Linking online course design and implementation to learning outcomes: A design experiment

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ABSTRACT

This paper reports on preliminary findings from ongoing design-based research being conducted in the fully online Master of Arts in Teacher Leadership (MTL) program at a small, Midwest public university. Researchers are using the Quality Matters (QM) and Community of Inquiry (CoI) frameworks to guide the iterative redesign of core courses in the program. Preliminary results from the redesign of one course suggest that such approach can improve student learning outcomes. Results also support the efficacy of the QM and CoI theoretical frames, and the usefulness of design-based approaches in online learning.

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1. Introduction

Design-based research blends empirical research with the theory-based design of learning environments. It centers on the systematic investigation of innovations designed to improve educational practice through an iterative process of design, development, implementation and analysis in real-world settings (Wang & Hannafin, 2005). Design-based research helps us understand "how, when, and why educational innovations work in practice" (Design-Based Research Collective, 2003, p. 5), because the innovations it explores are grounded in educational theory.

The research reported in this paper did not start out to be design-based. It was originally conceived as a study exploring the effects of revising an online course based on the Quality Matters framework. When results confounded our original assumptions, it became an ongoing design experiment centered on ongoing course redesign to enhance student learning. In the sections which follow, we explore the two theoretical frameworks that guided our study, and then describe the course redesign process as it unfolded. We next discuss the methodology of our ongoing study and its findings, and close with reflections on its educational significance.

2. Theoretical frameworks

2.1. Quality Matters (QM)

Quality Matters is a faculty-oriented, peer review process designed to assure quality in online and blended courses. The QM review process is centered on a rubric, originally developed through a FIPSE grant to MarylandOnline, but which is continually updated. The rubric is based on instructional design principles (Quality Matters, 2005) and is organized around eight categories — course overview, learner objectives, assessment and measurement, resources and materials, learner engagement, course technology, learner support, and accessibility (see http://www.qualitymatters.com).

Within these eight categories are 40 individual standards with ratings of 1, 2 or 3. There are 17 standards with a rating of 3 points. A course must meet all of these 3 point standards plus attain a minimum score of 72 out of 85 total points to meet the QM level of course design acceptance. Three trained reviewers analyze the course site and rate each standard as existing, or not, at an 85% level or higher. In doing so, they reference a five-page QM Instructor Worksheet that provides them with information about the course that may not be immediately evident. If the reviewer believes the standard exists at the 85% level, the full point value is awarded. A standard that is not met at the 85% level gets no points.

Two of the three reviewers must rate a standard as being met for that standard to be accepted as met in the course review. A major strength of the QM process is that comments are provided by the reviewers for each standard that is not met and these comments guide the instructor during the redesign of the course. The analysis process takes from 1 to 3 h per reviewer to complete. The three reviews are combined to determine the level at which the course has been rated and those areas which are in need of revision are presented to the instructor. Changes are made to the design based upon the identified needs and a second review is performed to assure that all identified changes have been made.

Although little research to date has explored links between QM review/redesign and learning outcomes, preliminary research (Legon et al., 2007) found higher grades and greater student interaction with course materials after redesign of a large enrollment undergraduate course. Currently, over 300 colleges and universities in 44 states are

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QM subscribers, including 11 statewide systems and several large consortia.

The QM framework, however, only addresses course design, from, it should be noted, an objectives-based perspective. Seven critical standards (standards that must be met or the course will fail the review), for example, are linked to well specified course and module objectives. The QM framework does not address course implementation and/or the processes of learning.

2.2. Community of Inquiry (CoI)

The Community of Inquiry (CoI) framework (Garrison, Anderson, & Archer, 2000), on the other hand, does address learning processes. It addresses them, moreover, from a collaborative constructivist point of view. Building from the notion that social presence supports learning in the online environment, the CoI framework represents online learning as supported by three presences: social presence, teaching presence, and cognitive presence. The CoI framework, moreover, views all three as working together to support deep and meaningful inquiry and learning online (see Fig. 1). Indeed, research findings have linked social presence (Picciano, 2002; Swan & Shih, 2005), teaching presence (Shea, Li, Swan, & Pickett, 2005) and cognitive presence (Garrison & Cleveland-Innes, 2005) to each other and to such outcomes as course satisfaction, community, and perceived and actual learning.

