Educational considerations for blended learning
Educational Considerations for Blended Learning is a resource booklet written to assist lecturers in their teaching and their ambitions to create a rich and meaningful blended learning environment for our students. We are embedded in a technology-driven society and students needs are changing and evolving. Just as many students have done, we need to embrace technology, and incorporate e-learning into our traditional face-to-face teaching methods. However, application needs to be pedagogically sound. This booklet covers eight “educational considerations” which should be taken into account when designing blended learning. Each consideration is supported by evidence from the literature.

The ways in which use of these educational considerations are already demonstrated by colleagues at Brunel are being explored in meetings in each School. Student usage and evaluation data is also being presented.

Happy reading.

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Spectrum of educational considerations

Student Learning

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OUTCOMES-BASED LEARNING

An effective learning experience:
is clearly outcomes-based.

This principle focuses on the constructive
alignment of learning outcomes, content and
assessment. Providing the student with a
clear statement of what is expected, not only
guides their studies but also helps prepare
them for assessment. Learning outcomes
should include a range of cognitive skills, e.g.
a selection of components from Bloom’s
taxonomy of educational objectives (a
hierarchy of cognitive levels consisting of
knowledge, comprehension, application,
analysis, synthesis and evaluation) to promote
‘deep’ learning as opposed to ‘surface’ learning.
In addition, there is value in breaking the
learning task into meaningful sub-goals, to help
to keep less motivated students on task. With
sophisticated commercial and institutional
software available nowadays, it is also possible
to create computer-based assessments which
offer the ability to test even the higher levels of
learning.
Motivational scaffolding for procrastinators
(Tuckman, 2007)

• **Method:** Students were divided into one of two groups, either traditional distance learning or motivationally-scaffolded distance. Both courses were the same, except the motivationally-scaffolded course contained extra features such as a “study skills support group” to help keep the students on track. The students met up each week and during the session students interchangeably switched roles to that of a student supporter. The supporter’s role was to assist the student in managing their time efficiently using a weekly “To-Do checklist” which consisted of “weekly study tasks broken down into small steps and listed as specific measurable, concrete activities (e.g. do the 10 exercises listed at the end of Chapter 3 in my maths textbook)”.

• **Conclusion:** The method demonstrated that this type of support can be valuable for those students who tend to procrastinate (often seen in distance courses as students are self-dependent and courses are less structured) as this type of student performed better under these circumstances in comparison to traditional methods.

Instructional Multimedia
(Aly et al., 2003)

• **Method:** An interactive multimedia program was created to teach Orthodontics to undergraduates and postgraduates to promote self-study and self-evaluation. The program contained information such as course goals and objectives, topics, access to a database of orthodontic information, graphical images, case-based scenarios and questions with feedback for self-assessment and evaluation.

• **Conclusion:** “Students believed that these courseware packages offered a good way of assessing their own ability and allow them to review their areas of weakness by using a quick and easy reference to a particular subject about which they were confused”.

Course structure
(Young & Norgard, 2006)

• **Method:** A survey was created and implemented to explore student perceptions about different aspects of online courses.

• **Conclusion:** 85% of students commented that it was important that courses are designed so that they are properly structured with set due dates similar to f2f courses. Badly designed courses can discourage the students and consequently affect learning outcomes. Furthermore, 97% surveyed agreed that the online material supported the course goals and 95% believed that implementing assignments in the online course facilitated mastering the content.
ACTIVE LEARNING

An effective learning experience requires active involvement by the student.

Piaget’s theory of cognitive development proposes that learners cannot be "given" information, which they immediately understand and use. Instead, learners must actively "construct" their own knowledge rather than be passive participants (or empty vessels into which knowledge is poured). They build their knowledge through experience. Experiences enable them to create schemas - mental models in their minds. Therefore, the teacher’s role is more of a facilitator rather than an imparter of information. Actively providing answers to questions (for example using online quizzes and interactive multimedia programs) can allow learners to engage with material, maintain their motivation, create new knowledge and facilitate comprehension.
Learning by doing virtually
(Sternberg et al., 2007)

• **Method**: Prior to performing an apicectomy on a pig cadaveric porcine jaw, 41 students were split into 2 groups, with group 1 given virtual apicectomy training using a simulator and group 2 receiving no virtual training.

• **Conclusion**: From the results, the implementation of a virtual training showed significant improvement in this (six-fold), as 16 out of 21 students (group 2) who did not experience the virtual training damaged vital structures compared to only 1 participant (in group 1) who received the virtual training. Virtual learning also allows students to actively learn and explore, e.g. anatomical structures, as opposed to passively reading from a textbook and also the ability to self-assess.

