

Note: When the initial call was released for the TWSIA award, before the online form became active, the preview application form specified different word limits to those on the online form. We prepared our application 'off line' to these original specifications and had to abridge the application to fit in to the online form. This document presents the full application, in its entirety, as originally intended.

Teaching with Sakai Innovation Award

Preview Application Form

Contact Information

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Course Information

Course Title: Part IB Plant and Microbial Sciences

Course Number/ID: Second year undergraduate course

Length of Course (in weeks): Course is taught across three 8-week terms

Course Description (100 words or less):

This course teaches an integrated view of Plant and Microbial Sciences, which incorporates molecular, cellular and ecological approaches to the subject. The lectures address current understanding of the relevant processes at the cellular and molecular levels, and explore their relevance to the major issues and ideas to arise from studying plants and microbes in the field. Teaching focuses on plants in their physical environment, on plants and their interactions with microbes, and on plant ecosystems in the Autumn, Spring and Summer Terms respectively. Key concepts are further explored through tutorials, laboratory work and a field course.

Delivery Mode:

Distance Learning In-Class Hybrid (less than 5 face-to-face interactions) Other:

Average Number of students enrolled:

Less than 10 students per course Between 10 and 30 students Between 30 and 60 students More than 60 students

Audience:

K12 Technical College Graduate Adult Learner Other:

Course Development and Delivery Information

Please state the name and role of all other contributors to this course (e.g., other faculty, instructional designers, media developers, programmers). If the instructor was the sole contributor to the course design, write “none” below.

Faculty members responsible for developing and updating online content for the course within Sakai (CamTools):

Miss Katy Jordan

Dr. Fran Tracy

Teaching co-ordinators for the course (senior staff members who co-ordinate all departmental teaching):

Dr. Keith Johnstone

Prof. Howard Griffiths

Faculty members who give lectures on the course (who were consulted about development of online resources for their part of the course):

Dr. John Carr

Dr. David Coomes

Dr. Nik Cuniffe

Dr. Julia Davies

Dr. Beverley Glover

Prof. John Gray

Prof. Howard Griffiths

Dr. Julian Hibberd

Dr. Keith Johnstone

Prof. Alison Smith

Dr. Edmund Tanner

Please provide a brief overview of the process used to develop this course including any ideas or concepts that informed your development and challenges you encountered and how they were overcome. If possible, highlight any instructional design strategies, learning theories or other principles. (600 word maximum)

The Department of Plant Sciences teaches undergraduates through lectures, practical classes and small group tutorials. As part of a teaching and learning research initiative called the Plant Sciences Pedagogy Project (see <http://www.tfln.org>), we sought to develop Sakai-based online resources (known at Cambridge as ‘Camtools’) to support the second year ‘Part IB Plant and Microbial Sciences’ (IB PMS) course.

The core content of this course and its goals were already defined by the Department at the start of this project. The primary mode of course content delivery is via lectures. To support this, we aimed to develop a CamTools site which would enhance student learning outside contact teaching hours and which would act synergistically with lectures and tutorials. In order to achieve this goal, we used an evidence-based approach to determine how best to develop the CamTools content to meet the needs of students (illustrated in Figure 1).

We first built an evidence base to inform and direct development. Initially, a literature review focused on recent projects in the UK Higher Education sector, particularly the 'Enhancing Teaching and Learning in Undergraduate Education' (ETL) project (Entwistle, Hounsell and McCune, 2002), the 'Social and Organisational Mediation of University Learning' project (SOMUL, 2005), and the 'Undergraduate students' Experience of Learning at the University of Oxford' project (Trigwell and Ashwin, 2003). This was used to inform the creation of items in a dual-scale questionnaire, where each question was a 'stimulus statement' related to a particular type of teaching practice, and respondees rated each in terms of how frequently it occurred and how valuable they perceived it to be. It is based on a design used in the Improving School Effectiveness Project (Robertson et al., 2001; MacBeath and Mortimore, 2001) and subsequently in the Teaching and Learning Research Programme's 'Learning how to Learn' project (James and Pedder, 2006). Students were also invited to participate in focus groups. Faculty members who taught on the course – as lecturers and/or tutors – were interviewed both about their opinions and beliefs about teaching practices, and concerning specific content of their course topics, particularly to identify the concepts that students typically found difficult.

