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Student Resistance to Collaborative Learning

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Abstract

The advancing complexity of today's corporate environment requires that employees are able to collaborate in the workplace. This mixed methods research study follows a nursing faculty's efforts to incorporate collaborative learning (CL) into an introductory nursing class. The mixed-methods research study found that while students' final grades improved in the initial CL flipped classroom design ($p < .0005$), their levels of student resistance deepened which resulted in significantly lower levels of community of inquiry ($p = .004$), lower levels of satisfaction, and many negative open-ended comments (83%). Using Tolman and Kreming's (2017) integrated model of student resistance (IMSR) as a guideline, the instructor was successful in redesigning the CL class to overcome students' resistance as measured by significantly higher levels of community of inquiry ($p < .0005$), higher levels of satisfaction ($p < .0005$), and many less negative open-ended comments (54% vs 83%).

Keywords

Collaborative learning, Student Resistance, Community of Inquiry, Integrated model of student resistance (IMSR)

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Student Resistance to Collaborative Learning

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The advancing complexity of today's corporate environment requires that employees are able to collaborate in the workplace. This mixed methods research study follows a nursing faculty's efforts to incorporate collaborative learning (CL) into an introductory nursing class. The mixed-methods research study found that while students' final grades improved in the initial CL flipped classroom design ($p < .0005$), their levels of student resistance deepened which resulted in significantly lower levels of community of inquiry ($p = .004$), lower levels of satisfaction, and many negative open-ended comments (83%). Using Tolman and Kreming's (2017) integrated model of student resistance (IMSR) as a guideline, the instructor was successful in redesigning the CL class to overcome students' resistance as measured by significantly higher levels of community of inquiry ($p < .0005$), higher levels of satisfaction ($p < .0005$), and many less negative open-ended comments (54% vs 83%).

INTRODUCTION

The advancing complexity of today's corporate environment requires that employees are able to collaborate in the workplace to solve critical issues (Austin, 2000). It is imperative that college students entering the workforce exhibit qualities to foster team-work. In an attempt to develop students' communication and collaboration skills, faculty across all disciplines are now beginning to revise their courses to include more collaborative learning activities (Leonard & Leonard, 2001). In the healthcare field, professional nurses must utilize effective communication skills to successfully collaborate with other members of the health care team to prioritize patients' needs (American Nurses Association, 2016). Research has shown that ineffective communication skills are key factors when health care teams have trouble working together (Brandt, 2015). The Joint Commission, which accredits health care organizations across the United States (U.S.), reported that communication failure is the primary cause of more than 60% of sentinel events in health care (Joint Commission, 2008). Health care workers who utilize clear effective communication skills can decrease the number of medical errors (Noguchi, 2014). Because of these findings, the American Association of Colleges of Nursing (AACN) has identified interprofessional communication and collaboration as one of the essential skills that undergraduate nursing programs must address to prepare students entering the workforce (AACN, 2008). In an effort to develop communication and collaboration skills of beginning nursing students, a Nursing professor redesigned an undergraduate physical assessment course to move from mostly lecture format to primarily collaborative learning. This article reviews outcomes from this mixed methods research study.

LITERATURE REVIEW

Collaborative Learning

Collaborative learning (CL) is a pedagogical approach to teaching that moves the student from a passive learner to an active participant in the educational process (Bransford, Brown, & Cocking, 2006). CL requires students to move away from memorization and regurgitation of material to an environment where they actively process and synthesize information. CL can be defined as an "intellectual endeavor in which individuals act jointly with others to become knowledgeable on some particular subject matter" (Koehn, 2001, p. 160). The goal of CL learning are environments

where students work together to co-construct knowledge (Chi & Wylie, 2014, Scardamalia & Bereiter, 2006). This allows students to sharpen communication skills, develop team-work and social skills, and hone their conflict resolution capacities (Jarvenoja & Jarvela 2009; Prichard, Stratford, & Bizo 2006, Ravenscroft & Luhanga, 2014). Research has revealed many benefits in designing classes that include high levels of CL. Collaborative learning activities can help students develop problem-solving skills, critical thinking skills, formulate ideas, discuss solutions, and receive feedback from each other (Cockrell, Hughes-Caplow, & Donaldson, 2000; Moore, 2009; Mitchell, 2004; Youngblood & Beitz, 2001). Learners also benefit socially and emotionally because they are required to listen to other's perspectives and articulate and defend their own ideas (Smith & MacGreggor, 1992).

Lipman (2003) posits that CL environments are a community of inquiry (CoI) where members of the community are "questioning, reasoning, connecting, deliberating, challenging, and developing problem-solving techniques" (p. 20-21). Garrison, Anderson, and Archer (2000) developed a CoI framework to model educational communities of inquiry where students participate in meaningful collaborative learning experiences. Garrison (2016) emphasizes that simply having students work in a group does not automatically result in students' development of deep thinking and construction of knowledge. Learning experiences need to be designed so that group projects are not simple social interactions, but encourage students to develop "cognitive involvement through social interactions" (Boujaoude, 2016, p. 124). The CoI framework outlines the process of designing and delivering educational experiences that are deep and meaningful and grounded in the three interdependent elements of social presence, cognitive presence, and teaching presence (Garrison et al., 2000).

The CoI framework has its roots in the collaborative constructivist learning theory which posits that individuals seek to understand the world through interactions with others (Dewey, 1959; Garrison, 2016, Piaget, 1970; Vygotsky, 1978). Constructivism can be looked at as a way of thinking (von Glaserfeld, 1992), an approach to teaching and learning (Huitt, 2003), and also a theory (Piaget, 1950). Common to all the constructivists' approaches is the belief that students' do not build knowledge by passively receiving information, but must actively building knowledge on their pre-existing mental structures (Ernest, 1995). The

collaborative constructivist theory emphasizes the importance of students working collaboratively in a community of inquiry to have a social construction of knowledge (Garrison, Anderson, & Archer, 2000).

