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Abstract

The purpose of this paper is to examine ways in which pedagogy and gender of instructor impact the development of self-regulated learning strategies as assessed by the Motivated Strategies for Learning Questionnaire (MSLQ) in male and female undergraduate engineering students. One hundred seventy-six students from four universities participated in the study. Within-group analyses found significant differences with regard to pedagogy, instructors' gender, and student gender on the learning strategies and motivation subscales as operationalized by the MSLQ. Pedagogy was operationalized as two general formats: lecture plus active learning techniques or problem-base/project-based learning. Male and females students reported significant post-test differences with regard to the gender of instructor and the style of pedagogy. The results of this study showed a pattern where more positive responses for students of both genders were found with the same-gendered instructor. The results also suggested that male students responded more positively to project and problem based courses with changes evidenced in motivation strategies and resource management. Female students showed decreases in motivation and resource management in these two types of courses. It is important to note that both of the instructors of problem-based and project-based courses were male, thus the result may be an interaction of the instructors' gender with pedagogy. Further, both male students and female students reported increases in lecture with active learning courses. Implications of these findings include the importance of female students having the opportunity to develop positive relationships with female faculty members to increase retention rates among female students in science, technology, engineering and mathematics (STEM) fields.

Gender Differences in Engineering Education: Sugar and Spice and Everything Nice?

Statistics examining undergraduate education, graduate education and the work force consistently show major disparities between the numbers of males and females in the fields of science, technology, engineering and mathematics (STEM). There is no dispute that women are underrepresented in science, technology, engineering and math (STEM) fields. For example, the National Center for Education Statistics found that in the year 2008, the percentage of bachelor's degrees (in any field) earned by women was 57.3% and the percentage of bachelor's degrees earned by males (in any field) was 42.7% (http://nces.ed.gov). Despite the fact that more female students are earning bachelor's degrees than male students overall, in engineering the ratio remains significantly skewed with 69,724 males receiving a bachelor's degree in engineering and only 14,129 female students earning such a degree (http://nces.ed.gov). If one considers that the number of bachelor's degrees in engineering awarded to females in 1966 was only 146(National Science Foundation, 2010), the 2008 distribution represents nearly a ten thousand percent increase for female engineering graduates. However, the actual percentage of female awardees in the distribution has only changed from 0.1% to 1.6% in the past forty years (National Science Foundation, 2010). What can account for this discrepancy and slow rate of change? The question is one that has been debated by researchers for the past forty years, with no single cause rising to the top as more salient than another.

Researchers have examined many factors in search of an explanation for why there are so few women in STEM fields. One possibility is that parents inadvertently encourage their daughters to focus on subjects that are 'traditionally' more feminine, such as reading or writing (Eccles-Parsons, Adler & Kaczala, 1982). Another is the lack of female role models in STEM fields (Blickenstaff, 2005). Others have focused their attention on the 'chilly climate' reported by some female students in university-level courses (Warrington & Younger, 2005). In addition to the explanatory factors listed above, many others exist for these differences including biological factors (Sadker & Sadker, 1994), poor academic preparation (Cole, 1997), and low levels of self-confidence (Brainard & Carlin, 1998). While it is important to determine the underlying causes for these discrepancies in attracting and retaining females to STEM fields, it may be enlightening to examine how pedagogical approaches in engineering college classrooms affect motivation and the use of learning strategies that would allow both male and female students to derive maximum benefit from their experience.

The purpose of this study is to examine how different types of engineering learning environments contribute to the development of lifelong learning skills among engineering undergraduates, with a specific focus on the interaction of instructor's gender with that of the student and within particular pedagogies. The independent variables of instructor gender and pedagogical style were specifically targeted and the questions asked were whether male and female students respond differently to different learning environments or to the gender of their instructors. Examining differences associated with the cognitive, behavioral, motivational and contextual factors that lead to the development of self-regulated learning should lead to a greater understanding of the learning environments that promote the development of these necessary skills and the role that gender plays in this development.