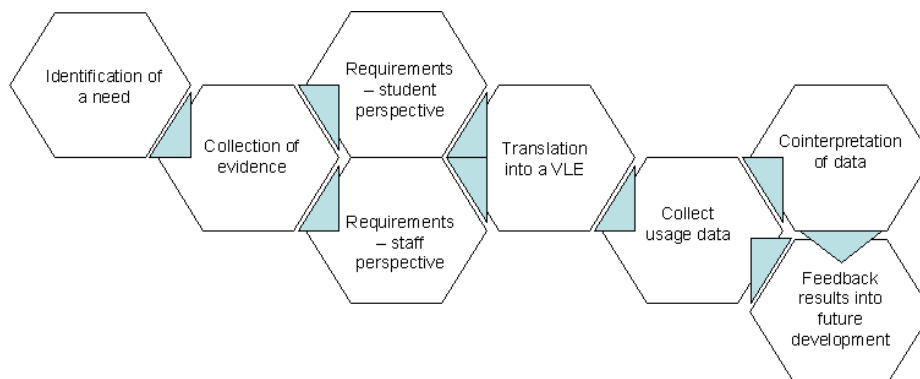


Figure 1: Schematic of overall process used to develop the VLE and online materials

From this evidence base, we built up a framework to develop the teaching and learning strategy for students on the course. The first four elements were concerned with teaching and learning practices:

- Making Learning Explicit: Sharing learning objectives, discussion of success criteria and relating specific learning activities to course objectives.

- Motivation, Engagement and Contingency: Teachers encouraging and engaging with student learning and the problems students may encounter; for example, by teaching 'contingently' to explore student understanding and misconceptions, and responding accordingly.
- Authentic Learning: Teaching with 'real-life' examples, and 'modelling' the authentic strategies and activities of experts in the field.
- Student Self-Regulation and Independence: Encouraging students to take greater responsibility for their own learning.

The final two elements were more concerned with department and institutional activities:

- Constructive Alignment, Synthesis and Throughlines: Drawing on the work of the ETL project (Entwistle *et al.*, 2002), this theme is concerned with the alignment of learning activities, assessment processes and student priorities.
- Transparency and Accountability: This further extends the organisational level of the framework, including issues such as the application of standards.

We drew upon these themes to inform development of the CamTools site, particularly the notions of 'Making Learning Explicit' and 'Constructive Alignment, Synthesis and Throughlines'. The flexibility of the 'Wiki' tool allowed integration of the main course content with other learning tools which were developed to address a range of specific issues.

Please provide a brief overview of the delivery of this course and any teaching and learning principals or theories that were deployed. It would be useful to discuss how you used particular Sakai tools to enrich the teaching and learning process. (600 word maximum)

The IB PMS course is one academic year in duration, taught in three eight week terms and assessed by examinations at the end of the academic year. Lectures are used to deliver the main course content, which is supported by practical classes and small-group tutorials. The CamTools site and online resources within it which we developed in light of the analytical model emerging from our educational research activities sought to support learners outside of these contexts, as well as during vacations and revision periods.

In the CamTools site, each lecture handout is located on its own page in the wiki, with links to specific resources and files associated with that particular topic. These include a pdf of the handout and the powerpoint slides. Enlargeable high-resolution versions of handout pictures and figures are embedded in the wiki pages for further detail. The most powerful aspect of presenting the lecture notes in a wiki is the ease of making links between pages – the notes included built in links to glossary definitions of specialist vocabulary, and links between different lecture topics to allow their relation to the course as a whole to be made explicit. The files and pictures are held in the site 'Resources' tool, but this tool was 'hidden' from students to avoid confusion with the wiki tool. Links to other websites and 'real world' examples of Plant Sciences in practice are integrated into the notes, and students are

able search their lecture notes as they would do the internet. The wiki tool has thus proved invaluable for allowing conversion of lecture notes from a collection of static pdf files to a dynamic network of information and learning resources.

