

**Articulating assessment design practice for online courses and programs; cases in assessment strategy design and development.**

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**Abstract**

As the demand for online learning environments grow in higher education, so does the need for systematic application of learning and educational theory to the design, development and delivery of assessment strategies within these environments. The assessment literature suggests a number of imperatives that should drive a renewed focus in assessment including; capturing the potential of online assessment, designing efficient and effective assessment, fostering academic honesty, and supporting effective group work. However, there is little guidance in the form of frameworks for the development of online assessment strategies.

As a group of instructional designers engaged in a collaborative process of developing assessment strategies with online instructors, we present in-situ qualitative case studies that articulate our design practice in support of the development of online assessments, in line with the imperatives identified above. We discuss a range of assessment strategies and how these have been designed and developed, including professionalism and peer assessment, virtual patients, collaborative writing, and problem solving with extended case studies. We present and discuss the reflections of our co-instructional designers, the instructors, on the impact of these approaches on their teaching practice and the experience of their learners. We discuss our successes, failures and challenges, and the next steps in our continued efforts towards articulating practice-driven innovation and frameworks in online assessment.

## **Introduction**

The process of teaching a course and the process of designing a course in online environments both represent a complex planning enterprise consisting of decisions framed within a set of constraints and opportunities. While we consider teaching as a specialized form of design (Wiggins and McTighe, 2005), the design professional who plans for a future implemented course works with simultaneous abstracted attention to multiple constructs; the structure of the content, the needs of the instructional team to create conceptually sound and interesting materials that will convey the stated goals of the course, and a keen awareness of the ways in which students will interpret and understand the material and forms of interaction created within the course. Bowden and Marton (1998) refer to this as having the ability to be focally aware of certain things in the foreground at the same time as being aware of more peripheral things, with the focal awareness changing over time depending on time and circumstances. This is a very good image of how we work in our design practice and while we limit the scope of our paper to a discussion of our approach to assessment strategies within this complex environment, it is within this larger context that we practice as designers.

Designing an assessment strategy requires an understanding of the differences in the ways that teachers and learners think about the sequence of events that occur in an online course. To the teacher, assessment is at the end of the teaching-learning sequence of events, but to the student it is at the beginning (Biggs, 2003). We believe that it is good design practice to articulate assessments as early as possible in the design process so that the development of objectives, learning activities and media resources are more clearly aligned with the outcomes that instructors are striving to achieve. We also believe that the articulation of assessment strategies in a clear and definitive manner serves to align the teaching activities of the teacher and the learning activities of the learner towards the same goal.

The creation and delivery support of online assessments present particular challenges and opportunities as will be addressed within each of the cases. In addition to general best practices concerned with creating representative and valid assessments and rubrics, online assessment design requires knowledge of the technical environments and the features they each offer to the designer and instructor, as well as the ability to create a reasonably sustainable assessment that the instructor, who may have limited technical expertise can manage. For example, managing grading for online group assessments requires the development of specialized rubrics and reporting that most instructors may find daunting without the help of a designer.

While there are a number frameworks that address online assessment of online discussions (Anderson, T., 2004; Levine, S. 2002), we are not aware of more generic frameworks that can guide online assessment strategy development. Therefore, this paper is the first step in developing an emergent practice-driven framework for design practitioners.

We begin with a brief description of our design and development process, followed by the presentation of 4 cases, and end with a discussion the way in which the cases may inform the development of frameworks to support online assessment design.

## **The Online Course Design and Development Process**

The Centre for Teaching, Learning and Technology (CTLT) is a central service department serving the University of British Columbia (UBC, Vancouver campus) that provides a broad range of services to the university in leadership, innovation and the application and integration of learning technologies and promotes scholarly approaches to curriculum and pedagogy. Within CTLT, our Distance and Blended Learning (DBL) group provides expertise in instructional development, project management, web designing, multimedia production and graphic artwork for the development of distance and blended learning courses.

