CRITICAL THINKING IN THE WORKPLACE: A COURSE DESIGN AND IMPLEMENTATION

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INTRODUCTION

In May 2010 Waterloo Engineering embarked on the development of a 2nd generation online professional skills development program, WatPD-Engineering. Like its predecessor, PDEng, the program is composed of five online courses taken by Waterloo Engineering students while they are on work terms. These courses focus on providing background knowledge underpinning professional skills such as communication, project management, problem solving, conflict resolution, and teamwork and connect this background knowledge to the application of the skills in the workplace. Students take one course per work term until they have met the professional skills component of their degree requirements. Each course is expected to take a total time commitment of 20 to 30 hours over a 10 week period and students work on the courses outside of work hours.

The WatPD-Engineering program consists of two core courses: PD 20 Engineering Workplace Skills 1 – Developing Reasoned Conclusions, and PD 21 Engineering Workplace Skills 2 – Developing Effective Plans, followed by three elective courses from the WatPD suite of elective courses: PD 3 Communication, PD 4 Teamwork, PD 5 Project Management, PD 6 Problem Solving, and PD 7 Conflict Resolution. While the WatPD elective courses have existed for three to four years and been offered to students from UWaterloo's non-engineering faculties, the two core courses, PD 20 and PD 21, had to be developed for the new program.

In essence PD 20 is a course on critical thinking in the workplace. In particular the objective of the course is to help engineering students that are new to the professional workplace make objective observations on all aspects of their workplace activity, draw logical conclusions from their observations, and communicate their findings to both lay and technical audiences.

This presentation describes the development of PD 20 from the initial vision formulation in May 2010 to its first offering in Winter 2011.

COURSE DEVELOPMENT PHASES

The development process followed the traditional engineering design and development process. There was an initial request for proposals, a selection of an instructional development team, a preliminary course design review, a final course design review, design testing with a student focus group, quality assurance testing by students and staff, the final version release, and continuous learning outcome assessment.

The initial request for proposals had a format very similar to that used in many engineering specification or requirement documents. Included in the request for proposals was a description of the intended course with suggested topics, a specification of the intended audience, a listing of both required and desirable course features, and a specification of the required expertise of the course content development team.

Two proposals were submitted for consideration. After a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of both proposals, the proposal submitted by a course content development team from the Philosophy Department was accepted.

In short order the development team was asked to give a presentation on their preliminary course design. This presentation included intended course outcomes, a weekly breakdown of course topics, presentation media and typical learning activities, sample assessments, and a rough prototype of an online weekly module. This presentation was reviewed by a panel of over 30 participants including faculty, students, online course developers, alumni, and coop employers, and the project team comprised of an online learning consultant (and project manager), an engineering advisor, and online developers. This review provided the development team with feedback on the level of the course topics, expectations for students, and on assessment methods.

Six weeks later the development team gave a second presentation where the finalized course design was presented to the review panel. The implementation phase and development of specific content components of the course took approximately three months. During the later portion of the development phase quality assurance testing was begun. The quality assurance testing included a high school student focus group study of one course module, internal consistency testing by the online developers, and pre-release testing by student and staff volunteers.

ILLUSTRATIVE COURSE FEATURES

Two of the key course development challenges were to ensure that students could make the most their learning time while in the online environment and that engineering students would find the presentation by the philosophy instructors relevant to their experiences in the engineering workplace. The first challenge was addressed by using a weekly page design that clearly indicated the desired learning outcomes for the week and itemized the expected learning tasks and activities. The primary media for delivery of the course content was narrated slides but media for audio only, slides only, and transcripts were also provided. Typical assessments included weekly quizzes with multiple choice and short answer questions and bi-weekly critical reflection written assignments (typically requiring one page of writing).

The second challenge was addressed by including a ten minute video presentation by a Waterloo Engineering alumni speaking on a relevant experience or situation from either their co-op work term or early post-graduation experience. These presentations provided a high degree of authenticity to the weekly course content.

INITIAL FEEDBACK AND DISCUSSION

The course was offered for the first time in the Winter 2011 term. Presently analysis of the student learning and reaction to the course is underway. An initial indication of the level of student engagement and learning in the course is that the course average was 78% which is significantly above the minimum grade of 60% required to earn a credit in the course (the course grade is reported on student transcripts as either credit or non-credit). Student participation in the course exit survey was over 90% and two thirds of the survey respondents provided written comments. On a five point scale (5 high and 1 low) the overall student evaluation of the course was 3.97. On a similar five point scale (5 often and 1 never) students reported finding connections in their workplaces to the course topics at 3.75.

While further follow-up is required to establish the long term effectiveness of the course, initial indications are that the course is highly successful. Using the traditional engineering design and development process enabled this success in spite of the compressed time available for course design and implementation.

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