Although the main Sakai tool we use is the wiki (which we have renamed to 'Course resources' on the site), we have also made use of a number of different Sakai tools. The Sakai environment has proved to be extremely flexible, allowing the resources and information for enhancement of student understanding and learning to be met using a combination of tools in the same location. The 'Syllabus' tool is used to convey key information about the course, its content, structure and assessment, uniting sources from the Departmental and University level. The 'Schedule' tool holds timetabling information for the entire course, including lectures, practical classes and seminars. We use the 'Announcements' tool for messages from teaching staff for various reasons – e.g. about deadlines, new resources or unanticipated timetable changes. This was particularly useful compared to simply sending out an email because students could locate announcements within the course VLE. The roster tool provided contact information for all members of the site – students, teaching staff and administrators – so when students needed to contact anyone for any reason, they were able to get in touch. We used the 'Site stats' tool (although it is only visible to faculty, not to students) to conduct further research throughout the academic year about how and when students used the site, and we used this information to inform the creation of further learning resources based on what was successful.

In addition to the Sakai tools, we have also found the CamTools environment amenable to including customised tools (as a 'Web resource' tool). Examples of custom tools we have developed and added to the IB PMS CamTools site include an online references library developed using the Exhibit tool from the SIMILE Toolkit (<http://simile.mit.edu/>) and a 3D molecular viewer based on Jmol (<http://jmol.sourceforge.net/>).

Self-Assessment of Course

You will need to self-assess your course using the included Teaching with Sakai Innovation Award Assessment Rubric. For each category, please score yourself and give specific evidence to support your score. Keep your descriptions brief (250 words or less for each category), highlighting those areas of your course that exemplify your strengths.

Rubric Category	Score (0-2)	Supporting Evidence (250 word max.)
Communication and Collaboration	1	Communication and collaboration associated with the CamTools site mainly occurred when considering improving pedagogy and e-learning within the Department. The project team collaborated with both faculty and students in determining the requirements for and creation of the site. They were supported

		<p>in this by using a separate CamTools VCE as a project development site. Members of teaching staff also have their own IB PMS CamTools site, to foster sharing of teaching practices and ideas.</p> <p>Our research established that students were already satisfied with the opportunities for collaboration and group work provided by the IB PMS course, as the University of Cambridge is a collegiate University, a context which fosters collaboration and close-knit work between students. Hence collaboration was not prioritised when we developed the CamTools site to support the course.</p> <p>The site did however facilitate and aid some opportunities for students. For example, in an Autumn Term practical class, students research, prepare and give a presentation in groups. Part of the 'Wiki' tool was used to hold the background information on the topic, with links to related online journal articles. Students could access this material individually or in groups to assist their assignment.</p> <p>Also the 'Roster' tool on the site could be used to contact a fellow student or a faculty member by looking up their name to find their email.</p>
Learning Material	2	<p>The visual design of the IB PMS site provides a clear and logical representation of all the course learning material within a simple interface. The different tools used for each type of learning resource are accessible from anywhere within the site via the left hand menu bar.</p> <p>The core learning material – lecture handouts, lecture slides, and practical class information – is clearly presented in a highly enhanced format in the wiki tool. The learning materials are organised in a way which mirrors the structure and chronology of the course, allowing easy navigation and implicit understanding of the course structure. It also provides opportunities for making explicit links between topics. Supporting learning materials are provided in a variety of formats for students to choose from – e.g. animations, video explanations, molecular visualization tools and multiple choice questions. For reference, an archive of the Plant Sciences</p>