Self- regulated learning (SRL) is a process in which the learner is an active participant in his or her own learning process (Pintrich, 2004). Self-regulated learners select their own goals, select and organize learning strategies, and monitor their own effectiveness. According to Boekarts, Pintrich and Zeidner (2000), there are four assumptions of self-regulated learning models. The first assumption is that learners are active participants in constructing meaning from information available in the environment in combination with what they already know. SRL models assume that students use prior knowledge as well as external resources to formulate their own learning strategies and goals. The second assumption of SRL models is that learners can control and regulate aspects of their thinking, motivation, behavior and in some instances their environment. While this regulation of thinking, motivation, and behavior is not always possible due to situational constraints, SRL models argue that there is often the *potential* for students to monitor, control and regulate these aspects. The third assumption of SRL models is the goal, criterion or standard assumption (Pintrich, 2004). This assumption presumes that learners compare their progress toward a goal against some criterion and this comparison informs the learners of the status of their progress. This comparison allows learners to monitor whether the learning process should continue as is or whether the learning process needs to be adjusted or changed. Finally, SRL models assume that self-regulatory activities are mediators between personality and cultural characteristics and performance or eventual achievement (Pintrich, 2004).

In accordance with social learning theory, the social cognitive view of self-regulated learning argues that learning is not solely determined by personal processes, but is also influenced by environmental and behavioral events (Zimmerman, 1989). Bandura (1974), who is credited with developing the concept of reciprocal determinism, states that “the term *determinism* is used to signify the production of events by effects, rather than in the doctrinal sense that actions are completely determined by a prior sequence of causes independent of the individual. Because of the complexity of interacting factors, events produce effects probabilistically rather than inevitably” (p. 345). Further, the influences exerted by personal processes, environmental and behavioral events vary according to differences in personality characteristics of individuals as well as situational factors.

Social cognitive theory assumes that self-efficacy is a crucial component of self-regulated learning. According to Zimmerman (1989), “self-efficacy refers to perceptions about one’s capabilities to organize and implement actions necessary to attain designated performance of skill for specific tasks” (p. 329). Bandura (1993) states that “efficacy beliefs influence how people feel, think, motivate themselves and behave" (p. 118). Research shows that students with high self-efficacy display more of the behavioral and environmental determinants of SRL, making self-efficacy critically important (Zimmerman 1989). Further, Bandura (1991) found that students with a greater sense of perceived self-efficacy were more likely to set higher goals for themselves and have a firmer commitment to them. Self-efficacy beliefs produce diverse effects through cognitive, motivational, affective, and selection processes (Bandura 1993).

In addition to the important role that self-efficacy plays in self-regulation, social cognitive theorists also assume that there are three sub-processes involved in self-regulation: self-observation, self-judgment, and self-reaction (Zimmerman, 1989). These three sub-processes are also reciprocal in nature. Self-observation refers to the learner systematically monitoring his or her own performance. In line with Bandura's (1974) concept of reciprocal determinism in which personal processes, behavioral and environmental events are interconnected, Zimmerman (1989) states that "self-observation is influenced by personal processes such as self-efficacy, goal setting and cognitive planning as well as by behavioral influences" (p. 333). One common method of self-observation is through quantitative recording of the amount of work that one completes. The second sub-process, self-judgment, occurs when a learner systematically compares his or her own performance against a standard or goal. Zimmerman (1989) states that two common ways that learners engage in self-judgment is by using checking procedures and rating their answers in relation to those of another student. The third sub-process, self-reaction, occurs when a learner reflects on his or her performance. Ultimately, not all forms of self-reaction lead to self-regulation (Zimmerman 1989).