Web3D for anatomy teaching
(Brenton et al., 2007)

• **Method**: This paper looks at the development of Web3D resources to teach students about a network of nerves, the brachial plexus.

• **Conclusion**: Such methods provide a possible solution to the limited availability of cadavers and also the lack of time available to teach anatomy. 3D models benefit the student enormously as it allows the “ability to view the spatial relationships between structures from numerous viewpoints”. Printed diagrams, 2D representations, projections and cadaveric specimens all come with disadvantages (e.g. encourage rote learning, provide limited educational value and also cadavers do not provide a true representation regarding the feel and texture of tissue).

The power of doing
(Price & Zhang, 2007)

• **Method**: Students were given a simple, visual, active learning technique for teaching the Central Learning Theorem (CLT). This was achieved through tossing a die.

• **Conclusion**: Students found the experience fun and also valuable to their understanding of the concepts, therefore “it seems that seeing really is believing”.

Bio-edutainment
(Cai et al., 2006)

• **Method**: This study explores the use of gaming with designs based on extreme sports to learn the 3D structures of proteins.

• **Conclusion**: This type of gaming application with virtual reality could provide learners with close interaction with the “virtual bio-molecular world”. It has the potential to create a fun learning environment which would be risk free and it would also allow the students to take the game repeatedly.
AN EFFECTIVE LEARNING EXPERIENCE
promotes collaboration between students.

Collaboration and communication are fundamental learning skills. In a collaborative environment learning is socially constructed. Peer-to-peer interaction is a key feature in the use of this pedagogical principle and interestingly, someone who only just understands something is often better to learn from than an expert. Communication can either be asynchronous (at different times) or synchronous (at the same time). With increasingly available technologies, different methods of collaborating and communicating online are becoming easily available e.g. emails, internet relay chat/instant messaging, video conferencing, blogs and wikis. Any form of online communication should however be underpinned by sound netiquette (etiquette in cyberspace) to avoid any misunderstandings or unintended insult.
Online vs. f2f discussion
(Campbell et al., 2007)

• Method: To determine the effects of f2f discussion seminars and online asynchronous discussion seminars on educational attainment.

• Conclusion: "Increased online activity was associated with higher assignment marks". Thus, the study demonstrated the importance of encouraging interaction between students.

e-mail vs. f2f communication
(Lightfoot, 2006)

• Method: A questionnaire was used to determine if students put more thought into communicating with instructors, groups of peers and individual students significantly more or indeed less than equivalent face-to-face communication.

• Conclusion: Students put significantly more "thought" (i.e. writing style, structure and content) into communication via email when corresponding with instructors and also group peers when compared to f2f equivalents to the same audience. Furthermore, this is indicative that the students were aware of social presence theory, hence put more thought into email communication when necessary to avoid the challenges and misconceptions which can incur through this type of medium.

Online focus groups
(Kenny, 2005)

• Method: WebCT was used to conduct an online, interactive focus group.

• Conclusion: Over 2000 postings were recorded during a 2 month period. Not only are online focus groups cost effective (i.e. traditional require a location, audio/videotape recordings and transcription) they can also provided anonymity and accommodate larger group sizes whilst requiring fewer facilitators. This study also demonstrated the importance of posting discussion questions at timely intervals rather than displaying all questions at the start of the discussion. Moreover, it was equally as important for students to post questions, as a consequence group dynamics and interaction flourished and multi-threaded discussions emerged".

Synchronous chat application
(Rutter, 2006)

• Method: A chat application was implemented with 43 students and was monitored by a demonstrator.

• Conclusion: Observations demonstrated that students were already familiar with Microsoft Messenger. Furthermore, results showed that implementation of a chat application can in fact be motivating and supporting to the student. Additionally, such methods allow for a certain degree of anonymity using nicknames and icons.
STUDENT-CENTRED LEARNING

An effective learning experience: creates a student-centred environment.

A student-centred environment is (inter alia) one that recognises the nature and needs of today’s students. They are very different from their predecessors. We are embedded in the information age and these very students have spent their lives surrounded by technology e.g. computer games, mp3 players, mobile phones, Internet, instant messaging, emails. They are used to sitting in front of a pc and receiving information instantly on demand. Implementing a Virtual Learning Environment allows students to access their work anytime and anywhere, thus accommodating these characteristics, needs, experience, expectations and choices of the learner in our mode of teaching.
Electronic delivery of lectures

(Stephenson et al., 2008)

- **Method**: A study was conducted to compare three different types of lecture delivery (traditional lectures, virtual lectures and e-lectures) for a human genetics module when increasingly deeper forms of learning were assessed (Bloom’s taxonomy). A cohort of 58 students were grouped such that all participants experienced all lecture types by the end of the module. All students received the same material but different groups received it via different delivery styles.

