material being presented.

### **Podcast**

This activity allows participants to create and maintain a RSS feed for an entire course not just an activity.

Included in this feed is a more streamlined way of adding video and audio Podcasts.

Many additional iTunes extended tags are available with this RSS feed.

Attachments download are also iTunes compatible.  
icon Questionnaire

The questionnaire module allows you to construct questionnaires (surveys) using a variety of question types, for the purpose of gathering data from users. It is based on phpESP, and Open Source questionnaire tool. See <http://phpesp.sourceforge.net>

### **QUIZZes**

This module allows the teacher to design and set QUIZ tests, consisting of multiple choice, true-false, and short answer questions. These questions are kept in a categorised database, and can be re-used within courses and even between courses. QUIZZes can allow multiple attempts. Each attempt is automatically marked, and the teacher can choose whether to give feedback or to show correct answers. This module includes grading facilities.

### **Resources**

Resources are content: information the teacher wants to bring into the course. These can be prepared files uploaded to the course server; pages edited directly in Moodle; or external web pages made to appear part of this course.

### **SCORM/AICC Packages**

A package is a bundle of web content packaged in a way that follows the SCORM or the AICC standard for learning objects. These packages can include web pages, graphics, Javascript programs, Flash presentations and anything else that works in web browsers. The Package module allows you to easily upload any standard SCORM or AICC package and make it part of your course.



## **Wikis**

A *Wiki* enables documents to be authored collectively in a simple markup language using a web browser.

"Wiki wiki" means "super fast" in the Hawaiian language, and it is the speed of creating and updating pages that is one of the defining aspects of wiki technology. Generally, there is no prior review before modifications are accepted, and most wikis are open to the general public or at least to all persons who also have access to the wiki server.

The Moodle Wiki module enables participants to work together on web pages to add, expand and change the content. Old versions are never deleted and can be restored.

This module is based on Erfurt Wiki.

## **Workshop**

A Workshop is a peer assessment activity with a huge array of options. It allows participants to assess each other's projects, as well as exemplar projects, in a number of ways. It also coordinates the collection and distribution of these assessments in a variety of ways. The Workshop module is contributed by Ray Kingdon.

## APPENDIX 4 - Moodle QUIZ Hyperlinks

### QUIZZes

This module allows the teacher to design and set QUIZ tests, consisting of multiple choice, true-false, and short answer questions. These questions are kept in a categorised database, and can be re-used within courses and even between courses. QUIZZes can allow multiple attempts. Each attempt is automatically marked, and the teacher can choose whether to give feedback or to show correct answers. This module includes grading facilities.

### Introduction

#### About the Richtext HTML editor

Availability: **The HTML editor is available**

The Richtext HTML editor provides a word-processor interface embedded in your web page to allow you to edit text in an intuitive way, and produces normal HTML code.

In addition to formatting text, this editor provides a number of extra features you may find useful.

#### Paste text in from other Applications

You can cut and paste rich text from other Windows applications such as Microsoft Word straight into this editor, and your formatting will be preserved. Just use the normal cut and paste menus in your web browser (or Control-C and Control-V).

#### Inserting images

If you have images that are already published on a web site and accessible via a URL, you can include these images in your texts using the "Insert Image" button.

#### Inserting Tables

To add layout to your texts, you can use the "Insert Tables" button in the toolbar.

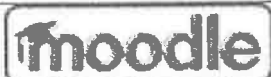
#### Inserting Links

To make a new link, first type the text that you want to be a link. Then select it and click the link button in the toolbar. Type the URL you want to link to and it's done!

## Inserting smilies (emoticons)

To embed these small icons in your text, click on the smiley icon in the toolbar. A dialog will pop up that allows you to select from the following smiley icons. (Alternatively, you can just type the corresponding code straight into your text and it will be converted later when your text is displayed).

 smile :-)	 sad :-(
 big grin :-D	 shy 8-.
 wink ;-)	 blush :-l
 mixed :-/	 kisses :-X
 thoughtful v-.	 clown :o)
 tongue out :-P	 black eye P-
 cool B-)	 angry 8-[
 approve ^-)	 dead xx-P
 wide eyes 8-)	 sleepy  -.
 surprise 8-o	 evil }-]



### Opening and closing the QUIZ

You can specify times when the QUIZ is accessible for people to make attempts.

Before the opening time, and after the closing time, the QUIZ will be unavailable.

### **Time limit**

By default, QUIZZes do not have a time limit, which allows students as much time as they need to complete the QUIZ.

If you do specify a time limit, then several things are done to try and ensure that QUIZZes are completed within that time:

- Javascript support in the browser becomes mandatory - this allows the timer to work correctly
- A floating timer window is shown with a countdown
- When the timer has run out, the QUIZ is submitted automatically with whatever answers have been filled in so far
- If a student manages to cheat and spends more than 60 seconds over the allotted time then the QUIZ is automatically graded zero

### **Time Delay between first and second attempt**

If you set a time delay, then a student has to wait for that time before they can attempt a QUIZ after the first attempt.

### **Time Delay between additional QUIZ attempts**

If you set a time delay here, then a student has to wait for that time before they can attempt their third or later attempts.

### **Questions per page**

For longer QUIZZes it makes sense to stretch the QUIZ over several pages by limiting the number of questions per page. When adding questions to the QUIZ page breaks will automatically be inserted according to the setting you choose here. However you will also be able to move page breaks around by hand later on the editing page.

### **Shuffle questions**

If you enable this option, then the order of questions in the QUIZ will be randomly shuffled each time a student attempts the QUIZ.

This is not related to the use of Random Questions, this is only about the displayed order of questions.

The intention is to make it a little harder for students to copy from each other.

### **Shuffle within questions**

If you enable this option, then the parts making up the individual questions will be randomly shuffled each time a student starts an attempt at this QUIZ, provided the option is also enabled in the question settings.

The intention is simply to make it a little harder for students to copy from each other.

This only applies to questions that have multiple parts, such as Multiple Choice or Matching Questions. For multiple choice questions the order of the answers is shuffled only when this option is set to "Yes". For matching type questions the answers are always shuffled, this setting controls whether in addition the order of the question-answer pairs is shuffled.

This option is not related to the use of Random Questions.

### **QUIZ attempts**

Students may be allowed to have multiple attempts at a QUIZ.

This can help make the process of taking the QUIZ more of an educational activity rather than simply an assessment.

### **Adaptive mode**

If you choose Yes for this option then the student will be allowed multiple responses to a question even within the same attempt at the QUIZ. So for example if the student's response is marked as incorrect the student will be allowed to try again immediately. However a penalty will usually be subtracted from the students score for each wrong attempt (the amount of penalty is determined by the penalty factor, set by the next option).

This mode also allows adaptive questions that can change themselves in response to a student's answer. Here is how the IMS QTI specification defines adaptive questions (items):

An adaptive item is an item that adapts either its appearance, its scoring (Response Processing) or both in response to each of the candidate's attempts. For example, an adaptive item may start by prompting the candidate with a box for free-text entry but, on receiving an unsatisfactory answer, present a simple choice interaction instead and award fewer marks for subsequently identifying the correct response. Adaptivity allows authors to create items for use in formative situations which both help to guide candidates through a given task while also providing an outcome that takes into consideration their path

In adaptive mode an additional Submit button is shown for each question. If the student presses this button then the response to that particular question is submitted to be scored and the mark achieved is displayed to the student. If the question is an adaptive question then it is displayed in its new state that takes the student's answer into account and will in many cases ask the student for another input. In the simplest adaptive questions this new state may differ only in the feedback text and prompt the student to try again; in more complicated question also the question text and even the interaction elements can change.

### **Each attempt builds on the last**

If multiple attempts are allowed and this setting is set to **Yes**, then each new attempt contains the results of the previous attempt. This allows a QUIZ to be completed over several attempts.

To show a fresh QUIZ on every attempt, select **No** for this setting.

### **Grading method**

When multiple attempts are allowed, there are different ways you can use the grades to calculate the student's final grade for the QUIZ.

#### **Highest grade**

The final grade is the highest (best) grade in any attempt.

#### **Average grade**

The final grade is the average (simple mean) grade of all attempts.

#### **First grade**

The final grade is the grade gained on the first attempt (other attempts are ignored).

#### **Last grade**

The final grade is the grade gained on the most recent attempt only.

#### **Apply penalty**

If a QUIZ is run in adaptive mode then a student is allowed to try again after a wrong response. In this case you may want to impose a penalty for each wrong response to be subtracted from the final mark for the question. The amount of

penalty is chosen individually for each question when setting up or editing the question.

This setting has no effect unless the QUIZ is run in adaptive mode.

### **Decimal digits**

By using this setting you can select the number of digits that should be shown after the decimal point when displaying student scores or grades. For example choosing '0' means the displayed grades will be rounded to integers.

This setting only effects the display of grades. It does not affect the internal calculations and rounding of the grades.

### **Allow review**

These options control what information users can see when they review a QUIZ attempt or look at the QUIZ reports.

Immediately after the attempt means within two minutes of the attempt being finished by the user clicking 'Submit all and finish'.

Later, while the QUIZ is still open means after this, and before the QUIZ close date.

After the QUIZ is closed means after the QUIZ close date has passed. If the QUIZ does not have a close date, this state is never reached.

Users with the capability 'View hidden grades' [moodle/grade:viewhidden] (typically teachers and administrators) are not affected by these settings and will always be able to review all information about a student's attempt at any time.

### **Browser security**

This option offers various ways to try to restrict how students may try to 'cheat' while attempting a QUIZ. However, this is not a simple issue, and what in one situation is considered 'cheating' may, in another situation, just be effective use of information technology. (For example, the ability to quickly find answers using a search engine.)

Note also that this is not just a problem of technology with a technical solution. Cheating has been going on since long before computers, and while computers make certain actions, like copy and paste, easier, they also make it easier for teachers to detect cheating - for example using the QUIZ reports. The options

provided here are not fool-proof, and while they do make some forms of cheating harder for students, they also make it more inconvenient for students to attempt the QUIZZes, and they are not fool-proof.

You should also consider other ways to make it harder for students to cheat at your QUIZ:

- You can use a large question bank, which the QUIZ picks a selection of questions randomly, so different students see different, but similar questions.
- You can use the shuffle answers option, so that the right answer to question 1 is not always option A.
- You can ask questions that required students to analyse the given information, rather than just recalling facts.

With the above warnings in mind, here is the description of the available options.

### **None**

No impediments are put in the way of students attempting the QUIZ.

### **Full screen pop-up with some JavaScript security**

There is a limit to what the QUIZ, which runs on a web server, can do to restrict what the student sitting at their computer can do while attempting the QUIZ. However, this option does what is possible:

- The QUIZ will only start if the student has a JavaScript-enabled web-browser.
- The QUIZ appears in a fullscreen popup window that covers all the other windows and has no navigation controls.
- The students are prevented, as far as is possible, from using facilities like copy and paste.

### **Require the use of Safe Exam Browser**

This option will only appear if your administrator has enabled it.

Safe Exam Browser is a customised web browser that must be downloaded and installed on the computer that the student uses to attempt the QUIZ. The restrictions placed on students are similar to those in pop-up window case, but because Safe Exam Browser is software running on the student's computer, it can do a much more effective job of restricting their actions. If you select this option:



- Students will only be able to attempt the QUIZ if they are using Safe Exam Browser.
- The browser window will be fullscreen (without any navigation elements).
- The window cannot be closed until the test is submitted.
- Shortcuts keys such as Win, Ctrl+Alt+Del, Alt+F4, F1, Ctrl+P, Printscreen, are disabled.
- Copy and paste, and the context menu, are disabled.
- Switching to other applications is disabled.
- Surfing to other web sites is prohibited.

### **Require a password**

This field is optional

If you specify a password in here then participants must enter the same password before they are allowed to make an attempt on the QUIZ.

### **Require network addresses**

This field is optional.

You can restrict access for a QUIZ to particular subnets on the LAN or Internet by specifying a comma-separated list of partial or full IP address numbers.

This is especially useful for a proctored QUIZ, where you want to be sure that only people in a certain room are able to access the QUIZ.

For example: **192.168. , 231.54.211.0/20, 231.3.56.211, 231.3.56.10-20**

There are four types of numbers you can use (you can not use text based domain names like example.com):

1. Full IP addresses, such as **192.168.10.1** which will match a single computer (or proxy).
2. Partial addresses, such as **192.168** which will match anything starting with those numbers.
3. CIDR notation, such as **231.54.211.0/20** which allows you to specify more detailed subnets.
4. A range of IP addresses **231.3.56.10-20** The range applies to the last part of the address, so this means all the IP addresses from 231.3.56.10 to 231.3.56.20.

Spaces are ignored.

## **Group Mode**

The group mode can be one of three levels:

- No groups - there are no sub groups, everyone is part of one big community
- Separate groups - each group can only see their own group, others are invisible
- Visible groups - each group works in their own group, but can also see other groups

## **APPENDIX 5 - Course topics and associated quizzes**

A complete list of course topics and associated quizzes. Those quizzes in grey font were not included in the analysis with 2007 as they were not available at that time.

