Using Informatics to Create a New Triangular Array of e-Assessment Tools through an International Synergy between Education and Business

Gary R Tucker
ACU Online, Abilene Christian University
Abilene, TX 79699, United States

and

Tina Powers
ACU Online, Abilene Christian University
Abilene, TX 79699, United States

and

Scott E Hamm
ACU Online, Abilene Christian University
Abilene, TX 79699, United States

Abstract: The increased power of the Internet, advances in authoring software, and the availability of sophisticated content management systems (CMS) have enabled instructional designers, educators, and teachers, to create flexible learning environments that use advanced pedagogies based on active learning, collaboration, multiple perspectives and knowledge building. As the new learning environments gain ground instruction there is an increased emphasis in what is called "authentic assessment." Due to the difficulty with translating authentic assessment into grades faculty are not being provided the information technology support systems that they need. This is a report on three assessment tools developed to address this need that came about due to the synergy of an international partnership.

Keywords: E-Assessment, Rubric, Online Team Evaluation, E-portfolio

Introduction

Traditional face-to-face learning environments are associated with instruction that takes the form of a directed approach in which the teacher using methods grounded in behavioral and early cognitive learning theory, is the expert, the main deliverer of knowledge, and the sole assessor of student learning (Hannafin, Hill & Land 1997; Kearsley, 2000; Dabagh & Bannan-Ritland, 2005). The increased power of the Internet, advances in authoring software, and the availability of sophisticated content management systems (CMS) have enabled instructional designers, educators, and teachers, to create flexible learning environments that use advanced pedagogies based on active learning, collaboration, multiple perspectives and knowledge building (Harasim, 1999; Dabagh & Bannan-Ritland, 2005). For sake of simplicity these flexible electronic empowered learning environments will be referred to as e-learning.

In the traditional learning environment measurement of learning through objective tests is standard practice. As the new e-learning environments gain ground without a concomitant change in assessment practices, instruction and assessment will become separate and ill-matched (Penderson and Williams, 2004). Due to this pressure there is an increased emphasis in what is called "authentic assessment." Authentic assessment examines what students do in terms of the types of tasks or performances for which instruction is designed. In other words, students are assessed on the way they perform the tasks they engage in and the artifacts they create as a natural part of their work. The integration of authentic assessment into learning environments is creating challenges to the grading process.

Assessment and grading are usually so closely linked that they are often considered synonymous, but there are important distinctions between the two. Assessment focuses on judgments of the quality of student work as it demonstrates mastery of defined learning outcomes. Assessment provides feedback to learners in areas of strength and weakness and provides insights into the effectiveness of given approaches. Grading is the translating of these assessments into letters or numbers that quantify or summarize students' performance (Penderson & Williams, 2004). The difficulty with translating authentic assessment into grades has created a perception by some faculty that they are being bombarded with assessment tasks that require them to provide time consuming feedback but are not being provided the information technology support systems that they need (Follendore, 2006). The escalation of e-learning and the need for the broadening of authentic assessment tasks requiring instructor feedback as well as the call from faculty for support systems have created a demand for improved e-assessment tools.

Creating the Partnerships

Abilene Christian University (ACU) is an independent, private institution of approximately 4700 undergraduate residential students. In the mid-1990s the decision was made that the future of ACU would be in the residential experience and that there would be neither online courses nor programs. In 2002, ACU found itself in a financial downturn. A strategic planning committee composed of faculty, staff, students and top administrators was organized to brainstorm possible solutions. One of the recommendations from this committee was to move into online education. In 2003, an online initiative began with specific undergraduate courses. This beginning venture was exceptionally successful. With this success, the decision was made to move aggressively into online graduate distance education program. In 2005, a Director of Distance Education was appointed, and resources were budgeted and placed under the supervision of an Associate Provost. Two online graduate degrees were launched in the fall of 2006, with 64 students enrolled. A second cohort was launched in the fall of 2007 with 77 new students enrolled.

The success of the initial phase of the online graduate program placed incredible demands on the IT and student support infrastructure. To make sure the undergraduate residential face-to-face programs would not be compromised, in October of 2007, ACU became a knowledge partner with Embanet, a Canadian for-profit company. The partnership is based on revenue sharing, with Embanet providing all upfront costs for marketing, course development, hosting, and 24/7 student support and ACU retaining all academic control. ACU faculty, under the guidance of ACU's Department of Distance Education, develops all courses. This innovative partnership allowed ACU and Embanet to move aggressively into creating modern sophisticated e-learning environments using advanced pedagogies based on active learning, collaboration, and knowledge building.

