FORM FOR SUBMITTING FULL PROPOSALS FOR CONSIDERATION
FOR THE
2014 ROBERT J. MENGES HONORED PRESENTATION AWARD

YOUR NAME:	INSTITUTION:	EMAIL:
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TITLE:	**Evaluating the impact of a large-scale, research-based, course transformation program**	

1. RESEARCH QUESTION(S) & WHY THEY ARE IMPORTANT TO THE FIELD:

As faculty developers, it is important that our work with faculty have a meaningful impact on students' learning experience as well as student performance. This study reports results from an ongoing course transformation initiative at one university. Using faculty learning communities as an organizational structure, our center for teaching and learning has partnered with university library, instructional technology, and extended campus staff in order provide ongoing professional development for faculty. Guided by self-determination theory (SDT; Deci & Ryan, 1985, 2000), the core mission of the project is for faculty to redesign a course they are already teaching so to promote a more student-centered learning climate. This is achieved primarily through the integration of active learning strategies and instructional technologies. Most faculty choose to restructure their courses using a supplemental, replacement, or fully online model as defined by The National Council for Academic Transformation's (NCAT; 2008). A separate support team consisting of an instructional designer, instructional technologist, and librarian assists each individual faculty member as they go through the redesign. The following research questions guided our inquiry:

1. **How do redesign model and perceived learning environment affect students' experiences and course grades?**
2. **How do students' perceptions of their classroom experiences interact to predict their final course grade?**

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2. DESCRIPTION OF RESEARCH DESIGN:

Participants and Setting

The course transformation initiative was initiated in 2011 by the Provost's Office. In evaluating the effectiveness of the initiative, we draw upon data from 102 redesigned course sections taught by 52 different instructors in the Fall of 2013. Course sections represented 10 of the 13 colleges on the university campus, with most (*n* = 64; 62.7%) in science, technology, engineering, and mathematics (STEM) disciplines.

Complete data were available from 1,290 cumulative student enrollments. The enrollments included 557 males (43.2%) and 733 females (56.8%). The average

enrollment was 20.40 years old (SD = 2.70) and 71.0% were White (*n* = 916). The sample was 34.3% freshmen (*n* = 443), 29.7% sophomores (*n* = 383), 20.2% juniors (*n* = 260), 12.0% seniors (*n* = 155), and 3.9% graduate and professionals students (*n* = 49).

Procedures and Instrumentation

While the data collected as part of the project are broad and varied, in this study we focused on two data sources: 1) a pre- and post-semester student perceptions data obtained from a survey intended to document students' experiences in the course in which they are enrolled and 2) demographic and grade data from the university's enrollment management system.

The student perceptions survey consisted of the Learning Climate Questionnaire (LCQ), student perceptions of competence and doubt, and the Perceived Knowledge Transfer Scale (PKTS). Participants responded to the all survey questions on a seven-point, Likert-type scale anchored by strongly disagree (1) and strongly agree (7). Each instrument is described below. Validity and reliability analyses are presented in Table 1.

***Learning Climate Questionnaire.* The LCQ (Williams & Deci, 1996) is a six-item, unidimensional scale intended to measure students' perceptions of the student-centeredness of the course learning climate. Higher scores on the LCQ reflect a more student-centered environment, while lower scores are reflective of a more instructor-centered environment.**

***Competence and Doubt.* The six items included in the competence subscale of the Basic Psychological Needs at Work Scale (Deci & Ryan, 2000) were modified to reflect a classroom situation (Levesque-Bristol, Knapp, & Fisher, 2010). The subscale contains three positively worded items and three negatively worded items. The three positively worded items aggregated into a measure of competence and the three negatively worded items loaded onto a measure of doubt (Deci & Ryan, 2000).**

***Perceived Knowledge Transfer Scale.* The PKTS (Richards, Zissimopoulos, & Levesque-Bristol, 2014) is an eight-item, unidimensional scale that measures students' perceptions that the information learned in a class will be relevant to them in the future. Higher scores on the PKTS indicate the perception of greater knowledge transfer.**

Data Analysis

Data analysis began with standard data screening procedures for inferential statistics (Tabachnick & Fidell, 2007). Following initial screening, indexes of the student survey variables were created by averaging all items that load on a particular construct (See Appendix B for a description of scale validity and reliability). Then, descriptive statistics and bivariate correlations were calculated for all study variables.

