# Peer review of online learning and teaching: New technologies, new challenges

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This paper reports on a collaborative project led by the University of South Australia, which involves the design and develop a comprehensive, integrated Web-enabled peer review system that guides academic staff in the development or redevelopment of their own courses through reflective processes, and uses these same criteria to have their work evaluated. The project, which is funded by an Australia Learning and Teaching Council Grant, builds on extensive work that has been undertaken both within Australia and overseas in the development of peer review of online learning and teaching, which supports and stimulates the scholarship of online learning and teaching, and has the capacity to demonstrate quality learning and teaching through course development, evaluation, improvement and interactive learning. Evidence produced through such quality processes can be used by academic staff as evidence to support claims for recognition and reward. The project commenced as a pilot in 2003 and has evolved in response to changing technologies and recognition of the need for a more adaptable system that enables academics to play a significant role in the creation of criteria and in contributing their own exemplars using a Web 2.0 approach. A major feature of the approach is its educative dimension, which is responsive to supporting online teaching and learning at a time when new Web 2.0 and 3D virtual learning technologies are presenting new challenges for educators. This paper describes the project and argues that online learning and teaching in this changing landscape is an emerging area of scholarship which needs to be supported and encouraged.

Keywords: quality assurance, peer review, scholarship, online learning and teaching, 3D virtual learning environments, web 2.0

## Introduction

The project reported in this paper focuses on providing professional development to academic staff in online learning and teaching. The approach involves the development of an online instrument and associated Website through funding provided by the Australian Learning and Teaching Council (formerly Carrick Institute for Learning and Teaching in Higher Education) to provide a scaffold for the development and evaluation of online courses or components of courses that are delivered online in a blended learning environment. The approach draws on the Boyer (1990) paradigm of scholarship, which is a framework in which the four scholarships identified by Boyer (discovery, teaching, integration and application) are considered integral to an environment that stimulates and engages learners. This framework has been applied to the design of a peer review instrument in which all four scholarships are considered essential for online learning and teaching and this has been achieved through the design and development of a checklist of agreed good practice. The approach is also consistent with Taylor and Richardson's (2001) recommendations relating to the design and construction of information and communication technology (ICT) based teaching resources in which they advocate for "the development of an explicit and shared understanding of the scholarship underlying the design and development of these resources" (p. 8). Such shared understanding, according to Taylor and Richardson (2001), can also form the basis for validating the quality of the resources.

This paper describes the development of the online peer review instrument and supporting Website, in which shared understanding about the scholarship of learning and teaching in resources developed for online delivery is made explicit. The project builds on extensive work that has been undertaken both within Australia and overseas in the development of peer review of online learning and teaching, which supports and stimulates the scholarship of online learning and teaching. It has the capacity to demonstrate quality learning and teaching through course development, evaluation, improvement and interactive learning. Evidence produced through such quality processes can be used by academic staff as evidence to

support claims for recognition and reward; a process which is required as an indicator against which Australian universities report via the Australian government's Learning and teaching performance fund.

The principles underlying the development of this approach are as follows:

- The criteria for the standards of development have been gathered from the full range of relevant academic literature surrounding online teaching and learning. This affirms the work of academics in the area and provides it in a highly practical form which is accessible to a broadly-based audience.
- The approach locates responsibility for the quality of learning and teaching with the academic staff responsible. Staff can use the items to guide the development or redevelopment of their own courses through reflective processes.
- Academics are empowered to construct their own tailored evaluation checklists and to contribute to the developing database of criteria.
- The instrument and its associated website provide an opportunity for just-in-time academic staff development by providing the accepted standards, information about how to meet these and exemplars contributed by academics themselves.
- The instrument is flexible and adaptable to accommodate changing technologies
- The supporting website is designed to provide a model of best practice, utilises latest Web 2.0 and database technologies, and has been validated using the W3C Mark-up Validation Service, and the W3C CSS Validation service, and complies with W3C Web Content Accessibility Guidelines 1.0.

The first section of this paper provides the rationale for the project and identifies the academic community as fundamental in all scholarly activity and provides the rationale underpinning the project.

The second section provides a general overview of the instrument and website. It argues that a highly detailed instrument is required because of the relatively low levels of expertise of the intended audience in online teaching and learning and the need to establish comprehensive standards derived from research. The development of the general approach and the specific instrument are outlined, with the four major areas (instructional design, interface design, use of media and technical aspects) specified.