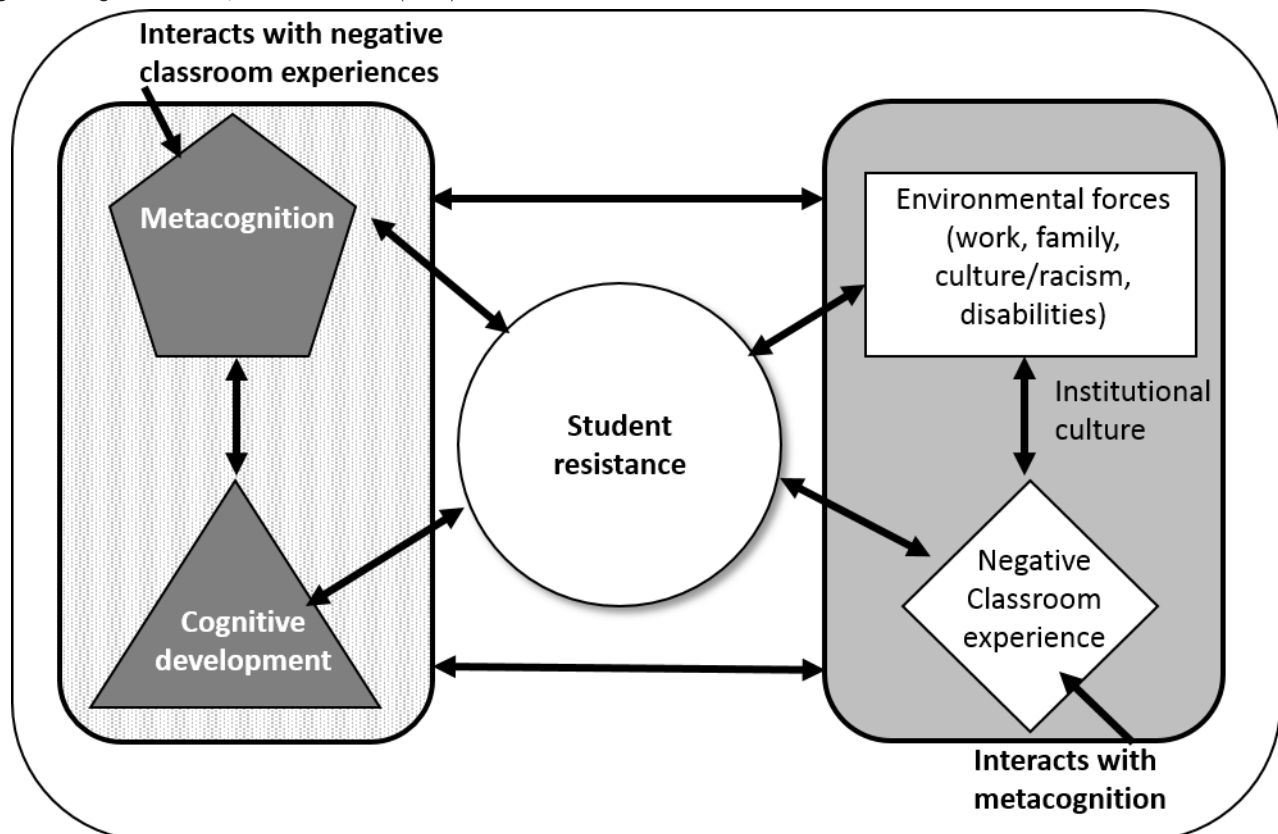
Student Resistance to Collaborative Learning

While many research studies have found benefits of incorporating CL, it is not uncommon for instructors to experience student resistance (Burke, 2011). Tolman and Kremling (2017) define student resistance as an, “outcome, a motivational state in which students reject learning opportunities due to systemic factors” (p. 3). Student resistance is not a trait that is part of a student’s personality enduring over time, but is a fluid motivational state that can be influenced (Tolman & Kremling, 2017). The external factors that have an impact on student resistance are environmental forces (family history, social class, and cultural identity) and students’ previous negative experiences with CL in the classroom. The internal forces that have an impact on student resistance are cognitive development (how student perceives education and knowledge) and metacognition (students’ internal self-awareness of how they learn). The integrated model of student resistance (IMSR) attempts to identify the factors that lead to student resistance (Tolman & Kremling, 2017, Figure 1). While the four elements in the IMSR are separate (metacognition, cognitive development, environmental forces, and negative classroom experiences), they are interdependent so that a change in one element has an impact on the rest of the system (Tolman & Kremling, 2017). When faculty experience student re-

sistance, they can use the IMSR model to make adjustments to their course design and can see a positive impact by just focusing on one aspect of the model (Tolman & Kremling, 2017).

Students are so entrenched in passive learning strategies, they exhibit strong levels of resistance when asked to participate in CL and may experience similar emotions that individuals experience when going through trauma and grief (denial, anger, bargaining, depression, and acceptance) (Kübler-Ross, 1969). Students may feel angry when participating in CL classrooms because they feel the instructor has changed the rules of an acceptable learning environment (Howard, 2015). Students often report disliking CL due to the dynamics of the group, including accountability on group projects. Group work requires students to collaborate, communicate, delegate, and rely on each other, which is challenging for introverts, dominating personalities, or independent workers (Taylor, 2011). Personality issues or conflicts may arise while students are working in a group, which causes students to complain about disliking other members (Virgă, Curșeu, Maricuțoiu, Sava, Macsinga, & Măgurean, 2014). Students may not value the academic knowledge of their peers and feel that peer-to-peer interactions take away from time they could be hearing from the professor (Taylor, 2011). Group dynamics may exert pressure for the group to reach a majority opinion, which may cause individual group members to agree to decisions they do not entirely support to avoid conflict (Beebe & Masterson, 2003). Group work often results in uneven participation because of social loafing which is the “tendency of individuals to expend less effort when working collectively than when working individually” (Karau & Williams, 1993, p. 681). Students

Figure 1. Integrated model of student resistance (IMSR)



Adapted from *Why Students Resist Learning: A Practical Model for Understanding and Helping Students*, by Anton O. Tolman and Janine Kremling, p. 13. Copyright 2017 by Stylus Publishing. Reprinted with permission.

have also reported disliking CL because they resent all members of a group receiving the same grade while a few members of the group have completed a disproportionately large amount of the work (Allan, 2016).

Suggestions for Instructors to Overcome Student Resistance

Tolman and Kremin's (2017) integrated model of student resistance (IMSR) provides a systematic model that outlines reasons for student resistance to CL. The four elements in the model are highly interdependent, so faculty can make adjustments to each element in an effort to lower levels of student resistance. When faculty design CL courses, they should create a proactive course design to address expected resistance. The following are suggestions how faculty can impact each of the four elements in the IMSR model to lower students' level of resistance.

IMSR- Cognition. An internal force that the IMSR identifies as leading to student resistance is students' cognition. Student cognition refer to the beliefs students hold about how knowledge is acquired (Cacioppo & Petty, 1982). Implementing pro-active approaches to address students' cognitive beliefs are strategies that will help overcome student resistance. Many students in have simplistic views of knowledge formation where they believe that the source of knowledge needs to be transferred from an authority figure (instructor) along with the information needed to pass the exam (Kloss, 1994; Perry, 1970). Students with simplistic views of knowledge formation will have strong levels of resistance to CL because peer learning may be viewed as a waste of time because their peers are not viewed as credible sources of knowledge. Instructors can promote cognitive development in students by publicly defining learning as a jointly constructed endeavor between students and the instructor, validating students as having an essential voice in the learning process, and situating learning to allow students to construct their own knowledge (Baxter Magolda, 1992).

IMSR- Metacognition. Another internal force that the IMSR identifies as impacting students' level of resistance is metacognition, which is closely related to cognition. Metacognition refers to students' self-awareness of their own cognition and their ability to regulate their cognitive processes (Vrugt & Oort, 2008). Dweck (2000) maintains that most students either view their intelligence as static (fixed mindset) or as changeable (growth mindset). Alpay and Ireson (2006) found that students with a fixed mindset can exhibit student resistance to CL because they prefer to work independently and have a negative view of group work. Students with a fixed mindset will resist collaborative learning because of the possibility of revealing shortcomings in his/her intelligence and do not want to risk any activity where they may fail. Students with a growth mindset enjoy CL because they view the active classroom environment as an opportunity to apply more effort to increase their own learning and believe any learning deficiencies can be overcome with hard work (Dweck, 2006). Instructors can share research outcomes on the benefits of CL to allow students to adopt more of a growth mindset in an effort to embrace the change (Fuchs & Fluegge, 2014).