For RQ1, a median split was performed on the post-semester LCQ variable in order to create higher and lower perceived learning climate groups. Then, 2x3x2 (Time x Redesign Model x Learning Climate) Mixed ANOVAs were used to examine changes over time in competence, doubt, and knowledge transfer while accounting for the

specific redesign model and perceived learning climate. A 3x2 (Redesign Model x Learning Climate) Factorial ANOVA was used to examine difference in course grades among redesign model and learning climate groups.

To answer RQ2, a structural equation model (SEM) was specified to examine how student perception survey variables interact to predict course grade. The fit of the SEM was evaluated using the same fit indices used to evaluate factorial validity (see Appendix B) as well as the root mean square error of approximation (RMSEA), which should be closer to 0 with values below .10 being considered adequate (Brown, 2006).

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3. LITERATURE REVIEW & THE RELATIONSHIP OF THE LITERATURE TO YOUR RESEARCH QUESTION(S):

Active learning refers to a cluster of instructional approaches that have gained in popularity both in K-12 and in colleges and universities (Prince, 2004; Reed-Rhodes et al., 2010). The approaches often involve such techniques as small-group discussions; new learning technologies, web-based social media applications that connect students with each other and the instructor, and written in-class assignments to engage students more fully in learning during a class rather than passively listening to an hour-long lecture by the instructor. Active learning has been integrated into different course-redesign models including the replacement (hybrid/flipped), supplemental, and fully online models.

Our project seeks to understand the mechanisms that explain the success of active learning models at improving student outcomes. To accomplish this goal we draw upon SDT (Deci & Ryan, 1985, 2000), which posits the creation of a student-centered learning environment will satisfy students' basic psychological needs of autonomy, competence, and relatedness. Based on SDT, we hypothesized that active learning models are effective at fostering student learning outcomes and positive experiences as long as they contribute to the creation of a student-centered, autonomy supportive learning environment. Redesign models which are implemented without a consideration toward the quality of the learning environment created will not be associated with improvement in student outcomes and experiences.

Autonomy supportive, student centered learning environments are those that meet the three basic psychological needs identified by SDT. Autonomy, in the context of SDT, does not mean independence but rather feelings of volition and choice. For example, students tend to feel autonomous when they are given choices and options about how to perform or present their work. Competence has been the focus of multiple higher education studies and represents the extent to which students believe they have mastered content material or are able to perform an academic (Deci, Koestner, & Ryan, 1999; Deci & Ryan, 2000). Finally, students perceive that their need for relatedness is met when they feel connected, intellectually and emotionally, to other students in the class as well as to their instructor. In addition, connectedness to the material presented in class, also termed relevance, is important to foster perceived relatedness.

Based on SDT framework and research, we expect non-academic variables, such as student experiences and motivational principles to have implications for student's course performance (e.g., grade), regardless of the specific redesign model implemented.

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4. FINDINGS: THEIR SIGNIFICANCE & LIMITATIONS:

Table 2 includes descriptive statistics for all variables from the student perceptions survey and course grades at the end of the semester. Table 3 includes bivariate correlations among all student perception survey variables and course grades at post-semester. Correlations were all significant at □ = .01 and in the expected direction: course grade, LCQ, competence, and PKTS were all positively correlated, and doubt correlated negatively with all other variables.

RQ1: Impact of Learning Climate and Redesign Model

SDT (Deci & Ryan, 1985, 2000) predicts that students who perceive a more student-centered learning climate will experiences more positive course perceptions and outcomes than those who perceive a more instructor-centered learning climate. Also of interest were potential differences among redesign models. A series of 2x3x2 (Time x Redesign Model x Learning Climate) Mixed ANOVAs were conducted to examine this question. Relevant interaction effects are discussed below.

Related to competence: Significant time x learning climate interaction effect, $F(1,1284) = 56.57$, $p < .001$, partial-$\square^2 = .042$ (See Figure 1). Follow-up tests indicated that perceived competence decreased when the learning climate was perceived to be lower, $t(691) = -11.01$, $p < .001$, $d = .59$, but increased when the learning climate was perceived to be higher, $t(597) = 6.10$, $p < .001$, $d = .35$.

For doubt: Significant time x learning climate interaction, $F(1,1284) = 4.74$, $p = .030$, partial-$\square^2 = .004$ (See Figure 2). Follow-up tests indicated doubt significantly decreased when the learning environment was perceived to be higher, $t(597) = -4.16$, $p < .001$, $d = .24$, and significantly increased when the learning environment was perceived to be lower, $t(691) = 2.51$, $p = .012$, $d = .14$.