In addition to personal processes and behavioral events, the instructional environment has a tremendous impact in the development of self-regulation. Vermunt and Vermetten (2004) refer to different teaching functions that can promote student learning and self-regulation. Their work suggests that different teaching strategies fall on a continuum of strong teacher-regulation to shared teacher-student regulation to loose teacher-regulation. Learning environments that are structured to be more loosely teacher-regulated require students to self-regulate more often than learning environments that are strongly teacher-regulated. The instructor's teaching strategies as well as the student's learning strategies help to determine how the student will navigate through the internal and external regulation demands. Vermunt and Vermetten (2004) state that, as a student attempts to balance self- versus external regulation forces, congruence or friction may occur. Congruence occurs when the instructor's teaching strategies and the student's learning strategies are compatible; friction occurs when this is not the case (Vermunt & Vermetten, 2004). There are two types of friction: constructive and destructive. Constructive friction causes students to adopt productive learning strategies that they might not have used prior to this learning experience. This may lead to a student making use of new learning strategies and to an increase in self-regulation. Destructive friction occurs when the level of self-regulation that the instructor expects from the students is considerably different from what the student is capable of using at that time (Vermunt & Vermetten, 2004). Destructive friction can, ultimately, lead to frustration for the student and it may decrease the amount of thinking and types of learning strategies that the student employs (Vermunt & Vermetten, 2004).

In many cases personal characteristics of students and instructors have been identified as having an impact on the learning process. One such characteristic that is studied to determine its effects on teaching and learning is gender. According to the social cognitive theory of gender development (Bussey & Bandura, 1999), gender development is promoted by three major modes of influence: modeling, enactive experience, and direct tuition. Bussey and Bandura (1999) state that "modeling is one of the most pervasive and powerful means of transmitting values, attitudes, and patterns of thoughts and behaviors" (p. 686). Further they state that "modeling is a major social mechanism through which behavioral patterns, social rules, and socio-structural arrangements get replicated across generations" (p. 689). Although modeling is often thought of as response mimicry (Bussey & Bandura 1999), social cognitive theory characterizes modeling as learning from exemplars (Bussey & Bandura 1999). It argues that once an observer understands the basic rules and structures of the modeled activity, he or she can then generate new patterns of behavior or thought processes that go beyond the modeled activity. This deviates from response mimicry in that the learner develops a deeper understanding of the modeled behavior and is then able to adjust their actions accordingly.

In addition to modeling, the social cognitive theory of gender development recognizes that people respond differently to the gender-linked conduct of children. Bussey and Bandura (1999) refer to this as enactive experience. For example, a father may have a more negative reaction to his son playing with a Barbie doll than the mother. Likewise, a mother may have a more negative reaction to her daughter playing with toy cars than the father. Through enactive experience, children witness these reactions from different people and integrate this information into their own guidelines for behavior (Bussey & Bandura, 1999).

The third mode of influence is direct tuition. In this mode of influence, Bussey and Bandura (1999) state that "gender conceptions are drawn from the tutelage of person's in one's social environment" (p. 689). Similar to the two other modes of influence, direct tuition is most effective when the gender role receives social support (Bussey & Bandura, 1999). In other words, if a child is exposed to gender stereotypes in their immediate social environment and the same stereotype is practiced and acknowledged by others outside of this environment, he or she will be more likely to adopt these gender stereotypes.

It is important to note that gender development is also reciprocal in nature. For example, a child's social environment is highly influential in his or her construction of gender conceptions, which impacts his or her behaviors and personal processes later in life. Ultimately, children do not passively absorb gender conceptions and biases; they glean information from their family members and community and construct their own personal views.

Method

Participants

One hundred seventy-six undergraduate engineering students and four engineering instructors from four different universities participated in the study. The universities participating in the study included a small, private, specialty engineering school with the number of male and female students being close to equal. Two small, private liberal arts universities also participated in the study. In these courses the number of male students was greater than the number of female students; also, each course had a small student- to-instructor ratio. Finally, one large, public university with a gender and student-to-instructor ratio typical of a large engineering program also participated in the study. Overall, 103 male and 73 female students participated in the study. Figure 1 displays the number of male and female students in each course, along with the students' year of study. Two of the universities were located in the northeastern United States and the other two universities were located in the far western United States. Data was collected from 11 courses over a two year period. Seven of the courses were required courses, while the other four courses were electives. The following four courses were included in the study one time each: electrical circuits, heat transfer, statics and a senior design course. An engineering materials science course was taught twice but by two different instructors at different universities. The following courses were included twice in the study, taught by the same instructors but in different semesters: failure analysis and prevention, thermal systems and metals and alloys. One instructor was a professor of chemical engineering, two instructors were professors of mechanical engineering, and one instructor was a professor of electrical engineering. Three instructors were male and one was female.