IMSR- External Forces – Negative Classroom Experiences. One of the external forces that the IMSR identifies includes students' negative classroom experiences. While CL has many documented benefits, many students have had negative experiences which leads to student resistance (Fiechtner & Davis,

1984). Miller (2014) reported that for instructors to develop productive CL environments they need to communicate clear intentions, assign intentional groups, develop protocols and structures for group work, and hold individuals accountable for their own work. As students work in individual groups, Cole (2007) determined it is important for faculty to eagerly encourage students to be active participants in the learning process by valuing them as they engage in group work. Instructors can also teach students the skills necessary to become an effective member of the Col. Instructors can do this by carefully observing student interactions and then demonstrating and modeling collaboration skills, give students feedback in class, and asking students to write short reflections resulting in self-realizations and growth (Bosworth, 1994). Instructors can also include actions that hold students accountable for their own knowledge with activities such as opening-class quizzes to ensure students have completed required readings so they have the knowledge background to be effective contributors to their Col.

When designing group activities, instructors can provide tools to manage conflict by empowering the group to only put contributors' names on group assignments. Student groups should also have a process in place to deal with difficult team members by scheduling a group crisis meeting or involving the instructor if necessary. As a last resort, groups should have the ability to remove uncooperative team members if there are members that are disruptive or unproductive members of the community.

IMSR- External Forces – Environmental Forces. Another external force that leads to student resistance identified in the IMSR is environmental forces (work, family, culture/racism, disabilities). Studies have found it can be challenging for minority students to participate in CL due to their lack of confidence (Roksa et al, 2017; White & Lowenthal, 2010). Widnall (1988) conducted studies that found that women may feel their contributions are devalued or discounted in CL environments and are also uncomfortable with the argumentative format adopted by some of the men in their group. However, if instructors created groups with more than one woman, this reduces that possibility (Felder, Felder, Mauney, Hamrin, & Dietz, 1995; Ford, 2011). Instructors should also emphasize the importance and benefits of group social acceptance to divergent views that most likely will arise due to differences in culture and background experiences with minority students (Curseu, Schruljer, & Foder, 2017, Smith, Parr, Woods, Bauer, & Abraham, 2010).

Research Questions

The research questions for this study are to investigate if the course design (traditional lecture or CL) in face-to-face classes has an impact on students enrolled in the class. Specifically, our research questions examined in this study include:

H1: Will the course design (traditional lecture or CL) have an impact on students' perceptions of Community of Inquiry (Col).

H2: Will the course design (traditional lecture or CL) have an impact on students' level of satisfaction (SAT).

H3: Will the course design (traditional lecture or CL) have an impact on final grades?

H4: Open-ended questions were asked to seek the impact of the course design (traditional lecture or CL) on students enrolled in these classes.

METHODOLOGY

This Institutional Review Board (IRB) approved mixed-methods research study was conducted at a medium-sized university located in the Mid-west. The instructor in an introductory Nursing course taught Class #1 in a traditional fixed seat auditorium using primarily lecture (Table 1). The fixed-seat auditorium made it extremely difficult for the instructor to incorporate any CL activities due to the inability of students to move into groups. The instructor then redesigned the course after moving to an active learning classroom and included many more collaborative learning activities. Class #2 (active learning architecture, CL teaching methodology, Table 1) was taught in a classroom equipped with round tables where students sat six per table that was specifically designed to accommodate CL activities. After teaching Class #2, the instructor received so much resistance from students that modifications were made to the class design. Class #3 (active learning architecture, CL teaching methodology, Table 1) was structured almost the same as Class #2; however, the instructor included short mini-lectures about the benefits of collaborative learning in an effort to get students to “buy-in” to the CL process.

Class	n	Class Architecture	Primary Teaching Methodology	% Lecture / % CL
1	77	Fixed-seat auditorium	L	L = 80% / CL = 20%
2	108	Active-learning classroom	CL	L = 20% / CL = 80%
3	117	Active-learning classroom	CL-RD	L = 20% / CL = 80%

N=302; L=Lecture, CL=Collaborative Learning; CL-RD=Collaborative Learning Redesign

Summary of the Method

Data were gathered from students in an introductory Nursing class to get perceptions about the level of Community of Inquiry (Col) and level of satisfaction (SAT). The data used in this research study were triangulated from multiple sources to ensure more accurate results (Yin, 2014). Quantitative and qualitative data were gathered from students by asking them to complete a scantron survey. Students' Likert scale responses were downloaded to an Excel spreadsheet and then imported into SPSS 23 for quantitative data analysis. There were 302 students enrolled in the three classes surveyed; however, only 291 students completed the survey, resulting in a 96% response rate. The survey was administered by a researcher who differed from the instructor to ensure anonymity and no identifying information was gathered. For the 291 records completed, four were removed due to missing more than 5% of the data (Bennet, 2001). Twenty-three records were removed because they were outliers in the data as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box, which resulted in 264 records. Col and SAT scores were normally distributed

for all classes. Qualitative data were gathered from an open-ended question included on the survey. Students were asked, “Do you have anything additional you would like to say about your experiences while enrolled in this class”. Students' qualitative open-ended comments were typed into an Excel spreadsheet for theme analysis.

The majority of students in these classes identified as female ($n = 227$) compared to male ($n = 36$). The majority of students reported their race as Caucasian ($n = 227$) with others identifying as African American ($n = 10$), Asian ($n = 10$), Other ($n = 8$), and Hispanic ($n = 7$). Even though students were enrolled in an introductory nursing course, they reported a range of academic classifications from Sophomore ($n = 105$), Junior ($n = 102$), and Senior ($n = 46$).

Instrument

Students completed a survey designed to measure perceptions of Community of Inquiry (Col) and satisfaction (SAT). Below is a summary of each component of the survey.

Community of Inquiry Scale. Arbaugh et al. (2008) developed the Col Survey to measure students' perceptions of their levels of Col in a learning environment. The Col survey has most often been applied to studying online and blended-learning environments (Akyol & Garrison, 2008; Cleveland-Innes, Garrison, & Kinsel, 2007; Garrison, 2008; Ling, 2007; & Shea & Bidjerrano, 2009); however, the Col framework can be applied to any collaborative learning environment (Garrison, 2016). The 34 self-report items from the Community of Inquiry (Col) (Swan et al., 2008) were slightly modified so that the survey was appropriate for a face-to-face environment (see appendix). Participants responded to questions such as, “Class discussions help me to develop a sense of collaboration” using a Likert-type scale ranging from 1 = “Strongly disagree”, 2 = “Disagree”, 3 = “Neutral”, 4 = “Agree”, and 5 = “Strongly agree”.