For perceived knowledge transfer: Significant time x learning climate interaction effect, $F(1,1284) = 52.26$, $p < .001$, partial-$\square^2 = .039$ (See Figure 3). Follow-up tests indicated that knowledge transfer significantly decreased in the lower learning environment condition, $t(691) = -13.89$, $p < .001$, $d = .75$, and did not significantly change in the higher learning climate condition.

For course grade, a 3x2 (Redesign Model x Learning Climate) Factorial ANOVA was used to examine differences in course grade based on redesign model and learning climate. There was a significant interaction effect, $F(1,1284) = 3.04$, $p = .048$, partial-$\square^2 = .005$ (See Figure 4). Follow-up tests indicated that course grades were significantly higher in the replacement, $t(401) = -4.02$, $p < .001$, $d = .40$, and supplemental, $t(826) = -1.98$, $p = .05$, $d = .14$, but not the online only model.

RQ2: Predicting Course Grades from student perceptions

A SEM model was created to examine the ways in which post-semester perceptions of the learning climate, competence, doubt, and knowledge transfer interacted to predict course grades. Based on SDT (Deci & Ryan, 1985, 2000), it was hypothesized that the learning climate would predict competence and doubt, which would go on to predict knowledge transfer and course grade.

The final model with completely standardized regression coefficients presented in Figure 5. The model fit was excellent, $\chi^2(72) = 1098.44$, $p < .001$; NNFI = .98; IFI = .98; CFI = .98; SRMR = .04; RMSEA = .06. All of the regression pathways specified in the model were significant at the $\alpha = .01$ level.

Results suggest that the influence of the learning climate on course grade is fully mediated by student perceptions of the classroom environment. The impact of the learning climate on course grade goes through the influence of the students' perceptions of competence, doubt, and knowledge transfer.

Discussion of Results

For all student perception variables, there was a significant interaction between time and learning climate. This significant effect generally demonstrates that student experiences tend to improve in a student-centered learning environment and decrease in the absence of such an environment. A similar pattern was observed relative to course grades. With the exception of the online only students, grades were significantly higher in a student-centered learning environment. Generally, these effects were observed regardless of redesign model used.

The results of this project suggest that the redesign models used to create active learning environments are less important than whether they have been implemented in a student-centered manner. Our results suggest that non-academic factors, such as students' experiences and perceptions, can have implications for student performance. When students perceive the learning environment to be student-centered, positive outcomes are observed. Perceptions of competence and knowledge transfer positively predicted course grades, while perceptions of doubt negatively predicted course grades. Unfortunately, non-academic factors are often ignored in university-wide student success initiatives. However, faculty developers can incorporate strategies to enhance the basic psychological needs and create student-centered learning environments in faculty-driven professional development initiatives.

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780

TOTAL WORD COUNT FOR ALL 4 SECTIONS:
1996

Appendix A: References

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Appendix B: Validity and Reliability of Survey Instruments

Confirmatory factorial validity for all student survey constructs was evaluated using confirmatory factor analysis (CFA). The non-normed fit index (NNFI), incremental fit index (IFI), and comparative fit index (CFI) were calculated as indicators of model fit (Brown, 2006). SRMR should be close to 0 with values below .10 indicating adequate fit. NNFI and IFI should be close to 1 with values above .90 indicating adequate fit. Composite reliability (□c; Diamantopoulos & Siguaw, 2000), average variance extracted (AVE; Fornell & Larcker, 1981), and Cronbach's (1951) □ were calculated as measures of reliability. Both $\square_c$ and Cronbach's □ should be above .70, and AVE should be above .50 for a model to be considered reliable. Results for each scale are summarized in Table 1. Overall, results indicate high factorial validity and reliability for the LCQ, Competence and Doubt, and PKTS.

Table 1.

Summary of factorial validity and reliability of psychometric instruments

Instrument	CFA Fit Indices	$\square_c$	AVE	□
LCQ	$\square^2(14) = 1070.87$, SRMR = .02, NNFI = .97, IFI = .98, CFI = .98	.95	.75	.95
Comp	$\square^2(8) = 192.89$, SRMR = .03, NNFI = .97, IFI = .99, CFI = .99	.85	.67	.84
Doubt		.82	.61	.80
PKTS	$\square^2(20) = 4532.88$, SRMR = .04, NNFI = .93, IFI = .95, CFI = .95	.97	.79	.97

Note. **LCQ=Learning Climate Questionnaire, Comp=Competence, PKTS=Perceived Knowledge Transfer Scale, I-CEQ=Instructor CEQ. Competence and Doubt were entered into CFA together as two separate factors.**

Appendix C: Accompanying Tables

Table 2.