In the third section of the paper, the strategies adopted to address the limitations and to incorporate features enabling the instrument to be dynamically updated in response to changing learning technologies, and to engage academics in being active contributors to the project using Web 2.0 technologies are outlined. The dynamic data driven approach adopted by the project to accommodate changing learning technologies is explained in some detail.

The strategies for engaging the higher education community to contribute to the project are outlined in the fourth section, and in the final section of the paper, the importance of this approach to the scholarship of learning and teaching is discussed. The instrument is seen as an instrument which is derived from scholarly research and has the potential to contribute to scholarly interaction around online teaching and learning.

## Rationale for the project

The project focuses on providing professional development to academic staff in online learning and teaching. One of the critical aspects of this approach is that it seeks to achieve scholarly outcomes in course development through processes which are, of themselves, scholarly. The Boyer approach to scholarship based on an understanding of the communal basis of all scholarly activity: that scholarship by its very nature is a public rather than private activity; that it is open to critique and evaluation by others; and that a field of study is progressed through the scholarly activity of building new ideas which are then open to the same processes of public scrutiny. All of the scholarships are exposed to the same rigorous approaches of peer review as a way of gaining quality, transparency and accountability (Shulman, 2002). Within this framework the scholarship of learning and teaching has emerged as a major theme in the higher education sector. The project described in the following sections addresses an identified need for an objective and accessible system that supports academics in the development or redevelopment of their own courses through reflective processes and enables them to use these same criteria to have their work evaluated. In exposing their work to scholarly appraisal and such public scrutiny, academics can also have their work affirmed and use as evidence when seeking promotion within their institution.

**Review of other instruments**

An extensive review of the literature and a range of peer review instruments published over the last six years identifies various approaches that have been developed to both identify and validate evaluation indicators designed to measure the intended outcome of online courses (e.g. Seok *et al.*, 2006), several focusing on the development of theoretical frameworks that can be applied to the evaluation of online learning and teaching materials (Barbera, 2004; Franklin *et al.*, 2004; Chua and Lam, 2007), and others that have focused on the development of instruments that take a quantitative approach to the evaluation of courses according to specified criteria. On the basis of this review, several limitations were noted:

- First, some of the instruments reviewed have been developed to address particular aspects of course development and are partial in their scope rather than comprehensive.
- Second, many of them are very general, open-ended instruments. Although there may be some justification for this in terms of providing a generic framework, these instruments make considerable assumptions about the level of expertise of those involved in the processes of online learning and teaching.
- Third, some instruments have been found to be comprehensive in their scope, but unnecessarily complex because the instrument and supporting online materials are not integrated.
- Fourth, most of the online instruments (including some listing accessibility as an important criterion for online course development) are inaccessible for users with disabilities.

The more comprehensive instruments reviewed require the use of additional applications (for example an Excel spreadsheet) and lack seamless integration with the supporting online material. Furthermore, many of these instruments treat aspects relating to accessibility and usability as separate considerations rather than embedded within criteria relating to instructional design, interface design, use of media and technological aspects. None of the approaches reviewed provide a fully integrated peer review system in an accessible format that enables staff to record their achievements in online learning and teaching, and to use that information in support of their applications for academic promotion.

The project builds on the knowledge gained from these existing approaches to peer review of online learning and teaching to develop an open source, Web-enabled peer review instrument.

**Relationship to institutional priorities**

The project, which involves collaborative national and international partner institutions, aims to provide an adaptable approach that can be tailored to addresses an institution's learning and teaching priorities, while still addressing the need for a learner-centred, flexible, technologically mediated and accessible integrated online peer review system in which criteria relating to inclusivity are embedded, and which provides guidelines and exemplars of best practice. This next section describes the ways in which the project addresses University of South Australia's learning and teaching strategies.

Teaching is a highly valued and respected activity at the University of South Australia. The University has adopted the four scholarships framework promoted by Boyer and this approach to the scholarship of teaching frames all aspects of the University's teaching enterprise, from academic induction to the more formal process required in the University's promotions and teaching awards processes. The University's Learning and Teaching Strategy 2006-8 outlines the distinctive University-wide approach to the scholarship of teaching, which involves engaging in reflective teaching practice through an iterative process of action, reflection and refined action that is both informed by the practices of peers, and open to their critique. This requires:

- gathering data about one's own teaching and learning performance – whether in preparation, facilitation or evaluation – and engaging in analysis of such data for the purpose of improving teaching and learning (i.e. being a reflective teacher),
- being cognisant of and open to the knowledge about teaching and learning which peers have generated through publishing and presenting, and using this to inform and improve one's own practice (i.e. being a scholarly teacher), and
- making public one's own work through presentations and writings in refereed contexts to contribute to knowledge and understanding of teaching and learning at national or international levels (i.e. contributing to the scholarship of teaching).