The role of the Instructional Designer (ID) is diverse and multi-faceted ranging from project team facilitation, to budgeting and scheduling, to understanding teaching epistemologies and to the selection of learning technologies. The ID works with the course author (a faculty member) who is

appointed by their faculty or department to provide disciplinary expertise. There is a constant interplay of negotiating the scope of the course content, setting learning outcomes, selecting appropriate technologies that enable learning, implementing interactive activities such as discussion forums, chats and blogs and developing appropriate assessment strategies. It is within this context that the following cases have been developed.

### **Case Presentations**

We present four cases as exemplars of design practice in online assessment strategy development, each of which has been developed by an Instructional Designer on the Distance and Blended Learning team. Each of the cases is represented using a common template designed to convey the essential aspects of the assessment design. Each of these cases represents the outcome of collaborative work between instructional designers and course authors over several years through a process of continuous refinement based on the experience of the online instructors and students. In all cases, the course authors and instructors were highly engaged in the development of the strategies and instruments represented here.

#### Case 1: Professionalism and Peer Assessment

The UBC Dental Hygiene Undergraduate Degree Program places high value on students developing the skills necessary to be practicing professionals during their course of study, using peer assessment as one means of assessing whether or not the core competencies of professionalism, critical thinking, collaboration and communication, have been achieved. These competencies are among those that have been identified as essential abilities for health care professionals for the 21<sup>st</sup> century and apply to all courses within the program (Dental Hygiene Educators Canada, 2008; Verma S., Paterson M., Medves J., 2006; World Health Organization, 2007).

*Rationale.* A primary consideration in choosing to implement a peer assessment model is to support the learner in the development of their role as a health care professional and in particular in developing decision-making abilities including taking responsibility for one's own learning, making constructive contributions to the learning of others, and self- and peer-evaluation. Another key objective is to support student participation in the decision-making process, which includes focusing on initiating decisions and providing meaningful feedback to colleagues about their professional decisions. In this way, peer assessment forms a foundational role in the overall assessment strategy of the program and provides a vital means for students to demonstrate their acquisition of the skills commensurate with a professional dental hygienist.

The need for peer assessment arose in part due to the demands and constraints of group and collaborative work required in the Dental Hygiene courses. There needed to be a means to assess a student's ability not only to learn the course content but also the ability to function within a professional setting. Peer assessment was designed to help students refine their conflict resolution skills and their ability to develop a respectful team environment. In order to do this we designed a rubric for assessing these skills according to clear and explicit criteria readily available to the students.

*Assessment Strategies.* In all 3 and 6 credit courses, students are expected to both self and peer assess, in addition to being assessed for professionalism by the instructor. Each term, students are organized into teams of between 4 and 6 members and are responsible for providing peer assessment for each team member. Peer assessment constitutes 20% of the final grade, half of which is determined by the instructor. Students are required to achieve a peer assessment minimum of 60% to be considered successful.

Students are assessed on a 5 point scale in the areas of: participating in group discussions, helping to keep the group focused on tasks, contribution of useful ideas; quality of work, quantity of work, and general conduct. The same rubric is used for all three assessments: self, peer and instructor (<http://www.oltubc.com/courses/dhyg/ipeer/ProfessionalismRubric.pdf>). Students are provided with extensive descriptors of the criteria needed for assessment of the criteria needed

for assessment at the start of term and these descriptors are woven throughout the course narrative during group and individual activities.

The professionalism grade not only assesses the learner's contributions to the general class discussions, but it also applies to the group work. By providing thoughtful feedback to their colleagues and reflecting on their own abilities, learners further develop their ability to take responsibility for their learning, as well as contributing to the learning of others. However, as the peer assessment is a summative, high stakes form of assessment, it is critical that students feel that the grades and comments assigned are an honest reflection of the work performed. Therefore, peer assessments remain anonymous to the students, but not the instructors, who are able to access the grades assigned and any comments made by the students.