Satisfaction Scale. The authors of this research study also included 15 questions in an attempt to measure students' level of satisfaction. The format for the satisfaction scale was based on a bipolar adjectives used to measure Social Presence using the semantic differential technique (Osgood, Suci, & Tannenbaum, 1957) where students selected a 1 to 6 score between sets of bipolar adjectives (example: Impersonal - Personal) (Short, Williams, & Christie, 1976). Although the format from the previous Social Presence was used, the bipolar adjectives were changed to measure students' level of satisfaction. The SAT questions originally had 15 sets of bipolar adjectives selected to measure their satisfaction (example: Dissatisfaction – Satisfaction). To determine if the 15 sets of bipolar adjectives had face validity (Holden, 2010), eight students outside the class enrollees were given a varied list of adjectives and asked to select the bipolar opposites. Results indicated 100% agreement on 7 terms; 87.5% agreement on 5 terms; 75% agreement on 1 term; and 62.5% agreement on 2 terms. To determine internal validity (Brewer, 2000) for the SAT Scale, an exploratory factor analysis (EFA) with principal axis factoring and varimax rotation was used to identify the underlying relationships between the survey items for the satisfaction scale to determine questions that could make up one single satisfaction grouping with primary factor loads of .4 or above (Costello & Osborne, 2005) and no cross-loadings higher than .32 (Tabachnick & Fidell, 2001). The satisfaction category resulted a reduction of 15 bipolar adjective question to a set of

nine questions. Cronbach's alpha for satisfaction ($\alpha = .912$) indicating an excellent level of internal consistency (DeVellis, 2012). The resulting nine bipolar adjectives used to determine students' satisfaction level are displayed in Table 2.

Question #	Word 1	Word 2	Factor
Q52	Passive	Active	.556
Q54	Frustration	Well-being	.813
Q57	Lack of interaction	Satisfactory interaction	.618
Q58	Confusion	Clarity	.766
Q59	Defeat	Success	.789
Q60	Anxiety	Security	.792
Q61	Lack of confidence	Confident	.739
Q63	Dissatisfaction	Satisfaction	.865
Q64	Bored	Excited	.625

RESULTS

Hypothesis 1: Community of Inquiry

A one-way Analysis of Variance (ANOVA) was conducted to compare the impact of course design (traditional lecture or CL) on students' perceptions of Col. Outliers, as assessed by boxplot were deleted; data were normally distributed for all classes as measured by skewness and kurtosis. Homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .533$), was adequate. There was a significant effect on students' perceptions of Col with course design changes [$F(2, 261) = 49.222, p < .0005$]. Post hoc comparisons using the Tukey HSD test indicated students perceptions of Col decreased from class #1 Lecture ($n = 62, m = 3.5 \pm 0.4$) to class #2 CL ($n = 100, m = 3.3 \pm 0.5$), a decrease of 0.2 (95% CI, 0.06 to 0.4) which was statistically significant ($p = .004$). However, students' perceptions of Col increased from class #2 CL ($n = 100, 3.3 \pm 0.5$) to class #3 CL-RD ($n = 102, 3.9 \pm 0.4$), an increase of 0.6 (95% CI, -0.8 to -0.5) which was statistically significant ($p < .0005$). Students' perceptions of Col increased from class #1 Lecture ($n = 62, m = 3.5 \pm 0.4$) to class #3 CL-RD ($n = 102, 3.9 \pm 0.4$), an increase of 0.4 (95% CI, -0.5 to -0.2) which was statistically significant ($p < .0005$, Table 3). The results suggest that course design (traditional lecture vs CL) does have an impact on students' perceptions of Col with a decrease in scores the first time the CL course was taught ($p = .004$) and an increase in scores when the course was redesigned ($p < .0005$).

Class	Method	n	M	SD	Tukey's HSD Post Hoc		
					C #1	C #2	C #3
1	L	62	3.54	.426		.004*	<.0005*
2	CL	100	3.30	.459	.004*		<.0005*
3	CL-RD	102	3.91	.429	<.0005*	<.0005*	

*Note: $p < .005$

Hypothesis 2: Student Satisfaction

A one-way ANOVA was conducted to compare the impact of course design (traditional lecture or CL) on students' perceptions of SAT. Outliers, as assessed by boxplot were deleted; data were normally distributed for all classes as measured by skewness and kurtosis. Homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .076$), was adequate. There was a significant effect on SAT for the three classes [$F(2, 261) = 16.407, p < .0005$]. Post hoc comparisons using the Tukey HSD test indicated students perceptions of SAT decreased from class #1 Lecture ($n = 62, 3.9 \pm 1.2$) to class #2 CL ($n = 100, 3.8 \pm 1.2$), a decrease of 0.1 (95% CI, -0.3 to 0.6) which was not statistically significant ($p = .746$). However, students' perceptions of SAT increased from class #2 CL ($n = 100, 3.8 \pm 1.2$) to class #3 CL-RD ($n = 102, 4.6 \pm 1.0$), an increase of 0.9 (95% CI, -1.2 to -0.5) which was statistically significant ($p < .0005$). Students' perceptions of SAT increased from class #1 Lecture ($n = 62, 3.9 \pm 1.2$) class #3 CL-RD ($n = 102, 4.6 \pm 1.0$), an increase of 0.7 (95% CI, -1.2 to -0.3) which was statistically significant ($p < .0005$, Table 4). The results suggest that course design (traditional lecture vs CL) does have an impact on students' perceptions of SAT. The first time the course was taught using CL (Table 4, Class #2) resulted in lower SAT scores; however the differences were not at significant levels ($p = .746$). The second time the same instructor taught the class using the CL-RD (Table 4, Class #3), students' SAT scores increased significantly from the lecture-teaching format (Class #1) and from the initial time teaching with CL (Table 4, Class #2) ($p < .0005$).

Group	Method	n	M	SD	Tukey's HSD Post Hoc		
					C #1	C #2	C #3
C #1	L	62	3.89	1.213			$p < .0005^*$
C #2	CL	100	3.76	1.209			$p < .0005^*$
C #3	CL-RD	102	4.62	0.099	$p < .0005^*$	$p < .0005^*$	

*Note: $p < .005$

Hypothesis 3- Final Grades

The final course grades provided a clear indication that the data were not normally distributed for the three classes, as assessed by Shapiro-Wilk's test ($p < .0005$). Therefore, a non-parametric test was used to compare the three classes. A Kruskal-Wallis H test was run to determine if there were differences in Final Grades between students in the three classes. Distributions of Final Grades were similar for all groups, as assessed by visual inspection of a boxplot. Median Final Grades (Table 5) were statistically significantly different between groups, $H(2) = 47.322, p < .0005$. Pairwise comparisons were performed using Dunn's (1964) procedure with a Bonferroni correction for multiple comparisons. This post hoc analysis revealed statistically significant differences in median Final Grade scores between Class #1 (85.72) and Class #2 (89.31) ($p < .0005$), and Class #2 (89.31) and Class #3 (86.68) ($p < .0005$), but not between Class #1 (85.72) and Class #3 (86.68). The results suggest that course design (traditional lecture vs CL) does have an impact on students' final grades.