		<p>first year lectures is included.</p> <p>Lecture notes and learning materials are supported by provision of course information in the syllabus tool, and a customised tool providing a full online searchable reference library with links to all the journal papers cited throughout the course. We use the announcements tool to communicate information about assignments and due dates to students. Full timetable information is shown in the schedule.</p> <p>What is required of students to succeed on the course is addressed in the syllabus tool, and made explicit by providing 'exemplar essays' to students for each lecture block, demonstrating examples of what constitutes a 1st class, 2.1 or 2.2 class essay.</p>
Learning Outcomes and Assessment	2	<p>The course goals and outcomes are clearly described in the syllabus tool. The course outcomes describe that on completion of the course, students should:</p> <ol style="list-style-type: none"> 1. have developed a sound knowledge of key concepts and current experimental approaches in plant and microbial sciences. 2. be able to provide reasoned arguments both for and against current hypotheses in plant and microbial sciences. 3. be able to assimilate and provide critical analysis of review articles in plant and microbial sciences. 4. be able to design, perform and interpret experiments to analyse fundamental aspects of plant sciences <p>These outcomes are supported by key content tools within the site: the wiki providing key Plant Sciences concepts in the lecture materials; a dedicated part of the wiki as a tool concerned with practical classes and experimental information; and a custom online references tool enabling easier student engagement with critical reviews and the wider Plant Sciences literature.</p> <p>The course is formally assessed via three 3 hour examination papers taken by the students at the end of the course. We have integrated examples of examination essays demonstrating a range of different grades into</p>

		<p>the wiki. When evaluating the impact of the site, we discovered that it is of major importance to students in preparation for exams – the revision period saw the heaviest site usage, and in focus groups students frequently referred to its importance when revising (see attached document of focus group quotes for examples).</p>
Course Look and Feel, Web Usability	2	<p>The IB PMS CamTools site has a clearly defined structure. Tools are clearly labelled and navigable from the left menu bar. Most of the course material is held in the wiki tool, which has a logical, hierarchical page structure, based on the different terms of the year and the chronological order of lectures. In focus groups, students reported that they found this structure very easy to use. However, they didn't like the way that the wiki pages looked when printed out – so to remedy this, we now have a link to the original handout pdf added to each lecture wiki page.</p> <p>Throughout the site, a conscious effort has been made to keep the appearance of different pages and tools as clear, simple and consistent as possible, so as to emphasise and enhance, but not distract from the content to be communicated – see screenshots in the final section of this application for some examples.</p> <p>The IB PMS course site uses a range of different types of media to convey different types of course content, including video tutorials, narrated or interactive animations, 3D visualisation tools, and podcasts. Some examples of these types of media are shown in the screenshots section.</p> <p>Provision for accessibility issues is built in to the site – for example, students can enhance the appearance of text and backgrounds on the site by using the 'PreferAble' tool built into their workspace on CamTools, and pictures and figures in the lecture notes wiki can be enlarged for a better view.</p>
Learner Support	2	<p>The IB PMS CamTools course site contains extensive information about both the online and university environment and requirements for this particular course, integrating information previously held in a number of different sites. The background information from the Department about the course structure and content are held in syllabus,</p>

		<p>along with crucial information from the central University resources about examinations and assessment. Full timetabling for lectures, practical classes, field trips and departmental seminars is held in the schedule tool, covering the whole academic year.</p> <p>Contact information is clearly presented as appropriate in the site. Email support is provided through the site for both general CamTools usage questions (with the site administrator – Katy Jordan – as a contact) and lecturers responsible for each taught lecture block, where their contact information is integrated into their specific lecture wiki pages. In addition to clear contact information, there are a variety of resources integrated into the site intended to help support students, such as video guides to using the site and specific learning tools, and a frequently asked questions page. These resources are further developed and added to on the fly as required in response to student issues.</p>
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Teaching Innovation

Although there are many ways in which technology, and in particular Sakai, can make the teaching process more efficient or productive, innovative technology applications truly transform the educational experience for the better. The intent of this award is to highlight examples of educational applications of Sakai which fall into this innovative or transformative category.

Please describe why your use of Sakai represents innovation with regards to the instructional process and provide evidence of how it transformed the educational experience for your students. (1000 word maximum)

The use of Sakai for the IB PMS course represents innovation with regards to the instructional process on two levels. Firstly, the CamTools site was designed in response to identified student needs, a process which engaged students as co-designers as well as co-interpreters in subsequent evaluation and refinement of the site. Secondly learning can be approached through a variety of novel approaches and materials within the site.