In 2008, researchers working with the CoI framework developed a survey designed to measure student perceptions of each of these presences (Swan et al., 2008). The survey consists of 34 items (13 teaching presence, 9 social presence, and 12 cognitive presence items) that ask students to rate their agreement on a 5 point Likert scale (1 = strongly disagree; 5 = strongly agree) with statements related to the CoI framework (see Appendix A). The survey has been validated through factor analysis (Arbaugh et al., 2008) and used to further explore the CoI framework and the interactive effects of all three presences (Garrison, Cleveland-Innes, & Fung, 2010; Shea & Bidjerano, 2009) with some meaningful results. For example, researchers have linked 21% of the variance in program retention to two social presence survey items (Boston et al., 2009). It should be noted, however, that perceptions are a subjective measure, and that while very appropriate in the constructivist frame, subjective measures may not be everywhere appropriate.

Accordingly, CoI researchers have recently begun exploring ways to link it to course outcomes (Arbaugh, Bangert, & Cleveland-Innes, 2010; Boston et al., 2009). Quality Matters (QM) researchers have begun likewise investigating the relationship between course redesign and course outcomes. The research reported in this paper explores links between course design (as guided by the QM rubric), learning processes (as measured by the CoI survey), and course outcomes.
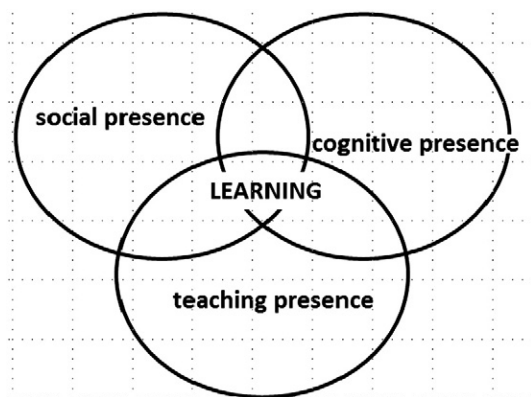
3. Course redesign

The original purpose of this study was to investigate relationships between course design, learning processes, and course outcomes. Its focus was on the review and revision of one fully online graduate course in Educational Research Methods based on the Quality Matters (QM) framework. Learning processes were measured using the Community of Inquiry (CoI) survey; outcome measures included scores on major course assessments as well as final course grades (all transformed to percent of possible scores); and all measures were compared before and after a QM review and redesign. This study was originally designed to investigate whether redesigning an online course to meet QM standards would result in improved learning processes as measured by the CoI survey, and that improved learning processes would then result in improved student performance. That is, we assumed that improved course design would result in improved learning processes which in turn would enhance student learning outcomes (see Fig. 2).

Our initial findings, however, showed an actual reduction in student perceptions of learning processes (CoI scores) but an increase in student performance (course outcomes) after the QM redesign. This led us to see what we should have known from the start — that the QM and CoI frames are really orthogonal (see Fig. 3); that is, they view learning from differing perspectives and so measure different things.

Because scores on the CoI survey went down after the QM redesign, we began exploring a second design-based notion; namely, whether iterative changes to the course based on CoI responses could actually raise those scores, and that increased CoI scores would lead to improved student performance.

We have thus been conducting design-based research involving a single graduate level online course. Initial course redesign involved the use of the QM rubric to identify areas that needed to be improved. In subsequent semesters, scores on the CoI survey were used to suggest areas needing improvement. The changes made based on the QM and CoI reviews are described in the sections which follow.