### **OG 1.0 Introductory Tutorials Obstetrics**

- OG 1.1 Obstetric History QUIZ
- OG 1.2 Obstetric Examination QUIZ
- OG 1.3 Antenatal & Pre-conceptual Care QUIZ
- OG 1.4 Normal Labour & Delivery QUIZ
- OG 1.5 Abnormal Labour & Delivery QUIZ
- OG 1.6 Post natal History & Examination QUIZ
- [OG 1.7 Operative Delivery QUIZ 2010]

### **OG 2.0 Introductory Tutorials Gynaecology**

- OG 2.1 Gynaecological History & Exam QUIZ
- OG 2.2 Anatomy of the Female Pelvis QUIZ
- OG 2.3 Normal Menstrual Cycle QUIZ
- OG 2.4 Peri-operative Care QUIZ
- OG 2.5 Essential Obstetrics & Gynaecological Terminology QUIZ

### **OG 3.0 Fetal Medicine Tutorials**

- OG 3.1 Embryological Development QUIZ 2007
- OG 3.2 Placental Function QUIZ 2007
- OG 3.3 Fetal Abnormalities & Genetics QUIZ 2007
- OG 3.4 Ultrasound and Fetal Well-being QUIZ 2007
- OG 3.5 Abnormal Fetal Growth QUIZ 2007
- OG 3.6 Preterm Labour and PPROM QUIZ 2007
- OG 3.7 Antepartum Haemorrhage Lecture QUIZ 2007
- OG 3.8 Multiple Gestation QUIZ 2011
- [OG 3.9 Anaesthesia in Obstetrics QUIZ 2012]

### **OG 4.0 Maternal Medicine Tutorials**

- OG 4.1 Physiological changes in pregnancy QUIZ 2007
- OG 4.2 Hypertension in Pregnancy QUIZ 2007
- OG 4.3 Diabetes in Pregnancy QUIZ 2007
- OG 4.4 Medical Disorders in Pregnancy QUIZ 2007
- OG 4.5 Infectious Diseases in Pregnancy QUIZ 2007
- OG 4.6 Medications and Drug Use in Pregnancy QUIZ 2007

### **OG 5.0 Intrapartum and Postpartum Care Tutorials**

- OG 5.1 Analgesia for Labour and Delivery QUIZ 2007
- OG 5.2 Induction of Labour and Post-term Pregnancy QUIZ 2007
- OG 5.3 Perinatal Asphyxia and Stillbirth QUIZ 2007
- OG 5.4 Breech QUIZ 2010
- OG 5.5 Postpartum Care QUIZ 2010
- OG 5.6 Obstetric Emergencies QUIZ 2010

### **OG 6.0 Early Pregnancy Tutorials**

- OG 6.1 Miscarriage QUIZ 2010
- OG 6.2 Ectopic Pregnancy QUIZ 2010
- OG 6.3 Gestational Trophoblastic Disease QUIZ 2010
- OG 6.4 Termination of Pregnancy QUIZ 2010

### **OG 7.0 Benign Gynaecology Tutorials**

- OG 7.1 Diagnostic and Surgical Procedures QUIZ 2007
- OG 7.2 Menorrhagia QUIZ 2007
- OG 7.3 Dysmenorrhea QUIZ 2007
- O.G 7.4 Infectious Diseases and Gynaecology QUIZ 2010
- OG 7.5 Sexual Assault and Domestic Violence QUIZ 2010
- OG 7.6 Menopause QUIZ 2010
- OG 7.7 Prolapse QUIZ 2010
- OG 7.8 Urinary Incontinence QUIZ 2010

### **OG 8.0 Gynaecologic Oncology Tutorials**

- OG 8.1 Cervical Cytology QUIZ 2007
- OG 8.2 Cervical Malignancy QUIZ 2007
- OG 8.3 Uterine Malignancy QUIZ 2007
- OG 8.4 Ovarian Abnormalities QUIZ 2010
- OG 8.5 Vulvar Abnormalities QUIZ 2010
- OG 8.6 Chemotherapy/ Radiotherapy in Gynaecology QUIZ 2010

### **OG 9.0 Human Reproduction Tutorials**

- OG 9.1 Contraception QUIZ 2007
- OG 9.2 Amenorrhoea QUIZ 2007
- OG 9.3 PCOS QUIZ 2007
- OG 9.4 Pathophysiology of Infertility QUIZ 2007
- OG 9.5 Infertility QUIZ 2007
- OG 9.6 Medico Legal Aspects QUIZ 2007

## APPENDIX 6 - Case upload Template



**Department of Obstetrics & Gynaecology**

**Royal College of Surgeons in Ireland**

**Students should record and upload cases presented during their clinical attachment**

Instructions

- 1 Complete the form below (all fields must be filled)
- 2 Enter case notes into the spaces below
- 3 Upload completed file via Moodle within 24 hours of seeing patient

Note : By completing and submitting this form electronically students declare that the work described here is entirely their own.

**Student ID Number**

**Group:**

**Attached Team:**

<b>Case:</b>			
<b>Date/Time patient seen:</b>		<b>Location: (Ward)</b>	
<b>NCHD:</b>		<b>NCHD Grade:</b>	
		<b>Case Type</b>	
<b>Patient Initials:</b>		<b>Patient Age:</b>	
		<b>Date of Admission:</b>	

<b>1 – Presenting Complaint:</b>	
<b>2 - History of Presenting Complaint:</b>	
<b>3 - Past Medical / Surgical History:</b>	
<b>4 – Past Obstetric History:</b>	
<b>5- Past Gynae. History</b>	
<b>6 – Medications / Allergies:</b>	
<b>7 – Family History:</b>	
<b>8 – Social History:</b>	

<b>9 – Systems Review:</b>	
<b>11 – Physical Examination</b>	
<b>12 - Learning Points</b>	
<b>13 - Summary of clinical course eg how did the labor go [max 100 words]</b>	
<b><u>14- Differential Diagnosis / Management</u></b>	

# APPENDIX 7 - E-portfolio Template

Royal College of Surgeons in Ireland *Coláiste Ríoga na Máinteá in Éirinn*



This Folder: MyCases

- Home
- Student Cases
- Search My Cases
- Search My Competencies
- Create Case Assignment
- Create Competency Assignment
- All Competencies
- Reports

## MyCases : New Item

Ok Cancel

Spelling... \* Indicates a required field

Title\*

Body System\* Cardiovascular

Date of Case 01/12/2010

Patient Initials\*

Patient Gender Female

Patient Age\*

Case Location\* ..Please Select..

Tutor\*

Presenting Complaint

Click for help about adding basic HTML formatting.

History of Presenting Complaint

Click for help about adding basic HTML formatting.

Menstrual Cycle

LMP 01/12/2012

Past Obstetric History

Click for help about adding basic HTML formatting.

Past Gynaecological History

Click for help about adding basic HTML formatting.

Smear History



**Past Surgical History**

[Click for help about adding basic HTML formatting.](#)

**Past Medical History**

[Click for help about adding basic HTML formatting.](#)

**Medications**

[Click for help about adding basic HTML formatting.](#)

**Allergies**

[Click for help about adding basic HTML formatting.](#)

**Family History**

[Click for help about adding basic HTML formatting.](#)

**Social History**

[Click for help about adding basic HTML formatting.](#)

**Systems Review**

[Click for help about adding basic HTML formatting.](#)

**Physical Exam**

[Click for help about adding basic HTML formatting.](#)

**Differential Diagnosis**

## CLINICAL SKILLS LIST

Auscultate heart sounds  
Auscultation of chest  
Assess for shifting dullness  
Assessment of tracheal deviation  
Blood pressure  
Body Mass Index  
Chest Expansion Measurement  
Cranial Nerve Exam  
Hand Exam  
Knee Exam  
Lower Limb Coordination  
Lower Limb Power  
Lower limb Reflexes  
Lower Limb Sensation  
Lower Limb Tone  
Palpation of AAA  
Palpation of Abdomen  
Palpation of Apex beat  
Palpation of Liver  
Palpation of spleen  
Percussion of chest  
Peripheral Pulses  
Pulse  
Respiratory Rate  
Temperature  
Upper Limb Coordination  
Upper Limb Power  
Upper Limb Reflexes  
Upper Limb Sensation  
Upper Limb Tone

## PROFESSIONALISM ENCOUNTERS LIST

Analyze my role and performance as a leader  
Apply 'duty of care concept'  
Communicate well with members of law enforcement  
Comply with RCSI 'Fitness to be a medical student'  
Consider legal and ethical responsibilities in a clinical case  
Consider role of doctor in forensic medicine  
Consider role and functions of other team members including managers  
Contribute to teamwork  
Explore my reactions to patients with disability, social disadvantage, elderly patients, the death of a patient  
Identify my own learning needs in a given situation  
Maintain confidentiality  
Manage issues of boundaries between patient and doctor  
Manage my time and priorities  
Obtain informed consent for procedures  
Provide effective constructive feedback to my peers  
Recognize the limitations of my expertise  
Recognize and can manage stress  
Reflect and learn from experience  
Solve problems  
Support peers and colleagues through stressful situations  
Take advice from others  
Treat all patients with respect  
Understand role of doctor as patients' advocate  
Understand the role of ethics committees, guidelines and research  
Undertake continuous professional development  
Work collaboratively with in an interprofessional multidisciplinary team

## APPENDIX 8- Questionnaire

### Obstetric & Gynaecology Moodle Course Review

*1	How old are you? Choose... ▾
*2	English is my first language. Choose... ▾
*3	What gender are you? Choose... ▾
*4	What is your nationality? <input type="text"/>
*5	Medicine is the first full time degree course I have studied? <input type="radio"/> Yes <input type="radio"/> No
*6	I am a medical student in the graduate entry program. <input type="radio"/> Yes <input type="radio"/> No
*7	Overall I found the on line Moodle O & G program useful for my studies. <input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree
*8	Overall I found the 11 Pre course Tutorial series useful in my preparation for the O&G clinical attachment <input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree
*9	I would prefer the precourse tutorials to have an accompanying explanatory voiceover <input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree
*10	I find the explanatory voiceover lectures helpful with my studies <input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree
*11	I find the MCQ Quizzes helpful with my studies <input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither <input type="radio"/> Disagree <input type="radio"/> Strongly <input type="radio"/> Agree
*12	The MCQ's were a complete waste of my time. <input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree <input checked="" type="radio"/> No answer

*13	I would like more feedback throughout the quizzes, explaining the answers for example	<input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither <input type="radio"/> Disagree <input type="radio"/> Strongly Agree
*14	I found the E-Portfolio easy to use	<input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither <input type="radio"/> Disagree <input type="radio"/> Strongly Agree
*15	Overall, I found the case uploads a useful way to review a particular topic.	<input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither <input type="radio"/> Disagree <input type="radio"/> Strongly Agree
16	I would prefer fewer quizzes, perhaps a single quiz for each segment eg. Benign Gynaecology Quiz.	<input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree Nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree <input checked="" type="radio"/> No answer
17	I would prefer to use a shortened version of the case upload.	<input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree <input checked="" type="radio"/> No answer
*18	The Case Upload OSCE station was a fair way to assess my understanding of the topic I was questioned on.	<input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree
*19	I am in favour of using a combination of the MOODLE MCQ results and the UPLOADED CASES as a part of a formal continuous assessment for the Final Professional examination in O & G.	<input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree
*20	I think the Final MCQ should take place through the MOODLE site.	<input type="radio"/> Strongly Agree <input type="radio"/> Agree <input type="radio"/> Neither Agree nor Disagree <input type="radio"/> Disagree <input type="radio"/> Strongly Disagree
21	Give one thing that you would change to the on-line delivery of the O & G course	<input type="text"/>
*22	List the poor aspects of the on-line delivery of the course that in your opinion need to be addressed. Give your suggestions for improvements where appropriate.	<input type="text"/>
*23	List the good aspects about the on-line delivery of the course that you would like to see more of next year.	<input type="text"/>

## Appendix 9 - Questionnaire Results.

View All Responses. All participants. Responses: 177

### Obstetric & Gynaecology Moodle Course Review

#### 1. How old are you?

Response	Average	Total
20-25yrs	72%	128
26-30yrs	24%	43
31-35yrs	3%	5
35+yrs	1%	1
<b>Total</b>	<b>100%</b>	<b>177/177</b>

#### 2. English is my first language.

Response	Average	Total
YES	68%	120
NO	32%	57
<b>Total</b>	<b>100%</b>	<b>177/177</b>

#### 3. What gender are you?

Response	Average	Total
MALE	44%	77
FEMALE	56%	100
<b>Total</b>	<b>100%</b>	<b>177/177</b>

#### 4. What is your nationality?

#	Response
3	American
1	Bangladeshi
1	Belgian
2	British
2	Canada
21	Canadian
1	Chinese
1	emaraty
1	French
1	Hong Kong
1	Indian
1	Iranian
62	Irish
2	Jordanian
2	kuwait
10	kuwaiti
2	Kuwaity
4	Malaysia
18	Malaysian

4	nigerian
3	Norwegian
4	qatarl
3	Singaporean
1	South African/Canadian
1	Swedish
1	Syrian
1	Thal
1	Trinidadian
11	UAE
1	uk
9	usa
1	USA/Irish

5. Medicine is the first full time degree course I have studied?

Response	Average	Total
Yes	63%	111
No	37%	66
Total	100%	177/177

6.

I am a medical student in the graduate entry program.

Response	Average	Total
Yes	38%	67
No	62%	110
Total	100%	177/177







7. Overall I found the on line Moodle O & G program useful for my studies.

Response	Average	Total
Strongly Agree	66%	116
Agree	33%	58
Neither Agree nor Disagree	2%	3
Total	100%	177/177







8. Overall I found the 11 Pre course Tutorial series useful in my preparation for the O&G clinical attachment

Response	Average	Total
Strongly Agree	51%	90
Agree	45%	80
Neither Agree nor Disagree	3%	5
Disagree	1%	2
Total	100%	177/177







9. I would prefer the precourse tutorials to have an accompanying explanatory voiceover

Response	Average	Total
Strongly Agree	 14%	24
Agree	 24%	42
Neither Agree nor Disagree	 27%	48
Disagree	 28%	49
Strongly Disagree	 8%	14
Total	 100%	177/177







10. I find the explanatory voiceover lectures helpful with my studies

Response	Average	Total
Strongly Agree	 16%	28
Agree	 23%	41
Neither	 34%	60
Disagree	 23%	40
Strongly Disagree	 5%	8
Total	 100%	177/177

11. I find the MCQ Quizzes helpful with my studies

Response	Average	Total
Strongly Agree	 32%	56
Agree	 48%	85
Neither	 10%	17
Disagree	 10%	18
Strongly	 1%	1
Total	 100%	177/177

12. The MCQ's were a complete waste of my time.

Response	Average	Total
Strongly Agree	 2%	4
Agree	 8%	14
Neither Agree nor Disagree	 20%	36
Disagree	 40%	70
Strongly Disagree	 24%	42
Total	 94%	166/177



13. I would like more feedback throughout the quizzes, explaining the answers for example

Response	Average	Total
Strongly Agree	36%	63
Agree	51%	91
Neither	10%	17
Disagree	3%	6
Total	100%	177/177

14. I found the E-Portfolio easy to use

Response	Average	Total
Strongly Agree	2%	4
Agree	50%	89
Neither	10%	17
Disagree	18%	31
Total	80%	141/177

15. Overall, I found the case uploads a useful way to review a particular topic.

Response	Average	Total
Strongly Agree	22%	39
Agree	54%	95
Neither	15%	27
Disagree	9%	16
Total	100%	177/177

16. I would prefer fewer quizzes, perhaps a single quiz for each segment eg. Benign Gynaecology Quiz.

Response	Average	Total
Strongly Agree	11%	19
Agree	27%	48
Neither Agree Nor Disagree	17%	30
Disagree	33%	58
Strongly Disagree	9%	16
Total	97%	171/177

17. I would prefer to use a shortened version of the case upload.

Response	Average	Total
Strongly Agree	14%	24
Agree	38%	68
Neither Agree nor Disagree	16%	29
Disagree	27%	47
Strongly Disagree	2%	4
Total	97%	172/177

18.

The Case Upload OSCE station was a fair way to assess my understanding of the topic I was questioned on.

Response	Average	Total
Strongly Agree	16%	28
Agree	57%	101
Neither Agree nor Disagree	15%	27
Disagree	9%	16
Strongly Disagree	3%	5
Total	100%	177/177

19. I am in favour of using a combination of the MOODLE MCQ results and the UPLOADED CASES as a part of a formal continuous assessment for the Final Professional examination in O & G.