Faculty experienced difficulty translating authentic assessment into grades and their concerns about feeling bombarded with assessment tasks that require them to provide time consuming feedback with little or no information technology support systems as identified by Follendore (2006) became very real. To address this need ACU and Embanet partnered with UVCMS, a commercial designer and developer of distance learning solutions in Buenos Aires, Argentina, to develop an array of e-learning assessment tools. This is a report on three e-assessment tools collaboratively developed for integration into the open-source CMS Moodle that came about due to the synergy of this international partnership

The 360 Degree E-Assessment Tool

The formation of learning communities in online courses is an important component of achieving learning outcomes; however it does present new assessment challenges. One of the main instructional design techniques in facilitating the formation of learning communities is the use of collaboration. The main objective of collaborative learning is for learners to work together in teams and share knowledge, yet still stand as individuals. In a collaborative learning environment, peers often have the best perspective on whether their teammates are providing valuable contributions. Therefore, learning environments that encourage collaborative activities should incorporate self and peer evaluations as well as instructor feedback (Conrad & Donaldson, 2004). The key to effective evaluation of collaborative learning is feedback. To effectively

assess the outcome of the learning environment, team work assessment and individual evaluation must all work together within the course design (Belfer and Wakkary, 2005). In the design of our online courses we use collaborative learning environments extensively.

Feedback from our instructors confirmed that we were overwhelming them due to the complexity of the collaborative assessment. Prior to the development of the automated team assessment tool, students completed an assessment (a word form) for themselves and their team members' performance on the collaborative project. The students emailed the completed forms to the instructor. The instructor collected the forms, opened each one, manually compiled and averaged the team and individual scores, provided feedback to each student, and posted the assignment grade for each individual team member to the Moodle (CMS) gradebook. Instructors were not being provided the information technology support systems they needed to make that process efficient. This feedback initiated the partnership between ACU Online, Embanet and UVCMS to develop a user-friendly automated assessment tool to support the assessment of collaborative team based learning. ACU Online provided the academic support, Embanet provided the financial support, and UVCMS provided the programming support. The tool was named the 360 degree assessment because of its "full circle" nature. At the beginning of the team collaborative project, the students are given a copy of the evaluation rubric to be used in the assessment. When the team project has been completed, the team members complete the 360 degree assessment.

The 360 contains three evaluation rubrics. One rubric allows students to self-assess, the second allows a team member to anonymously assess teammates, and the third allows the instructor to assess the team product. When the group has finished an assignment and submits the collaborative product, the team members submit a personal evaluation and an evaluation for each of their teammates. The instructor finishes the 360 process by reviewing the students' assessments and grading the collaborative product. The system will then calculate the student grade and update the gradebook. An email is generated and sent to each team member with a table that shows their evaluation, the average of their team members' evaluations with anonymous feedback, the instructor's evaluation with feedback and the total score. The system also allows the instructor to attach a document if they want to include the original submission with embedded feedback.

The instructional designer can build and customize any rubric within the 360 to fit the needs of each assignment. When the personal, team member, or instructor rubric is selected a window is provided that allows the designer to edit, delete or add new criteria as well as adjust point values. (Figure 1)

When the 360 is customized for an assignment it is embedded in Moodle as a link. Initially, the student opens the link to the Personal Rubric, responds to the self evaluation questions and justifies each response. (Figure 2)

Next, the student opens the link to the Team Member Rubric which reveals each team member's name. Student then selects a name and evaluates each team member. (Figure 3)

The system will notify the instructor when all students have submitted their evaluations. The systems also provides an instructor a visual where they can quickly determine who has or has not submitted evaluations. The next step in the process is the instructor review of all personal and team member

evaluations. The instructor can override any student assessment of a teammate and edit any comments. The system archives the student's original evaluation for record keeping.