Innovation in the instructional process

The overarching innovation is the novel presentation of the complete course using a wide range of types of learning resources as a 'network' of

information, which was particularly facilitated by the flexibility of the wiki tool. Examples of individual innovations related to the teaching and learning conceptual framework that use Sakai or other tools which are supported by this structure include:

- (i) Integration of course content: the explicit interlinking of related content and the provision of a cross course search tool.
- (ii) Making learning explicit: the intuitive organization of course materials and the provision of exemplar essays on a timed release basis which facilitates their use in the tutorial context.
- (iii) Support for difficult concepts: a range of materials including video-explanations, flash animations and links to other web sites.
- (iv) Novel representations of learning material: the presentation of concept maps and the use of 3-D molecular modeling to facilitate understanding.
- (v) Enhancing learning: provision of self tests allows students to develop confidence about their factual knowledge, freeing tutorial time for deep learning activities.
- (vi) An online journal reference library: the creation of a searchable reference library which both allows student exploration, as well as developing confidence about the relevant literature.

A particular strength of the CamTools site is that it allows students to engage with the resources which suit their personal approaches to learning at relevant times in the year (including the vacations) to support the development of their factual knowledge and their conceptual understanding of the course content.

Indicators of success

Research activities have been ongoing since the CamTools site was first introduced to students. This has included student questionnaires, analysis of site usage and student focus groups. Collectively this has shown that our 'enhanced' CamTools site has had a very positive impact upon student engagement and learning on the IB PMS course.

A self-efficacy questionnaire had been circulated to students in the year before the introduction of the new CamTools site, asking students to rate their confidence with respect to a series of Plant Sciences concepts. The survey was also circulated at the end of the first year using the new CamTools site. When comparing the 'before' and 'after' years, student self-efficacy showed significant improvements in three specific Plant Science topics; these particular topics closely aligned with ones which had been enhanced with additional resources within the CamTools site, demonstrating a positive impact of the resources.

Student opinion of the CamTools site and its resources was assessed using an online student questionnaire and analysis of site usage data. Usage data showed that students had engaged with the site and made use of its learning resources, particularly during the revision period (Figure 2).

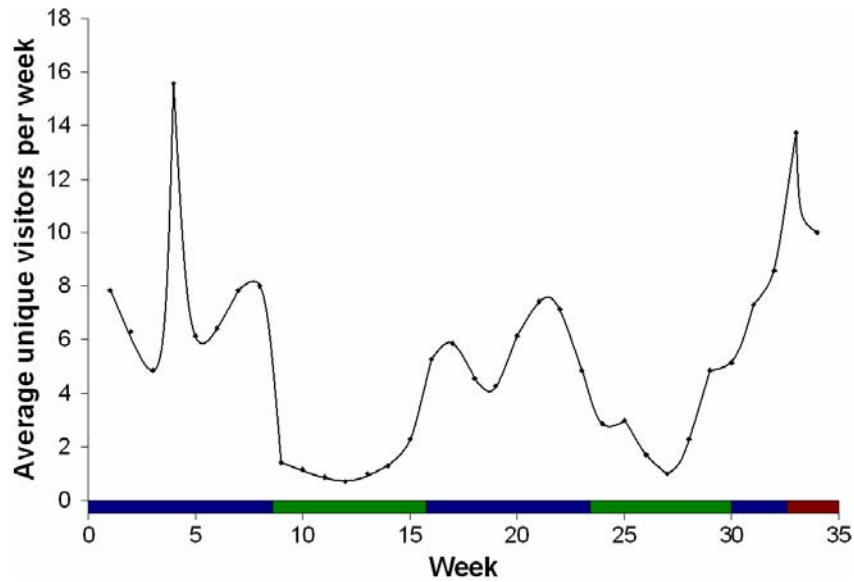


Figure 2: Average number of unique student logins to the CamTools VLE each week, after the start of term (beginning October 2006). Term periods are highlighted in blue, holidays are green and the exam period is red. Note, in week 4 the practical class was a statistical practical for which the data file was hosted on CamTools. 26 students were enrolled on the course in this particular year.