Response	Average	Total
Strongly Agree	19%	33
Agree	42%	74
Neither Agree nor Disagree	18%	31
Disagree	16%	29
Strongly Disagree	6%	10
Total	100%	177/177

20. I think the Final MCQ should take place through the MOODLE site.

Response	Average	Total
Strongly Agree	9%	16
Agree	19%	34
Neither Agree nor Disagree	23%	40
Disagree	31%	54
Strongly Disagree	19%	33
Total	100%	177/177

21. Give one thing that you would change to the on-line delivery of the O & G course

#	Response
3	-
1	Accuracy of quiz answers
1	Amenorrhoea-add detail
1	block on repeating quizzes
2	Case uploads
1	Change eportfolio
1	clearer deadlines - timer
1	correct mcq answers
1	Correct MCQ answers!
1	Emq's rather than mcq's
1	ePortfolio!
1	errors in the mcqs
1	examination Video links
1	Explanation for quizzes
1	Explanation of MCQ answer
1	Extended matching Mcqs
1	Feedback on case uploads
1	fewer "selected readings"

1	Format
1	Include OSCE notes
1	Increase limit of trial
1	it's good the way it is
1	lecture notes numbering
1	less quiz
1	less quizzes
1	Less quizzes,better quizs
1	Less topic repetition.
1	Less Topics
1	Mandatory lectures
1	MCQ answer explanations
1	MCQ less mistakes
1	more camtasia please =)
1	More detail
1	More MCQs
1	More quizzes for topics
1	More video links
1	more voice overs
1	Neonatology lectures
1	no change
1	no comment
1	no pre-course quizzes
1	No quizzes/more relevant
10	Nothing
1	Nothing. Its perfect
1	Please correct grammar
1	pre lectures quizzes
1	Provide mcq answers
1	quiz answers CORRECT
1	quiz for topic & segment
2	quizzes
1	record of complete quizzes
1	reduce MCQ pass mark
1	relevance of quizzes
1	short note questions
1	Some lectures more concis
1	The end of year exam
1	The Eportfolio
1	too many quizzes
1	Tracking of the quizzes.
1	Upload a .doc for cases
1	uploads in 'word' format
1	Very Well Done
1	Videos of clinical exams
1	Videos of exam technique
1	videos of examinations
1	Wrong answers in MCQ's
1	wrong quiz answers

22. List the poor aspects of the on-line delivery of the course that in your opinion need to be addressed. Give your suggestions for improvements where appropriate.

#	Response
1	<ul style="list-style-type: none"> <li>• no poor aspect, only would be helpful if videos of physical exams (practical stuff) were included</li> <li>• also to have notes on Instruments in O&amp;G would be nice</li> <li>• not sure where to check to see which quiz has been done, so have an easily accessible checklist with our progress</li> </ul>
1	Limited trial
3	*
1	<ul style="list-style-type: none"> <li>- marking of the cases had a huge discrepancy between the two tutors. one was handing out 50's, another was handing out 70's. and it was not that the students were just better. therefore if it is considered that these marks be used in the future, a standardization of the marking must be put in.</li> <li>- videos of clinical exam on patients should be added to moodle. cartoons or something of that nature.</li> </ul>
1	<ul style="list-style-type: none"> <li>- MCQs - need answers as to why answer is wrong</li> <li>- some lectures were mediocre: namely medications in pregnancy</li> <li>- ALL LECTURES need to follow a similar format and be concordant: i.e., definition, epidemiology, etiology, etc. Overlap gynae was absolutely horrible, albeit understandable.</li> <li>- need a lecture for Rhesus and EDD: If these questions are worthy of coming up on the short notes, then they should be included in course content PROPERLY. 2 slides on rhesus isoimmunization in the miscarriage lecture doesn't count! RCSI students are used to not expecting anything normal on exams, hence ppl cover the material on their own. Rhesus is the biggest concern in obs &amp; gynae, and every other medical institute that is noteworthy covers this topic inside out. Why does RCSI not? It's not a secret. Give us a lecture on it.</li> </ul>
1	<ul style="list-style-type: none"> <li>- The glitches in the MCQs - wrong answers, gibberish questions and answers - were very annoying.</li> <li>- MCQs that were more representative of material likely to be asked in the final exams would be appreciated, rather than merely copied and pasted sentences from lectures.</li> </ul>
1	<ul style="list-style-type: none"> <li>- The MCQs at the end of each topic need working on as they sometimes are corrected wrongly. I realise that the course coordinators are aware of this and it is an ongoing practise to improve them with the students' help</li> <li>- More MCQs as they were very helpful in remembering details and statistics. Made it more interactive too</li> </ul>
1	---
1	-fewer MCQs would have made doing them more beneficial academically. I was just doing them to get through them, not as a learning tool which they should have been.
1	<ul style="list-style-type: none"> <li>-many wrong answers in the quizzes</li> <li>-more clinical based quiz</li> <li>-more voice over with the lecture notes</li> <li>-upload the tutorial presentation in the moodle</li> </ul>
1	<ul style="list-style-type: none"> <li>-Not enough info on rhesus isoimmunisation -Expand on twin to twin transfusion syndrome -Is there a way to organise the course to prepare more for the MCQs? Examples of EMQs etc. Those that have done the USMLEs are at great advantage as half the class will have never seen an EMQ before. -More preparation for the long case. Even written material detailing what to do etc in one document would be a great help. -The neonates teaching seems to vary to a great degree in each hospital. This should be addressed. Everyone should have to do neonates uploads (maybe just 1 or 2). -One more thing, could info on current Irish practice be added. For example, learning about breech and multiple gestation delivery, a short note on the fact that in practice (as opposed to in theory), most of these women undergo elective C section. -It would be good if the end of rotation assessment counted for more marks. It was a great weight off your shoulders in paed.</li> </ul>
1	-Some information regarding numbers and percentages of the same topic are different in different lectures
1	.
1	* lack of time.
1	* Some of the answers to the online quizzes are incorrect - In direct contrast to the lecture material
1	MCQ answers were often incorrect or incorrectly written which was frustrating at times - these should be reviewed. It would have greatly benefited from receiving feedback on case uploads.
1	<ul style="list-style-type: none"> <li>- Would be nice to get feedback from MCQ or explanation for answer</li> <li>- feedback from case uploads</li> </ul>
1	<ul style="list-style-type: none"> <li>-Quizzes: I think it would be better if you could repeat the quizzes straight away if desired, I don't think the lock-out block of when you can repeat the quiz is helpful.</li> <li>-Some of the answers to the questions in the quizzes are wrong, I know that the quizzes are being constantly updated and the answers changed when they are reported as being wrong, it'd be nice if this was completed, as it is frustrating when they are marked wrong.</li> <li>- The neonate lectures are slightly messy, they aren't as clear and well presented as the rest of the obsgynae page. It would be easier to study neonates if these were better presented and the information in them as clear cut as the obsgynae lectures are.</li> </ul>
1	
1	<ul style="list-style-type: none"> <li>1- We need formal lectures on consultation for different topics such as ( how to counsel down syndrome, miscarriage ....etc)</li> <li>2- I think quizzes are just waste of time I haven't seen any of them in the final EMQ's exam.</li> </ul>

	Otherwise the contents of the lectures were perfect.
1	<p>Consistency in the MCQ answers- although most were rectified by the end of my attachment, it was frustrating.</p> <p>Videos of some common gynaecology surgeries- eg: Burch Colposuspension; Different type of Hysterectomies to aid the lecture notes</p>
1	EMQ's are more like what we get in the exam at the end of course so online practice in those as opposed to mcqs would have been great. MCQs beneficial all the same. thanks.
1	<p>Everything is well-lined for the students. I think this is the only subject I get all information from the moodle.</p> <p>However, the case upload is a bit too lengthy, since we have quizzes too. Hope it will be in a shorter version: eg- intro + history + physical exam + investigation + management.</p>
1	<p>Fix the MCQ questions and their answers.</p> <p>Alert students that the introductory lectures should probably be completed prior to the semester starting as they are very time consuming and take a complete weekend to complete along with associated quizzes.</p> <p>This is difficult if the student has other commitments.</p> <p>Make the Uploaded cases Microsoft Word only as the system used for entering in the details keeps crashing and doesn't cache previously stored information. A Word format would allow the patient to complete the template off-line and then just upload it when ready.</p>
1	<p>I feel the MCQs are a great , but need to be fine tuned and the answers need to be correct. some of the answers to the questions were wrong.</p> <p>Also a way for the student to know what MCQs have been done like a check box on moodle seeing as they are necessary for completion of the course.</p>
1	i think everything is great
1	I think it should be improved by making some videos in the hard topics as well as doing a revision lecture for pictures only.
1	<p>I think that the quizzes need to be edited to ensure the questions are correct and relevant to the topic being tested.</p> <p>Supplemental material outside of the powerpoint file is very difficult to include in finals preparation. Even if the material is reviewed as part of the course there is a variable time period to the final exam which may favour groups with Obs/Gyn later in their schedule. It would be very helpful if all the examinable material was included in the core powerpoints.</p>
1	i think there should be a video/audio commentary for all the lectures especially the physical examination . i found it very helpful where the tutor elaborates on some important points which are not in the notes.
1	<p>I would make the MCQ question more applicable to the lecture it is suppose to be covering.</p> <p>More bedside tutorials would be beneficial to cover the major topics in both obstetrics and gynecology.</p> <p>Ensure learning is more proactive in clinics, perhaps have students seeing their own patients rather than just sitting in on consultations.</p>
1	<p>Material examined in both the end of course OSCE and final exams were not fully covered neither in tutorials or moodle.</p> <p>Even if I had access to all the lecture notes I wouldn't have been able to answer the final MCQ. If they wanted us to read around and more about a topic (as they asked in the MCQs) they should have provided us with the extra reading material or at least added to the lecture notes.</p> <p>There was a lot of material to study for the course in the first place and asking questions outside the course's scope was a bit unfair.</p>
2	none
1	<p>One thing, the quizzes need to be reviewed as some of the quizzes have wrong answers (not just in my opinion) which can result in not getting the marks for something which is correct and leads to a lot of frustration if it's late at night and one is trying to get the quizzes done.</p> <p>There are a large amount of quizzes so maybe if, as suggested, there were a certain number of compulsory review quizzes, longer obviously than the others i.e. one per section and then the rest of the quizzes could be available for learning purposes.</p>
1	<p>Overall it was a great course, one of the best organised courses I have done to date. The quizzes were however a little bit annoying as some of the answers were wrong and not the same as the lectures.. I just found myself doing them alot . sometimes multiple attempts and not gaining much from them in the way of learning. The OG lectures were fantastic and i liked how the RCOG guidelines were included in some of the subjects. Many thanks...xxx</p>

- 1 Overall the online delivery of the course was excellent. However the main issue I had with the lectures was that they sometimes contradicted each other and I had to look up which information was correct (for example the doses and when to administer antenatal corticosteroids). When multiple treatment options are available for a certain condition, it might be useful for the lecture to state which one is actually used in Ireland or in the various hospitals because some examiners only accept specific answers. All of the quizzes should be minimum best score >80 rather than average 80. Rhesus immunisation could be done in more detail, especially as it was a question on our paper yet there was no lecture on it.
- 1 Perhaps more feedback on our case uploads.
- 1 Some lectures weren't up to par such as the 'Medications in Pregnancy' lecture. It could have been delivered in a much better way.  
There could be a logbook or a checklist of things that are student 'Must sees' during the O&G rotation.  
More self directed learning time (lots to know, little time to study for it)  
More time for the history taking station and the station after that (writing the history and deciding what investigations need to be done and the differentials for the history) in the end of rotation OSCE  
More standardized questions for the consultants to ask in the Clinical Oral exam at the end of the year  
Not enough exposure to neonates. Moving it to Paediatrics or giving it more time during the O&G rotation would be preferred.
- 1 Some of the MCQs had either incorrect answers, or answers that were different to those in the lectures. This was a little confusing.
- 1 Some of the online mcqs answers were incorrect and did not match what was said in the lecture notes, but I assume that those ones were corrected for the other groups that followed us. Explanation why specific answers are correct would aid in the overall learning experience.
- 1 Structure the neonates course online like the ObGyn course - which was very well organised.  
Online voice overs excellent, especially if the topic is hard. But don't take away the powerpoints - these are good for when you are on peripheral (and your 3G stick doesn't actually work that well in most), or if you need to review the topic quickly - ie when cramming.  
MCQs - a good few mistakes in them. This is grand because they just have to be done, but I would not recommend they count for marks as part of continuous assessment as there are too many inaccurate ones, and a good few questions that don't even make sense as a sentence or question English wise. I found them however extremely good for motivating me to get through all the lectures and kept my study goal directed.
- 1 The answers to the quizzes should be correct, especially since a passing grade is required
- 1 there should be a record of what quizzes you have completed and which ones you have failed, instead of having to click into each one separately. there should be explanations for quiz answers. and topics should only be from that lecture, as there is such a high pass mark it is unfair to include anything that isn't expected. eportfolio was also unreliable and twice I lost all the material after transferring a whole case from word. they should also be corrected before the OSCE.
- 1 This is with regards to neonates.  
I would have preferred if there was an announcement on the moodle page stating that we ought to complete one mcq a week to avoid the problem of losing marks due to thinking that the neonates mcqs were of the same format as the obs n gynae ones.
- 1 we needs more tutorials.
- 1
- More additional foot notes on the pre-course topics
  - Perhaps more MCQ quizzes for each individual topics
  - videos or links to other online sources would be helpful
- 1
- More detail needed in the lectures, even though they were great anyway.
  - I felt that a couple of the lectures had some information that could have been a little outdated/contradicting to the guidelines/doctor's teaching
  - MCQ's had a good number of mistakes
- 1
- Quizzes should be trackable - I would like to see which quizzes I have completed to the passing standard and which quizzes I have not.
  - While I do not think that there should be a voiceover to the lectures (I prefer to study at my own pace), if there are any additional comments that a lecturer would make, it would be nice to have them noted at the bottom section of the powerpoint presentation. Many of the slides already have this.
  - Taking a quiz per lecture was tedious, and sometimes useless. I would have just finished the lecture and a particular statistic would be fresh in my mind and I would properly answer it on the online MCQ. However, a few weeks later I would not be able to recall the statistic. I think this can be evaded if we had to take a quiz per block (1 - 9). That way, I would have studied the series of lecture within that block, and the quiz would be a much more accurate assessment of my knowledge as it takes more than just half an hour to complete an entire block.
  - My E-portfolio cases were never graded, so I don't know what my standard was and I don't know if I did poorly