Figure 1. Number of male students, female students and year of study for each course.

Course Title	Male	Female	First-year	Sophomore	Junior	Senior
Heat Transfer	12	4	0	0	16	0
Thermodynamics	18	2	0	0	0	20
Failure Analysis	1	9	0	3	5	2
Metals and Alloys	3	6	0	3	1	5
Statics	10	8	0	14	3	1
Circuits	10	6	0	14	2	0
Materials Science	11	11	0	8	12	2
Failure Analysis	6	9	0	10	4	1
Senior Design	12	4	0	0	0	16
Statics	15	8	1	22	0	0
Materials Science	5	6	3	0	4	4

The eleven courses examined can all be described as being either a problem-based, project-based or lecture with active learning course. The courses that tend to be more lecture with active learning emphasize students acquiring new content knowledge to add to the students growing knowledge of the field of engineering. The courses that are either problem or project-based emphasize students engaging in activities that use content knowledge to solve problems that mimic real world experiences. In some instances, students in the project-based courses did engage in real world experiences with clients, as in the senior design course. Figure 2 shows the breakdown of the courses designated content-oriented and process-oriented.

The eleven courses examined in this study also follow along a continuum of teacher-centered to student- centered courses. Teacher- centered courses involve the instructor making decisions such as what content will be covered in the course, methods of evaluation, and group assignments. Student- centered courses involve students sharing (with the instructor and each other) decisions regarding the course. These decisions could include deciding what content will be covered throughout the semester, how class time should be spent, group assignments, as well as evaluation procedures. Figure 2 also illustrates the continuum of the teacher-centered to student-centered courses involved in this study.

Figure 2. Description of each course as the degree to which the course was teacher-centered to student centered.

Lecture with Active Learning/More Teacher Centered	Problem-Based/ Moderately Teacher Centered	Project-Based/ Student Centered
Thermodynamics	Heat Transfer	Failure Analysis
Statics	Materials Science*	Senior Design
Statics		Failure Analysis
Circuits		Metals and Alloys
Materials Science*		

*Indicates two courses with the same title but taught by two different instructors

Procedure

A brief description of the study was given to the students by their instructor on the first day of class and informed consent was obtained. Separate consent was obtained for survey completion, being audiotaped and participation in focus group sessions. Quantitative data was collected from the students at the beginning of the semester and at the end of the semester via Survey Monkey. Instructors conducted their classes using the style of pedagogy they determined best suited for the goals of the course and identified where in the semester audiotaped portions of their instruction or student work would occur.

Instruments

Students responded to the Motivated Strategies for Learning Questionnaire (MSLQ, Pintrich, Smith, Garcia, & McKeachie, 1991) at the beginning and end of each semester.

Motivated Strategies for Learning Questionnaire. The Motivated Strategies for Learning Questionnaire (MSLQ) is an 81 item self-report questionnaire designed to measure motivational orientations and the use of cognitive learning strategies in college students. The questionnaire is designed in a 7 point Likert format. An indication of 1 on the Likert scales represents 'not at all true of me' and a 7 indicates 'very true of me.' The MSLQ has 15 subscales that include 6 subscales that address motivation (intrinsic goals, extrinsic goals, task value, control of learning beliefs, self efficacy, and test anxiety) and 9 subscales that address learning strategies (rehearsal, elaboration, organization, critical thinking, self-regulation, time and study environment, effort regulation, peer learning and help seeking). The survey has high predictive validity and adequate to good internal consistency. Pintrich, Smith, Garcia, McKeachie (1991) found the following motivation subscale internal consistency reliabilities: intrinsic goal orientation (0.74), extrinsic goal orientation (0.62), task value (0.90), control of learning beliefs (0.68), and self-efficacy for learning and performance (0.93). The following Cronbach alphas were reported for the learning strategies subscales: rehearsal (0.69), elaboration (0.76), organization (0.64), critical thinking (0.80), metacognitive self-regulation (0.79), time and study environment (0.76), effort regulation (0.69), peer learning (0.76), and help seeking (0.52). Cronbach alphas obtained on the basis of the data collected for this study are fairly consistent with the Pintrich et al. (1991) alphas, with subscale reliabilities ranging from .93 to .62.