The University of South Australia has a strong commitment to online learning and all programs have some aspect delivered online. The strategic combination of learning opportunities—a blend of traditional

distance education, electronic engagement and face-to-face activity—enables learning to be tailored towards particular student groups, both onshore and offshore, to achieve high quality learning outcomes. The University also adopts an inclusive approach to equity, by developing resources and providing opportunities that enrich learning for all students, as well as making specific arrangements for those who have experienced educational disadvantage. Online accessibility is an important priority for the University, and the institution has a detailed Web accessibility policy, which outlines the technical requirements that authors must meet to ensure their online materials are compliant with the World Wide Web Consortium's (W3C) Web Content Accessibility Guidelines (1999). Compliance with these guidelines helps to ensure that course materials are accessible to a diverse student audience including students with disabilities, students of non-English speaking background, and students who are located in isolated regional locations with limited access to high speed Internet connectivity.

The next sections of the paper describe the ways in which these priorities have been incorporated into the instrument and accompanying website, beginning with an overview of the project and then more detailed explanation of the structure of the peer review instrument.

## Overview of the project

This project builds on the experience gained by the project team leader, who is the first author of this paper, and two members of the proposed project team from a project that led to the design and development of a prototype of a peer review instrument. The prototype has been trialed at the University of South Australia and the results of the trials published (George and Wood, 2003; George, Wood and Wache, 2004, George and Wood, 2005 and Wood and George, 2003). While limited in scope and functionality, the findings from the trials together with the enthusiastic response from the higher education community at conference presentations, suggested that the proposed system when fully implemented as an open source instrument would be well received. Negotiations with potential partner institutions confirmed an interest and commitment in progressing the prototype to a fully developed instrument, and in 2007 an application was submitted to the Australian Learning and Teaching Council for priority funding to enable the project to proceed. Funding was received for a two-year project in July 2007, and the project will be completed in July 2009 (http://www.unisanet.unisa.edu.au/peerreview/).

The specific objectives are as follows:

- Encourage and raise awareness and practice of the scholarship of online learning and teaching, and the collection of evidence for promotion purposes by academic teaching staff who use the online environment to support learning.
- Assemble comprehensive online learning and teaching standards based on research with associated nationally agreed on criteria that can be used to guide academic staff who are not skilled in the development and practice of online learning and teaching.
- Affirm the work of academics in the area and provide a highly practical approach to peer review of online learning and teaching, which is accessible to a broadly-based audience.
- Locate responsibility for the quality of learning and teaching with academic staff and guide them in the development or redevelopment of their own courses through reflective processes, and use these same criteria to have their work evaluated.
- Facilitate "just-in-time" academic staff development by providing the accepted standards, information about how to meet these and examples of how this can be achieved within the one Web-enabled peer review instrument.
- Support academic staff in the development of their courses by encoding the elements of good practice in an agreed checklist for online learning and teaching.
- Provide a comprehensive, integrated open source peer review system that enables staff to record their achievements in online learning and teaching, and to use that information in support of their applications for academic promotion.

The distinctive component of this project is its focus on developing, trialing and evaluating a research-based, Web-enabled instrument for peer review of online learning and teaching, based on an existing prototype that has been developed and trialed at the University of South Australia (George, Wood and Wache, 2004). The instrument incorporates banks of standards-based criteria for use in peer review, explanations of the meaning of these criteria, exemplars and an underlying database that can record peer review results and make them available for promotion purposes. It has been developed as an open source platform, to enable it to be adapted by other institutions to suit their learning and teaching and technical contexts. The project is also developing case studies of peer review using the instrument.