The program is delivered primarily through WebCT Vista, so it is important that we create a smooth, reliable and low-maintenance integration of the peer assessment framework within the LMS. In consultation with Faculty, it was decided that combining the native grading form tool in WebCT Vista with the discussion board would provide the most cost-effective option while offering the necessary functionality. This approach provides a low-threshold solution that does not require extensive faculty or student training prior to implementation and does not require the integration or development of an external application within the WebCT Vista environment.

From a design perspective, key considerations include the level of support students and instructors might require, the level of institutional support available, and whether students need to access external resources. By using grading forms in conjunction with graded discussion threads, a clear and effective workflow can be easily implemented without resorting to external tools.

*Lessons Learned.* One of the drawbacks of this implementation is that the statistical treatment of peer review data is limited. Attaching a grading form to a discussion post in WebCT Vista does not allow for easy statistical review by the instructor, which means instructors must manually calculate, or employ other tools, should they wish to analyze the results further or compare the results to previous course offerings. This can be both time consuming and frustrating for the instructor. In addition, although an aggregate of responses is readily provided, individual student responses must be viewed by clicking an 'Expand/Collapse' button beside each student's name. While not overly onerous, this small task can make the process seem tedious when working with a large cohort. Figure 1 shows a completed peer assessment:

Objective/Criteria	Performance Indicators			
	Extensive Indicators of Criteria 5/5	Substantive Indicators of Criteria 4/5	Solid Indicators of Criteria 3/5	Criteria not met 2/5 or 1/5 depending on degree to which criteria demonstrated
Participated in group discussions	67% (4)	33% (2)	0% (0)	0% (0)
Helped keep group focused on tasks	50% (3)	50% (3)	0% (0)	0% (0)
Contributed useful ideas	33% (2)	67% (4)	0% (0)	0% (0)
Quality of work	83% (5)	17% (1)	0% (0)	0% (0)
Quantity of work	83% (5)	17% (1)	0% (0)	0% (0)
General conduct	83% (5)	17% (1)	0% (0)	0% (0)

**Reviewers**  
 (Click the reviewer's name to view the individual evaluations.)

🗨 Brockton Oval

Figure 1. Completed Peer Assessment

In addition, students initially require detailed instructions on the use of grading forms. Otherwise, they may provide their peer assessment by simply replying to the initial message, thereby making their comments public and personally identifiable, which can lead to embarrassment. However, once students are made aware of how grading forms work, they find them easy to work with. After

the first implementation it was noted that further faculty training would be required if they were to be responsible for the management of the framework, including setup each term. In response to this, a screencast was developed and made available to all instructors. Once such training resources were made available, instructors have found implementation reasonably easy and effective.

#### Case 2: Virtual Patients; Assessment and Treatment Planning for Advanced Periodontal Diseases

Educators and designers in health professions have been using virtual patients in different forms to respond to students needs for real patient encounters and opportunities to practice in safe, accessible and responsive environments (Ellaway, R., Poulton, T., Fors, U., McGee, JB., & Albright, S., 2008). The UBC Dental Hygiene Undergraduate Degree Program has introduced virtual patients in a few courses and we will discuss specifically a course in Assessment and Treatment Planning for Advanced Periodontal Diseases. This course has been using virtual patient cases as a form of assessment for the last few years. It is a fourth year course with approximately 20 students in each term that is primarily for dental hygiene degree students and builds upon basic knowledge acquired from diploma dental hygiene education and dental hygiene practice. Using virtual patient cases, students learn to assess each patient's specific needs, develop a periodontal diagnosis, develop a comprehensive dental hygiene care plan based on current and reliable evidence, and evaluate the effectiveness of their dental hygiene care with follow-up strategies in a team environment.

*Rationale.* Assessment is one of the key components of the educational experience in the dental curriculum as the results of assessment can be used to evaluate students' readiness to enter their fields as entry-level practitioners. Assessment in the dental curriculum should require higher order thinking skills (i.e. analysis, evaluation, etc.) as well as effective communication skills, procedural skills, problem-solving and critical thinking skills. To facilitate learners' transfer, specifically in health professions, assessment needs to be designed to mimic authentic environments (Huwendiek, S., Reichert, F. Bosse, HM., et al, 2009).