- **Conclusion**: Although students showed a preference for traditional lectures, they were aware of the advantages of the electronic delivery of lectures. The virtual lectures incorporated self-assessment questions and interactions and received praise from the students for this reason: “I like virtual lectures they are informative and maybe it is because I am not a good listener when it comes to real lectures” and “The short multiple choice tests/questions in the virtual lectures were good”. Furthermore, the e-lectures (i.e. PowerPoint slides incorporating a recording of the lecturer’s voice) demonstrated the importance of students being able to rewind sections they did not feel they grasped the first time or, conversely, skip sections they were already familiar with, hence empowering the students.

Electronic submission

(Bridge & Appleyard, 2007)

- **Method**: 47 students submitted their essay style assignments online using Blackboard™ Virtual Learning Environment and received feedback. Using a questionnaire, students were then asked to compare this method of submission with that of paper submission methods which they had previously performed in another course.

- **Conclusion**: Online Assignment Submission Management (OSAM) has numerous advantages. 88% of students felt it was considerably time saving and it reduced printing burden hence environmentally friendly. 93% of students commented that feedback was received faster electronically than by the traditional method. Students liked the notion of accessing and printing their feedback many times for inclusion in different portfolios. They also liked the ‘safety’ of having an online copy in case it got mislaid and furthermore, the issue of illegible handwriting was solved. 56% preferred online feedback whilst a mere 6% preferred paper-based feedback (32% had no preference).

PocketPCs

(Dearnley et al., 2007)

- **Method**: Student midwives were provided with PocketPCs for recording information on assessment documentation.

- **Conclusion**: Students welcomed the idea of word-processing as opposed to hand writing and furthermore, it was also agreed by the students that they liked the ability to edit and extend their entries continually and also with considerable ease. From the perspective of the staff, they agreed that “going mobile” was a “good thing!”.
LEARNING STYLES

An effective learning experience: takes into account different learning styles.

Learners perceive and process information in different ways (e.g. visual, auditory, kinaesthetic and tactile). Consequently, effective learning is promoted when instructors provide diverse teaching environments to accommodate this. Recognising and understanding learning styles (and Multiple Intelligences) helps to create a more successful and versatile student. Virtual Learning Environments, with rich multimedia options, allow us to embrace the varying student learning styles. Material can be presented in a variety of formats such as graphic, video, audio, animation, simulation and text. This is also thought to minimise cognitive load.
LEARNING STYLES

Photographs
(Perry, 2006)

**Method:** This study used a modified version of the photovoice (PV) teaching strategy. For the first activity of each unit on the online course digital photographic images with an accompanying reflective question were posted.

**Conclusion:** Rich dialogue resulted. Using photographic images in online courses can capture student attention, stimulate creativity and create a community.

Voice-over vs. text only web lectures
(Ridgway et al., 2007)

**Method:** 88 medical students were involved in this web-based surgical lecture series. HTML lecture slides were delivered to the students via the Virtual Learning Environment Blackboard™. However, half of the cohort experienced the addition of voice-over (consisting of reinforcement of text and further reading).

**Conclusion:** There was considerable student support for the incorporation of voice over files. Furthermore, it enhanced knowledge transfer and significantly improved exam performance compared to the text only web-based lecture group.

Lecture vs. online multimedia
(Kekkonen-Moneta & Moneta, 2002)

**Method:** Students were delivered a course on “computing fundamentals” either via PowerPoint lecture notes or web-based, multimedia rich highly interactive equivalents (which included short videos, hyperlinks, still and interactive graphics, narrated and non-narrated animations, narrated screen capture recordings and interactive exercises).

**Conclusion:** Results showed that if the interactive learning modules are designed correctly, then it can foster higher-order learning outcomes.

Animated pedagogical agent
(Dunsworth & Atkinson, 2007)

**Method:** In this study, 51 undergraduate students were assigned to one of three groups depending on how they were to receive the course content on the human cardiovascular system. The three computer-based presentation modes were: ‘on screen text’, ‘narration’, or ‘narration and animated agent’.