Table 5. Descriptive Statistics for Final Grades across the Three Classes

Class	Method	N	Median	SD	Kurtosis	Kurtosis SE	Skewness	Skewness SE
1	L	74	85.72	14.07	4.797	.552	-2.240	.279
2	CL	106	89.31	7.44	64.388	.465	-7.144	.235
3	CL-RD	117	86.68	7.75	57.289	.444	-6.463	.224

Hypothesis 4: Open-Comments

Students were asked an opened-ended question about their experiences while enrolled in the class to gain a deeper understanding of the impact of the course design (traditional lecture or CL). Students’ comments were grouped into common themes. There were 135 open comments included on the survey with the majority being negative (n = 103, 76%) and the rest positive (n = 32, 24%) (Table 6). The top two theme groupings for each class are summarized below.

Class #1 Traditional Lecture. The majority of the comments for Class #1 were negative (34 of 39, 87%). The largest theme for Class #1 were negative comments by students about issues with the course design (n = 8) by saying things such as, “Would like to see the different sections of PE [physical exam] acted out in lecture. Needs to be demonstrated.” Students also had issues with the exams in the class (n = 7) with comments such as, “I had anxiety over every exam/ competency and caused me more stress”.

Class #2 Collaborative Learning. The majority of the comments for Class #2 were negative (49 of 59, 83%). The largest open-ended theme for Class #2 were negative comments where students felt as if they had taught themselves the material (n = 15) with comments such as, “Did not like how we never lectured over all the material. Had to learn everything on our own outside of class”. The next largest theme were negative comments where students did not like active learning (n = 11) with comments such as, “I am not a fan of the active learning. We pay a lot of money for these courses, and would prefer the professor to actually teach us rather than us doing pointless discussion and activities in class.”

Class #3 Collaborative-Learning Redesign. While most open-ended comments were negative (20 of 37, 54%), there were also many positive comments (17 of 37, 46%). The largest theme grouping for Class #3 were positive statements of students saying they liked the class (n = 11) with comments such as, “It was a tough semester, but all of the little things really added up and I feel like I know the content well”. The second highest theme was also positive where students expressed liking the social and grouping aspects of the class (n = 6) with comments such as, “I loved the table arrangements and that I was able to meet new people and become good friends with them (sometimes it is hard to make friends at school when you commute!)”.

DISCUSSION

The Joint Commission and the American Association of Colleges of Nursing (AACN) has emphasized the importance of undergraduate nursing programs incorporating courses designed to develop effective communication and collaboration skills. In an effort to develop these skills in her students, this Nursing professor redesigned her large lecture class from a primarily lecture format to a class that required students to utilize collaborative interactions. The first class was taught in a fixed seat auditorium using primarily lecture teaching pedagogies (80%) and infrequent CL activities (20%) such as case studies. The fixed-seat auditorium style lecture hall made it difficult for students to complete

group activities. During Class #2 and Class #3, the class was moved to an active-learning classroom equipped with round tables specially designed to accommodate collaborative learning. The instructor redesigned her class to incorporate less lecture (20%) to more collaborative learning activities (80%). The majority of the collaborative activities were case studies that required the student groups to apply the nursing concepts learned in class to resolve the case. The collaborative learning case study are powerful because students get opportunities to apply content knowledge, practice problem solving skills, and improve their interpersonal skills (Woods, 1996).

The first time this instructor taught her class using CL (Table 3, Class #2), she was met with strong levels of student resistance which resulted in significant lower levels of community of inquiry (p = .004) and also lower levels of student satisfaction. Even though the instructor received strong levels of student resistance the first time the CL course was taught, she saw the benefit in student’s learning which resulted in a significant im-

Table 6. Open-Ended Comments Theme Groupings

Class #1: Lecture	
Positive Comments (n=5, 13%)	Negative Comments (n=34, 87%)
Liked professor (3)	Issues with course design (8)
Liked course design (2)	Issues with Exams (7)
	Issues with direction for exams (7)
	Issues with course delivery (6)
	Issues wanting more interactions (4)
	Other issues (2)
Class #2: Collaborative Learning	
Positive Comments (n=10, 17%)	Negative Comments (n=49, 83%)
Enjoyed the active learning (6)	Felt as if taught themselves content (15)
Active learning helped engage (2)	Did not like active learning (11)
Liked labs (2)	Active learning was not aligned well (8)
	Issue with course delivery (6)
	Issue with disorganization (6)
	Issue with classroom or technical (3)
Class #3: Collaborative Learning Redesign	
Positive Comments (n=17, 46%)	Negative Comments (n=20, 54%)
Liked class (11)	Did not like active learning (6)
Liked social and groups (6)	Issue with course delivery (5)
	Felt as if taught themselves content (3)
	Technical or structure issue (3)
	Wanted more clarification (2)
	Lab issues (1)
Total	
Positive comments: 32 (24%)	Negative comments: 103 (76%)

Table 7. Strategies for Overcoming Student Resistance

IMSR Elements	Strategies
Metacognition	It is important for instructors to be transparent and let students know the reason to move from the passive lecture model to a collaborative learning course design format. In Class #3, this instructor let her students know that she was incorporating the CL format in an effort to develop students' communication and collaboration skills because the health care environment requires employees to collaborate to solve complex issues.
Cognitive development	It is important for instructors to let students know how their brain learns best. During Class #3, this instructor let the students know about the recent findings by neuroscience that has identified the positive impact of collaboration on learning (Hohnen & Murphy, 2016).
Environmental forces	It is important for instructors to share their expectations about the new CL format right from the beginning. In Class #3, the instructor was much more intentional about sharing her expectations that students would take on a more active role by working in collaborative teams. Expectations were shared publicly and frequently in multiple formats (mini-lectures in class, directions for class assignments, and class documentation).
Negative classroom experiences	It is important for instructors to share current research on the learning benefits of collaborative learning. This instructor shared the research that collaborative learning results in higher academic achievement than individualistic learning (Johnson, Johnson, & Smith, 2014).

provement of final course grades ($p < .0005$). To gain students' buy-in, the instructor redesigned her class in an effort to change students' epistemic fluency, which is the student's personal view on how the learning process should occur (Markauskaite & Goodyear, 2017). The instructor kept most of the CL activities the same from Class #2 to Class #3, but incorporated many short mini-lectures in an effort to convince students about the benefits of active CL over traditional lecture teaching methodologies. The instructor shared some of the research studies that have identified the benefits of CL and also shared the grade improvements of students in the previous class taught with CL. The instructor's additions to Class #3 paid off and student resistance was remarkably reduced with less negative open-ended comments (Class #1 = 87%; Class #2 = 83%, and Class #3 = 54%), significantly higher levels of Col ($p < .0005$), and SAT ($p < .0005$) from Class #2. Final course grades rose significantly from Class #1 to Class #2 ($p < .0005$). Final course grades increased from Class #1 to Class #3, but not at significant levels. While there is no clear explanation for this outcome, the authors note that the cohort in Class #3 included more students directly admitted from high school and theorize that these students may lack experience with institutions of higher learning.