Variability in the characteristics of student use of the CamTools site highlights the benefit of designing a flexible VLE, providing resources in different formats to allow students to personalise their learning by choosing the resources most useful to their individual needs. This was also born out by the questionnaire data; the majority of students found the site very useful (Figure 3), but the extent to which individual students used different types of learning resources varied (Table 1).

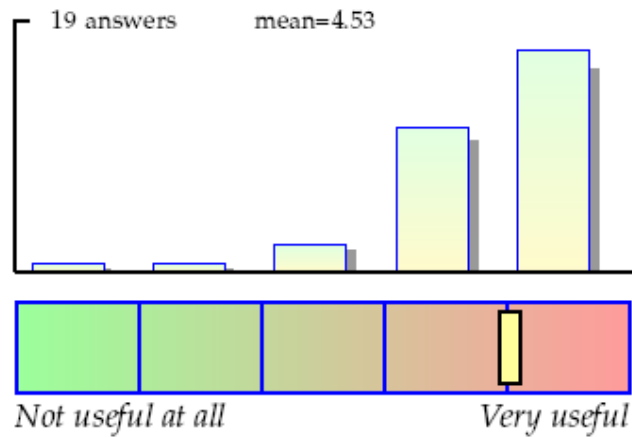


Figure 3: Students response ratings from the CamTools questionnaire for the question “Overall, how useful have you found the site?”

Component	Usefulness: 1 (min) to 5 (max)
Online references library	4.5
Exemplar essays	4.3
Animations	4.1
Lecture slides	4.1
Wiki lecture notes	4.0
Video explanations	4.0
Self test questions	3.7
Glossary definitions	3.5
3D molecules	3.1

Table 1: Mean average 'usefulness' of different novel CamTools course components as reported by students in an online questionnaire.

The site usage data was presented to students within a focus group for co-interpretation. It was clear that students do not see the CamTools site as a substitute to teaching in lectures, but as an extremely valuable additional resource. It was clear that although there are many different factors which had prompted students to use the VLE, it was particularly useful at the end of the year for revision. This demonstrated that our evidence-based approach had succeeded in creating a VLE which supported learning from the student perspective, and that students genuinely found that the resources developed aided their learning. See attached supporting pdf file for a selection of quotations from focus group participants.

The introduction of the new CamTools site for the IB PMS course has been accompanied by a marked increase in student retention within Plant Sciences as a whole. At the end of the second project year (the first class to have experienced the enhanced CamTools site), 69% of the IB PMS class chose to major in Plant Sciences in their third year, compared to 38% at the end of the first project year (before the new resources).

In recognition of the innovative, evidence-based approach used to create the IB PMS CamTools site and its learning resources and its success, the Plant Sciences Pedagogy Project won the inaugural 2007 BERA Sage award for putting research into practice in a 16+ setting.

References cited in TWSIA application

Entwistle, N., Hounsell, J. and McCune, V. (2002) *Approaches to Studying and Perceptions of University Teaching-Learning Environments: Concepts, Measures and Preliminary Findings*. ETL Occasional Paper 1.

James, M. and Pedder, D. (2006). Beyond Method: assessment and learning practices and values. *Curriculum Journal*. 17(2), 109-138.

MacBeath, J. and Mortimore, P. (Eds.). (2001) *Improving School Effectiveness*. (Buckingham, Open University Press).

Robertson, P., Sammons, P., Thomas, S., and Mortimore, P. (2001) The Research Design and Methods. In MacBeath, J. & Mortimore, P. (Eds.). *Improving School Effectiveness*. (Buckingham: Open University Press).

SOMUL (2005) The Social and Organisational Mediation of University Learning Project. Website at:
<http://www.ioe.stir.ac.uk/research/projects/somul.php> - Last accessed 14th April 2008.

Trigwell, K. and Ashwin, P. (2003) *Undergraduate students' Experience of Learning at the University of Oxford* (Oxford: University of Oxford).