The MSLQ can be used in whole or in part. For the purposes of this study, the test anxiety subscale was eliminated because tests were not given in all of the courses participating in the study. Additionally, the wording in several of the items was modified to more accurately reflect the learning environment of the courses. For example, specific references to “study” or “studying for the course” were replaced with “prepare” or “preparing for the course” and a reference to “lecture” was replaced with “class discussion.” Therefore, students participating in the study responded to a 76 item and 14 subscale MSLQ, when the items regarding test anxiety were deleted.

Data Analyses

Quantitative Data Analysis. The subscales of the MSLQ were the dependent variables for all analyses. Paired sample t-tests and analyses of variance (ANOVA) were conducted to detect gender differences in response to instructional environment (lecture with active learning/problem and project-based), and gender differences in response to instructor gender. Analysis of Covariance (ANCOVAs) was conducted where differences at pretest between the two groups were found.

Results

Paired sample t-test—gender of instructor. Within-group differences were found for both genders when taught by a female instructor. Males and females reported increases in the strategy of organization, $t_{(1,20)}=-2.87$, $p=.005$, $d=0.63$; $t_{(1,16)}=-4.66$, $p=.005$, $d=1.16$; respectively. Females reported increases in intrinsic goal orientation, $t_{(1,16)}=-2.23$, $p=.02$, $d=0.54$ and control of learning beliefs $t_{(1,16)}=-2.25$, $p=.02$, $d=0.55$. Female students reported a decrease in help seeking $t_{(1,16)}=1.54$, $p=.01$, $d=0.37$. Males reported a decrease in help seeking, $t_{(1,20)}=2.61$, $p=.01$, $d=0.57$ and task value $t_{(1,20)}=2.09$, $p=.03$, $d=0.46$. With male instructors , females reported decreases in extrinsic goal orientation, $t_{(1,55)}=1.99$, $p=.003$, $d=0.27$, rehearsal, $t_{(1,54)}=1.84$, $p=.04$, $d=0.25$, and time and study environment, $t_{(1,54)}=2.09$, $p=.02$, $d=0.28$. Males reported increases in organization, $t_{(1,81)}=-1.89$, $p=.03$, $d=0.20$, rehearsal, $t_{(1,81)}=-1.87$, $p=.033$,

d=0.20, metacognitive self-regulation $t_{(1,81)}$=-3.18, p=.001, d=0.35 and peer learning, $t_{(1,81)}$= -2.04, p=.02, d=0.22. Means and standard deviations are reported in Table 1.

Paired sample t-test—lecture with active learning/project and problem-based. In the project and problem-based courses, females reported decreases in extrinsic goal orientation, $t_{(1,37)}$=1.89, p=.033, d=0.30 and time and study environment, $t_{(1,37)}$=2.80, p=.004, d=0.; while males reported increases in rehearsal, $t_{(1,38)}$=-2.20, p=.02, d=0.35, elaboration, $t_{(1,38)}$=-1.99, p=.03, d=0.50, organization, $t_{(1,38)}$=-1.99, p=.03, d=0.30, and peer learning, $t_{(1,38)}$=-2.28, p=.01, d=0.36. In the lecture with active learning courses, only males reported increases in organization, $t_{(1,63)}$=-1.80, p=.04, d=0.22 and effort regulation, $t_{(1,63)}$=1.89, p=.03, d=0.22. No significant differences were found for the female students in the lecture with active learning courses. Means and standard deviations are reported in Table 1.