Figure 1: Administrative View of the 360 Degree Evaluation (allows designers to customize rubrics for an assignment)
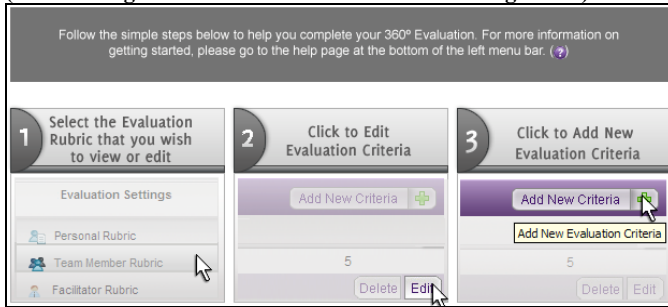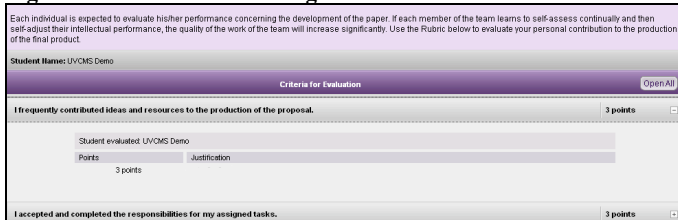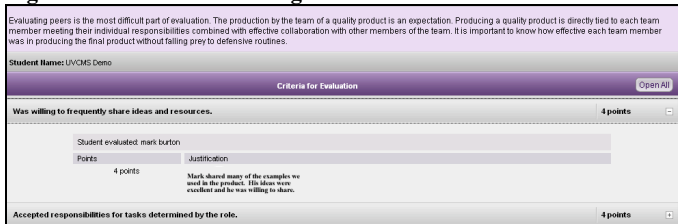

Figure 2: Personal Rubric Page

Figure 3: Team Member Page

The instructor assessment of the product begins by selecting the Instructor Rubric. The instructor is presented with a window that shows the criteria, along with a drop down menu to assign points and comment area. (See Figure 4) After completing the evaluation, the instructor selects 'Submit to Grade book.' The system averages the team evaluations. This averaged score is automatically added to the personal and the instructor evaluation and uploaded to the grade book.

Figure 4: Instructor Assessment Page
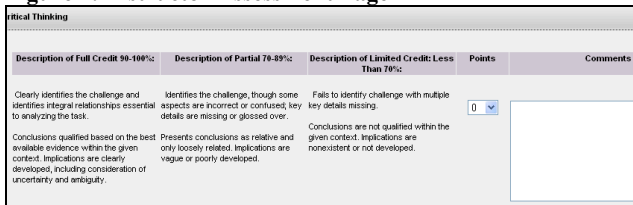
The 360 was integrated into all courses beginning fall, 2008.

The Instructor Only Assessment

The success of the partnership in developing the 360 initiated the development of the Instructor Only Assessment (IOA). The majority of the student assessments used in our online courses use criterion-referenced measures. In this type of authentic assessment a student achieving a learning outcome is determined by matching the student's performance against a set

of criteria. To measure student performance against a pre-determined set of criteria, a rubric, or scoring scale, is typically created which contains the essential criteria for the task and appropriate levels of performance for each criterion.

Due to the fact that rubrics are criterion-referenced measures for specific learning outcomes they must be customized for each assignment. The success of a rubric is directly related to how well it is adapted to a specific outcome. The desire is to use information systems to help reduce the workload on course designers in creating specific rubrics for assignments. After the rubric has been created the goal was to use the design of the instructor's assessment in the 360 to allow the instructor to use the rubric, enter feedback and submit the grade to the gradebook. This would then generate an email to the student providing the rubric with the score and feedback. The system also allows the instructor to attach a document with feedback embedded.

The IOA is supported by a rubric repository. When rubrics are generated there are many criterions that may be reused or modified slightly to meet the new outcome. The IOA allows the designer to create a new rubric or to select a rubric from the repository and make the changes necessary. When the rubric has been created it is assigned to the IOA. (See Figure5)

When a rubric is selected from the repository it the designer has the ability to edit existing criteria, add new criteria and manage mastery levels. The rubric can be renamed and saved in the repository for future use or be deleted. (See Figure 6) When the customized rubric is complete it can be placed into Moodle with a single click.

The instructor assessment of the product begins by selecting the IOA for an assignment. The instructor is presented with a window that shows the criteria, along with a drop down menu to assign points and comment area. The system allows the instructor to attach the assignment where they have embedded feedback. After completing the evaluation, the instructor selects 'Submit to Gradebook.' The system generates an email to the student and the instructor. The scoring rubric is included in the email with the assigned points and feedback. The grade is automatically entered into the gradebook.