The development team has used virtual patient cases to give learners opportunities to learn within the context of "real" or authentic patient experience or exposure in order to respond to learners' needs and to cover the above skills/competencies. Students are required to work collaboratively with their peers to problem solve the complexities of each individual actual patient case studies, on the "real patient" case studies. Each person within the small team is expected to contribute in a significant way to the overall team projects. The purpose of teamwork is to stimulate discussions, share perspectives and experiences, and ultimately learn from each other. Each case unfolds in different rounds/stages, over 2 or 3 weeks and learners are required to work only on what is revealed and factual not on what they may anticipate about a case, similar to a private practice setting.

*Assessment Strategies.* The course development team incorporated a number of instructional strategies (Huwendiek, S., Reichert, F. Bosse, HM., et al, 2009) when designing the virtual patients cases. Cases are designed to predict the learner's performance outside of the instructional environment and in a "real" situation; cases unfold in different stages over 2 or 3 weeks to provide a record/baseline of performance over time, and multiple types of assessments within a case are provided to address learning style differences and enhance motivation. Learners are encouraged to work interactively and collaboratively with peers in a small team and later with the whole class. The small team format helps learners to master the skills necessary to assess, diagnose, plan, implement, and evaluate (ADPIE) (2004) a case study. Students' professionalism is also assessed through the content of discussion, participation and contribution to the groups and by self and peer assessment forms.

Initially, learners work through a sample case together to become familiar with the case study approach and what is expected of them (there is no grade attached to the sample case).



Figure 2: Sample Virtual Patient Case

As shown above in Figure 2., each case is divided into different rounds, and each round is divided into Disclosure and Tasks sections. In the Round 1 Disclosure, the students receive information about patient’s medical history, dental history (including odontogram and radiographs, see Figures 3 and 4 below), oral health care routine and oral self-image



Figure 3: Radiograph for Sample Virtual Patient

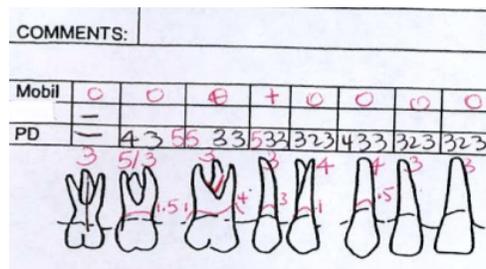


Figure 4: Odontogram for Sample Virtual Patient

In Round 1 Tasks, students are asked to work with their team members to answer different questions, to apply the skills obtained from the previous blocks and identify their client’s risk factors for periodontal disease within their teams. Then they move on to the analysis of their client’s clinical and radiographic findings with their team and continue their teamwork to arrive at an evidence-based dental hygiene diagnosis and dental hygiene care for their patient. At the conclusion of the case, students are asked to develop a further plan of action for their client’s continuing care. The same format is used for Round 2. The subsequent second case study is more complicated than the first to provide learners with additional challenges.

*Lessons Learned.* While designing a virtual patient case can be complicated and costly, designers with limited budget and resources can still develop good cases using simple text and images. What is important in design is to make the cases as much as possible interactive, and relevant with questions and explanations tailored to the clinical reasoning process. The instructor

uses Virtual Patient in the course to enhance the learning experience and to aid in the transition from simulation to practice. As the cases are “real” patient cases, they give learners opportunities to see exactly how the new clinician will encounter the condition in practice. In response to the question “if you had more budget and time, how you would have developed the cases?” the instructor replied, “More interactive, for example, we would have a virtual patient ‘in the chair’ and would have a ‘real’ scenario and see how the students ask questions to achieve an assessment. Instead of the information given to them, they would have to ask questions to achieve more information. This approach encourages higher level thinking processes in contrast to only identifying a ‘diagnosis’. It is more valuable for a student to be encouraged to solve problems with a systematic methodology that can be applied in any situation than to support only the development of a single diagnosis

Students find the cases challenging and thought provoking, as they have never seen such advanced conditions. The cases help them to tie in the knowledge they have learnt in various course all in one (i.e. gaps the bridge of knowledge).