Students may feel uncomfortable as faculty move away from lecture dominated pedagogies to collaborative learning formats. CL will change students' roles from passive learner to becoming an active partner that is responsible for developing their own knowledge creation. Students may not be as receptive to the new CL design and may be downright hostile to the new active role they will be required to assume more responsibility for their own learning (Doyle, 2008). It is important for instructors to share the benefits of the active collaborative learning pedagogy and why the instructor has opted to move away from the passive lecture model. Here are some strategies for faculty change students' epistemic fluency (Markauskaite & Goodyear, 2017) to becoming more accepting of collaborative learning pedagogies.

Outcomes from this research study are significant because many faculty will experience strong levels of student resistance when implementing CL in the classroom. Fear of poor student evaluations may stop instructors from adopting CL because of the negative impact on their career (Gooblar, 2015). Student resistance might result in lower course ratings for instructors and could have a negative impact on the faculty careers. Strong student resistance may hinder faculty from implementing CL teach-

ing methodologies which may improve students' communication skills and collaboration skills.

This research is also significant for faculty development departments as they develop their curriculum for conducting professional development sessions about active and collaborative learning pedagogies. Traditionally faculty developers would include the "How To" information about developing collaborative learning environments such as how to develop collaborative learning activities and how to use technologies to implement collaborative learning. In addition to this "How To" information, faculty developers need to give faculty strategies on how to change their students' epistemic fluency in an effort to make students be more accepting of the collaborative learning process.

CONCLUSION

Today's complex workforce requires workers to have strong levels of communication and collaboration to solve the complex issues facing our society. Faculty in all disciplines are beginning to update their curriculum to incorporate more collaborative community projects in an attempt to develop students' communication skills and teamwork. Nursing faculty are also beginning to include more CL in courses in an effort to enhance teamwork in the workplace. This mixed-method research study shows that many students dislike group work so much that their high levels of student resistance will actually decrease students' level of Col and satisfaction. Faculty that are incorporating CL in their classroom are encouraged to include strategies to pro-actively address students' resistance using Tolman and Kreming's (2017) integrated model of student resistance (IMSR) as a guideline. It is essential that faculty overcome student resistance before students are willing to embrace CL and become a member of the community of inquiry.

Study Limitations

There are three primary limitations of this study. First, this study only included 302 students from one nursing program in one institution, making the findings not generalizable across other programs or institutions. However, the recommendations for helping faculty design CL environments may be useful as classes are restructured.

Second, the students in this study were asked to give their perceptions about their own level of community of inquiry and satisfaction while participating in the class. While the survey was anonymous, there could have been many influences that impact-

ed student responses. Issues such as social desirability bias (Zerbe & Paulhus, 1987) can have an impact on students' responses because they may choose a rating to make themselves more desirable. Reference bias (Groot, 2000) could also have an impact on responses because students could have different standards of comparison.

Finally, the Col Survey was developed for use in online and blended-learning classes. The verbiage in the survey needed to be modified to be appropriate for students in a face-to-face setting. While the changes made were minor, the updates could have had an impact on the reliability of the instrument.

Areas for Future Research

This research study was conducted with students in an introductory nursing class. However, it is important for students in all disciplines to develop communication and collaboration skills, so this study could be conducted with students in other disciplines. Another suggested area for further study would be to gather data from students in different programs or institutions to compare results. Another area for future research would be to conduct focus group interviews with students to more deeply explore the reasons for student resistance to collaborative learning.

REFERENCES

- Akyol, Z., & Garrison, D. R. (2008). The development of a Community of Inquiry over time in an online course: understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Networks*, 12, 61-69.
- Alpay, E., & Ireson, J. (2006). Self-theories of intelligence of engineering students. *European Journal of Engineering Education*, 31(2):169-180.
- American Association of Colleges of Nursing-AACN (2008). *The Essentials of Baccalaureate Education for Professional Nursing Practice*. Washington, DC. Retrieved from <http://www.aacn.nche.edu/education-resources/baccessentials08.pdf>
- American Nurses Association. (2016). *Collaborative Health Care: How Nurses Work in Team-based Settings*. ANA web site. Retrieved from <http://nursingworld.org/Content/Resources/Collaborative-Health-Care-How-Nurses-Work-in-Team-Based-Settings.html>
- Allan, E. G. (2016). "I hate group work!": addressing students' concerns about small-group learning. *InSight: A Journal of scholarly Teaching*, 11(2016), 81-89.
- Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. D. & Swan, K. P. (2008). Developing a community of inquiry instrument: testing a measure of the Community of Inquiry framework using a multi-institutional sample. *The Internet and Higher Education*, 11(3-4), 133-136.
- Austin, J. E. (2000). Principles for partnership. *Journal of Leader to Leader*, 18 (Fall), 44-50.
- Baxter Magolda, M. (1992). *Knowing and Reasoning in College: Gender-related Patterns in Student Development*. San Francisco, CA: Jossey-Bass.
- Beebe, S. A., & Masterson, J. T. (2003). *Communicating in Small Groups*. Boston, MA: Pearson Education Inc.
- Bennett, D. A. (2001). How can I deal with missing data in my study? *Australian and New Zealand Journal of Public Health*, 25(5), 464-469.
- Bosworth, K. (1994). Developing collaborative skills in college students. Collaborative learning: underlying processes and effective techniques. *New Directions for Teaching and Learning*, 59, 25-31.
- Boujaoude, S. (2016). Thinking collaboratively: learning in a community of inquiry [Review of the book *Thinking collaboratively: Learning in a community of inquiry*]. *International Review of Education*, 62(123-125). doi: 10.1007/s11159-016-9538-9
- Bransford, J., Brown, A. L., & Cocking, R. (2006). *How People Learn: Brain, Mind Experience, and School*. Washington, DC: National Academic Press.
- Brandt, B. (March 2015). Interprofessional education and collaborative practice: welcome to the "new" forty-year old field. Presented at the NAAHP Conference. San Francisco, CA.
- Brewer, M. (2000). Research design and issues of validity. In H. Reis & C. Judd (Eds.) *Handbook of Research Methods in Social and Personality Psychology*. Cambridge, UK: Cambridge University Press.
- Burke, A. (2011). Group work: how to use groups effectively. *The Journal of Effective Teaching*, 11(2), 87-95.
- Cacioppo, J. T., & Perry, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology*, 42(1), 116-131.
- Chi, M. T. H., & Wylie, R. (2014). The ICAP framework: linking cognitive engagement to active learning outcomes. *Educational Psychologist*, 49, 219-243. <http://dx.doi.org/10.1080/00461520.2014.965823>
- Cleveland-Innes, M., Garrison, D. R., & Kinsel, E. (2007). Role adjustment for learners in an online Community of Inquiry: identifying the challenges of incoming online learners. *International Journal of Web-Based Learning and Teaching Technologies*, 2(1), 1-16.
- Cockrell, K. S., Hughes-Caplow, J. A., & Donaldson, J. F. (2000). A context for learning: collaborative groups in problem-based learning environment. *The Review of Higher Education*, 23(3), 347-363.
- Cole, D. (2007). Do interracial interactions matter? An examination of student-faculty contact and intellectual self-concept. *Journal of Higher Education*, 78(3), 249-281.
- Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Practical Assessment, Research, & Evaluation*, 10(7), 1-9.
- Curşeu, P. L., Schrujier, S. G. L., & Fodor, O. C. (2017). Minority dissent and social acceptance in collaborative learning groups. *Frontiers in Psychology*, 8(458), 1-9. doi: 10.3389/fpsyg.2017.00458
- Dewey, J. (1959). My pedagogic creed. In J. Dewey (Ed.), *Dewey on education* (pp. 19-32). New York: Teachers College, Columbia University. (Original work published 1897)
- DeVellis, R. F. (2012). *Scale Development: Theory and Applications*. Thousand Oak, CA: Sage Publications.
- Doyle, T. (2008). *Helping Students Learn in a Learner Centered Environment: A Guide to Facilitating Learning in Higher Education*. Sterling, VA: Stylus.
- Dunn, O. J. (1964). Multiple comparisons using rank sums. *Technometrics*, 6, 241-252.
- Dweck, C. S. (2000). *Self-theories: Their Role in Motivation, Personality and Development*. NY: Taylor & Francis.
- Dweck, C. S. (2006). *Mindset: The New Psychology of Success*. NY: Ballantine Books.