Analysis of Variance—gender of instructor. With regards to a female instructor, ANCOVA resulted in statistically significant post-test differences in control of learning beliefs, $F_{(1,35)}$ =2.103, p =0.08, d = 0.12, elaboration, $F_{(1,35)}$ =1.87, p =0.09, d = 0.74 and the strategy of organization, $F_{(1,35)}$ =10.08, p =0.02, d = 1.23 with females reporting higher means than male students on the elaboration and organization subscales and males reporting higher means on the control of learning beliefs subscale. With regards to a male instructor, ANCOVA resulted in statistically significant differences at post-test in extrinsic goal orientation, $F_{(1,135)}$ =5.71, p=.009, d = 0.72 and the strategy of organization, $F_{(1,135)}$ =5.83, p=.001, d = 0.18 with male students reporting higher means scores than female students on both subscales. Means and standard deviations are reported in Table 2.

Analysis of Variance—lecture with active learning/project and problem-based. In the lecture with active learning courses, ANOVA reported significant differences at post-test in rehearsal, $F_{(1,97)}$ =5.05, p=.01, d =.49, and peer learning, $F_{(1,97)}$ =4.66, p=.02, d =.49 with female students reporting higher means on both subscale. In the problem and project-based courses ANCOVA reported significant difference at post-test in extrinsic goal orientation, $F_{(1,76)}$ =7.68, *p*=.01, *d* = .33, in which male students reported higher mean scores than female students. ANOVA reported significant differences at post-test in rehearsal, $F_{(1,76)}$ =3.49, *p*=.03, *d*=.53, with the female students reporting higher mean scores than the male students. Means and standard deviations are reported in Table 2.

Discussion

The findings can be linked to the research surrounding observational learning and social cognitive theory of gender development. Bussey and Bandura (1984, 1992) found that observers attend more to same-gendered models. Further, people are motivated by the success of others who are similar to themselves (Bussey & Bandura, 1999). The results of this study showed a pattern where more positive responses for students of both genders were found with the same-gendered instructor. The pattern of positive responses to a same-gendered instructor appeared to emerge over time as evidenced by the within-group analyses. Female students showed positive changes over time when instructed by a female but decreases in motivational and cognitive strategy use over time with male instructors. Male students reported increases over time in cognitive strategies and with male instructors and mixed results with a female instructor. The only place where there was a consistent increase in both male and female students was in organizational strategies in the presence of a female instructor, who herself demonstrated very high degrees of organization in her teaching. The male students reported increases in extrinsic goal orientation when in the presence of a male instructor. This might be interpreted as an attempt to emulate and gain the approval of their male instructor. Interestingly, male students showed a decrease in help seeking when in the presence of a female instructor; however, female students also showed this decrease. Perhaps this finding is a reflection of their enhanced organizational strategies? It could be hypothesized that as the students are becoming more organized, they are less likely to need the help of others.

When comparing male students to female students at the end of the semester, female students reported using some learning strategies more when taught by a female instructor than the male students. Female students reported that they used higher levels of reading strategies as well as integration of new material with previously learned information than the male students. In the presence of a male instructor, male students reported higher levels of organization than female students.

Male students reported that they believed that their efforts to learn would result in a positive outcome more frequently than female students. When taught by a male instructor, male students reported that they participated in tasks associated with the course for reasons such as competition, receiving a higher grade than others, or a positive evaluation from others more frequently than female students. According to Golombok and Fivush (1994) these findings can be linked to gender stereotypes, in which males are often seen as more instrumental, assertive and competitive than females.