The E-Portfolio

For many years now, online education is used a variety of student-centered learning methodologies to enhance student learning (Norte, 2005; DeBoer, 2002; Scott & Buchanan, 1998). Unfortunately, many online designers who incorporate these approaches often use assessment methods designed for traditional teaching. To be considered student-centered, the assessment technique should directly involve students in examining their own cognitive development (Pedersen & Liu, 2003). An electronic portfolio (e-portfolio) system is a solution because it places students at the center of demonstrating mastery of learning outcomes. There are many e-portfolio systems available but none meet the needs of our programs.

To meet our needs an e-portfolio system would need to encompass five features: storage across the entire program, provide information management through matrices to facilitate students and instructors, provide connections between courses, programs and practicum experiences, smooth the process of

student-centered assessment, and facilitate communication of mastery of program outcomes.

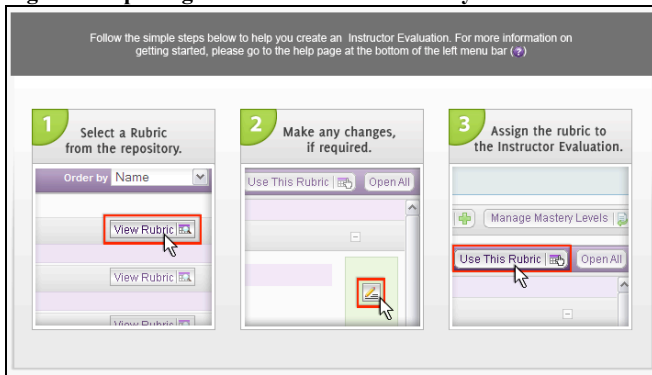**Figure 5: Opening Screen for Instructor Only Assessment**

Figure 6: Change Screen(to customize and insert rubrics into the course)
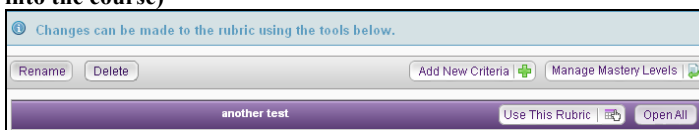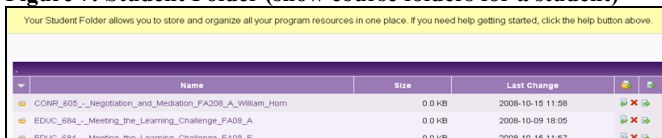

Figure 7: Student Folder (show course folders for a student)

Storage: The Student Folder

The Student Folder is a secure, designated storage space which the student has access throughout their program. When a student is enrolled in a course the system creates a course folder. Students can create sub-folders, upload, delete or move items. (See Figure 7) Students are encouraged to save all their work in the student folder. An item must be in the Student Folder before it can be uploaded into the Course Matrix.

Information Management Through Matrices: The Course Matrix

The Course Matrix is a graphic representation of the student's e-portfolio in which they demonstrate mastery of the learning outcome(s) of a course. At the administrative level the matrix may be customized for any program and any number of learning outcomes both at the course level and the practicum level. (See Figure 8) The system also allows the administrator to create the assessment rubrics for each outcome. (See Figure 9)

At the completion of a course, the student is required to look back over all of their work and select an example (artifact) that they believe shows mastery of the course learning outcome(s). The student must upload a reflection paper to accompany the artifact. In the paper the student must demonstrate full knowledge and understanding of the learning outcome through the process of illuminating how the artifact demonstrates mastery. It is the reflection process that is critical to the student-centered learning.

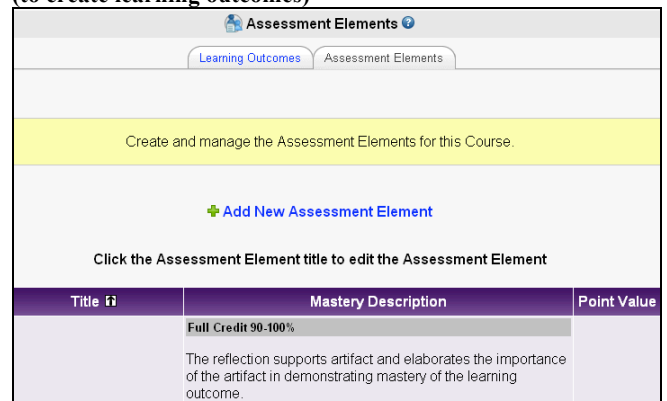**Figure 8: Administrative Screen 1 of E-Portfolio (to create learning outcomes)**