The instrument is constructed around four sets of considerations: instructional design, interface design, the use of multimedia to engage learners and the technical aspects of interactive educational multimedia. These areas have been developed through consideration of the literature. Several of these major sections are broken down into smaller subsections for ease of consideration

- instructional design
    - clarity of expectations
    - building student knowledge
    - learning activities
    - assessment
    - evaluation
    - human interaction
- interface design
- use of media
    - interactive multimedia
    - writing style and accuracy of text
    - copyright
- technical aspects

In each of these sections (or sub-sections), items were developed. These items:

- directly relate to quality concerns agreed in the literature
- are expressed in non-technical ways
- use the same language and constructs as checklists developed for other areas of teaching such as lecturing
- incorporate an easy-to-use ratings system
- provide for qualitative feedback through comments

The rating system used to measure the extent to which the specified metrics meet these criteria is a 5-point Likert scale ranging from strongly agree to strongly disagree for metrics that involve value judgments, and from always to never for metrics that consider the frequency of occurrence. Each criterion also provides a free form text area for comments since a combination of quantitative (Likert rating scale) and qualitative (open-ended user comments) measures will most likely yield comprehensive results. Users can create new criteria and customise the method for rating performance against each of the criteria. Supported response options in addition to the Likert scale metrics include yes/no, drop-down selections, multiple response, occurrence scales as well as the qualitative responses (Figure 1).

## Educative aspects

The educative dimension is central to both the 'just-in-time' approach to professional development and approaches which involve more formal educational development. Each of the items has a 'more information' button , which is a hyperlink to detailed information about the issue including explanations and references to the literature. For example, one of the criteria specified in the sub-section 'Clarity of Expectations' is an item referring to the statement of objectives or learning outcomes. There is often confusion among reviewers about the difference between general statements about the overall goals and clearly specified objectives. By clicking on a 'more information' hyperlink, the reviewer can check their understanding of these terms and also learn more about effective techniques for specifying objectives or learning outcomes from the hyperlink references included in the related explanatory screen .

## Inclusivity

Items addressing issues of inclusivity have been embedded across the four sections of the instrument. These relate to socio-cultural aspects including gender and culture, and have a particular focus on W3C Techniques for Web Content Accessibility Guidelines. The decision to embed these rather than to extract them into separate categories is based on the view that essentially the items reflect good teaching and ought to be seen in a more integrated way. For example, a course that includes streaming media presentations containing voice-over or dialogue would need to be reviewed to determine whether the media is accessible to students with hearing impairments. Information on the accessibility issues for people with disabilities and the relevant W3C checkpoints can be accessed by selecting the 'more information' link next to the criterion relating to synchronised captions for video clips that contain audio tracks in the 'Use of Media' section of the instrument.

**Figure 1: Selection of criteria and response type can be customised by the academic staff member**

## Flexibility

One of the issues around the development of the instrument has been to ensure it has maximum flexibility. For this reason, the instrument has been designed to be very detailed and also flexible so that it can be used in part or as a whole depending on the intended outcome. Potential outcomes may include:

- course development or improvement through personal reflection
- formative or summative evaluation of online materials by peers
- career advancement through providing evidence that supports applications for promotion, tenure or awards
- framework for professional development staff to use when working with academics.

## Limitations of original prototype

The original embodiment of the instrument was limited in the following ways:

- The number of categories included in the prototype and the range of criteria addressed within each of the categories was not comprehensive. Project team members have been assisting in the development of new categories and the addition of more extensive criteria within each of the categories.
- Not all criteria had been populated with links to detailed information about the criterion including explanations and references to the literature. Project team members and also academics using the instrument during trials will be able to contribute to and build their own banks of criteria.
- The original website was not linked to a database, and the Likert-scales were static and non-functional. This means that the only way academics could use the prototype was by printing out the scales and completing the review by hand. In the redevelopment of the instrument, the peer review will be completed online and results of the review stored in a data base for retrieval by academics in support of their applications for promotion and awards.
- There was no facility enabling academics to populate the instrument with their own criteria. The developing instrument incorporates a wizard front-end enabling them to select from banks of criteria, and add their own categories of criteria to tailor the peer review survey to best suit the nature of their specific courses to be reviewed.
- There were no case studies demonstrating best practice relating to the categories incorporated into the instrument. Project team members, through their extensive networks, will be progressing contributing to these case studies and provision has been made via the linked website of resources for academics not associated with the project to contribute their own case studies by registering their interest through an interactive form.

In the next section of the paper, the strategies adopted to address the limitations and to incorporate features enabling the instrument to be dynamically updated in response to changing learning technologies, and to engage academics in being active contributors to the project using Web 2.0 technologies are outlined.