Descriptive statistics for all student perception and performance data

Constructs	M	SD	Minimum	Maximum	Skewness
Learning Climate_Post	5.06	1.40	1.00	7.00	-.82
Competence_Post	4.58	1.41	1.00	7.00	-.42
Doubt_Post	3.40	1.47	1.00	7.00	.45
Knowledge Transfer_Post	5.05	1.48	1.00	7.00	-.87
Course Grade	3.45	.80	.00	4.00	-1.68

***Note.* Learning climate, competence, doubt, and knowledge transfer were measured on a seven-point, Likert-type scale ranging from strongly disagree (1) to strongly agree (7). Course grade is represented on a standard four-point grading scale.**

Table 3.

Bivariate correlations among all student perception survey variables at post-semester and course grades

Variables	LCQ	Competence	Doubt	PKT	Grade
LCQ	1.00				
Competence	.71*	1.00			
Doubt	-.35*	-.31*	1.00		
PKTS	.60*	.75*	-.28*	1.00	
Grade	.15*	.14*	-.29*	.14*	1.00

Note. **LCQ = Learning Climate Questionnaire, PKTS = Perceived Knowledge Transfer Scale, Grade = Course Grade, *p < .01.**

Appendix D: Accompanying Figures

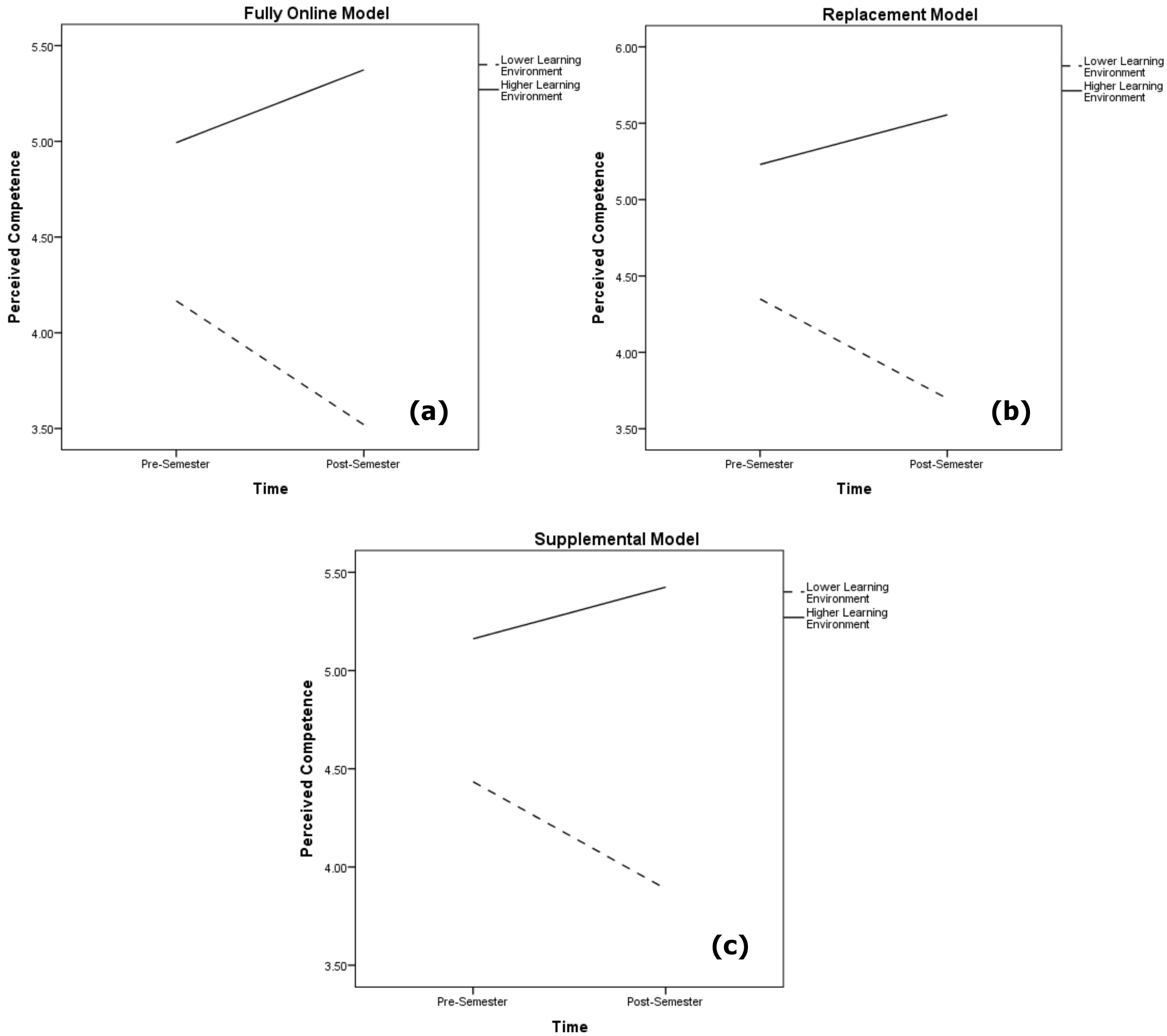

***Figure 1.* Means plots displaying the results of the significant time x learning climate interaction for competence in the (a) fully online model, (b) replacement model, and (c) supplemental model.**