### Case 3: Improving Problem-solving skills through extended Biology case studies

Problem-solving and critical thinking are important skills that help to solve relevant real-world practical problems and are crucial for students who pursue careers in health sciences (e.g., biochemistry, microbiology, physiology, genetics and molecular biology). Biology 200, *Introduction to Cell Biology*, is an online foundational course in undergraduate life science education consisting of reflective assignments, self-tests, problem workshops and extended case studies, all of which contribute to helping students to develop these skills.

Each course module is organized around an extended case study. The three case studies count for 20% of the final grade. The key objectives for the case studies lie in the experience with problem solving in life science, experience with putting ideas about biological issues into writing and experience with taking collaborative approaches to learning and problem solving. The extended case studies ask students to think about realistic global health challenges and to develop solutions to the challenges they pose and serve to extend problem-solving skills across all the course modules.

*Rationale.* The rationale for developing the extended Biology case studies is to help student to go beyond simply memorizing biology facts. They were designed and developed to offer examples of real-world problems and challenge students to apply their learning. It is expected that students will begin to understand the connections between elements of basic cell biology and real health problems faced by populations around the world. In this sense, the case study plays an important role in the overall assessment in the course and provides the students with an opportunity to demonstrate their knowledge and apply the knowledge to resolve real problems, which are aligned with the course content and its objectives.

The extended case studies use a “cycle” model as a process guide for student work. The cycle model consists of five phases as shown below:

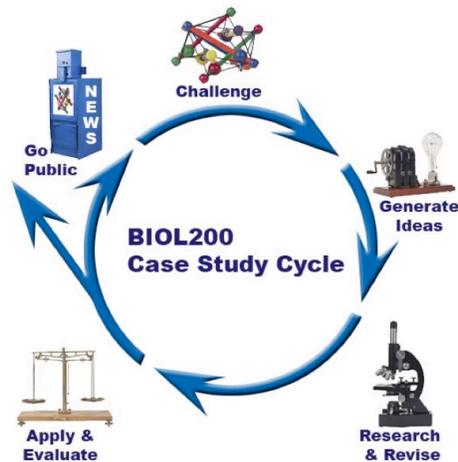


Figure 5: BIOL 200 Case Study Cycle

The cycle starts with the initial challenge. In the next two phases students generate ideas as an individual or a group, and research additional perspectives for more information and revise ideas if necessary. In the fourth phase, students evaluate their findings and exchange feedback from peers. As a final phase, students go public with their solutions to the challenge in a measured and thoughtful way. This process model teaches students not only how to engage in a particular case, but teaches them a general problem-solving framework that will extend well beyond the course to their careers in health sciences. For the set-up and submission of the case studies, WebCT Vista Assessment Tool and Assignment Drop Box were chosen. As the course is delivered through WebCT Vista, the reliable and smooth integration of the case studies within the LMS was a primary consideration.

*Assessment strategies.* Students are engaged in three different assessments: self, peer and instructor assessment. The following are instructions to students.

- **Case Study 1 is worth 5% of your final grade.** You will complete a report on your diagnosis of malaria in blood samples from a Kenyan Village.
- **Case Study 2 is worth 5% of your final grade.** Your team will write a report explaining to your Supervisor the genetic bases of the different forms of hearing loss that you have investigated in a Nepalese community. In addition, your fellow team-members will also be asked to rate your participation in the team-based work through a process of peer review. You may gain an additional 1-point from a positive peer review.
- **Case Study 3 is worth 10% of your final grade.** Your team will prepare a report for the Global Health Organization. You may gain an additional 1-point from peer review. (BIOL 200, Jan. 2008)

In addition to the WebCT Vista Assignment Drop Box, Turnitin is employed for the improvement of student writing for the final reports of the case studies; Students are expected to submit their reports through Turnitin before they submit their final reports to the Assignment Dropbox. The main objective of using Turnitin in this course is to help students avoid committing plagiarism. The instructor allows students to rewrite their reports if any plagiarism is found and submit their updated report to the Assignment Drop Box. In this course, Turnitin is used as an educational guide.