	<ul style="list-style-type: none"> <li>Neonatology needs to be better defined as a course. Is it paediatrics, obstetrics and gynaecology, or a self-sufficient course? We had neonatology assessment during OB/Gyn and Paediatrics. It would be nice if we could consolidate our neonatology teaching into one place. However, the quality of the weekly Neonatology quizzes was higher than the post-lecture Ob/Gyn quizzes.</li> </ul>
1	A lot of errors in the mcqs. They were fixed (apparently) when we emailed about them but sometimes it meant taking a quiz 2 or 3 times because of being marked incorrectly.
1	A lot of the MCQ answers were either incomplete or incorrect, I think it's important to review these to ensure their accuracy.
1	A lot of the quiz questions were just sentences quoted directly from the lecture so I felt they were not testing an overall understanding of the topic, and because there were so many you were spending your time not necessarily helping yourself for the final exam preparation, just doing the quizzes for the sake of having them done. Some questions had no right answers, which is frustrating. The case uploads need to have the requirement explained clearly. There was a lot of confusion about when it was acceptable to submit, based on being within 48 hours of seeing the patient but also having had your tutor correct it so it was not possible to make edits while still trying to get 2 cases submitted per week - and whether this actually mattered at all. The place for uploading them was unclear as you could still upload a week 1 case in week 5 so it was just confusing. I think the guidelines for uploading should be clearer, and having them form part of continuous assessment might be a good idea.
1	A set amount of quizzes/case uploads to be completed each week to avoid backlog might be an idea.
1	An additional online video resource, even just a short clip, reviewing what the examiners are looking for in the physical examination would be extremely useful in revising before exams.
1	Answers to mcqs Not all topics were covered that we were examined on e.g. Rhesus incompatibility should have had a lecture devoted to it
1	At times the eportfolio wasn't working appropriately sections of cases were lost or not saved properly resulting in a lot of time wasting but I did feel the cases were instrumental in learning certain topics and relating them to appropriate history taking, I think if there was a new fool proof template made i.e like a word document template that was uploaded this might lead to less problems with the eportfolio system.
1	Blatantly wrong answers to many of the MCQs need to be corrected IMMEDIATELY to prevent incorrect knowledge from being remembered as correct.
1	Change eportfolio for upload of MS Word documents instead
1	During the course, I have difficulty to get track all the quizzes that I have done, Therefore, we need help from the Tutor to look which quiz that we have miss. Hopefully in the future, there will be a track list of all the quizzes that we have done.
1	every thing was great but we need more emq
1	extend the course to 8 or 10 weeks
1	Feedback on quizzes Camtasia are sometimes useful
1	Give practise with the extended multiple choice, was really prep'd for the final one cause I didn't know how detailed they were actually going to be
1	Having MCQ questions with clinical scenarios would be useful
1	I can't write more than a few words in the section on what to change hence I'll add my comments here. I would add a feedback/questions section attached to each lecture/section to allow students to ask questions. Then make the questions/answers available to all students (anonymised).
1	I cant remember specifics - did obs/gynae before christmas
1	I did not find any poor aspects of the on line delivery of the course at all.
1	I didnt feel there were any deficiencies in the online delivery.
1	I feel that the case uploads for this course was not focused on during the OSCE. A great amount of time was spent working on these cases, and they were not efficiently used during the OSCE. Furthermore, the number of cases should NOT be increased or decreased.  The MCQs were full of flaws and contain many errors. However, if they can be fixed, they should continued to be used.
1	I felt the topics we needed to cover in the 6 weeks and for the end of year exam was a lot to get through. Maybe there would be some way of condensing it a little or removing topics that are not too important.
1	I found the online mcqs helpful, but full of mistakes. This improved as time went on so I presume is no longer a problem. The online mcq questions were completely different to the end of year assessment. Lack of familiarity with the end of year format made it difficult. I would like to see more extended matching examples available online. I didn't find getting through the material difficult, but some students did. Perhaps it would be useful to include a suggested timetable for students so that they can see immediately when they are falling behind. The neonates section could be developed to be laid out as the OBGYN sections are.
1	i like the online mcqs
1	i think it is already fine.
1	I think it is well organised
1	I think it would be easier to write out cases in Word and then upload the doc file to moodle, rather than use eportfolio with its annoying html editing, etc.
1	I think that the online lectures should be optional. Some of them were good, but some of them were very poor quality. I would rather read about important topics in a book than through moodle lectures. Because these lectures were mandatory, I had to do both, which was a waste of my time.
1	I think the only think I could say is that the gynaecology oncology lectures could be more comprehensive especially vulval and ovarian lectures. Maybe thr contraception lecture could also be reviewed. Apart from that te lectures are actually brilliant.

1	I think they should put a list that we can all look at so that we know how many quizzes left that we haven't done.
1	I thought it was good overall, nothing much to complain about!
1	I thought it was very well organized
1	If possible, on the O&G page, if there was a way to show us that we've already completed quizzes satisfactorily, instead of searching through forums and profiles, that would be very helpful. Perhaps a tick or line through the quizzes. A voiceover of the pre-course work is ideal, as no one has any idea what is going on, however, voiceovers for the rest of the course are useless. At this time, we have already found an appropriate style of studying and the voiceover can be tiresome.  With respect to the case uploads. If possible, one should be due by the end of the first week and this case upload should be corrected as soon as possible so that students have an idea of what to do for the rest of them. Logistically this may be difficult but I think it would improve the quality of the subsequent case uploads.
1	In general, I found it great except for eportfolio. The use of eportfolio increases the workload hugely due to formatting issues i.e. having to inset line/paragraph breaks manually. It also has a tendency to crash and delete your work in the process. This means that you have to write your case as a word document, paste it into eportfolio and then fix the formatting! It is also difficult to read when printed in that format. A direct upload to moodle of a word document (as is the case with neonatology) would be much easier.
1	incorrect answers in the mcqs
1	is very organized, but is lack of time to study, only have 6 weeks
1	it was a good site.
1	It was very hard to determine whether you have actually finished all quizzes unless you had kept track yourself. It would be more helpful to have a page on moodle clearly outlining which quizzes have been taken and the scores received on those quizzes.  The MCQ/EMQ section of the final examination did not mirror the online quizzes whatsoever. I felt like a majority of the class was unprepared for the style of questions posed in the end of course MCQ and may have done poorly. Changing the moodle MCQs to those which will actually be examined would be very beneficial to students.
1	It would be good to have a zip folder apart from individual powerpoint links so it's easier to download notes.
1	It would be very helpful if students could see on moodle whether or not they had completed a quiz after having taken the quiz, as there are many to keep track of. Also, fewer quizzes covering more content with accurate questions would be helpful too.
1	Less time devoted to quizzes and case uploads which I feel took away time from actually history taking practice and learning from patients. Students were so focused on just the particular cases they had to upload and the quizzes they had to complete that they did not see the point in just taking histories, presenting theses and learning from all the patients. It was very distracting at times and impossible to do both in the amount of time that we are given for this course.
1	little to change for OBGYN. excellent course. for the neonatology course, would suggest a review of the lectures, some are obviously very old and need to be updated.
1	Many of the Moodle MCQs test nitpicky details - questions that change one word or one number in a sentence from the lecture, making them false. This isn't a helpful way to test understanding, it tests recall of often useless details and encourages keeping the lecture open to check if the correct answer.
1	Many questions in the MCQs had wrong answers. Some topics are too short to have their own individual MCQ. An MCQ for each section might be a better revision for the entire section, especially if it provides explanations of answers, etc.
1	maybe should improve the learning objective and lecture notes in the neonatal subject
1	MCQ's were not correct sometimes, vague and difficult to deal with
1	mistakes in the quizzes which are already being addressed
1	More clinical teaching - maybe a video on examination of a pregnant woman, and pictures with descriptions of instruments etc. for recall before exams
1	More feedback online from tutor on ur progress whether good or bad!
1	more standardisation in terms of layout. Links to MCQ online quizzes were sometimes not on the same webpage as the ppt files (Eg, TOP lecture)
1	Most lectures are not assisted with explanatory voice; hence since no formal lectures conducted to cover all notes, it would be good if this matter can be tackled online.
2	N/A
1	NAD
1	Neonatology lectures were not as well constructed as the Obs/Gyn. Less direction given. Eportfolio assignments were not available to tutor to be corrected and so not very useful in getting feedback initially. Should be included in overall mark due to amount of work put into them. There should definitely be a method of following what lecture mcqs have been completed as it is easy to miss one. Having to go into each one to recheck is tedious and time consuming.
1	No
1	No issues.
1	no poor aspect that i've found, O&G on line delivery course is perfect.
1	No poor aspects
1	No poor aspects.
1	no suggestions, except that the material of the lecture notes were not adequate to answer the final MCQ exam.
6	None



1	nothing in particular
1	podcasts might be a good idea but I think the O&G moodle page is excellent
1	Quite a few mistakes in MCQs.
1	sheer number of lectures is intimidating. consolidation into fewer lectures would be easier to manage. assigning deadlines for each quiz (e.g. on a weekly basis, as for neonates) would make it easier to keep up with the curriculum. Some lectures have more immediate relevance to students than others (e.g. management of PET vs. gynaecological oncology) and should be learned first. A condensed E-portfolio upload format more focused on O&G would be appreciated.
1	Some answers from the quizzes were wrong but I think many amendments had been made.
1	some lectures did not provide as much explanation as I thought they would have. they were basically repetitions of the printed lecture, which made them a bit redundant.
1	Some lectures needed to be more concise and flowing, making some topics more difficult than others
1	some MCQs are incorrectly programmed to the wrong answer and marks are deducted although the candidate gave the correct answer.
1	some mistakes in mcq questions.
1	Some of the MCQ answers were incorrect, for example the same question would be asked in both a positive and a negative way and the same answer would be marked correct.
1	Some of the MCQ's contained inaccurate answers or information that was not part of that lecture.
1	Some of the mcq's give you the mean mark if you try them multiple times instead of the best mark you got. This seems only to be the case for some of the mcq's.
1	Some of the MCQs don't make sense and need to be proofread. Also many of the questions in a quiz following a particular lecture did not actually relate to that lecture.
1	Some of the quizzes had no relevance to the corresponding lecture (ie. multiple questions about danazol in the PCOS lecture, when danazol was only briefly mentioned in the on-line lecture).
1	Some of the quizzes have been marked incorrectly by the computer and some of the questions are from a different lectures.
1	Some questions had the wrong answers. They should all be reviewed to ensure to mistakes.
	The 30minute time out between exams is too long in my opinion.
	The format of the moodle MCQs, while being good for learning, were utterly useless when it came to sitting the actual end of year MCQ. I personally found the EMQs to be extremely difficult and had no practice in them. The end of year questions were much harder and I think similar questions should be included in the moodle quizzes.
1	Some questions on the online MCQ were wrong and need revision
1	Some the quizzes had wrong answers and this made it difficult.
1	some times, the answer of the mcq is opposite the lecture notes
1	Sometimes it is hard to find a particular case such as infertility. The case upload should be for things that are more common to find in hospital setting.
1	Suggestions to review the latest developments for certain topics.
1	Switch neonatology into paediatrics. One week in the 3 maternally hospitals dedicated to neonatology means people would have a decent grasp of the subject and it wouldn't take from obstetrics teaching.
1	The answer on Moodle were wrong a lot of the times and therefore it was confusing to know whether the information given in lectures was correct.
1	The answers in some of the quizzes are wrong. They should have some links on how to interpret a partogram better.
1	The answers to some of obs & gynae quizzes are not correct
1	The answers to the quizzes are not always correct or match what was delivered in the online content, making it sometimes difficult & frustrating to achieve the required mark.
1	the averaging of quiz marks was sometimes incorrect, making it difficult to get above the required mark
1	The Eportfolio is quite difficult to use at times and a lot of the fields for case uploads are unnecessary. It randomly deletes work you have done sometimes so you have to have a word backup.
1	The eportfolio upload is a bit confusing. There should be only one link to upload each week.
1	The headings of the notes should be consistent. e.g not O.G 3.1 Obs history, then revisedversiongynaexamination.
1	The lecture notes had so much details which covered the written paper. However, it did not help with the MCQ paper as more explanations needed and the 6 weeks course is not long enough to gain such more details from external sources especially we have to cover all the lectures to pass the on-line MCQ.
1	The MCQ's that we do after each lecture was nothing like the MCQs that came in final exam.
1	The moodle mcq answers need to be looked over because some of them are incorrect.
1	The neonatology lectures could have been more structured
1	the number of quizzes are too many they would be very helpful if the the correct answers were correct. sometimes the answers are the opposite of what the lecture notes say, this causes much confusion and made me wish that I didn't do the MCQ. MCQs should consolidate the info we just studied instead confusing them.
1	The OBS/GYN moodle page is superbly organised. Regarding improvements, if students could be guided as to what specific elements of "extra reading" are most relevant to each topic, it will help expand our knowledge beyond the basic lecture material while still maintaining a focused study schedule, as it is not always feasible to review the entire RCOG guidelines for each condition.  Also, regarding the MCQ's, if questions that test the application of knowledge, rather than acquisition of the factual knowledge, this would be a better learning tool; for example, MCQ's that start with a clinical vignette.