## Features incorporated in the developing instrument

The original prototype was developed using static HTML, which meant that each page had to be manually coded to display specific content. While a static HTML page provides the developer with a degree of accuracy with how the content is displayed, such an approach lacks flexibility. The developing instrument has therefore been designed to function as a dynamic system and features server-side scripting to enable pages to be dynamically generated to display data and content in response to users' queries. A dynamic site, while more flexible, also features a greater level of complexity, including additional system resources and applications for the server to run. From the user's point of view, both static and dynamic versions of the site will appear the same, with no additional software required, however the dynamic version will be able to be dynamically prepared at runtime to better support the user.

The new dynamic Peer Review system is made up of the following components:

- A main *template* with consistent look-and-feel
- Several modules that are designed to perform specific tasks for the user. Modules can be nested, meaning that the 'administration' module can contain a 'user' module, for example, to enable the administration of users. Each module can have set permissions to ensure only authorised users can access specific modules. For example, the administration module is only available to specified authorised users, while the change password module is available to all users.
- A *database* storing all of the data, including peer reviews, user data, criteria, glossary items and exemplars.

The most powerful feature of this dynamic approach is its runtime configurability. The static version of the instrument included a number of pre-defined categories and criteria to assist with the peer review process. While this set of criteria is useful and well-rounded, updates are hard to achieve, requiring input from a web developer to add, remove or modify any categories or criteria. Such an approach would have been problematic in view of the rapidly evolving new learning technologies including Web 2.0, Flash, AJAX-powered applications and 3D virtual learning environments.

The dynamic approach adopted for this project enables users to add, remove or modify criteria at any time through the use of the database and dynamically-prepared web pages. This flexibility future-proofs the system ensuring that as new technologies emerge, they can be added into the system without additional programming work. The dynamic instrument also provides a greater level of customisability for each unique review. Some categories and criteria may not be applicable to all peer reviews, and the dynamic version of the instrument enables the user to choose from banks of existing criteria to create customised peer review checklists, at runtime, without the need for technical HTML knowledge. This means that each peer review can be fully customised to suit the requirements of the review itself, independent to all other reviews in the system (Figure 2).

The peer review system makes use of the following open source technologies:

- *Apache HTTP Server 2.0.63*, which is an open source HTTP server that enables the hosting and deployment of web pages.
- PHP (PHP: Hypertext Processor), which is a server-side scripting language that can be embedded into HTML documents to enable dynamic pages to be created. This enables the developers to create powerful pages including features such as tables and form elements to be populated with data on-the-fly based on the specific data requests of the user. PHP 5 is the current major version of this programming language.
- *MySQL 5.0.51a*, which is a powerful relational database management system (DBMS) that is well suited for web applications.

The decision to use open source technologies for the project has been to address the concerns expressed by authors such as Neumann (1999) who argues that closed source proprietary software carries a number of risks, such as restricted customisation and interoperability, inflexibility, and more complicated black box system integration. While the development server is running MySQL 5, the framework for the system has been constructed using a series of database abstraction classes, which store all of the database logic,

such as the construction and execution of queries. When a module in the system requires data, it calls a generic database method, which is passed on to the appropriate database handling classes. This means that each of the modules can be written without prior knowledge of the SQL syntax that the DBMS is expecting. Should future developers wish to implement the system using another database, such as Postgres or Microsoft SQL Server, the developer will only need to create a new set of database abstraction classes, and modify the system configuration to use a different server type. This separation of SQL syntax logic from the modules is a key concept in ensuring the system is able to be extended to suit a variety of different DBMSs with a minimal amount of coding, and no re-engineering.

The instrument is based on a standardised XHTML form generation system, which creates customised forms including valid XHTML code. The system also generates meaningful error messages in the case of missing or inaccurate data and the appearance of the interface is controlled through an external style sheet (CSS file). The form generation system makes it easy to create a new form for a module without knowledge of XHTML, enabling the rapid and accurate development of new modules.