- Ernest, P. (1995). The one and the many. In P. Steffe & J. Gale (Eds.), *Constructivism in Education* (pp. 355-366). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Felder, R. M., Felder, G. N., Mauney, M., Hamrin, C. E., & Dietz, E. J. (1995). A longitudinal study of engineering student performance and retention. III. Gender differences in student performance and attitudes. *Journal for Engineering Education*, 84(2), 151-163. doi: 10.1002/j.2168-9830.1995.tb00162
- Feichtner, S. B., & Davis, E. A. (1984). Why some groups fail: a survey of students' experiences with learning groups. *Journal of Management Education*, 9(4), 58-73. doi: https://doi.org/10.1177/105256298400900409
- Ford, K. A. (2011). Race, gender, and bodily (Mis) Recognitions: women of color faculty experiences with white students in the college classroom. *The Journal of Higher Education*, 82(4), 444-478.
- Fuchs, E., & Fluegge, G. (2014). Adult neuroplasticity: more than 40 years of research. *Neural Plasticity*, 2014, 1-10. doi: http://dx.doi.org/10.1155/2014/541870
- Howard, J. R. (2015). *Discussion in the College Classroom: Getting Your Students Engaged and Participating in Person and Online*. San Francisco: Jossey-Bass.
- Garrison, D. R. (2008). Communities of inquiry in online learning: social, teaching and cognitive presence. In C. Howard (Ed.), *Encyclopedia of Distance and Online Learning*. Hershey, PA: IGI Global
- Garrison, D. R. (2016). *Thinking Collaboratively: Learning in a Community of Inquiry*. NY: Routledge.
- Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: computer conferencing in higher education. *The Internet and Higher Education* 2(2-3): 87-105.
- Gooblar, D. (2015, February 4). Why students resist active learning. *Chronicle Vitae*. Retrieved from https://chroniclevitae.com/news/893-why-students-resist-active-learning
- Groot, W. (2000). Adaptation and scale of reference bias in self-assessments of quality of life. *Journal of Health Economics*, 19(3), 403-420.
- Hohnen, B., & Murphy, T. (2016). The optimum context for learning: drawing on neuroscience to inform best practice in the classroom. *Educational & Child Psychology*, 33(1), 75-90.
- Holden, R. B. (2010). Face validity. In I. B. Weiner & W. E. Craighead, *The Corsini Encyclopedia of Psychology* (4th ed.) (pp. 637-638). Hoboken, NJ: Wiley.
- Huitt, W. (2003). The information processing approach to cognition. *Educational Psychology Interactive*. Valdosta, GA: Valdosta State University. Retrieved [date] from, http://www.edpsy-cinteractive.org/topics/cognition/infoproc.html
- Jarvenoja, H., & Jarvela, S. (2009). Emotion control in collaborative learning situations: do students regulate emotions evoked by social challenges? *The British Journal of Educational Psychology*, 79(3): 463-81.
- Johnson, D.W., Johnson, R.T., and Smith, K.A. (2014). Cooperative learning: improving university instruction by basing practice on validated theory. *Journal on Excellence in College Teaching* 25(3-4), 85-118.
- Joint Commission. (2008). *Improving America's Hospitals: The Joint Commission's Annual Report on Quality and Safety*. Retrieved from https://www.jointcommission.org/annualreport.aspx
- Karau, S. J., & Williams, K. D. (1993). Social loafing: a meta-analytic review and theoretical integration. *Journal of Personality and Social Psychology*, 65(4), 681-706.
- Kloss, R. J. (1994) A nudge is best. *College Teaching*, 42(4), 151-159. doi: 10.1080/87567555/1994/9926847
- Koehn, E. (2001). Assessment of communications and collaborative learning in civil engineering education. *Journal of Professional Issues in Engineering Education and Practice*, 127(4), 160-165.
- Kübler-Ross, E. (1969) *On Death and Dying*. NY: Routledge.
- Leonard, P. E., & Leonard, L.J. (2001). The collaborative prescription: remedy or reverie? *International Journal of Leadership in Education*, 4(4), 383-399.
- Ling, L. H. (2007). Community of Inquiry in an online undergraduate information technology course. *Journal of Information Technology Education*, 6, 153-168.
- Lipman, M. (2003). *Thinking in Education* (2nd ed.). Cambridge: Cambridge University Press.
- Markauskaite, L., & Goodyear, P. (2017). *Epistemic Fluency and Professional Education: Innovation, Knowledgeable Action and Actionable Knowledge*. NY: Springer.
- Miller, A. (2014). *Not Just Group Work—Productive Group Work* (Edutopia report for George Lucas Educational Foundation). Retrieved from https://www.edutopia.org/blog/productive-group-work-andrew-miller
- Mitchell, R. C. (2004). Combining cases and computer simulations in strategic management courses. *Journal of Education for Business*, 79(4), 198-204. http://dx.doi.org/10.3200/JOEB.79.4.198-204
- Moore, K. D. (2009). *Effective Instructional Strategies, from Theory to Practice* (2nd ed.). Sage Publications.
- Noguchi, I. (2014). Miscommunication a major cause of medical error; study shows. Retrieved from https://ww2.kqed.org/stateofhealth/2014/11/25/miscommunication-a-major-cause-of-medical-error-study-shows/
- Osgood, C.E., Suci, G., & Tannenbaum, P. (1957). *The Measurement of Meaning*. Urbana, IL: University of Illinois Press.
- Pérez-Cavana, M. (2009). Closing the circle: from Dewey to Web 2.0. In C. Payne (Ed.), *Information Technology and Constructivism in Higher Education: Progressive Learning Frameworks* (pp. 1-13). Hershey, PA: Information Science Reference. doi:10.4018/978-1-60566-654-9.ch001
- Perry, W. G. (1970). *Forms of Intellectual and Ethical Development in the College Years: A Scheme*. NY: Holt, Rinehart and Winston.
- Piaget, J. (1950). *The Psychology of Intelligence*. NY: Routledge.
- Piaget, J. (1970). *Genetic Epistemology*. NY: Columbia University Press.
- Prichard, J. S., Stratford, R. J., & Bizo, L. A. (2006). Team-skills training enhances collaborative learning. *Learning and Instruction*, 16(3), 256-265. doi: http://doi.org/10.1016/j.learn-instruc.2006.03.005
- Ravenscroft, B., & Luhanga, U. (2014, January 1). Developing employability skills in humanities and social sciences using the flipped model. *Proceedings of the International Conference on e-Learning*, p. 142-149.
- Roksa, J., Kilgo, C. A., Trolan, T. L., Pascarella, E. T., Blaich, C., & Wise, K. S. (2017). Engaging with diversity: how positive and negative diversity interactions influence students' cognitive outcomes. *The Journal of Higher Education*, 88(3), 297-322.
- Scardamalia, M., & Bereiter, C. (2006). Knowledge building: theory, pedagogy, and technology. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 97-115). Cam-