3.1. QM redesign

In the fall of 2009, three QM reviewers, including a QM expert, an instructional designer, and a faculty member in educational leadership, reviewed a version of a core Educational Research Methods course in the Masters of Teacher Leadership program. The course received a score of 58 (out of 85) and failed to meet 5 of the essential (3 point) standards, all of which had to do with learning objectives. These deficits were addressed in the Spring 2010 version of the course, which was reviewed again and received a score of 84 out of 85. Most of the changes made centered on the development of complete objectives for every unit in the course and the linking of objectives to assessments. Module objectives were given on the covers of the module folders and placed in a matrix, available to students, which gives all the module level objectives and assessments as they are related to the four overarching course goals (see Fig. 4).

3.2. CoI redesign

As previously stated, however, CoI measures of learning processes declined, especially in the area of teaching presence. Thus, small measures were taken with the intent of improving CoI ratings. For example, in the spring of 2010, items whose average scores were less than 3.75 (slightly less than "agree" (4)) were selected as indicating

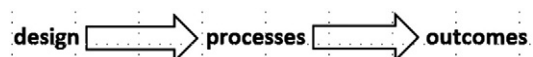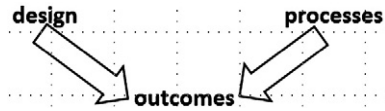**Fig. 1.** Community of Inquiry model.
Garrison et al., 2000.

Fig. 2. Initial model of effects of course design on learning outcomes.

Fig. 3. Revised model of the effects of course design and learning processes on learning outcomes.

problem areas. These problem areas seemed to be mainly focused on online discussion and collaborative group work (see Fig. 5). Revisions for the Summer 2010 version of the course thus centered on changing the grading of the discussion from counting for extra credit to counting for 16% of the course grade (to show students it was valued), and asking student groups to agree on participation expectations before they began group work (to avoid time on task issues).

Community of Inquiry scores improved considerably after the spring revisions outlined above; so much so that no items had average scores under 3.75. Some items still had scores under 4, however, including numbers 11 and 16 (identified in the spring results and not much improved by summer) and two new cognitive presence items. These problem areas still seemed focused on discussion, but not on collaborative work, and moreover seemed focused on the content of discussion (see Fig. 6). Thus, for the Fall 2010 version of Educational Research Methods, discussion questions were changed to call upon students' experience (when previously they involved specific data related problems).

In the fall 2010 semester, CoI scores again increased, with no items scores falling below a 4. Taken altogether, our data show improved performance after the QM revision and performance gains resulting from changes made in course design based on CoI findings, but

EDL 541 COURSE GOALS AND OBJECTIVES

UNITS	OBJECTIVES (Students will be able to:)	ASSESSMENT
1.	**A GENERAL UNDERSTANDING OF QUANTITATIVE AND QUALITATIVE RESEARCH METHODS**	
1	Distinguish between *types of research and research methodologies*	Unit One Quiz
1	Define *content analysis*	Unit One Quiz
1	Define *mean, median* and *mode* and give examples of when they and *percents* might be employed in descriptive studies	Unit One Quiz
1	Identify *independent and dependent variables* in experimental research	Unit One Quiz
. . .		
8	Discuss the *benefits & drawbacks of quantitative, qualitative, and mixed methods research*	Unit Eight Quiz
8	List the *steps of action research*	Unit Eight Quiz
8	Distinguish between *action research and formal research*	Unit Eight Quiz
FINAL	*Demonstrate a general understanding of qualitative and quantitative research methods*	Final Exam
2.	**THE SKILLS NEEDED TO CRITICALLY READ EDUCATIONAL RESEARCH**	
3	Critically review a research article employing content analysis.	Article Review #1
4	Critically review quantitative research	Article Review #2
5	Critically review qualitative research.	Article Review #3
6	Critically review a research article employing mixed methodologies	Article Review #4
3.	**THE ABILITY TO WRITE A RESEARCH PROPOSAL**	
2	Write a *problem statement* for a research proposal	Problem Statement Assignment
3	Develop *literature sources* for a research proposal and correctly reference them.	Literature Sources Assignment
4	Write a *literature review*.	Literature Review Assignment
5	Write a *research question*	Research Questions Assignment
6	Develop and describe the *research methodology* for a research proposal	Methodology Assignment
7	Write a complete *research proposal* in proper APA style	Research Proposal
4.	**ABILITY TO APPLY QUANTITATIVE AND QUALITATIVE TOOLS TO DECISION MAKING**	
1	Describe educational research and apply it to their own work	Unit One Discussion
2	Discuss the issues surrounding the use of children as research subjects.	Unit Two Discussion
3	Develop a research topic relevant to their own context.	Unit Three Discussion
4	Discuss the differences between and the advantages/ disadvantages of experimental and quasi-experimental research.	Unit Four Discussion
5	Describe in some detail research they could conduct.	Unit Five Discussion
6	Consider inferential statistics and how they might use them in their own work.	Unit Six Discussion
7	Consider how they might use qualitative techniques in their own research.	Unit Seven Discussion
8	Define educational research and reflect on its scope.	Unit Eight Discussion