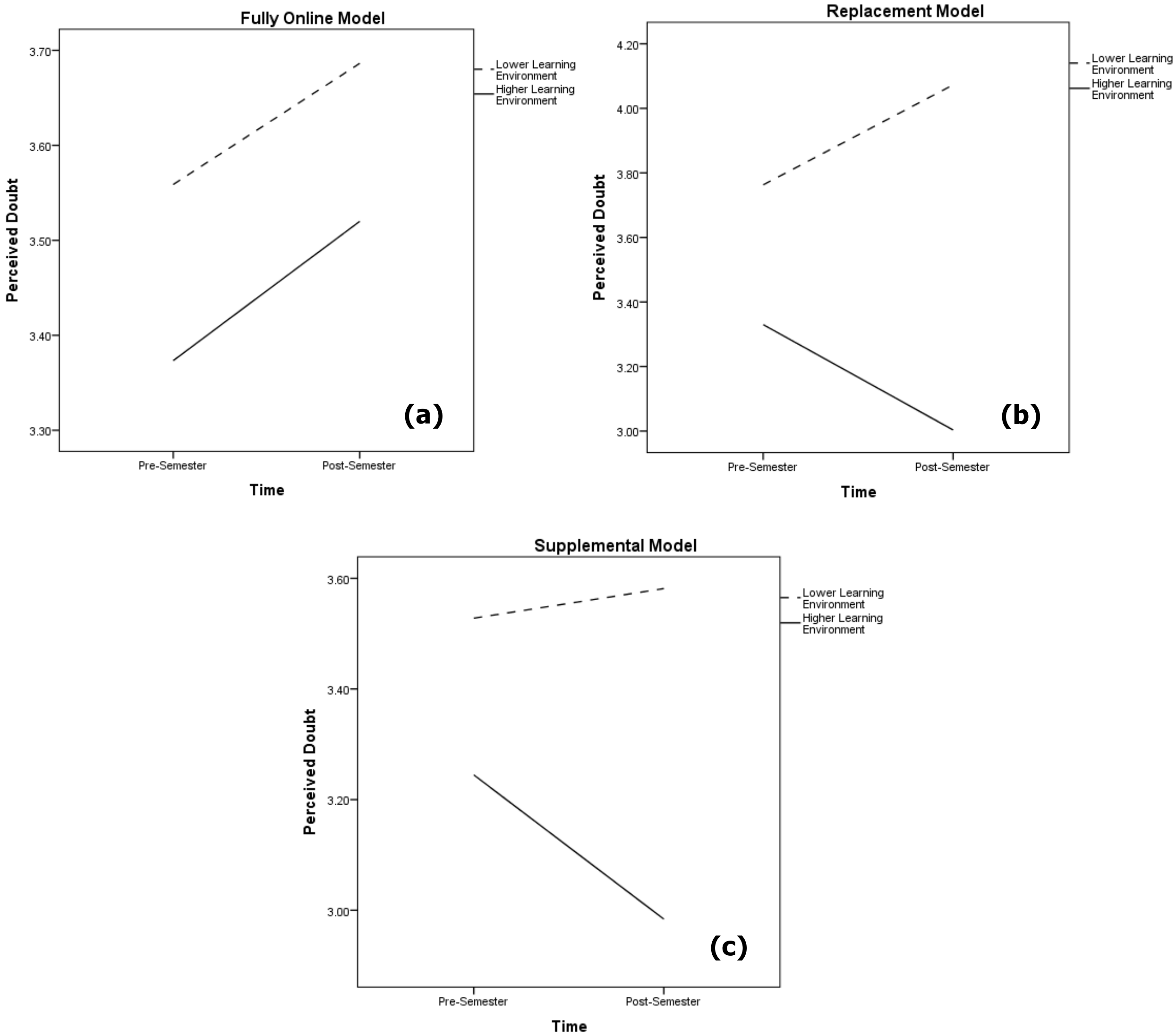

Figure 2. **Means plots displaying the results of the significant time x learning climate interactions for doubt in the (a) fully online model, (b) replacement model, and (c) supplemental model.**