	A very crucial point that I wish to mention, not relating to the online aspect of the course, is its length. I believe that the vast proportion of the student body would agree that the course is far too short for the amount of material to be covered, and to be covered to high degree of competence and understanding. If no provision can be made to increase the length of the course, I would support the old system of delivering lectures prior to the start of a rotation such that the six week rotation is entirely dedicated to clinical learning and less so to theoretical study. I believe that this is a sentiment echoed by many students in fourth med.
1	The online assessment was suitable.
1	The only thing I would think of adding would be to give you the explanations to the answers in the quizzes. This might help students identify where they are going wrong. Other than that- nothing.
1	The quizzes for the gyn part of the course did not really assess the information for the lectures very well, but otherwise I thought the online part of the course was very effective.
1	The quizzes frequently had wrong answers, incorrect grammar, and in lots of places, in order to get the 'right' answer', I had to try and predict what answer was wanted, not the actual right answer. I found the quizzes useful to keep me on my toes and make sure I was getting enough work done throughout the course. To make them more useful, I suggest someone go through the quizzes and check all of them for correctness. Also, the e-portfolio was useful, but the cases expected were very long and time-consuming, and the e-portfolio format did not easily accommodate an obs or gynae history.
1	The standard of the online MCQs was hit and miss - please correct grammar and incorrect/inaccurate questions.
1	There are a lot of similarities between many risk factors and complications of different maternal problems- example p.prom, preterm labour, antepartum haemorrhage etc.. It would be useful to have an additional lecture summarising all the those risk factors in order to be able to visualise the similarities and differences in a table for example, and that way it would be less confusing.
1	There are a multitude of questions in the MCQs in which the answers that are marked as correct are not in fact correct according to the lectures. This NEEDS to be fixed as it is so incredibly frustrating when you study the material and end up not passing the quiz due to false answers.
1	There are some quizzes with answers either wrong or contradictory to the lecture content (off top of my head infections in pregnancy and trophoblastic disease). There are some lectures where the lecture content does not match the quiz content (termination of pregnancy). Finally, there are some discrepancies albeit small between obstetric emergencies and the topics covered in different lectures (e.g. pre-eclampsia)
1	there are too many quizzes and online assignments to be completed, there is no time to learn from books, which would have been more useful in the end of course assessment. the quizzes are not useful, as they are some very obvious answers and no feedback (eg what the right answers were). I think 6 weeks is not enough time to complete the online course and have the expected clinical skills at the end of attachment, it made the obs & gynae course very gruelling and unenjoyable and depressing.
1	There were errors in the online MCQ's which resulted time being wasting trying to obtain the 80%.
1	There were quite a number of mistakes in the questions
1	There were wrong answers in the online mcqs, if those could be corrected it would be great.
1	too many mcqs
1	too many quizzes
1	upload cases in word format: easier to format that way, and once a file is uploaded, tutors know that is the final version rather than a work in progress.
1	use emq instead of mcqs so that students can be familiar with exam type questions.
1	Voice overs are a waste of time, we can all read, the topics are not complicated we just need to learn them, or at least have a powerpoint alternative. A lot of the questions in the quizzes were irrelevant. They take time away from clinical time and study.
1	While the MCQs were a useful tool, they could be very frustrating when the questions/answers were incorrect or incomplete. Including explanations for the MCQ answers would be very useful and writing them could also serve the purpose of weeding out faulty MCQ questions.
1	Would have liked to be able to monitor my progress online, and results on in-course quizzes. It would also be nice for the information to be presented in word format in addition to slide format.
1	You could control F for any of the quizzes. If the upload cases were made a mandatory number per week that would actually take pressure off students at the end
1	You waste ALOT of time reformatting whatever you up-load to e-portfolio. When you write a case up in Word and then copy and paste the various sections all the formatting disappears (whatever browser you use) and so you end up spending 45mins just making it not look like a mess. ePortfolio tech support say the formatting should transfer but it doesn't. It's a waste of time when we could just upload them in Word templates instead.

23. List the good aspects about the on-line delivery of the course that you would like to see more of next year.

#	Response
1	
1	Lectures with voice-over where instructor could draw on the slides were the best.
1	the MCQs within a lecture notes were very helpful
4	-
1	- Extremely organized, most organized course I have experienced in my 5 years in RCSI. Learning outcomes well defined. Lectures also made by the same person, format easy to follow. Very comprehensive. - More online MCQs, great way of learning important details. - The voice overs were fantastic, easy to remember lectures. The individual who made the clip about colposcopy was great, more of him please!!! - The RCOG included with each lecture was very clinically relevant. Good to compare with textbook answers. Please continue to update these in the years to follow, I really did appreciate them and felt they helped me prepare for exams

	Thanks for a great course. Thoroughly enjoyed it.
1	- quizzes dont test true knowledge, but theyre good to get thru a topic and make sure you know it decently well - pre course mcq was probably more valuable than the course content itself as it covered EVERYTHING
1	- the quizzes are absolutely fantastic in keeping us on track - the lectures are really good - the website is well organized - pre-quizzes I found very useful - having to do cases was essential in my opinion
1	---
1	-The information given is accurate, up to date, and what we need to know.
1	-the lectures notes is very good plus with the rcog guidelines. -the quizzes in every topic -the important topics for case upload
1	-This was without a doubt the best lecture material we've had in the college, it was (almost) a pleasure to learn. It was extremely logical in layout. -This was the most enjoyable rotation of the year and the one for which I worked the hardest. The people in the Coombe made it a very enjoyable experience.
1	?
1	-
1	* good online resources. * perfect tutorials.
1	* Well organised * Logical sequence of lectures
1	Well organized, the quizzes were a good way to test our knowledge. Also the lectures highlighted the subjects we were to focus on.
1	- Very well presented. A few videos of physical examination etc. could be a useful adjunct to the pre-course material.
1	- It is very organised and it was the only module that is like this, it should be used as a template for the rest of the modules. - Having the eportfolio cases corrected and commented on is excellent and is really helpful to understand where you are going wrong and how to improve.
1	- online material was very good - Hints of where to get more material for topics that is correct and appropriate to Ireland - Videos on certain procedures - as not all of us got to see everything
1	- online quiz for each topic - pre-course quizzes - online case upload
1	1- We should have separate 6 weeks for neonate and another 6 weeks for gyn/obs because I think we haven't had enough time to do neonatology 2- Peripheral hospital was just wasting of time, we went there and we didn't get enough teaching, I preferred if we stayed in Dublin 3-end of rotation exam: it was very stressful time as doing two exams in one day A: It should be in two separate days (on day for neonate and the next for obs/gyn B: I think every 5 min there should be at least 5 min break to prepare for the next station and read the instruction for the next. C: we need feedback from the osce as I think we did very good but we marked down as for the future career we need feedback for improvement what is the point if we pass and we don't know what are our mistakes
1	e portfolio
1	Easy to obtain and good revision material
1	Excellent organisation of topics and lectures on Moodle, really helped with a busy stressful course. I knew always exactly what I had to get through to do ok in the exams (and so I could plan that I would do 15 lectures per week etc), and even each lecture had nice clear knowledge objectives at the start and mcqs at the end. The best organised Moodle site and course in general I have experience so far. There were no online Camtastias that had no downloadable file to go with it, and all the files were powerpoint and in the same clear format - no adobe slides you can't edit, or powerpoint slides with silly backgrounds and colour schemes.  If this could be incorporated (particularly the structuring) into the neonates section on Moodle this would be good, otherwise the neonates lectures are good. Also in the neonates section there is no contact details of who is overseeing the neonates course and who you can email if you have a query. This would be helpful.

ObGyn was the best organised course I have done so far, it made what was seen as the hardest rotation the most enjoyable for me. Maybe I'm straying off the topic but the Paediatrics course online in particular, and the GP and psychiatry courses would be so much easier if they were structured in this simple and organised format.

Excellent Moodle course.

1	Good MCQs, helped reviewing the topics. Good distribution of topics.
1	I found the menstrual cycle cartoon to be extremely helpful - first time I ever realised properly how it all came together
1	I liked that that lectures had mcqs on them to test what we have learned from them and focus on our weak points.
1	MCQ's for self assesment are very useful. Case uploads and mcqs take a lot of time, can be stressful worrying about getting them done and feeling like you are wasting time not having as much time for self-directed learning, so at the time you don't like them much but they really help you to learn about topics and what's clinically important, and you end up learning a lot in a more focused way than it just being self-directed the whole time. I always really appreciate the feedback I get on my cases, they are very helpful. Thanks.
1	none
1	nothing, just keep it like this year
1	Provide simple illustrations to aid learning.
1	The clarity of the lecture content_ MCQ's scattered throughout the lectures
1	The lectures were helpful in guiding the extent of knowledge we need to know The structure of this course was excellent, the only worry on the student is knowing the information in the lectures, the rest is all done for us. So, thank you for that. It has been a great experience overall.
1	The lectures were very easy to understand and straight forward, they followed in a logical order. The feedback for the case uploads were excellent. The bedside tutorials were extremely useful in discussing topics in obstetrics.
1	the organisation and categorisation was great, the quizzes were good.
1	Well laid out, the lectures are excellent - full of appropriate information and not too long-winded. It was helpful to know what exactly we were expected to know.
1	Well structured lectures - Information up the point and exactly what you need to know to master obstetrics and gynaecology
1	<ul style="list-style-type: none"><li>• good clear pictures</li><li>• concise descriptions of important facts about each topic</li></ul>
1	<ul style="list-style-type: none"><li>• It's well organised</li></ul>
1	<ul style="list-style-type: none"><li>• The pre-test MCQs is very good as an early exposure and preparation for students.</li><li>• The lectures are great source of learning</li><li>• The MCQs are very helpful</li></ul> <p>I think everything on moodle regarding this course was superb and very helpful. Thank you very much for everyone's hard work.</p>
1	<ul style="list-style-type: none"><li>• The presentations were self-sufficient. I could read them with light textbook supplementation and have a full understanding for the topic.</li><li>• Best organized course in 5C1 and thus far at RCSI.</li></ul>
1	<ul style="list-style-type: none"><li>• Very well organised</li><li>• Straight to the point and concise lectures</li><li>• MCQ's were helpful for reviewing the topics</li></ul>
1	<ul style="list-style-type: none"><li>• Well organised</li><li>• Contain all the informations we have to know as well as EBM.</li></ul>

1	Accompanying rcog guidelines was helpful Mayer have these available for all topics. Video demonstration of physical examination required.
1	All encompassing. Well laid out. Consistent descriptions of conditions. Broad headings were the same in each lecture.
1	All the notes were structured accordingly which has made us easier to look.
1	Although getting through the quizzes is a pain, it encourages students to get through the material early on.
1	As a general impression and statement, OBS/GYN has been the most well structured rotation during 4th med. I support the provision of extra reading material such as the RCOG guidelines, but as stated above, I believe that if students could be directed as to what specific elements to focus on, this would be good.
1	audiovisual is a great way to learn. more pictures and charts more clinical scenarios
1	Best organized course ever, it was systematically and logically put together to maintain great study regimes
1	Case Uploads and feedback were very good
1	every thing is good
1	Everything is in a perfect shape, I liked the format very much. Thank you for being very organized 😊
1	Everything is very well laid out and easy to access (unlike in Paediatrics!) Wouldn't change it much at all really. I think some students would benefit from regular check ups to ensure they are keeping on top of quizzes as many left the majority until the last week of the rotation.
1	excellent course, really enjoyed the extra topics of interest, eg. abortion in Ireland, more of them next year!
1	Excellent lectures, very clear, very well laid out, and the MCQs were a motivation to learn the lectures well (80% rule helped too)
1	Excellent lectures, very organized
1	first couple of Quizzes we could see the feed back on our results for MCQs but that didnt continue for the rest of the quizzes
1	Flawless course. Everyone leaves this course with a thorough understanding of obstetrics. The best module I have ever studied at RCSE. Fantastic department.
1	good coverage of topics. more than enough to excel.
1	good coverage of topics. quizzes are good way of assessing learning from the online lectures, however many of the quizzes need to be altered to a) reflect the content of the lecture; b) to have the correct answers.
1	Good focused lectures on each topic
1	good synopsis of course
1	good way to study, however I do not think the online MCQs were in any way representative of the end of year MCQs. There were topics that weren't covered in the online MCQs and other topics that were covered in very little detail that formed a substantial proportion of the end of year MCQ. Also the online quizzes were exclusively MCQs and the end of course exam was exclusively EMQs, which I thought was a little unusual.
1	I like how the online content is organised & well laid out. In fact this is probably the easiest of the Moodle pages to navigate & know what is required.
1	i like it
1	I liked doing the case uploads. They made me link important topics to actual patients. I thought they were a good learning tool, and having already done several PET cases helped me in my long case. Overall, I really enjoyed this course! I am considering O&G as a future career!
1	I liked that the lectures uploaded were detailed and sufficient for the course. I thought they were clear and organized and the tutors in the hospitals supplemented this knowledge well. Although the end of year MCQ was not a reflection of this material.
1	I liked the voice over in part of the gynae section.
1	I likes doing the quizzes right after the lectures because it helps to solidify the information that has just been covered.
1	I think Obs and Gynae was the best organised rotation by far and I might be biased as it is my favourite subject but genuinely the course ran very smoothly and the online interaction, feedback from tutors with cases and mcq I found very helpful in assessing what level I was at. I think the online course mcqs could do a mini extended matching mcq after each part i.e one for obs one for gynae etc.. for more preparation for the end of rotation EMQ overall I think it has alot to offer and with the additional information in papers and research links I also must say I found the articles interesting to read for additional sources of information and no other module did this so effectively.
1	I think the lecture notes are well written, however, they were insufficient for the final MCQs.
1	I think the online O & G section is the most structured of all of our specialties and the other modules could take a leaf out of your book. The lectures literally cover everything we need to know as undergraduates which makes it much easier when it comes to studying both throughout the rotation and at the end of the year.
1	I thought the course was extremely well organised and well taught, The online quizzes really helped me to study and learn throughout the course.
1	I thought the quizzes were good revision and it was a way to ensure you were covering the material as you were going along. The quality of the lectures was excellent, better than most of the books. It was very organised and easy to learn.
1	I thought the work/case load was just about right, and it was easy to get all the required cases
1	In general the rotation was very busy but was clearly organised and very enjoyable.
1	It delivered good understandings of the O&G for medical students
1	It helped you stay on track and update with all the material you are suppose to cover in the course.