Fig. 4. Portions of course goals and objectives matrix.

- **TP 7 (3.5)** The instructor helped to **keep course participants engaged and participating** in productive dialogue

- **TP 9 (3.3)** The instructor helped **keep the course participants on task** in a way that helped me to learn

- **TP 11 (3.7)** The instructor helped to **focus discussion on relevant issues** in a way that helped me to learn.

- **SP 14 (3.7)** **Getting to know other course participants** gave me a sense of belonging in the course.

- **SP 16 (3.7)** Online or web-based communication is an excellent medium for **social interaction**

- **CP 27 (3.5)** **Brainstorming** and finding relevant information helped me resolve content-related questions

Fig. 5. Items on the CoI survey that received average scores of less than 3.75 in the spring 2010 semester (boldface added).

significant changes only across the whole process. We think this approach — bringing a course into compliance with the QM design standards, and then iteratively "tweaking" it based on CoI ratings, holds promise, but of course this is only one course. We are now expanding the study to include all the core courses in our fully online Master of Teacher Leadership (MTL) program. In the Methodology section which follows we describe the design-based approach we are employing and provide results from trying this approach with the Educational Research Methods course.

4. Methodology

4.1. Research questions

The investigation reported in this paper used a design-based approach involving the iterative redesign of one graduate level education course based on the Quality Matters (QM) and Community of Inquiry (CoI) frameworks. Three research questions were investigated:

- Can course redesign based on meeting Quality Matters standards (QM revisions) result in improved student learning outcomes?
- Can changes in course design and implementation targeted to enhance particular Community of Inquiry scores (CoI revisions) result in increased CoI scores, and improved student learning outcomes?
- Can the combination of QM and CoI revisions over time lead to improved student learning outcomes?

4.2. Subjects and setting

Subjects were graduate students of education enrolled in a fully online graduate program in education at a small, Midwestern, public university. The researchers focused on one course in that program, Educational Research Methods, which they submitted for a QM review

- **TP 11 (3.83)** The instructor helped to **focus discussion on relevant issues** in a way that helped me to learn.

- **SP 16 (3.83)** Online or web-based communication is an excellent medium for **social interaction**

- **CP 27 (3.83)** Course activities **piqued my curiosity**

- **CP 28 (3.83)** Online discussions were valuable in helping me **appreciate different perspectives.**

Fig. 6. Items on the CoI survey that received average scores of less than 4.0 in the summer 2010 semester (boldface added).
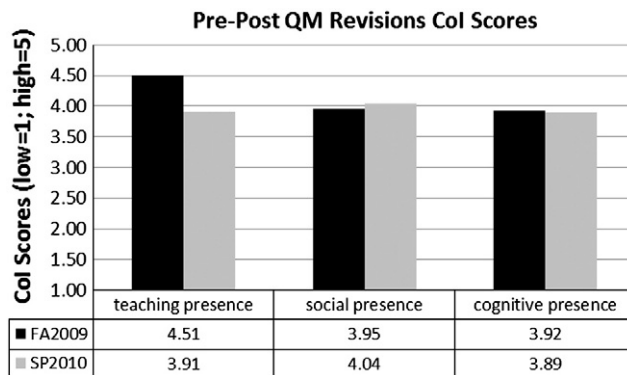