**Conclusion:** Implementing the animated agent called “Dr Bob”, who has the ability to move on screen and assist and guide the learner by gazing and pointing, can considerably promote learning whilst simultaneously avoiding split attention problems.
INDEPENDENT LEARNING

An effective learning experience:
encourages student independence.

Metaphorically, learning can be likened to a staircase, where the steps represent increasing learning capability. The teacher’s role is to design a staircase which will be proportionate to the learner, and it is the learner’s role to climb the stairs. In designing the staircase, the teacher uses their knowledge of the task, analysing it into achievable chunks. Each new stage of learning builds on the student’s prior knowledge and experiences, and where necessary support can be provided in the form of (temporary) scaffolds. Personal responsibility and initiative are required by the student, who should increasingly take over goal setting and time management. Providing suggestions for resources such as journals (instead of, always, a specific article) or referring the students to the Internet (which provides a wealth of information) are examples of how to encourage independent learning and eliminate the need for scaffolding.
Interactive electronic lectures on genes and chromosomes
(Griffin & Stephenson, 2005)

**Method:** A series of lectures on chromosomal aspects of genetics taught via an interactive environment of self assessment questions, quizzes, animations, rollover buttons and hotspots was created.

**Conclusion:** Such methods can be used as a revision aid or as a primary means of delivery to the student (which decreases lecture time). Students are left to their own devices to explore the material (although slightly restrained by the navigation to avoid getting lost) and can also explore words they do not understand by rolling their mouse over “hotspots” to see a definition.

Interactive laboratory procedure
(Payne et al., 2007)

**Method:** The programme KaryoLabPorc was created to practise the skills of chromosome analysis, specifically hypoprolificacy (infertility) in boars, in an interactive way. The programme consisted of an extensive tutorial, practice section and an assessment. The e-learning package was tested on 25 employers at a pig breeding company and their karyotyping grades were recorded pre and post tutorial viewing.

**Conclusion:** Providing the participants with a tutorial significantly improved their porcine karyotyping skills. Furthermore, such packages promote constructivist and asynchronous learning.

The use of WebQuest
(Drozd & O’Donoghue, 2007)

**Method:** A WebQuest (web inquiry) was designed, implemented and evaluated as a solution to support independent learning for a cohort of undergraduate nurses.

**Conclusion:** Student attitudes were encouraging, comments included: “references at hand”, “reinforced my understanding”, “allows private time at home…can go back to it at my leisure”, “all the information was there…good links to other sites”, “easy to locate”, and “good way of working”. Furthermore, incorporating a WebQuest into the course has the power to promote inquiry-based learning, leading to active and deep learning.

Web-based resources
(Gibbon & Currie, 2008)

**Method:** The SONIC (Student Online in Nursing Integrated Curricula) project involved the development and evaluation of web-based resource-enriched scenarios for students undertaking problem-based learning or enquiry-based learning. The online materials contained such features as audio commentaries and animations [http://www.uclan.ac.uk/facs/health/nursing/sonic/scenarios/salfordanim/heart.html](http://www.uclan.ac.uk/facs/health/nursing/sonic/scenarios/salfordanim/heart.html).

**Conclusion:** Students liked the 24/7 access to the material and also the flexibility (home and campus).
An effective learning experience: provides opportunities for timely and constructive feedback.

Embedded in behaviourism, the notion of providing information regarding the correctness and/or quality of individual performances is very important for the student’s progress. For feedback to be meaningful it needs to be timely, helpful and encouraging. Furthermore, positive feedback can have the power to motivate the student. In the context of e-learning, online feedback can be implemented to provide information automatically and instantly (e.g. computer-based assessment). This decreases staff marking load. In addition, the provision of more qualitative and/or personalised feedback can be managed online, avoiding issues of handwriting illegibility. Computers do not get tired and can display feedback in a variety of formats (e.g. graphical, audio, video).
Online Assessment and Feedback

*(Stephenson et al., 2007)*

**Method:** A computer-based assessment bank was created (incorporating mini tutorials and formative and summative feedback) for students to practise the higher learning skills of analysis and application in the field of genetics. Question types included text entry, drag and drop and MCQ radio buttons. Feedback was constructive and supportive and displayed in a variety of media. A cohort of 16 students used the assessment to practise their skills.

**Conclusion:** Such programs allow students to answer questions repeatedly and receive instant feedback. Such repetition in this study led to the majority of students (11/16) gaining a mark of 85% or more and 5 students a score of 98% or greater. Formative and summative feedback also eliminates problems often associated with tutor marking.