1	It helps you to plan your day
1	It was all good.
1	It was good to have a comprehensive list of topics to study so we know what is expected of us in the examination.
1	It was very concise, organised, and to-the-point, which helped alot with studying a particular subject.
1	It was very well organized, easily accessible and covered all the topics well.
1	Lecture content overall is laid out very well.
1	Lecture notes quite comprehensive and easy to read.
1	Lectures had pretty much all the required info.
1	Marks being awarded for the work we put in to the cases (which includes neonatology if you're in Rotunda).
1	MCQ for each lecture... ensures you cover all material. All lectures in the same format i.e. powerpoint. This was much better than other courses where there was a mix of camtasia, adobe and powerpoint files, which were consequently harder to learn from.
1	mcq's were a handy way of reviewing the lecture
1	MCQs after each lecture.
1	MCQs are good way to make you study
1	MCQs are great as they make sure you read, and not just skim the lectures. I would however, be helpful if there were more clinical-based questions and case vignettes (like the end of year EMQs) as this would prepare us better for the standard that is expected.
1	More animations in relations to topics and video links in relation to physical examination, acknowledging the right way to perform physical examination such as SFH.
1	more challenging mcq with expansion of the answers...
1	More videos?
1	more voiceovers.
1	Must achieve over 80% on each quiz to proceed.
1	No
1	No issues.
1	no suggestions
2	none
1	notes
1	Notes were structurally outlined under specific heading-ie intrapartum and postpartum care etc.
1	nothign
1	nothing thanks
1	Obs & Gyne was one of the most organised sections in moodle compared to the other subjects. I liked the way how lectures are grouped together under certain topics, it really made things easy for us. Giving that we have limited time to study such a big specialty, the lectures that were available in moodle were very sufficient in order to gain a good understanding of the subject.
1	organised
1	Overall a good way to ensure the breadth of the obs/gyn course is covered. The MCQ's are a good way to ensure lectures are covered.
1	Overall I felt the course was amazing! It was the best this year. The online lectures were well layed out and easy to understand. Everything that could be done to make it a really good online course has already been done I think. The only thing I feel is that the course is a lot to handle for 6 weeks.  I was in Rotunda Hospital and we were given regular feedback on our uploaded cases. I found that very useful.
1	Overall it was brilliant especially the lectures and layout of the course. Definitely the best course for moodle resources
1	PPT slides were excellent in their layout and content.
1	Quizzes were useful along with additional guidelines provided for reading. Format of lectures very good!
1	Quizzing students on lectures is a good idea and great practice for exams.
1	see above
1	Superb way to learn and superb resource. Perhaps a lecture on Rhesus disease and/or one incorporating gynaecology into the acute abdomen in surgery/medicine.
1	systematic arrangement of the topic and lecture notes to cover. clear learning objective
1	The case uploads were a great way of covering the topic so I would like to see more emphasis placed on them and that they would be count towards the final grade because they do take a lot of time and effort.
1	The clear lecture lists and topic lists, divided up as they are is good. Learning objectives could be highlighted more, with reference to text books and chapters recommended for particular topics.
1	The lay out, organisation and content of the lectures was excellent. The collection of lectures was extremely comprehensive and clearly categorized and this was of great benefit when it came to preparing for exams. Compared to some of the other subjects, where the lectures are just thrown up on moodle in no apparent order, this was a great help. Please don't change this! The MCQ's, whilst frustrating at times, served to encourage consistent study throughout the course. I felt that they were helpful overall. Overall, OBGYN has by far the best organised and most comprehensive moodle page and I feel you should try keep up this organisation and clarity for next year.
1	The lecture material was an excellent study resource

1	The lecture material was an excellent study resource
1	The lecture material was excellent, and the MCQ afterwards a very good way of studying. Perhaps an additional MCQ combining all topics in the style of the EOY MCQ could be provided as a good practice for the End of year MCQ, which was an awful experience.
1	The lecture notes available are of good quality and it is helpful having access to all of these in the one place. The voice overs to the lectures are also useful as they enable you to download them and listen to the material on the go. I feel that it would be useful to have these available for more of the lectures.
1	The lecture notes on moodle were very good for obs&gynae.
1	The lecture notes online were very good and detailed for O&G curriculum.
1	The lectures are excellent when compared with other courses.
1	The lectures given are well thought out and provide a reliable amount of information. I am glad that they are there to help us and feel very organized so we know exactly what is expected for us to know.
1	The lectures were concise, manageable and gave good direction as to knowledge required.
1	The lectures were good and concise. If there were a few videos of procedures for example insertion of TVT it would help with understanding a lot. Providing the links RCOG guidelines is excellent.
1	The lectures were very good - concise and addressing the examined content. It was great being able to access them in the powerpoint format as they were easy to annotate while studying.
1	The lectures were very useful and I used them for the basis of my learning. They contained all the important information, laid out in a comprehensive manner and were easy to learn from.
1	The lectures were very well done. All of the information was available and I particularly liked the links to the RCOG and additional supplemental information.
1	The lectures were well explained
1	The MCQs forced us to keep up with the course work
1	The mcqs were a useful learning tool
1	The MCQs were very good to keep the student on top of the course and is a good guide to what are the most important aspect of the lecture.
1	the moodle page is very well organized in sections, with relevant topics easy to identify. I thought the quizzes were a great way to ensure that I was keeping on top of things throughout the rotation.
1	The moodle page was extremely well organised and easy to follow.
1	The notes are good for my study.
1	The notes are very organized and easy to grasp
1	The O&G moodle page is excellent and other courses should model their pages on this format. Everything is really well laid out and the quiz for each lecture is a great learning tool.
1	the O&G notes are well organized to make the course easier, so I just have to say well done O&G staff you've made O&G more easier and interesting.
1	The Obs and Gynae moodle page is very well organised and easy to use and follow. However I think it would be appropriate, at the end of each lecture to add in the RCOG guidelines for that topic as these guidelines feature strongly in exams. Overall though I felt it was the most organised and well taught course in 4th med. It made a subject that was completely new accessible and easy to learn. I liked that it wasn't presumed that we knew the basics and that it started from scratch.
1	The obs/gynae moodle is very well-organised, and it is clear what material should be covered. This really helped me, and in fact, I wish the other rotations were as well organised.
1	The online lecture series covers much of what we are expected to know by the end of the OG course, which really helps in setting goals and tracking progress when studying for exams.
1	THE ONLINE NOTES WERE GREAT FOR STUDYING!!
1	the organization of lectures
1	The page layout is organized. However, Neonatology should be in a separate page. Everything else was good.
1	The quizzes should be made a bit like the emqs, they should mirror the standard of the end of year exam. Apart from the the lectures are fantastic, they are very comprehensive and easy to understand- absolutely top notch. Overall the ob&gyn module is fantastic and very enjoyable for students because the department put so much effort into teaching us. It is a model for the teaching of any subject. Well done!
1	The topics were very well organized and presented. The knowledge objectives and skills objectives were useful in guiding learning.
1	The voiceover for the gynae oncology section was very informative and was presented in a very succinct manner. This kind of teaching would be useful in other parts of the course.
1	The way the lectures are grouped under categories is very structured and fit in to each other- especially the oncology lectures.
1	They covered most of the important topics on the course which made studying much easier and much focus on relevant more important areas.
1	Very detailed and comprehensive material
1	very good quality lectures
1	very organized i have to say, better than other module
1	Very well organised lectures, covers most topics well, quizzes help to make sure I understood the important aspects.
1	Very well organized compared to other modules. Definitely a great way to study. It would help if the lecture material was more fairly represented by the extended matching mcq at the year end exam, as I felt that the moodle MCQs did not prepare us for that at all.

1	Very well organized, the material was easy to learn, and knew what was expected of me
1	Very well organized. There was a lot of information that was categorized and presented in an effective manner, providing a good structure to study from.
1	very well organized.. excellent notes.. I would love to have a camtasia
1	Very well organized Lectures were appropriate, succinct and well organized.
1	voice over explanations on the topics.
1	voice-overs in the gynaecology lectures were helpful. uniform format of lectures is helpful - perhaps adding a topic/heading list as the 2nd slide in each lecture would make it quicker and easier to find pertinent information.
1	Well organised moodle page. It was good revision to do the moodle mcq's.
1	Well organized. Well structured. It was easy to find what you needed from the page.
1	well organized
1	Well organized.
1	Well organised and structured!
1	well structured, enough information and everything required for the exam.
1	Without doubt, the Department of Obstetrics and Gynaecology is the most impressive in Senior Cycle 1 and, I believe, at RCSI. It was the most organised and enjoyable rotation I've had to date at RCSI. Moodle is very accessible and the content in each of the lectures is tailored very specifically to the Final Professional Exam. Your Moodle site should be the poster-child for all of the Departments at RCSI.





## References

1. The Royal College of Physicians and Surgeons of Canada. OBJECTIVES OF TRAINING IN OBSTETRICS & GYNECOLOGY. 2010.
2. Council TM. Review of Medical Schools in Ireland 2007. A Report to the Public By The Medical Council. 2007.
3. The Royal College of Surgeons in Ireland. RCSI medical Curriculum Overview. 2012; <http://www.rcsi.ie/medical-curriculum>. Accessed 6 November 2012, 2012.
4. The Royal College of Surgeons in Ireland. RCSI Medical Cycles. 2012; [http://www.rcsi.ie/courses\\_medicine\\_cycles](http://www.rcsi.ie/courses_medicine_cycles). Accessed 6 November 2012, 2012.
5. The Royal College of Surgeons in Ireland. Department of Obstetrics and Gynaecology, RCSI. 2012; <http://www.rcsi.ie/index.jsp?p=248&n=259>. Accessed 6 November 2012, 2012.
6. The Medical Council. Review of Medical Schools in Ireland 2003. A report to the public by the Medical Council. 2004.
7. Health Service Executive. *Annual Assessment of NCHD Posts July 2011 to June 2012* July 2012 2012.
8. Fields SA, Morris C, Toffler WL, Keenan EJ. Early identification of students at risk for poor academic performance in clinical clerkships. *Academic medicine: journal of the Association of American Medical Colleges*. 2000/10// 2000;75(10 Suppl):S78-80.
9. Garrison DR, Kanuka H. Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, 7(2), 95–105. 2004;7(2):95-105.
10. World Federation for Medical Education. World Federation for Medical Education. 2012; <http://www.wfme.org>. Accessed September 2012, 2012.
11. World Federation of Medical Education. Basic Medical Education WFME Global Standards for Quality Improvement. 2003; <http://www.wfme.org/>.
12. WORLD FEDERATION FOR MEDICAL EDUCATION. *Basic Medical Education WFME Global Standards for Quality Improvement The 2012 Revision*. Copenhagen: WFME;2012.
13. Committee General Medical Council Education. *Tomorrow's Doctors : Recommendations on Undergraduate Medical Education*: General Medical Council; 1993.
14. World Health Organization. *Doctors for Health: A WHO Global Strategy for Changing Medical Education and Medical Practice for Health for All*: World Health Organization; 1996.
15. Yates J. Development of a 'toolkit' to identify medical students at risk of failure to thrive on the course: an exploratory retrospective case study. *BMC Med Educ*. 2011 2011;11.
16. Cohen PA, Dacanay LS. Computer-Based Instruction and Health Professions Education A Meta-Analysis of Outcomes. *Eval Health Prof*. 1992/09/01/ 1992;15(3):259-281.
17. Friedman CP, Wildemuth BM, Muriuki M, et al. A comparison of hypertext and Boolean access to biomedical information. *Proc AMIA Annu Fall Symp*. 1996:2-6.
18. Ripkey DR, Case SM, Swanson DB. Identifying students at risk for poor performance on the USMLE Step 2. *Academic medicine: journal of the*

- Association of American Medical Colleges*. 1999/10// 1999;74(10 Suppl):S45-48.
19. Abdelhai R, Yassin S, Ahmad MF, Fors UGH. An e-learning reproductive health module to support improved student learning and interaction: a prospective interventional study at a medical school in Egypt. *BMC Med Educ*. 2012 2012;12(1).
  20. Thakore H, McMahon T. Sink or swim: the future of medical education in Ireland. *Clin Teach*. 2006 2006;3(2):129-132.
  21. Cornell RM, Eining MM, Hu PJ-H. The Effects of Process Accountability on Individuals, Use of a Familiar Technology. *Journal of Information Systems*. 2011/03// 2011;25(1):109-128.
  22. Dasgupta S, Granger M, McGarry N. User Acceptance of E-Collaboration Technology: An Extension of the Technology Acceptance Model. *Group Decision and Negotiation*. 2002 2002;11(2):87-100.
  23. Gutierrez E, Trenas MA, Ramos J, Corbera F, Romero S. A new Moodle module supporting automatic verification of VHDL-based assignments. *Computers & Education*. 2010/02// 2010;54(2):562-577.
  24. Martin-Blas T, Serrano-Ferndendez A. The role of new technologies in the learning process: Moodle as a teaching tool in Physics. *Computers & Education*. 2009;52(1):35-44.
  25. Romero C, Ventura S, Garcia E. Data mining in course management systems: Moodle case study and tutorial. *Computers & Education*. 2008/08// 2008;51(1):368-384.
  26. Irby DM, Cooke M, O'Brien BC. Calls for Reform of Medical Education by the Carnegie Foundation for the Advancement of Teaching: 1910 and 2010. *Acad Med*. 2010 2010;85(2):220-227 210.1097/ACM.1090b1013e3181c88449.
  27. Abraham. F. *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching: With an introduction by Henry S. Pritchett, President of the Foundation, Bulletin Number Four*,. New York City: The Carnegie Foundation; 1910 1910. 4.
  28. Wang Ts SJL. AN education theory, based method to teach a procedural skill. *Arch Dermatol*. 2004/11/01/ 2004;140(11):1357-1361.
  29. Spencer J. ABC of learning and teaching in medicine: Learning and teaching in the clinical environment. *Bmj*. 2003/03/15/ 2003;326(7389):591-594.
  30. Guile D, Young M. Apprenticeship as a conceptual basis for a social theory of learning. *Journal of Vocational Education and Training*. 1998;50(2):173-193.
  31. Garvin JT, McLaughlin R, Kerin MJ. A pilot project of European Working Time Directive compliant rosters in a university teaching hospital. *The Surgeon*. 2008 2008;6(2):88-93.
  32. Meshkat B, Cowman S, Gethin G, Higgins P, Ryan K, Mulligan E. Elective surgery: a comparison of in-patient versus day surgery practices in Ireland. *Irish journal of medical science*. 2012 2012:1-9.
  33. Preis M, Salzman J, Kahler Z, Fox S. Pediatric emergency medicine core education modules: Utility in asynchronous learning. 2012; S174. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=70745483>. Accessed (Preis, Salzman, Kahler, Fox) Carolinas Medical Center, Charlotte, NC, United States, 19.
  34. Schreiber W.E., Giustini D.M. Pathology in the era of Web 2.0. *Am J Clin Pathol*. 2009 Dec;132(6):824-8. 2009;132(6):824-828.
  35. Giustini D. How Web 2.0 is changing medicine. *Bmj*. 2006;333:1283.

36. Dubose C. The Social Media Revolution. *Radiological Technology*. 2011;83(2):112-119.
37. Chu LF, Young C, Zamora A, Kurup V, A. M. Anesthesia 2.0: internet-based information resources and Web 2.0 applications in anesthesia education. *Current Opinion in Anaesthesiology*. 2010;23(2):218-227.
38. Farrell AM, Mayer SH, Rethlefsen ML. Teaching Web 2.0 beyond the library: adventures in social media, the class. *Med Ref Serv Q*. 2011;30(3):233-244.
39. Doherty I. Agile Project Management for e-Learning Developments. 2010; 1:91-106. Available at, 24.
40. Woltering V, Herrler A, Spitzer K, Spreckelsen C. Blended learning positively affects students' satisfaction and the role of the tutor in the problem-based learning process: results of a mixed-method evaluation. *Adv Health Sci Educ Theory Pract*. Dec 2009;14(5):725-738.
41. Moeller S, Spitzer K, Spreckelsen C. How to configure blended problem based learning-results of a randomized trial. *Med Teach*. 2010;32(8):e328-346.
42. Warnecke E, Pearson S. Medical students' perceptions of using e-learning to enhance the acquisition of consulting skills. 2011; 6:300-307. Available at: <http://www.amj.net.au/index.php?journal=AMJ&page=article&op=view&path%5B%5D=736&path%5B%5D=791>  
<http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=2011371779>. Accessed (Warnecke, Pearson) School of Medicine, University of Tasmania, Private Bag 34, Hobart. 7000, Australia, 4.
43. Tochel C, Beggs K, Haig A, et al. Use of web based systems to support postgraduate medical education. 2011; 1034:800-806. Available at: <http://pmj.bmj.com/content/87/1034/800.full.pdf>  
<http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=2011652200>. Accessed (Tochel, Beggs, Haig, Watson) NHS Education for Scotland, Edinburgh, United Kingdom, 87.
44. Mayer RE. ELEMENTS OF A SCIENCE OF E-LEARNING. *Journal of Educational Computing Research*. 2003/12/01/ 2003;29(3):297-313.
45. Bullen M, Janes DP. *Making the Transition to E-learning: Strategies And Issues*: Idea Group Inc (IGI); 2007.
46. Garrett TJ, Ashford AR, Savage DG. A comparison of computer-assisted instruction and tutorials in hematology and oncology. *J Med Educ*. Nov 1987;62(11):918-922.
47. Walsh K. Launching BMJ Learning. *Bmj*. 2003/11/08/ 2003;327(7423):1064-1064.
48. Link T, Marz R. Computer literacy and attitudes towards e-learning among first year medical students. *BMC Med Educ*. 2006/06/19/ 2006;6(1).
49. White B, Larusson J. Seeing, Thinking, Doing: Strategic Directives for Learning Management Systems. *ELEARN 2010*. 20101018 2010(1):1279-1288.
50. Gormley GJ, Collins K, Boohan M, Bickle IC, Stevenson M. Is there a place for e-learning in clinical skills? A survey of undergraduate medical students' experiences and attitudes. *Med Teach*. Jan 2009;31(1):e6-12.
51. Clark RE. Dangers in the Evaluation of Instructional Media. *Acad Med*. 1992 1992;67(12):819-820.
52. Campbell JL, Ramsay J, Green J, Harvey K. Forty-eight hour access to primary care: practice factors predicting patients' perceptions. *Family Practice*. 2005/06/01/ 2005;22(3):266-268.