Fig. 7. Comparisons of CoI ratings between fall 2009 and spring 2010 semesters.

	teaching presence	social presence	cognitive presence
■ FA2009	4.51	3.95	3.92
▢ SP2010	3.91	4.04	3.89

in the fall of 2009 and revised for implementation in the spring 2010 semester. Educational Research Methods is a required course in the teacher leadership program, and because it is a core course, several sections, taught by multiple instructors, are offered every semester. To ensure consistency in learning outcomes, common goals, materials, and assessments are used by all instructors. Educational Research Methods had been taught online for nine years in the fall of 2009, and minor adjustments had been made to it by the multiple instructors who taught it.

In the fall of 2009, two sections of Educational Research Methods were offered. Both were submitted for QM review, which involves a collaborative assessment by three evaluators led by a QM expert reviewer. To meet QM review expectations, courses must meet all 3-point criteria and earn a total of 72/85 points or more on the entire evaluation measure. Both sections failed the QM review, mostly due to a lack of stated course objectives.

Based on the QM review, Educational Research Methods faculty began making revisions to course sections designed to address areas identified as in need of improvement. The first of these revised sections was implemented in the spring of 2010. The revisions took the section from a failing QM score of 58 to a passing score of 84. As previously stated, further changes to this single version of Educational Research Methods were made in the two semesters following the QM revisions based on CoI data.

The preliminary study reported in this paper was a design experiment which used a pre/post, quasi-experimental design. The independent variables were the QM and the CoI (iterative) revisions. The dependent variables were CoI scores and learning outcomes (as measured by overall course grades and grades for two major assignments, a research proposal and a final exam). Learning outcomes were examined semester by semester as revisions were made to the course.

	FA09	SP10
■ research prop	91	98
▢ final exam	82	87
▢ course grade	90	93

Fig. 8. Comparisons of learning outcomes between fall 2009 and spring 2010 students.
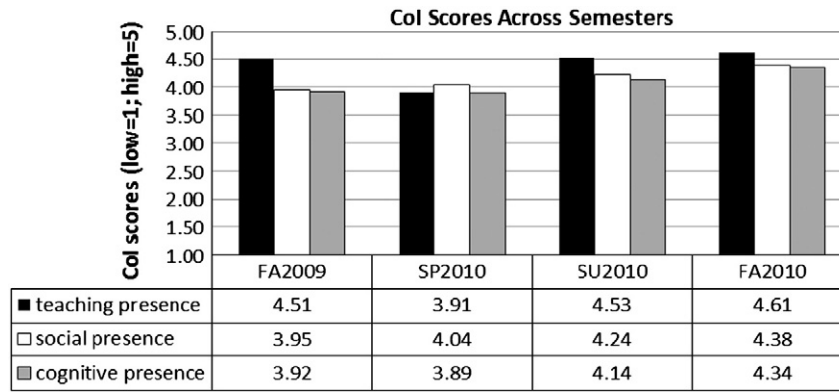
Fig. 9. Comparison of CoI scores over four semesters.

As previously stated, this is an ongoing study. We are currently exploring whether the redesign process outlined above — course redesign to meet QM standards and then iterative tweaking of design and implementation factors to raise CoI scores — can work together to improve learning outcomes in other courses, beginning with the four courses that make up our program core. At present three more courses have undergone QM review and are being revised accordingly. The same research questions will be applied to these courses and the same independent variables will be manipulated. Dependent variables will likewise include CoI scores and learning outcomes, although the latter will, of course, vary depending on the course.