Figure 9: Administrative Screen 2 of E-Portfolio (to create assessment elements for learning outcomes)
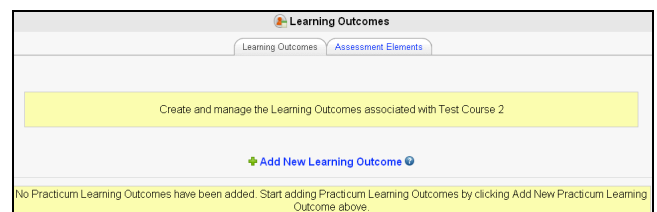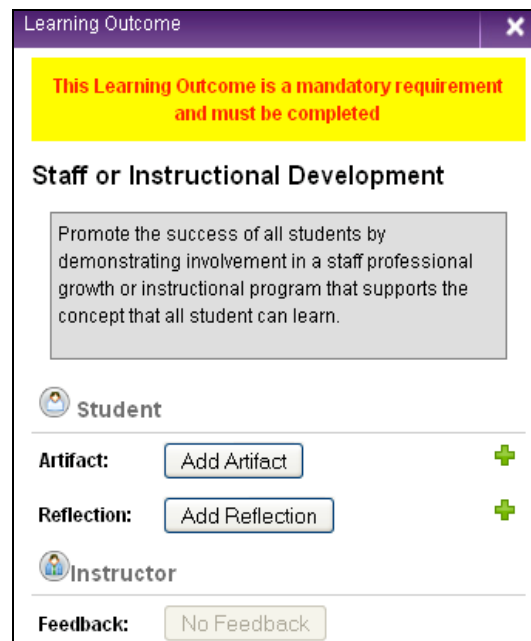

Figure 10: Student Submission and Instructor Feedback Page

The student uploads the artifact or reflection by selecting the button in the matrix. This provides a screen that presents the learning outcome to the student, provides buttons to upload either the artifact or the reflection. If instructor feedback has been submitted the student can view that feedback from this screen (See Figure 10).

The matrix indicates what has been uploaded by changing color and title. (See Figure 11) An instructor can quickly determine if their students have submitted an artifact and/or a reflection through the visual communication of the matrix. The system also sends an email to the instructor when an item has been

uploaded. It also sends an email to the student when the instructor as uploaded an assessment.

The reflection paper rubric provides criteria for the artifact and reflection paper. The instructor downloads the artifact and reflection paper for review. When the instructor is ready to submit an assessment they go to the grading screen which includes rubric criteria, grade points, and a feedback area. (See Figure 12) When the instructor submits their assessment, an email is sent to the student, the instructor and any other designated individuals. The email shows the rubric scores and instructor feedback. The instructor can lock or unlock the matrix for a student at anytime.

Information Management Through Matrices: The Practicum Matrix

The Practicum Matrix is based on the same graphical design principles as the Course Matrix using a design engine that allows the administrator to customize the matrix based on the types of work related or practical experiences required. This Matrix has a section for requirements and learning outcomes. (See Figure 13) A program may have requirements that must be completed before a student begins their practicum experiences. Any number of experiences can be added. Under each experience there can be an array of activities. The administrator can make activities mandatory in which case the cell will have a red outline.   If an activity is optional then no red outline appears. (See Figure 13)

Students are required to submit an artifact and a reflection as they did in the Course Matrix. (See Figures 10 & 11) The Matrix uses a color code and creates a visible Key which tracks submissions Instructors who have to supervise large numbers of students in practicum experiences the matrix allows them to visually quickly assess what has/has not been submitted. Just like the course matrix when the instructor submits their assessment, an email is sent to the student. The email shows the rubric scores and instructor feedback. The instructor can lock or unlock any area of the practicum matrix for a student at anytime.

Figure 11: Instructor View of Course Matrix

Figure 12: Instructor View of an Assessment Rubric for Course Matrix

Connections between Courses: Capstone Area

The Capstone Area is where students make connections between courses by demonstrating mastery of their program learning outcomes. In the Capstone Area students use a built-in graphical editor to create a web-based presentation called an Exhibition. The students can creatively assemble items from their Course Matrix, Practicum Matrix or Student Folder. (See Figure 14)   When items are added from either the Course Matrix or the Practicum Matrix, the Artifact and the Reflection are uploaded as a single file.