53. Bates CK, Chheda SG, Dunn K, Pinsky L, Karani R. Update in medical education. *J Gen Intern Med.* May 2010;25(5):465-469.
54. Chickering AW, Gamson ZF. Development and Adaptations of the Seven Principles for Good Practice in Undergraduate Education. *New Directions for Teaching and Learning.* 1999 1999;1999(80):75-81.
55. Laurillard D. *Digital Technologies and Their Role in Achieving Our Ambitions for Education:* Institute of Education - London. 20 Bedford Way, London, WC1H 0AL, UK. Tel: +44-20-7612-6000; Fax: +44-20-7612-6126; e-mail: ioepublications@ioe.ac.uk; Web site: <http://www.ioe.ac.uk/publications>; 2008.
56. Weller M, Pegler C, Mason R. Students' experience of component versus integrated virtual learning environments. *Journal of Computer Assisted Learning.* 2005/08// 2005;21(4):253-259.
57. Blackboard. Blackboard Website. [Website]. 2012; <http://www.blackboard.com/About-Bb/Who-We-Are/At-a-glance.aspx>. Accessed 1 November 2012, 2012.
58. Moodle. Moodle.com. 2012; <http://moodle.com/>. Accessed 1 November 2012, 2012.
59. Ilias. Ilias Website. 2012; <https://http://www.ilias.de/docu/>.
60. Sakai. Sakai Website. 2012; <http://www.sakaiproject.org/>.
61. Claroline. <http://www.claroline.net/>. 2012; <http://www.claroline.net/>. Accessed 1 Nov 2012, 2012.
62. Escobar-Rodriguez T. The acceptance of Moodle technology by business administration students. *Computers & Education.* 2012/05/01/ 2012;58(4):1085-1093.
63. Rice W. *Moodle 1.9 E-learning Course Development: A Complete Guide to Successful Learning Using Moodle 1.9:* Packt Publishing Ltd; 2008.
64. Dougiamas M, Taylor PC. Moodle: Using Learning Communities to Create an Open Source Course Management System. [Refereed paper]. 2003; <http://dougiamas.com/writing/edmedia2003/>. Accessed 31 OCTOBER 2012.
65. El Saadawi GM, Azevedo R, Castine M, et al. Factors Affecting Feeling-of-Knowing in a Medical Intelligent Tutoring System: The Role of Immediate Feedback as a Metacognitive Scaffold. 2010; 1:9-30. Available at, 15.
66. Brydges R, Carnahan H, Rose D, Rose L, Dubrowski A. Coordinating progressive levels of simulation fidelity to maximize educational benefit. *Acad Med.* May 2010;85(5):806-812.
67. Freudenberg LS, Bockisch A, Beyer T. An approach towards problem-based learning in virtual space. *GMS Zeitschrift fur medizinische Ausbildung.* 2010;27(5):Doc73-Doc73.
68. Espey E, Nuthalapaty F, Cox S, et al. To the point: medical education review of the RIME method for the evaluation of medical student clinical performance. *American Journal of Obstetrics and Gynecology.* 2007;197(2):123-133.
69. Cox K. Planning bedside teaching--1. Overview. *Med. J. Aust.* 1993/02/15/ 1993;158(4):280-282.
70. Bruner J. *Actual Minds, Possible Worlds.* Cambridge, MA: Harvard University Press.; 1986.
71. Sawyer RK. *The Cambridge Handbook of the Learning Sciences:* Cambridge University Press; 2005.
72. Downie CM, Basford PR, eds. *Teaching and assessing in clinical practice: A reader:* Greenwich University Press; 1998. Rogers A, ed. The Nature of Learning What is it...? .

73. Sandars J, Haythornthwaite C. New horizons for e-learning in medical education: ecological and Web 2.0 perspectives. *Med Teach.* 2007/01// 2007;29(4):307-310.
74. Broadbent B. *ABCs of e-Learning.* San Francisco: Jossey-Bass/Pfeiffer; 2002.
75. Nilsson M, Ostergren J, Fors U, et al. Does individual learning styles influence the choice to use a web-based ECG learning programme in a blended learning setting? *BMC Med Educ.* 2012;12:5.
76. Cox K. Planning bedside teaching--8. Deriving working rules for next time. *Med. J. Aust.* 1993/07/05/ 1993;159(1):64-65.
77. Friedman RB. Top Ten Reasons the World Wide Web May Fail to Change Medical Education. 1996; 9:979-981. Available at, 71.
78. Fillion G, Ekionea J-PB. Integrating ICT into Higher Education at the University of Moncton: A Qualitative Inquiry of Onsite vs. Online Students, Å Perceptions. *ELEARN 2012.* 20121000 2012(1):557-566.
79. Burge SM, Lancaster T. Assessment in undergraduate dermatology. *Clin. Exp. Dermatol.* 2004/07// 2004;29(4):441-446.
80. Brown T, Zoghi M, Williams B, et al. Are learning style preferences of health science students predictive of their attitudes towards e-learning? *Australasian Journal of Educational Technology.* 20 SEPTEMBER 2009 2009;25(4):524-543.
81. Arthurs JB. A juggling act in the classroom: Managing different learning styles. *Teaching and Learning in Nursing.* 2007;2(1):2-7.
82. Coffield F, Moseley D, Hall E, Ecclestone K, Learning, Skills Research C. Should we be using learning styles?: what research has to say to practice, Should we be using learning styles?: what research has to say to practice. 2004 2004 2004.
83. Kolb DA. *Experiential Learning: Experience as the Source of Learning and Development.* 1 ed: Financial Times/ Prentice Hall; 1983.
84. Lewin K. *Field theory in social science: selected theoretical papers* (Edited by Dorwin Cartwright.). 1951.
85. McNulty JA, Sonntag B, Sinacore JM. Evaluation of computer-aided instruction in a gross anatomy course: a six-year study. *Anat.* Jan-Feb 2009;2(1):2-8.
86. Smith MK. 'David A. Kolb on experiential learning', the encyclopedia of informal education. . 2001; <http://www.infed.org/biblio/b-explrn.htm>. Accessed 14 November 2012, 2012.
87. Titiloye VM, Scott AH. Occupational Therapy Students' Learning Styles and Application to Professional Academic Training . *Occupational Therapy in Health Care.* 2002;15(1-2):145-155.
88. Honey P, Mumford A. *Using Your Learning Styles.* Maidenhead, UK.: Peter Honey Publications 1983.
89. Carr V, Locatis C, Reid JC, Ullmer E, Weisberg M. *An Online Education Sourcebook.* 1999.
90. Hargreaves D. *About learning: Report of the Learning Working Group.DEMO.* London: Demos;2005.
91. Graff M. Cognitive Style and Attitudes Towards Using Online Learning and Assessment Methods . *Electronic Journal of e-Learning.* 2003;1(1):21-28.
92. Hong H, Kinshuk D. Adaptation to Student Learning Styles in Web Based Educational Systems. *EDMEDIA 2004.* 20040000;2004(1):491-496.

93. Shih CC, Gamon JA. Relationships among learning strategies, patterns, styles, and achievement in web-based courses. *Journal of Agricultural Education*. 2002;43(4):1-11.
94. Bird E, Romanelli F, Ryan M. Learning styles: a review of theory, application, and best practices. *American journal of pharmaceutical education*. 2009/02// 2009;73(1).
95. Shumway JM, Harden RM. AMEE Guide No. 25: The assessment of learning outcomes for the competent and reflective physician. *Med Teach*. 2003/11// 2003;25(6):569-584.
96. Anziani H, Durham J, Moore U. The relationship between formative and summative assessment of undergraduates in oral surgery. *European Journal of Dental Education*. 2008;12(4):233-238.
97. Cilliers FJ, Schuwirth LWT, Herman N, Adendorff HJ, van der Vleuten CPM. A model of the pre-assessment learning effects of summative assessment in medical education. *Adv Health Sci Educ Theory Pract*. 2012/03// 2012;17(1):39-53.
98. Krasne S, Wimmers PF, Relan A, Drake TA. Differential effects of two types of formative assessment in predicting performance of first-year medical students. *Advances in health sciences education: theory and practice*. 2006/05// 2006;11(2):155-171.
99. Yates J, James D. Predicting the "strugglers": a case-control study of students at Nottingham University Medical School. *BMJ (Clinical research ed.)*. 2006/04/29/ 2006;332(7548):1009-1013.
100. Yates J, James D. Risk factors for poor performance on the undergraduate medical course: cohort study at Nottingham University. *Med Educ*. 2007/01// 2007;41(1):65-73.
101. Ferguson E. Factors associated with success in medical school: systematic review of the literature. *Bmj*. 2002/04/20/ 2002;324(7343):952-957.
102. Woolf K, Potts HWW, McManus IC. Ethnicity and academic performance in UK trained doctors and medical students: systematic review and meta-analysis. *Bmj*. 2011/03/08/ 2011;342(mar08 1):d901-d901.
103. Silva CS, Souza MB, Silva Filho RS, Medeiros LMd, Criado PR. E-learning program for medical students in dermatology. *Clinics*. 2011;66(4):619-622.
104. Seluakumaran K, Jusof FF, Ismail R, Husain R. Integrating an open-source course management system (Moodle) into the teaching of a first-year medical physiology course: a case study. *Adv Physiol Educ*. 2011/12// 2011;35(4):369-377.
105. Seabra D, Srougi M, Baptista R, Nesrallah LJ, Ortiz V, Sigulem D. Computer aided learning versus standard lecture for undergraduate education in urology. *J Urol*. Mar 2004;171(3):1220-1222.
106. Lee S-P, Su H-K, Lee S-D. Effects of computer-based immediate feedback on foreign language listening comprehension and test-associated anxiety. *Perceptual and motor skills*. 2012/06// 2012;114(3):995-1006.
107. Bussieres J-F, Metras M-E, Leclerc G. Use of Moodle, ExamSoft, and Twitter in a first-year pharmacy course. *American journal of pharmaceutical education*. 2012/06/18/ 2012;76(5).
108. World Health Organisation. *Doctors for Health: A WHO Global Strategy for Changing Medical Education and Medical Practice for Health for All*: World Health Organization; 1996.



- WS=N&AN=17554096. Accessed (Wright, Henzi) Department of Restorative Dentistry, University of Texas Health Science Center at San Antonio, Mail Code 7890, 7703 Floyd Curl Drive, San Antonio, TX 78229-3900, USA., 71.
123. Brann DW, Sloop S. Curriculum development and technology incorporation in teaching neuroscience to graduate students in a medical school environment. 2006; 1:38-45. Available at: <http://advan.physiology.org/cgi/reprint/30/1/38>  
<http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed7&NEWS=N&AN=16481608>. Accessed (Brann) Institute of Neuroscience, Institute of Molecular Medicine and Genetics, Department of Neurology, 30.
  124. Gutierrez E, Trenas MA, Ramos J, Corbera F, Romero S. A new Moodle module supporting automatic verification of VHDL-based assignments. *Computers & Education*. 2010/02// 2010;54(2):562-577.
  125. Lewin LO, Singh M, Bateman BL, Glover PB. Improving education in primary care: development of an online curriculum using the blended learning model. 2009; 33. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed9&NEWS=N&AN=19515243>. Accessed (Lewin) Department of Pediatrics, Case Western Reserve University School of Medicine, Cleveland, OH, USA., 9.
  126. Chandra V, Watters JJ. Re-thinking physics teaching with web-based learning. *Computers & Education*. 2012;58(1):631-640.
  127. Casey PM, Goepfert AR, Espey EL, et al. To the point: reviews in medical education--the Objective Structured Clinical Examination. *American Journal of Obstetrics and Gynecology*. 2009/01// 2009;200(1):25-34.
  128. Postgraduate Medical Education and Training Group. *Preparing Ireland's Doctors to Meet the Health Needs of the 21st Century: Report of the Postgraduate Medical Education and Training Group*. Dublin: Department of Health and Children;2006.
  129. Brooks DW, Nolan DE, Gallagher SM. *Web-Teaching: A Guide to Designing Interactive Teaching for the World Wide Web*: Springer; 2001.
  130. Ogilvie RW, Blue AV, Trusk T. Computer-administered formative quizzes in a basic science course. *Acad Med*. May 1999;74(5):574-575.
  131. Department of Health & Children / Department of Education & Science. *Medical Education in Ireland, A New Direction – Report of the Working Group on Undergraduate Medical Education and Training 2006*.
  132. Faraone KL, Garrett PH, Romberg E. A blended learning approach to teaching pre-clinical complete denture prosthodontics. *European Journal of Dental Education*. 2012;n/a,Äin/a-n/a,Äin/a.
  133. Heinze A, Procter CT. Reflections on the use of blended learning. 2004 2004.
  134. Spedding R, Jenner R, Potier K, Mackway-Jones K, Carley S. Blended learning in paediatric emergency medicine: preliminary analysis of a virtual learning environment. *European journal of emergency medicine: official journal of the European Society for Emergency Medicine*. 2012.
  135. Owen LE, Byrne DJ, Ker JS. A learning package for medical students in a busy urology department: design, implementation, and evaluation. *Urology*. Nov 2008;72(5):982-986.
  136. Cox K. Planning bedside teaching--3. Briefing before seeing the patient. *Med. J. Aust*. 1993/03/15/ 1993;158(6):417-418.
  137. Perkins GD, Kimani PK, Bullock I, et al. Improving the Efficiency of advanced life support training: A randomized, controlled trial. 2012; 1:19-28. Available at: <http://annals.org/data/Journals/AIM/24329/0000605-201207030-00005.pdf>