4.3. Data sources and analyses

This preliminary research reported in this paper used a design-based methodology to explore the effects of course revisions on student learning outcomes. Subjects were graduate students enrolled in one section of Educational Research Methods in the fall 2009 (n = 12), spring 2010 (n = 14), summer 2010 (n = 9), and fall 2010 (n = 15) semesters. Outcome measures included scores on a written research proposal and the final exam, as well as overall course grades. The former measures represent two of the four major course goals — general understanding of quantitative and qualitative methods, and the ability to write a research proposal. Measures of the other two course goals — the skills needed to critically read educational research, and the ability to apply quantitative and qualitative tools to data-based decision making — were not included in the analyses

due to a ceiling effect. All scores were transformed to percent of total possible. In addition, CoI (learning processes) data was collected from a subset of students who volunteered to complete the survey each semester.

All students taking Educational Research Methods in the fall of 2009, before the QM review, were asked to complete the CoI survey and their course grades were collected. Six out of twelve students returned the surveys. In the spring of 2010, after the QM review and redesign, students were again asked to complete the CoI survey, and their course grades were collected. Eleven out of fourteen students returned the survey in the spring of 2010. This same section of Educational Research Methods was revised again for the summer 2010 semester when nine students took the course and six students returned the survey. In the Fall 2010 semester, after yet another small revision, grades were again collected, and twelve out of fifteen students returned the CoI survey.

All data were averaged and compared using descriptive statistics. Outcome data were compared using analysis of variance.

5. Results

Initial findings regarding the effects of the QM revisions on learning processes as measured by the CoI survey could not be investigated statistically due to the very low numbers of subjects (see Fig. 7). However, descriptive statistics show that teaching presence was rated substantially lower in the revised version of the course taught in the spring (4.51 fall; 3.91 spring). Social presence and
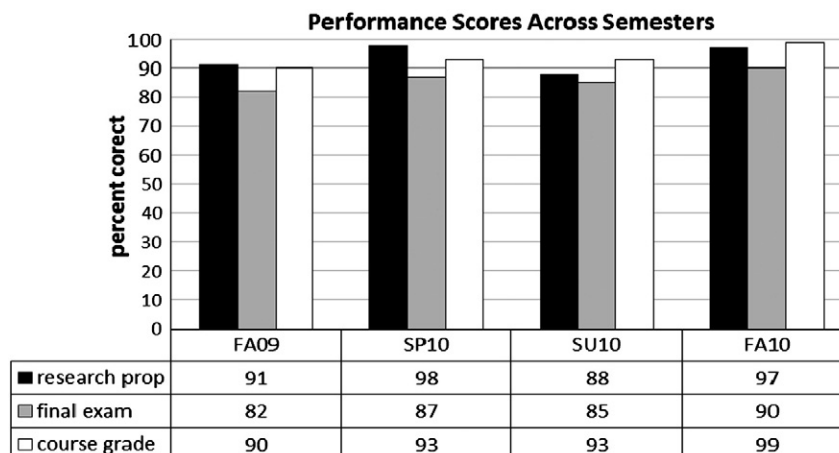

Fig. 10. Comparison of learning outcomes across four semesters.

Table 1
Analysis of variance comparing learning outcomes across semesters.

ANOVA table	Mean square	F	Sig
Research Proposal %*Semester Between Groups Within Groups Total	242.956 134.952	1.800	1.61
Final Exam %*Semester Between Groups Within Groups Total	503.526 179.503	2.805	.05
Course Grade %*Semester Between Groups Within Groups Total	191.473 30.814	6.214	.001

cognitive presences remained essentially the same in the fall and spring semesters (social presence — 3.95 fall; 4.04 spring; and cognitive presence 3.92 fall; 3.89 spring).

Partial responsibility for these results may be attributed to the fact that only half the students enrolled returned the CoI survey in the fall whereas nearly 4/5 of the students returned the survey during the spring semester. Thus, it could be that those students returning the survey in the fall were the ones who were most satisfied with the course. It could also be that the instructor was attending to QM and not CoI issues in the course revisions, and so paid less attention to teaching presence in particular during the spring implementation.

On the other hand, a comparison of learning outcomes for the fall and spring versions of the course (see Fig. 8) reveal meaningful, if not significant, increases on all three outcomes measures. Grades on the research proposal went from an average of 91% to an average of 98%, grades on the final exam went from an average of 82% to an average of 87%, and overall course grades improved from an average of 90% to an average of 93%. The findings indicate that the QM course revisions did indeed result in improved student outcomes. Arguably, student performance improved because the QM revision led instructors to focus on objectives and the mapping of objectives to assessments, which in turn led to a clearer focus in the course.