*Lessons Learned.* One of the drawbacks of the case studies is in students' unequal participation in the group work. Even though each member's contribution to their case studies is expected, some students demonstrated perfunctory and procrastinated participation in their group work. The problems stem from various reasons such as the heavy workloads for the course

activities, language problems as a non-native speaker, being disoriented in problem-solving skills, etc. However, most of the student feedback on the case studies is generally positive, and focuses on how their research skills have improved, how group work has helped them to share and articulate information with peers, and how from the instructor's regular feedback and stimulated interest by the topics the case studies has engaged them more in the discussions. The following comments are cited from evaluations of the course taught in September 2010.

*Case study 2 was a lot more interesting and researching the topic of interest helped tie in the fundamentals of cell biology. (Student A)*

*Unexpectedly, this Distance Education course turned out to be as good or better than the regular classroom course! Because of the relatively small group size, we had an opportunity for more discussion, group work and regular feedback from Dr. Berger. Excellent set of activities and practice problems, and an interesting approach to learning! (Student B)*

The frequent and thorough feedback from the instructor to the discussion forum and to student assignments has contributed to the course successful and to meaningful learning. Reflecting on the development process of the course and case studies as an instructional designer, it is clear that no matter how well we design activities or assessments, the success of a course cannot be achieved unless the course instructor implements them successfully. However, the instructor did note that offering this volume of feedback and encouragement for their case studies was overwhelming in terms of workload.

#### Case 4: The Design Wiki; assessing collaborative writing in the context of a multi-year community knowledge-building project

ETEC510: Design of Technology Supported Learning Environments is a graduate level course within UBC's online Masters of Educational Technology (MET). ETEC510 is a core course and each year between approximately 100 students take the course: 75% in-service teachers in the primary or secondary level; 25% higher educators and workers in government and corporate training contexts. A key learning outcome is for students to "[d]evelop skills in the design of educational media, and the integration of design thinking with scholarship in education." (ETEC510, 2011) This case will focus on an individual or paired activity called Design Wiki worth 20% of student final mark, where students collaborate on an extensive community knowledge base.

*Rationale.* The rationale for the Design Wiki assignment activity is to provide a space where all ETEC510 students will engage actively over the duration of one semester, with the twin goals of learning and communication in a publication medium that affords editing, linking, and dialogue as persistent and critical elements in the production of useful knowledge (Scardamalia & Bereiter, 1994). Alongside the course materials created by the course authors (Mary Bryson and Jeff Miller), the Design Wiki materials are a resource that is many times larger than the original course, and students express a strong sense of ownership and responsibility for the material that they have authored, edited and curated year to year. By running this activity outside of the WebCT Vista, we can extend student work beyond the duration of a course as well as provide public access to this growing educational knowledge base developed by MET students, (ETEC510 Design Wiki site. <http://sites.wiki.ubc.ca/etec510/>)

For the Design Wiki assignment, we chose to use Mediawiki because it is open source software that may be of use for cash-strapped school districts. It is worth noting that students have regularly gone on to transfer this collaborative knowledge-building approach into their own classrooms, often within days of starting the activity.

*Assessment strategies.* The assessment criteria for the Design wiki were designed to encourage students to engage in collaborative knowledge building with their peers. Students are asked to consider the contribution they are making to the Design Wiki as well as the quality of their writing. For new entries, students are assessed on three main components; is it a meaningful contribution to the Design Wiki, is it educationally significant, and does it provide a

unique critical perspective. Students are also assessed on the nature of the resources they contribute; are they diverse, useful and connected to the topic. Finally, students are assessed on the quality of their writing in terms of the Wikipedia format we ask them to use, as well as for clarity and for proper documentation. For revisions of existing entries, students are assessed in a similar fashion on the focus and resources of the entry, but they are assessed on a rationale they write to justify their revisions. Many of these rationales are now attached to secondary pages (discussion pages) that are created alongside the main page for an article in MediaWiki. These sub-textual pages make it possible for readers to see both the top-level article and the messy process of knowledge creation.