- <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=2012396923>. Accessed (Perkins) Heart of England NHS Foundation Trust, Birmingham, United Kingdom, 157.
138. Yoo SJ, Han S-h, Huang W. The roles of intrinsic motivators and extrinsic motivators in promoting e-learning in the workplace: A case from South Korea. *Computers in Human Behavior*. 2012;28(3):942-950.
  139. Royal College of Physicians of Ireland. *CURRICULUM OF HIGHER SPECIALIST TRAINING IN OBSTETRICS & GYNAECOLOGY*. <http://www.rcpi.ie2012>.
  140. Cox K. Planning bedside teaching--2. Preparation before entering the wards. *Med. J. Aust*. 1993/03/01/ 1993;158(5):355-357.
  141. Varkey P, Antonio K. Change management for effective quality improvement: A primer. *American Journal of Medical Quality*. 2010;25(4):268-273.
  142. RCSI. RCSI medical Curriculum Overview. 2012; <http://www.rcsi.ie/medical-curriculum>. Accessed 6 November 2012, 2012.
  143. Benjamin AS, Tullis J. What makes distributed practice effective? *Cognitive Psychology*. 2010/11// 2010;61(3):228-247.
  144. Rawson KA, Dunlosky J. Optimizing schedules of retrieval practice for durable and efficient learning: how much is enough? *J Exp Psychol Gen*. 2011/08// 2011;140(3):283-302.
  145. Dunlosky J, Rawson KA, Marsh EJ, Nathan MJ, Willingham DT. Improving Students, Learning With Effective Learning Techniques Promising Directions From Cognitive and Educational Psychology. *Psychological Science in the Public Interest*. 2013/01/01/ 2013;14(1):4-58.
  146. Carpenter SK, Pashler H, Cepeda NJ. Using tests to enhance 8th grade students' retention of U.S. history facts. *Applied Cognitive Psychology*. 2009;23(6):760-771.
  147. Fazio LK, Agarwal PK, Marsh EJ, Roediger HL. Memorial consequences of multiple-choice testing on immediate and delayed tests. *Memory & Cognition*. 2010/06/01/ 2010;38(4):407-418.
  148. Vaughn KE, Rawson KA. Diagnosing Criterion-Level Effects on Memory What Aspects of Memory Are Enhanced by Repeated Retrieval? *Psychological Science*. 2011 2011;22(9):1127-1131.
  149. Lonn S, Teasley SD. Saving time or innovating practice: Investigating perceptions and uses of Learning Management Systems. *Computers & Education*. 2009;53(3):686-694.
  150. Rabinowitz HK, Babbott D, Bastacky S, et al. Innovative approaches to educating medical students for practice in a changing health care environment: the National UME-21 Project. *Acad Med*. Jun 2001;76(6):587-597.
  151. Young L, Orlandi A, Galichet B, Heussler H. Effective teaching and learning on the wards: easier said than done? *Med Educ*. Aug 2009;43(8):808-817.
  152. Hay DB, Kehoe C, Miquel ME, et al. Measuring the Quality of E-Learning. 2008; 6:1037-1056. Available at, 39.
  153. Hadzigeorgiou Y. Some Thoughts on the Notion of Purposeful Learning. *The Educational Forum*. 2001;65(4).
  154. Guilford WH. "Shrink wrapping" lectures: teaching cell and molecular biology within the context of human pathologies. *Cell Biol Educ*. 2005;4(2):138-142.
  155. Song HS. The Effects of Learners' Prior Knowledge, Self-Regulation, and Motivation on Learning Performance in Complex Multimedia Learning Environments. 2010.

156. Davis J, Crabb S, Rogers E, Zamora J, Khan K. Computer-based teaching is as good as face to face lecture-based teaching of evidence based medicine: a randomized controlled trial. *Med Teach*. 2008;30(3):302-307.
157. Hauer KE, Chou CL, Souza KH, et al. Impact of an in-person versus web-based practice standardized patient examination on student performance on a subsequent high-stakes standardized patient examination. *Teach Learn Med*. Oct 2009;21(4):284-290.
158. Vash JH, Yunesian M, Shariati M, Keshvari A, Harirchi I. Virtual patients in undergraduate surgery education: a randomized controlled study. *ANZ J Surg*. Jan-Feb 2007;77(1-2):54-59.
159. Weih M, Triebner S, Heckmann J, Segarra L, Hahn E, Kornhuber J. E-learning about dementia: A randomized study. 2008; 8:465-469. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed8&NEWS=N&AN=2008405815>. Accessed (Weih, Triebner, Kornhuber) Psychiatrische und Psychotherapeutische Klinik, Universitätsklinikum Erlangen, 76.
160. Davis J, Chryssafidou E, Zamora J, Davies D, Khan K, Coomarasamy A. Computer-based teaching is as good as face to face lecture-based teaching of evidence based medicine: a randomised controlled trial. 2007; 23. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed8&NEWS=N&AN=17659076>. Accessed (Davis, Chryssafidou, Zamora, Davies, Khan, Coomarasamy) The Education Resource Centre, The Birmingham Women's Hospital NHS Trust, Edgbaston, Birmingham, UK., 7.
161. Carpenter SK. Semantic information activated during retrieval contributes to later retention: Support for the mediator effectiveness hypothesis of the testing effect. *J Exp Psychol Learn Mem Cogn*. 2011/11// 2011;37(6):1547-1552.
162. Knowles MS. *The modern practice of adult education*: Association Press New York; 1970.
163. Kalet A, Song HS, Nick M, Pusic M. Read around your cases: Does clinical exposure activate medical students to learn more from computer modules? 2011; S286. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=70653764>. Accessed (Kalet) NYU School of Medicine, Brooklyn, NY, United States, 26.
164. Schitteck M, Mattheos N, Lyon HC, Attström R. Computer assisted learning. A Review. *European Journal of Dental Education*. 2001 2001;5(3):93-100.
165. Armstrong P, Elliott T, Ronald J, Paterson B. Comparison of traditional and interactive teaching methods in a UK emergency department. *Eur J Emerg Med*. Dec 2009;16(6):327-329.
166. Donohoe CL, Sayana MK, Kennedy MT, Niall DM. European Working Time Directive: implications for surgical training. *Irish medical journal*. 2010;103(2):57-59.
167. Davis MH, Ponnampereuma GG, Ker JS. Student perceptions of a portfolio assessment process. *Med Educ*. 2009 2009;43(1):89-98.
168. Driessen E, Overeem K, van Tartwijk J, Cp, Muijtjens A. Validity of portfolio assessment: which qualities determine ratings? *Med Educ*. 2006/09// 2006;40(9):862-866.
169. Hulsman RL, Harmsen AB, Fabriek M. Reflective teaching of medical communication skills with DiViDU: assessing the level of student reflection on

- recorded consultations with simulated patients. *Patient Educ Couns*. Feb 2009;74(2):142-149.
170. Rushforth H. Reflections on a study tour to explore history taking and physical assessment education. 2008; 1:31-40. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed8&NEWS=N&AN=18086451>. Accessed (Rushforth) School of Nursing and Midwifery, University of Southampton, Highfield, Building 67, Southampton, S017 1BJ, United Kingdom, 8.
  171. Pink J, Cadbury N, Stanton N. Enhancing student reflection: the development of an e-portfolio. *Med Educ*. Nov 2008;42(11):1132-1133.
  172. Schon DA. *The reflective practitioner: How professionals think in action*. Vol 5126: Basic Books; 1984.
  173. Vernazza C, Durham J, Ellis J, Teasdale D. Introduction of an e-portfolio in clinical dentistry: staff and student views. *European Journal of Dental Education*. 2011/02/01/ 2011;15(1):36-41.
  174. Driessen E, Van Tartwijk J, Van Der Vleuten C, Wass V. Portfolios in medical education: why do they meet with mixed success? A systematic review. *Med Educ*. 2007 2007;41(12):1224-1233.
  175. Bekkers MJ, Simpson SA, Dunstan F, et al. Enhancing the quality of antibiotic prescribing in primary care: qualitative evaluation of a blended learning intervention. 2010; 34. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed10&NEWS=N&AN=20459655>. Accessed (Bekkers) South East Wales Trials Unit, School of Medicine, Cardiff University, Cardiff, UK., 11.
  176. Zarkoskie L. *Using Moodle forums to increase middle school student participation and level of detail in student responses* [1475261]. United States - New Jersey, Caldwell College; 2010.
  177. Noble D.J., Lemer C., E. S. What has change management in industry got to do with improving patient safety? *Postgrad Med J*. 2011;87(1027):345-348.
  178. Finlay, Maughan, Webster. A randomized controlled study of portfolio learning in undergraduate cancer education. *Med Educ*. 1998 1998;32(2):172-176.
  179. Murrell K, Harris L, Tomsett G. Using a portfolio to assess clinical practice. *Professional Nurse*. 1998 1998;13(4):220-224.
  180. Koole S, Vanobbergen J, De Visschere L, Aper L, Dornan T, Derese A. The influence of reflection on portfolio learning in undergraduate dental education. *European Journal of Dental Education*. 2012:n/a,Äin/a-n/a,Äin/a.
  181. Mathers NJ, Challis MC, Howe AC, Field NJ. Portfolios in continuing medical education ,effective and efficient? *Med Educ*. 1999 1999;33(7):521-530.
  182. Joyce P. A framework for portfolio development in postgraduate nursing practice. *Journal of Clinical Nursing*. 2005/04// 2005;14(4):456-463.
  183. Herse P, Lee A. Optometry and WebCT: a student survey of the value of web-based learning environments in optometric education. *Clinical and Experimental Optometry*. 2005 2005;88(1):46-52.
  184. Chen K-cJ, Glicksman JT, Haase P, Johnson M, Wilson T, Fung K. Introduction of a novel teaching paradigm for head and neck anatomy. *J Otolaryngol Head Neck Surg*. Aug 2010;39(4):349-355.
  185. Driessen EW, Van Tartwijk J, Overeem K, Vermunt JD, Van Der Vleuten CPM. Conditions for successful reflective use of portfolios in undergraduate medical education. *Med Educ*. 2005 2005;39(12):1230-1235.

186. Bouhuijs PA, van der Vleuten CP, van Luyk SJ. The OSCE as a part of a systematic skills training approach. *Med Teach*. 1987;9(2):183-191.
187. Hudson JN, Rienits H, Corrin L, Olmos M. An innovative OSCE clinical log station: a quantitative study of its influence on Log use by medical students. *BMC Med Educ*. 2012;12(111).
188. Lillis S, Gibbons V, Lawrenson R. The experience of final year medical students undertaking a general practice run with a distance education component. *Rural and remote health*. 2010;10(1):1268-1268.
189. Roberts C, Lawson M, Newble D, Self A, Chan P. The introduction of large class problem-based learning into an undergraduate medical curriculum: an evaluation. *Med Teach*. Sep 2005;27(6):527-533.
190. Driessen E, Van Dervleuten C, Schuwirth L, Vantartwijk J, Vermunt J. The use of qualitative research criteria for portfolio assessment as an alternative to reliability evaluation: a case study. *Med Educ*. 2005/02// 2005;39(2):214-220.
191. Miller GE. The assessment of clinical skills/competence/performance. *Acad Med*. 1990;65(9).
192. Phillips SP. Models of medical education in Australia, Europe and North America. *Med Teach*. 2008 2008;30(7):705-709.
193. Driessen EW, Muijtjens AMM, Van Tartwijk J, Van Der Vleuten CPM. Web- or paper-based portfolios: is there a difference? *Med Educ*. 2007 2007;41(11):1067-1073.
194. Merlino N. *Key pedagogical strategies for millennial generation students in university business courses* [3370198]. United States -- California, University of La Verne; 2009.
195. Juliet M. Corbin R. N DNS, Strauss A. Grounded theory research: Procedures, canons, and evaluative criteria. *Qual Sociol*. 1990/03/01/ 1990;13(1):3-21.
196. Al-Fahad FN. Students' Attitudes and Perceptions towards the Effectiveness of Mobile Learning in King Saud University, Saudi Arabia. 2009; 2, 8.
197. Dorup J. Experience and attitudes towards information technology among first-year medical students in Denmark: longitudinal questionnaire survey. 2004; 1:e10. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=med4&NEWS=N&AN=15111276>. Accessed 100959882, 6.
198. Scheiner JD, Mainiero MB. Effectiveness and student perceptions of standardized radiology clerkship lectures: a comparison between resident and attending radiologist performances. *Acad Radiol*. Jan 2003;10(1):87-90.
199. Ameh N, Kene TS, Ameh EA. Computer knowledge amongst clinical year medical students in a resource poor setting. 2008; 1:40-43. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed8&NEWS=N&AN=19357731>. Accessed (Ameh, Kene, Ameh) Department of Obstetrics and Gynaecology, Ahmadu Bello Univerity, Zaria, Nigeria., 8.
200. Dornan T, Brown M, Powley D, Hopkins M. A technology using feedback to manage experience based learning. *Med Teach*. Dec 2004;26(8):736-738.
201. Cranton P. *Working with Adult Learners*. Middletown: Wall & Emerson; 1992.
202. Hudson JN, Tonkin AL. Clinical skills education: outcomes of relationships between junior medical students, senior peers and simulated patients. *Med Educ*. Sep 2008;42(9):901-908.
203. Driessen E, Van Der Vleuten C, Schuwirth L, Van Tartwijk J, Vermunt J. The use of qualitative research criteria for portfolio assessment as an alternative to reliability evaluation: a case study. *Med Educ*. 2005 2005;39(2):214-220.

204. Wilkinson TJ, Challis M, Hobma SO, et al. The use of portfolios for assessment of the competence and performance of doctors in practice. *Med Educ.* 2002;36(10):918-924.
205. Roels P, van Roosmalen G, van Soom C. Adaptive feedback and student behaviour in computer-assisted instruction. 2010; 12:1185-1193. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed9&NEWS=N&AN=21070344>. Accessed (Roels) Tutorial Services, Faculty of Science, Catholic University of Leuven, Leuven, Belgium., 44.
206. Conigliaro RL, Stratton TD. Assessing the quality of clinical teaching: a preliminary study. *Med Educ.* Apr 2010;44(4):379-386.
207. Ross MT, Cameron HS. Peer assisted learning: A planning and implementation framework: AMEE Guide no. 30. 2007; 6:527-545. Available at: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed8&NEWS=N&AN=2007538091>. Accessed (Ross, Cameron) The Medical Teaching Organisation, The University of Edinburgh, Edinburgh, United Kingdom, 29.