Taken together the CoI and outcomes measures suggest, as previously noted, that the QM and CoI frameworks view online learning from different perspectives, and measure different aspects of online courses. This suggestion seems quite reasonable since the QM review/revision is external, objectives-based, and rooted in course design, while the CoI survey is subjective, constructivist in nature, and rooted in course implementation. It follows, then, that both measures might be used to improve online courses. The research has thus become design-based and has proceeded in two phases:

- QM Revisions: the revision of teacher leadership core courses to meet QM course design standards and the comparison of CoI and outcome scores before and after those revisions; and
- CoI Revisions: the semester to semester "tweaking" of teacher leadership core courses based on perceived deficits highlighted in the CoI responses. In this phase, CoI data becomes a way of making sure changes made actually improved perceived presences, and outcome data is compared across semesters to test the effects of CoI improvements on student performance.

Table 2
Effect sizes for pre/post revisions learning outcomes.

	Eta	Eta Squared
Research Proposal %*Semester	.327	.107
Final Exam %*Semester	.397	.158
Course Grade %*Semester	.541	.293

As previously stated, QM revisions were centered on developing detailed objectives at the unit level and linking the objectives to assessments. This process also resulted in revisions to course lectures, study guides, and quizzes to make sure they were tightly focused on particular concepts.

Starting with revisions to the summer 2010 Educational Research Methods course, CoI revisions centered on valuing participation in course discussions and setting participation requirements for group work. In the fall of 2010, CoI revisions included changing discussion prompts to make them more relevant to participants' practice.

CoI revisions to course design and implementation actually did result in gradual improvements in students' perceptions of teaching, social, and cognitive presence from the spring of 2010 to the point where teaching presence scores were higher in the fall of 2010 than they were in the fall of 2009, and social and cognitive presence scores were a good bit higher (see Fig. 9).

Perhaps more importantly, learning outcomes also increased across the semesters (with a slight dip in the summer semester, which is understandable in that the same content is covered in eight rather than sixteen weeks). The data show that the combination of both the QM and CoI revisions across four semesters brought average scores on the research proposal from 91 to 97 and on the final exam from 82 to 90, while overall course grades went from 90 to 99 (see Fig. 10).

Moreover, analysis of variance shows these differences border on significance for the final exam scores at $p = .05$ level and are significant for overall course grades at the $p = .001$ level (see Table 1). Using Cohen's (1992) analysis of eta squared results, effect sizes of the cumulative QM/CoI revisions were small for the research proposal (.11) and the final exam (.16), but small to moderate in terms of the overall course grades (.29). Although there may be a ceiling effect operating with respect to outcome measures, if similar effects hold for other core courses, these results may be magnified by the greater numbers.

The findings suggest that revising EDL 541 around stated objectives (QM) and presence deficits identified by CoI scores resulted in better student performance, especially in terms of overall course grades. The results thus indicate that ongoing course redesign guided by the Quality Matters (QM) and Community of Inquiry (CoI) frameworks can result in improved learning. Future research will explore whether such approach can work in other courses (Table 2).

6. Discussion

The linking of online course design and implementation to learning outcomes is long overdue in online education. This ongoing study is not only a first step in that direction but it employs what are probably the two most commonly used theoretical frameworks in online education in the process. Findings suggest that, taken together, QM and CoI revisions can be linked to improved outcomes, but unfortunately not to each other. As significant differences only showed up across multiple revisions, however, they do suggest a trajectory. For incremental improvement of online courses: begin with a QM review and revision and then uses scores on the CoI survey to incrementally "tweak" of course design and implementation. We are beginning to explore the efficacy of such an approach at the program level. If it indeed can lead to improved student performance across a variety of courses, then it will be of widespread practical use. In addition, demonstrating a link between the QM framework and student outcomes, and the CoI framework and student outcomes has great theoretical merit, especially as regards the latter and the cognitive presence construct in particular. Finally, the efficacy of our efforts demonstrates the usefulness of design-based approaches to research on online learning.