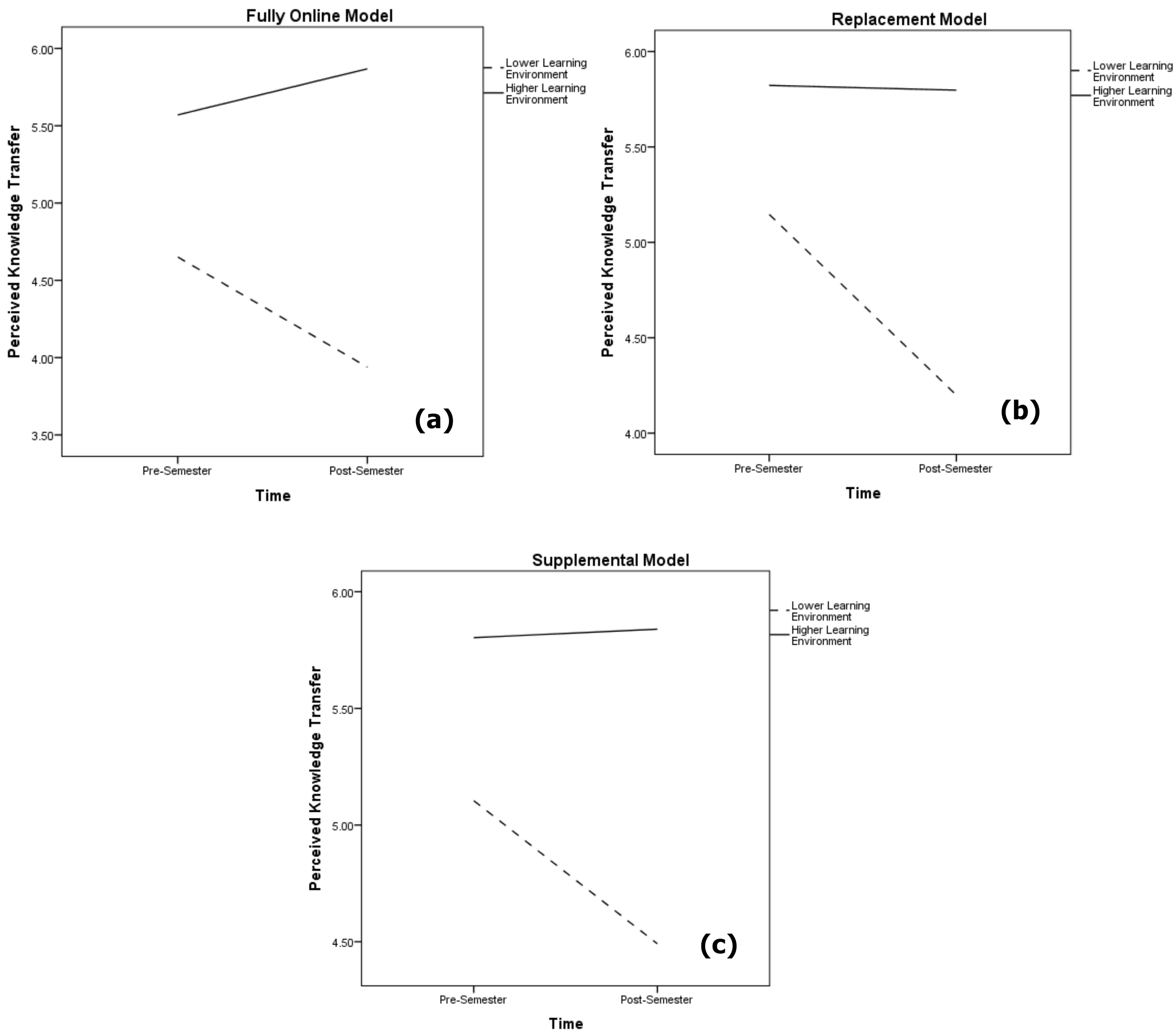

***Figure 3.* Means plots displaying the results of the significant time x learning climate interactions for perceived knowledge transfer in the (a) fully online model, (b) replacement model, and (c) supplemental model.**