In summary, the modules of this developing peer review system have been designed to be flexible, extensible and adaptable to accommodate new and emerging learning technologies. This enables content in the system, such as criteria, to be updated, managed and maintained even after the launch of the initial software, including specific customisation for each individual installation.
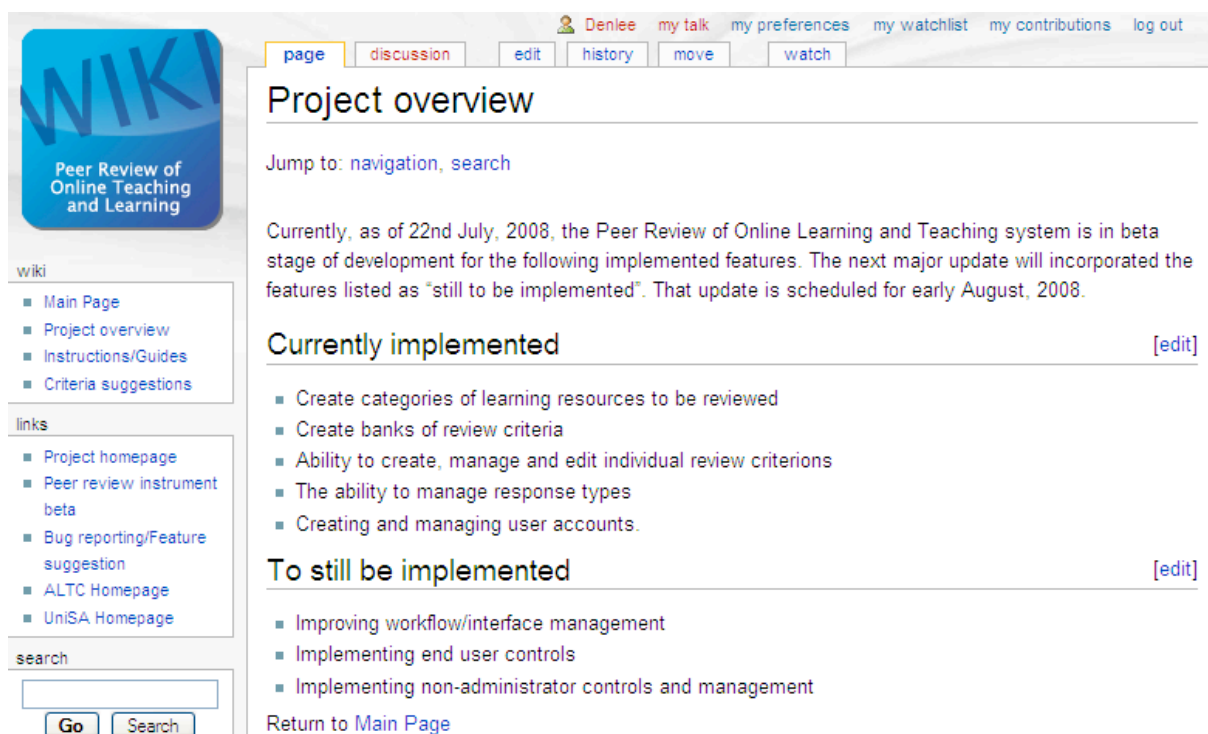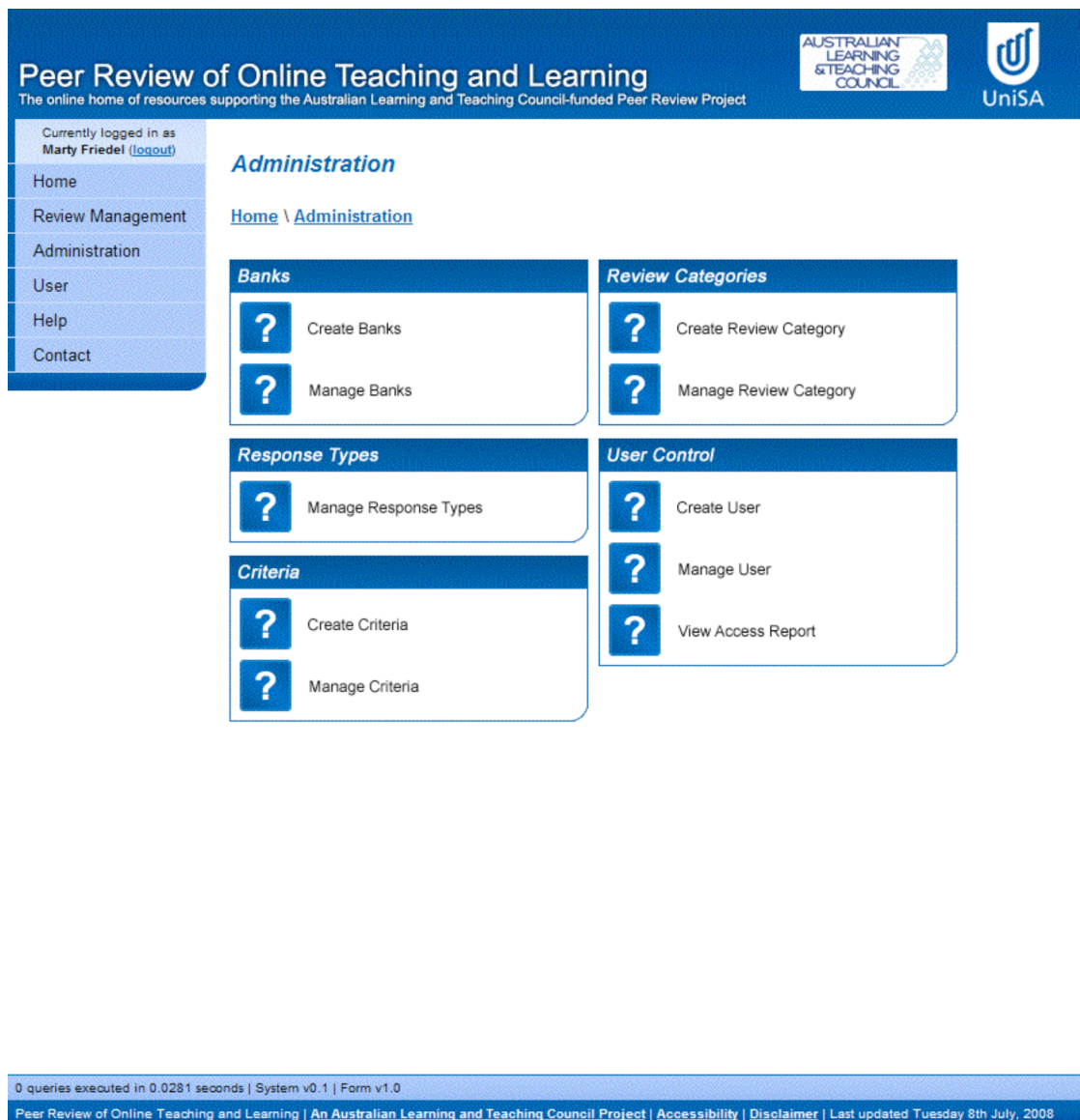