Appendix A. Community of Inquiry survey

The following statements relate to your perceptions of "*Teaching Presence*" — the design of this course and your instructor's facilitation of discussion and direct instruction within it. Please indicate your agreement or disagreement with each statement.

#	Statement	Agreement 1 = strongly disagree; 5 = strongly agree
1	The instructor clearly communicated important course topics.	1 2 3 4 5
2	The instructor clearly communicated important course goals.	1 2 3 4 5
3	The instructor provided clear instructions on how to participate in course learning activities	1 2 3 4 5
4	The instructor clearly communicated important due dates/time frames for learning activities.	1 2 3 4 5
5	The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	1 2 3 4 5
6	The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.	1 2 3 4 5
7	The instructor helped to keep course participants engaged and participating in productive dialog.	1 2 3 4 5
8	The instructor helped keep the course participants on task in a way that helped me to learn.	1 2 3 4 5
9	The instructor encouraged course participants to explore new concepts in this course.	1 2 3 4 5
10	Instructor actions reinforced the development of a sense of community among course participants	1 2 3 4 5
11	The instructor helped to focus discussion on relevant issues in a way that helped me to learn.	1 2 3 4 5
12	The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.	1 2 3 4 5
13	The instructor provided feedback in a timely fashion.	1 2 3 4 5

The following statements refer to your perceptions of "*Social Presence*" — the degree to which you feel socially and emotionally connected with others in this course. Please indicate your agreement or disagreement with each statement.

#	Statement	Agreement 1 = strongly disagree; 5 = strongly agree
14	Getting to know other course participants gave me a sense of belonging in the course.	1 2 3 4 5
15	I was able to form distinct impressions of some course participants.	1 2 3 4 5
16	Online or web-based communication is an excellent medium for social interaction.	1 2 3 4 5
17	I felt comfortable conversing through the online medium.	1 2 3 4 5
18	I felt comfortable participating in the course discussions.	1 2 3 4 5
19	I felt comfortable interacting with other course participants.	1 2 3 4 5
20	I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.	1 2 3 4 5

Appendix A (continued)

The following statements relate to your perceptions of "*Teaching Presence*" — the design of this course and your instructor's facilitation of discussion and direct instruction within it. Please indicate your agreement or disagreement with each statement.

#	Statement	Agreement 1 = strongly disagree; 5 = strongly agree
21	I felt that my point of view was acknowledged by other course participants.	1 2 3 4 5
22	Online discussions help me to develop a sense of collaboration.	1 2 3 4 5

The following statements relate to your perceptions of "*Cognitive Presence*" — the extent to which you were able to develop a good understanding of course topics. Please indicate your agreement or disagreement with each statement.

#	Statement	Agreement 1 = strongly disagree; 5 = strongly agree
23	Problems posed increased my interest in course issues.	1 2 3 4 5
24	Course activities piqued my curiosity.	1 2 3 4 5
25	I felt motivated to explore content related questions.	1 2 3 4 5
26	I utilized a variety of information sources to explore problems posed in this course.	1 2 3 4 5
27	Brainstorming and finding relevant information helped me resolve content related questions.	1 2 3 4 5
28	Online discussions were valuable in helping me appreciate different perspectives.	1 2 3 4 5
29	Combining new information helped me answer questions raised in course activities.	1 2 3 4 5
30	Learning activities helped me construct explanations/solutions.	1 2 3 4 5
31	Reflection on course content and discussions helped me understand fundamental concepts in this class.	1 2 3 4 5
32	I can describe ways to test and apply the knowledge created in this course.	1 2 3 4 5
33	I have developed solutions to course problems that can be applied in practice.	1 2 3 4 5
34	I can apply the knowledge created in this course to my work or other non-class related activities.	1 2 3 4 5

See also: http://communitiesofinquiry.com/methodology

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