The National Science Foundation reported that in the year 2006, 30% of full time faculty positions in science and engineering fields were held by women (http://www.nsf.gov/statistics/infbrief). Although this is a more than a three-fold increase from 7% in 1973 (http://www.nsf.gov/statistics/infbrief), there is still a sizable discrepancy in the number of women instructors in the field of engineering compared to the number of male instructors. One impact of such a low number of female engineering instructors is that female students may not have the opportunity or choice to have a female instructor. The results from this study show that female students have greater increases in learning strategies when taught by a female instructor. Further, the literature surrounding gender indicates that learners are more likely to model behaviors after someone that they view as similar to themselves (Bussey & Bandura, 1999). Recent cuts in funding to post-secondary education and cuts in the funding that the National Science Foundation provides to research may impact programs such as the Society of Women Engineers (SWE) and IEEE Women in Engineering (WIE). Policy makers should be reminded of the role that such programs may play in encouraging more young women to enter science, technology, engineering and math (STEM) fields. Having the opportunity to develop positive relationships with female engineering faculty members may foster positive experiences for female engineering students and increase the potential for retention of talented female students in STEM fields. The results of this study continue to inform educators about the differential effects of their instruction and provide opportunities for instructors to consider how they might design environments for all students to be successful.

There are several limitations to this study that should be addressed in future research. This study only included one female professor as part of the design. Because of this, it is difficult to determine whether the effects that that were found should be attributed to gender or to this particular professor. It is recommended that future studies examining the impact of professors' gender in science, technology, engineering and mathematics (STEM) fields include more than one female instructor as part of the design.

Table 1

Means and standard deviations for Significant Within-Group Differences on MSLQ

	Female Students		Male Students	
MSLQ Subscale	Pre M(SD)	Post M(SD)	Pre M(SD)	Post M(SD)
Female Instructor				
Intrinsic Goal Orientation	5.10 (0.97)	5.47 (1.06)		
Organization	4.53 (1.12)	5.41 (.76)	3.74 (1.17)	4.18 (1.14)
Help Seeking	5.13 (0.74)	4.75 (1.06)	5.12 (1.08)	4.68 (1.02)
Control of Learning Beliefs	5.15 (0.88)	5.51 (.94)		
Task Value			5.49 (1.02)	5.06 (1.21)
Male Instructor				
Time and Study Environment	5.37 (0.81)	5.18 (0.88)		
Extrinsic Goal Orientation	4.14 (1.39)	3.89 (1.60)		
Rehearsal	3.45 (1.19)	3.16 (1.34)	3.20 (1.23)	3.45 (1.21)
Organization			3.59 (1.23)	3.89 (1.27)
Metacognitive Self-Regulation			4.33 (0.87)	4.64 (0.78)
Peer Learning			3.72 (1.33)	3.98 (1.56)
Project and Problem-Based Courses				
Extrinsic Goal Orientation	3.59 (1.29)	3.30 (1.49)		
Time/Study Environment	5.40 (0.76)	5.11 (0.78)		
Rehearsal			2.97 (1.30)	3.44 (1.37)

Peer Learning	4.31 (0.90)	4.71 (1.16)
Elaboration	4.70 (1.06)	4.97 (0.98)
Organization	3.59 (1.26)	4.02 (1.41)
Lecture with Active Learning Courses		
Organization	3.64 (1.15)	3.84 (1.16)
Effort Regulation	5.57 (1.15)	5.37 (1.01)

Table 2

Means and standard deviations for Significant Between-Group Differences on MSLQ

	Female Students		Male Students	
MSLQ Subscale	M	SD	M	SD
Female Instructor				
Organization	5.41	0.78	4.18	1.14
Control of Learning Beliefs	5.51	0.94	5.62	0.85
Elaboration	5.28	0.77	4.49	1.26
Male Instructor				
Organization	3.61	1.28	3.84	1.28
Extrinsic Goal Orientation	3.89	1.60	4.86	1.15
Project and Problem-Based Courses				
Extrinsic Goal Orientation	3.70	1.49	4.52	1.18

Rehearsal	3.44	1.36	3.52	1.18
Lecture with Active Learning Courses				
Peer Learning	4.36	1.40	3.65	1.66
Rehearsal	4.08	1.09	3.52	1.18

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