Figure 13: Practicum Matrix Showing Requirements and Learning Outcomes

Figure 14: The Selection Tool in the Capstone Area

Figure 15: Instructions on How to Build a Capstone Exhibition.

Communication of Mastery of Program Outcomes: The Exhibition

Using the graphical editor students create an Exhibition demonstrating their creativity by selecting products created in their programs, artifacts with their reflections from courses and practicum, and any other type of digital item to demonstrate that they have mastered the program outcomes. The Exhibition is not accessible to the public.   It is made available to the student's instructor(s) when the Exhibition is published and the system emails an URL. (See Figure 15) Much like an oral

defense the student then must schedule a presentation date with his instructor. On that date the students demonstrates mastery of the program outcomes by going through the published Exhibition with their instructor.

Career Folder

The Career Folder is another feature of the e-portfolio. It works exactly like the Capstone Area and allows students to creatively assemble items from their Course Matrix, Practicum Matrix or Student Folder to create a Web-based résumé. The student can share their résumé with potential employers. The résumé may be deleted or updated at any time. Multiple résumés, each with its own unique URL, can exist at any given time.

Conclusion

The partnership between ACU Online and Embanet is committed to providing all our students the highest quality online education available. Incorporating the Internet, modern sophisticated authoring software, and the open source CMS Moodle our instructional designers, educators, and teachers are creating flexible learning environments using advanced pedagogies based on active learning, collaboration, multiple perspectives and knowledge building. No learning environment is successful even with the best design if the instructors are not empowered. Much of that success is dependent on authentic assessment. Hearing our faculty with their legitimate struggle of feeling overwhelmed with assessment tasks that require them to provide time consuming feedback a full scale development project was implemented by bringing UVCMS into the partnership. Through this collaborative partnership the array of e-learning assessment tools were designed, tested and implemented. The triangular array of assessment tools offer opportunities for diverse assessment tasks and increase assessment options. Additionally, these tools provide an efficient method for feedback. The automated assessment tools decrease time consuming tasks for students and instructors. Higher education institutions can archive accreditation evidence. Students are provided with a centralized electronic storage area for coursework. The e-portfolio system and the 360 Degree Assessment were implemented in ACU Online programs in the Fall of 2008. The Instructor Only Assessment will be integrated in to all courses in Spring 2009. Our initial use of these tools has shown them to be successful for student, instructor, and institutional purposes. We are in the process of gathering data on the tools and in future papers give a more detailed analysis of their effectiveness.

References

Belfer, K. & Wakkary, R. (2005). Team assessment guidelines: A case study of collaborative learning in design. In *Assessing online learning.* P. Comeaux, editor. Bolton, MA: Anker Publishing.

Conrad, R. & Donaldson, J.A. (2004). *Engaging the online learner: Activities and resources for creative instruction.* San Francisco: Jossey-Bass.

Dabbagh, N. & Bannan-Ritland, B. (2005). *Online learning: Concepts, strategies, and applications.* Upper Saddle River, NJ: Pearson.

DeBoer, G. E. (2002). Student-centered teaching in a standards-based world: Finding a sensible balance. *Science & Education, 11*, 405-417.

Follendore, R. (2006). *The problem with rubrics.* Retrieved November 10, 2008, from http://noisetoknowledge.com/the_problem_with_rubrics.htm.

Hannafin, K.M., Hill, J.R. & Land, S.M. (1997). Student-centered learning and interactive multimedia: Status, issues, and implication. *Contemporary Education*, 68(2), 94-99.

Harasim, L. (1999). A framework for online learning: The Virtual-U. *IEEE Computer,* 32(9) 44-49.

Kearley, G. (2000). *Foundations of distance education.* New York: Routledge.

Norte, M. B. (2005). Self-access study and cooperative foreign language learning through computers. *Linguagem & Ensino, 8*, 145-169.

Pedersen, S., & Liu, M. (2003). Teachers' beliefs about issues in the implementation of a student-centered learning environment. *Educational Technology Research & Development, 51*(2), 57-76.

Pendersen, S. & Williams, D. (2004). A comparison of assessment practices and their effects on learning and motivation in a student-centered learning environment. *Journal of Educational Multimedia and Hypermedia.* 13(3), 283-306.

Scott, J., & Buchanan, B. (1998). *Student centered learning in a large, first year management class: History, reflections, and future directions. VITAL Event Day University of Waikato* (177-200). Hamilton, New Zealand