- bridge: Cambridge University Press.
- Shea, P., & Bidjerano, T. (2009). Community of Inquiry as a theoretical framework to foster “Epistemic engagement” and “Cognitive presence” in online education. *Computers & Education*, 52(3), 543-553
- Short, J., Williams, E., & Christie, B. (1976). *The Social Psychology of Telecommunications*. London: John Wiley & Sons.
- Smith, B. L., & MacGregor, J. T. (1992). What is collaborative learning? In Goodsell, A. S., Maker, M. R., and Tinto, V. (Eds.), *Collaborative Learning: A Sourcebook for Higher Education*. Syracuse University: National Center on Postsecondary Teaching, Learning, & Assessment.
- Smith, H., Parr, R., Woods, R., Bauer, B., & Abraham, T. (2010). Five years after graduation: undergraduate cross-group friendships and multicultural curriculum predict current attitudes and activities. *Journal of College Student Development*, 51(4), 385-402.
- Swan, K. P., Richardson, J. C., Ice, P., Garrison, R., Cleveland-Innes, M., & Arbaugh, J. B. (2008). Validating a measurement tool of presence in online communities of inquiry. *E-Mentor*, 2(24), 1-12.
- Tabachnick, B. G. & Fidell, L. S. (2001). *Using Multivariate Statistics*. Boston: Pearson Publishing.
- Taylor, A. (2011). Top 10 reasons students dislike working in small groups. . . and why I do it anyway. *Biochemistry and Molecular Biology Education*, 39(3), 219-220.
- Tolman, A. O. & Kremling, J. (2017). *Why Students Resist Learning: A Practical Model for Understanding and Helping Students*. Sterling, VA: Stylus Publishing.
- Virgă, D., Curșeu, P. L., Maricuțoiu, L., Sava, F. A., Măsinga, I., Măgurean, S. (2014). Personality, relationship conflict, and teamwork-related mental models. *PLoS ONE* 9(11):e110223. doi:10.1371/journal.pone.0110223
- von Glasersfeld, E. (1992). Aspects of radical constructivism and its educational recommendations. Paper presented at the 7th meeting of the International Congress of Mathematics Education, Quebec, Ontario.
- Vrugt, A., & Oort, F. J. (2008). Metacognition, achievement goals, study strategies and academic achievement: pathways to achievement. *Metacognition and Learning*, 3(2), 123-146.
- Vygotsky, L. S. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.
- White, J. W., & Lowenthal, P. R. (2010). Minority college students and tacit “codes of power”: developing academic discourses and identities. *Review of Higher Education*, 34(2), 283-318.
- Widnall, S. E. (1988). AAAS presidential lecture: Voices from the pipeline. *Science*, 241, 1740-1745. Retrieved from http://web.mit.edu/aeroastro/sites/widnall/aaas_pres.pdf
- Woods, D. R. (1994). *Problem-based Learning: How to Gain the Most from PBL*. Hamilton, Ontario: W. L. Griffen Printing.
- Yin, R. K. (2014). *Case Study Research Design and Methods* (5th ed.). Thousand Oaks, CA: Sage.
- Youngblood, N., & Beitz, J. M. (2001). Developing critical thinking with active-learning strategies. *Nurse Educator*, 26(1), 39-42. <http://dx.doi.org/10.1097/00006223-200101000-00016>
- Zerbe, W. J., & Paulhus, D. L. (1987). Socially desirable responding in organizational behavior: a reconception. *Academy of Management Review*, 12, 250-264.

APPENDIX

Directions for the Col Survey: Please read the following questions and based on your experiences in this class, make a determination if you *Strongly Disagree*, *Disagree*, *Neutral*, *Agree* or *Strongly Agree*.

1. The instructor clearly communicated important course topics.
2. The instructor clearly communicated important course goals.
3. The instructor provided clear instructions on how to participate in course learning activities.
4. The instructor clearly communicated important due dates/time frames for learning activities.
5. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.
6. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.
7. The instructor helped to keep course participants engaged and participating in productive dialogue.
8. The instructor helped keep the course participants on task in a way that helped me to learn.
9. The instructor encouraged course participants to explore new concepts in this course.
10. Instructor actions reinforced the development of a sense of community among course participants.
11. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.
12. The instructor provided feedback that helped me understand my strengths and weaknesses.
13. The instructor provided feedback in a timely fashion.
14. Getting to know other course participants gave me a sense of belonging in the course.
15. I was able to form distinct impressions of some course participants.
16. Class discussions are an excellent medium for social interaction.
17. I felt comfortable talking during class.
18. I felt comfortable participating in the course discussions.
19. I felt comfortable interacting with other course participants.
20. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.
21. I felt that my point of view was acknowledged by other course participants.
22. Class discussions help me to develop a sense of collaboration.
23. Problems posed increased my interest in course issues.
24. Course activities piqued my curiosity.
25. I felt motivated to explore content related questions.
26. I utilized a variety of information sources to explore problems posed in this course.
27. Brainstorming and finding relevant information helped me resolve content related questions.
28. Class discussions were valuable in helping me appreciate different perspectives.
29. Combining new information helped me answer questions raised in course activities.
30. Learning activities helped me construct explanations/solutions.
31. Reflection on course content and discussions helped me understand fundamental concepts in this class.
32. I can describe ways to test and apply the knowledge created in this course.
33. I have developed solutions to course problems that can be applied in practice.
34. I can apply the knowledge created in this course to my work or other non-class related activities.

Arbaugh, J.B., Cleveland-Innes, M., Diaz, S.R., Garrison, D.R., Ice, P., Richardson, & Swan, K.P. (2008). Developing a community of inquiry instrument: Testing a measure of the Community of Inquiry framework using a multi-institutional sample. *The Internet and higher Education*, 11(3-4), 133-136. Used with permission.