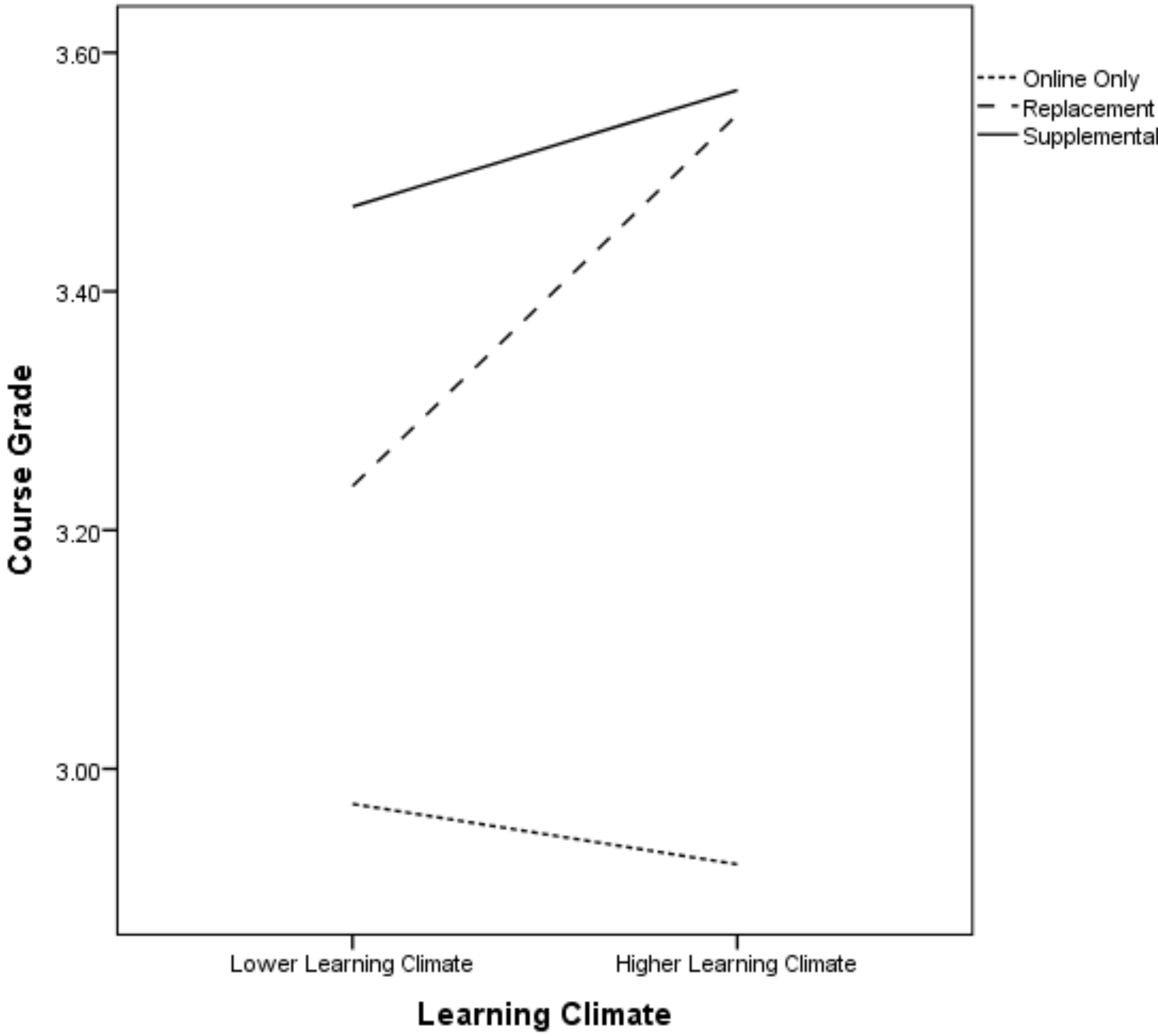

Figure 4. **Means plot displaying the significant redesign model x learning climate interaction for course grade.**