**Figure 2: Design of the peer review system ensures maximum flexibility and adaptability**

## Engaging the higher education community

As suggested in a previous section of this paper, the notion of an engaged, networked community of academics who contribute to a shared understanding of online learning and teaching, while reflecting on their own teaching practices, underpins the design and development of the peer review project. To facilitate and strengthen this learning community, Web 2.0 technologies have been employed, enabling academics to contribute to the developing database of criteria, glossary items and exemplars. To this end, a project Wiki has been established enabling interested academics to contribute to the developing instrument (Figure 3) available at: http://peerreview.unisa.edu.au/wiki/index.php/Main_Page. In addition, a dynamic bug tracking system has been developed to track user's feedback once the BETA version of the instrument is released to the higher education committee for trials. The project website will remain a dynamic resource, populated with content from the higher education community once the development of the instrument has been completed, to enable ongoing sharing of resources and case studies demonstrating best practice in online learning and teaching.



**Figure 3: Project Wiki designed to engage the higher education community**

## Conclusion

This paper outlines a project that follows a scholarly approach to quality assurance in online learning and teaching. The project described in this paper involves developing an open source, Web-enabled peer review instrument and an associated website that will assist academic staff with the course development of their materials and provide a structured approach to peer review. The design and development of the instrument has been informed by research into online learning and teaching and identifies criteria relating to online course development and the standards associated with them. These standards are being codified into a checklist of simple statements, which can be used by staff without technical expertise. The interactive checklist is linked to a dynamic database so that the results of peer reviews of course materials are recorded centrally and the data can be retrieved by academics to support their applications for academic promotion and awards. The extensible nature of the approach ensures that the system is flexible and adaptable to accommodate new and emerging learning technologies to address the challenges associated with a rapidly changing online learning and teaching landscape. The interactive peer view system, which is also supported by a website, provides highly focused just-in-time information to enhance the knowledge and expertise of staff. This approach is consistent with a scholarly approach to learning and teaching because it supports staff in reflective practice and provides a structured and informed approach to peer review. Beyond this, the system provides a means by which they can have their work publicly affirmed and to use this as evidence to support them in their applications for promotion and awards.

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