Red pen annotation vs. electronic feedback

*(Denton et al., 2007)*

**Method:** Marking activities for a laboratory report assignment were divided between seven lecturers. Three markers assessed 20 scripts with the traditional red pen annotation and another 20 scripts using the electronic feedback software which has features such as “Automark” and a bank of statements which the marker could choose and then insert into the feedback report. The remaining 4 markers assessed their scripts using only the red pen annotation format, a method which had been used in the previous years.

**Conclusion:** The students rated the electronic feedback as “superior”. Furthermore, “students appreciate the structured word-processed feedback produced by the software as it clarifies the mark scheme employed and is easier to read than handwritten annotation”.

Peer feedback

*(Ertmer et al., 2007)*

**Method:** Graduate students were required to submit 2 postings per week to the WebCT discussion board (1 post to the initial weekly discussion question and 1 response to a student). The quality of the postings was determined using Bloom’s Taxonomy as a scoring rubric. Data collection was achieved via pre and post surveys and interviews.

**Conclusion:** “The majority of students indicated that peer feedback positively impacted the quality of their discussion postings. They described a number of specific benefits including recognition of their ideas, access to multiple perspectives, and receiving a greater quality of feedback than would have been received from the instructor alone”. Furthermore, students commented that peer feedback improved the quality of their given feedback, e.g. they realised they had not been in-depth or constructive as they could have been and consequently adapted subsequent postings.
LEARNING BY REFLECTION

An effective learning experience: includes encouragement to, and time for, reflection.

The fundamental process of metacognition is reflection and a pedagogically-sound learning experience provides opportunities for reflective learning to occur. Metacognition refers to thinking about cognition (memory, perception, calculation, association, etc.) and analysing one’s own thinking and learning. Metacognitive strategies include planning ahead and preparing, self-monitoring through checking one’s understanding, self-evaluation and review. Practices such as blogging can promote this activity as the logged conversations can be re-read and reflected upon. Such activities are considered important as they create a more confident independent student, aware of their own learning, who can monitor their progress and adapt their strategies in new learning settings.
Portfolios and interviews  
(Gordon, 2003)

• **Method**: Students were required to keep a portfolio (for Personal and Professional Development) designed for reflection and self-evaluation. This was subsequently followed by an interview to discuss the contents.

• **Conclusion**: 96% of students agreed they had “engaged in useful reflection on their approach to the course” and 91% of students believed that this activity had been meaningful. Additionally, 76% of students stated that as a consequence of this application, they could see “opportunities to modify their approach”.

Web-based feedback  
(Fox, Reid & Evans, 2003)

• **Method**: Students were given exam results via web-based feedback as opposed to the traditional typed list (of matriculation number, final mark and grade) placed on the noticeboard, which provided no feedback or anonymity.

• **Conclusion**: Students were able to access (username and password protected) their percentage mark from each assessment (but not those of other candidates). Additionally, they could view a histogram reflecting the whole class scores, the column which their score resided and also their rank in the class. Questionnaire results revealed that 90% thought the individual assessment breakdown was useful and 80% thought the histogram which displayed their score in relation to other students was valuable. As a result of high student acceptability, the original noticeboard format has been ceased.

Mobile clinical e-portfolio  
(Garrett & Jackson, 2006)

• **Method**: Used to promote reflection, students were provided with PDAs which allowed them to record their experiences via multiple formats (e.g. text, audio and images) and also retrieve clinical expertise and materials remotely.

• **Conclusion**: Students’ comments were encouraging. The quick reference tools (e.g. drug and diagnostic references) were especially useful. Comments included, “It’s a great support tool, like a friend in my pocket!”. This study demonstrated that students using mobile e-portfolios can “store digital artefacts, add reflections, demonstrate their competency with particular learning outcomes, invite commentary and assessment, and selectively publish components online to document how they are achieving their clinical competency with careful planning and support”.

Self-assessment modules  
(PEAT & Franklin, 2002)

• **Method**: SAMs were introduced to a first year biology course. They specifically tested the students on different levels of Bloom’s taxonomy and also incorporated “a statement of educational rationale”. After completing a SAM, students were required to review their work and compare it to that of a fictitious student – Mary Rotelearner.

• **Conclusion**: SAMs allow students to reflect on their learning and also “draw together related parts of a course to help students make connections between topics in biology and promote a deeper learning strategy”.

REFLECTION
u-Link tools to promote the educational considerations
“A successful blended solution is like a balanced meal, combining a range of ingredients, each of which has a unique purpose”.

(Shepherd, 2005)
References


References