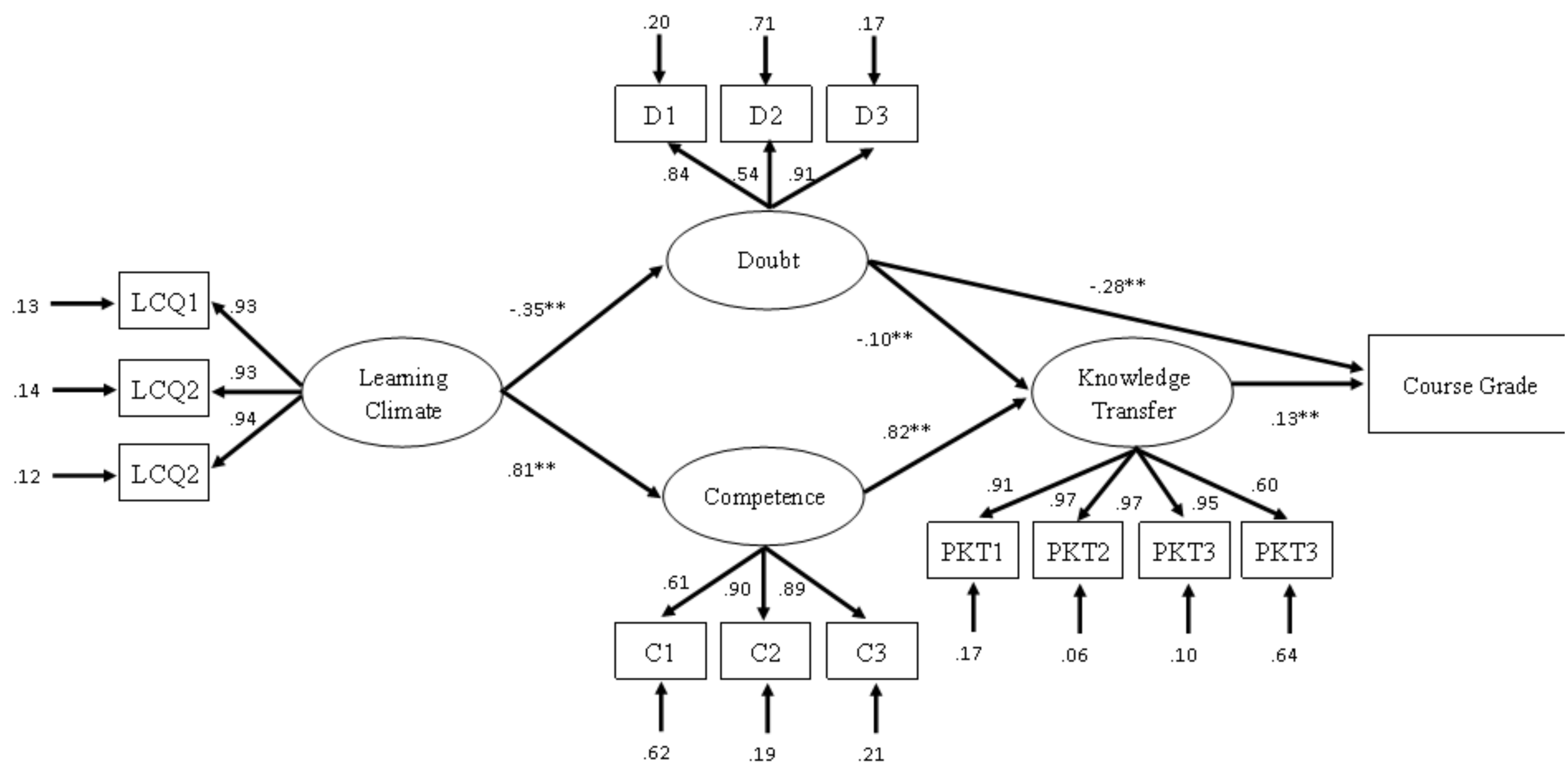

Figure 5. **Final structural model with completely standardized path coefficients, $\chi^2(72) = 1098.44$, $p < .001$; NNFI = .98; IFI = .98; CFI = .98; SRMR = .04; RMSEA = .06, LCQ = Learning Climate Questionnaire, D = Doubt, C = Competence, PKT = Perceived Knowledge Transfer Scale, **p<.01.**