One of the most important tools within the wiki for instructors is the history page that tracks the revision history of an article. By looking at and comparing versions, it is easy to identify student edits as well as to assess the amount of time students have put into the authoring or editing. The history page, along with the discussion page for each article provides context relating to the writing process. They also provide students with a means to contribute their own responses to the work developed by their peers. It has been interesting to see that students end up receiving feedback from their peers, even though we don't mandate that students provide such feedback to one another.

*Lessons Learned.* The growth of the Design wiki has created challenges relating to the structure of the activity and our assessment approach. Starting from a state of *tabula rasa* in the first year, the Design wiki has grown enormously and in 2011 has over 230 topics, some of which have been edited and revised multiple times by close to 500 students who have taken the course in the last 5 years. The activity has been revised and expanded several times moving from a focus on the creation of new entries, to revision of existing entries, to revision of the overall organizational structure of the Design Wiki. Students engage with the Design Wiki as authors and editors, and students now often curate areas of the Design wiki so as to build coherence, look for overlap between entries and to look for opportunities to improve the quality of this peer-authored, collaborative knowledge base

The Design wiki has also students and instructors to consider the nature of writing in a shared space where it is possible for one student to make edits and revisions to another student's work. Writing in shared spaces can create tensions between students, particularly if they feel that their work has been overwritten or changed. At the same time, the negotiation of what ends up on the main page of the entry, and the process by which revisions come about, leads to critically engaged and engaging conversations both within the Design Wiki and in the discussions that are posted to WebCT Vista by the students. Perhaps most importantly, the experience of negotiating writing in this community site has an impact on how these students, who are themselves teachers, design similar interactions for their own students.

## **Discussion and Conclusion**

We have seen in the cases presented that clearly articulated assessment strategies are vital to the effective design of online courses and programs. The peer assessment case demonstrates a program-level solution to the need for providing a tool that assesses professional skills in group-level and individual-level performance within an online context. The virtual patient case illustrates how low-tech resources used within a phased set of "rounds" help students to engage in authentic practice. The design of extended case studies in the problem-solving case in Biology shows how an iterative process model for problem solving supported by discussion and feedback contributes to an effective online learning experience for students. And finally, the Design Wiki case illustrates how an open-source environment designed for the purpose of encouraging collaborative learning within a well-specified assessment strategy leads to a persistent shared workspace that has a life beyond a single course.

While some argue (Norton, 2004) that making assessment criteria more explicit in higher education may have a deleterious effect on students' learning, our design practice demonstrates that establishing meaningful learning activities aligned to course objectives as a purposeful and

iterative collaborative process of working with instructors from initial design through to delivery and evaluation is an effective design practice.

We can see the beginnings of an emergent framework, with some early constructs becoming evident within and between the different cases. For example, the discipline-specific practices and teaching approaches must be well understood in order to develop a rationale for assessment strategy development. Two of our cases deal with systematic diagnostic problem solving and use both generic and discipline-specific models in their assessment strategies. Another construct evident in each of the cases is the affordances of technologies and tools that can be used and customized to meet the purpose for online assessment. The design wiki tools in particular provide tracking and revision histories that afford visibility of individual contributions in the collaborative learning process. These constructs are just initial examples of our early inductive analysis process towards developing an online assessment framework.

We are pursuing several research activities. As we have discussed above, we are capturing the common elements within and between the cases in order to develop a framework that designers can use to guide the design of online assessment strategies. We are also planning to gather both quantitative and qualitative data that will help us to have a more comprehensive view of the online learning environments and the experiences of the students and the instructors as a way of improving our practice and in considering new models of assessment. The process of articulating and sharing our design practice has had a positive impact on our teams' awareness of the critical role of online assessment design in our work.

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