EDU 647: Take Home Final Exam

Three Designs and Statistical Analyses for Three Different Studies.

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Author Note

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Design 1: Self-regulated Learning Strategies Affect Undergraduates' Self-efficacy in Online Courses

Rationale and importance: Success in an online learning environment heavily relies on a student's ability to autonomously and actively engage in the learning process (Wang, Shannon, & Ross, 2013). It is therefore particularly important that online learners compared to their traditional classroom peers, have the self-generated ability to control, manage, and plan their learning actions (Ally, 2004). Self-regulated learning (SRL) strategies are important when taking online courses to motivate students in learning (Wijekumar, Ferguson, & Wagoner, 2006).

Research has shown motivation and self-regulated learning promote the use of self-regulatory strategies (Moos, el ta., 2008; Schunk, 2010). Other research implicitly centered on how motivational beliefs predict self-regulation (Cho, el ta.2015; Duffy el ta., 2015; Pintrich,1999). However, there is little empirical research on how SRL strategies influence undergraduates' perception of motivation in online learning environments. Therefore, this study seeks to fill that research gap. This study will explore undergraduates' motivation and responses to online instruction with the assist of self-regulated learning strategies. The motivation perception in this study will be only focused on undergraduates' self-efficacy for learning and performance.

Research Question: Does the instruction embedded SRL strategies improve undergraduates' self-efficacy for learning and performance?

Research Hypothesis: Instruction embedded SRL strategies increase undergraduates' self-efficacy for learning and performance.

Methods Design: Experimental design (between-group; post-test only).

Sampling: 120 students are randomly sampled from the pool of newly admitted freshmen students, and are randomly assigned into three groups of 40 students.

G*power Analysis: In this study of three independent groups, the significance of the differences in three sample means is being evaluated using ANOVA. The alpha level is p=0.05, the probability of a beta error is 0.20 and the power is 0.80. Using G*Power, in the present study (d = .50), an n of approximately 37 would be needed to obtain statistical power at the recommended .80 level (Cohen, 1988).

Measures: At the end of the semester, The Motivated Strategies for Learning Questionnaire (MSLQ), developed by Pintrich et al. (1991), is a self-report, Likert-type (1 = not true of me, to 7 =very true of me) instrument designed to measure undergraduates' motivational orientations and their use of different learning strategies. In this study, sub-scales designed to assess students' self-efficacy for learning and performance. In motivation section, there are 31 items that assess students' goals and value beliefs for a course, their beliefs ab out their skill to succeed in a course, and their anxiety about tests in a course. In this study I focus on only one part of the motivation section, totally 8 items. All the learners will take pretest by using the tailored MSLQ.

Procedures: Three groups of students of 40 students each (N = 120) are randomly selected from Syracuse University in North Eastern United States, who will take the same instructor's online course on Information Management. The course will be taught in different sections. The subject matter is the same, but the experimental groups get SRL strategies embedded in the instruction in different ways. The first group gets a study guide with SRL strategies. The second group receives instruction embedded SRL strategies. The third group is a control group which will get neither the study guide nor instruction embedded SRL strategies. At the end of the semester, all students will complete MSLQ questionnaire, different groups' results will be compared.

Analysis

Null Hypothesis: H0: μ1=μ2=μ3 There is no statistically significant difference among three groups regarding the results of MSLQ questionnaire (hypothesis of difference).

Data Analysis: The data of the tests are in the interval form and form a normal distribution. Hence, one-way ANOVA test (Fisher's F ratio) will be used to analyze variance among the three groups of students on the results of MSLQ questionnaire.

First, a correction factor will be calculated:

$C = \frac{(\sum X)^2}{N}$. Then, the total sum of squares will be found:. $SS_t = \sum X^2 - C$

Then, the following procedures will be done to find an *F* ratio:

	Variance			
	SS	*df*	*MS*	*F*
Between groups	$SS_b = \frac{(\sum X_1)^2}{n_1} + \frac{(\sum X_2)^2}{n_2} + \frac{(\sum X_3)^2}{n_3} - C$	$df_b = K - 1$	$MS_b = \frac{SS_b}{df_b}$	$F = \frac{MS_b}{MS_w}$
Within groups	$SS_w = SS_t - SS_b$	$df_w = N - K$	$MS_w = \frac{SS_w}{df_w}$	

where X is raw scores, n is the number of subjects within each group, N is the total number of scores in all the groups combined, K is the actual number of sample groups, df is degrees of freedom, and MS is the mean square. Then, we turn to the table of critical values of F and compare our obtained value of F with the one in the table for the appropriate degrees of freedom. The null hypothesis is rejected when the obtained value of F is equal to or greater than the table value of F. If it is less than the table value, then we fail to reject the null hypothesis If the null hypothesis is rejected, we then calculate effect size (η2): $\eta^2 = \frac{SS_b}{SS_t}$. For eta square (η2), effect is considered small at 0.01, medium at 0.06, and strong at 0.14.

I expect to find the F ratio to be significant and will further want to see where exactly the three samples are different. To do this, we will use Tukey's HSD tool at an alpha level (α) of 0.05. The group sizes are equal, so we will use the formula: $HSD = \alpha_{.05} \times \sqrt{\frac{MS_w}{n}}$. We use the critical value of the Tukey's HSD for α=0.05 in the table for the appropriate degrees of freedom and our three-group design. Then we find differences between the tree pairs of means and it should be equal to or greater than the obtained Tukey's HSD to be statistically significant.

Results and Discussions

Expected results: The expectation is that the null hypothesis will be rejected at α = 0.05. We further expect, using Tukey's HSD, to find a statistically significant difference between the second group and the other two (first and third) and no significant difference between the first and third groups. Our hypothesis is that instruction embedded SRL strategies improve undergraduates' self-efficacy for learning and performance. The study guide alone has minor impact on students' behavior. The benefit of the study to the body of literature is that we will have empirical evidence of the instruction embedded SRL strategies impact on students' perception of motivation, especially their self-efficacy for learning and performance. Implications include incorporating relevant SRL strategies into explicit instruction for the instructor.

Limitations: The study has several limitations. One limitation is that of sample size. To control the dependable variables, I use one instructor's different sections. As such, the sample size is not large to generalize conclusions to settings. Additionally, the study does not account for the background knowledge of students—some students may have learned SRL strategies before they go to college. There is also a reliability threat: all individual psychological characteristics of students are not taken into consideration.

Design 2: The Effectiveness of Self-regulated Learning Strategies on Undergraduates' Perception of Motivation in Online Courses

Rationale and importance: Self-regulated learning (SRL) strategies are important when taking online courses to motivate students in learning (Wijekumar, Ferguson, & Wagoner, 2006).

Research has shown motivation and self-regulated learning promote the use of self-regulatory strategies (Moos, el ta., 2008; Schunk, 2010). Other research implicitly centered on how motivational beliefs predict self-regulation (Cho, el ta.2015; Duffy el ta., 2015; Pintrich,1999). However, there is little empirical research on how SRL strategies influence undergraduates' perception of motivation in online learning environments. Therefore, this study seeks to fill that research gap. This study will explore undergraduates' motivation and responses to online instruction with the assist of self-regulated learning strategies. The motivation perception in this study will be only focused on students' intrinsic goal orientation.

Research Question: Do students improve their intrinsic goal orientation from the instruction embedded SRL strategies than those only receive regular instruction?

Research Hypothesis: Instruction embedded SRL strategies influence students' intrinsic goal orientation.

Methods Design: Experimental design (between-group; post-test only).

Sampling: 200 students are randomly sampled from the pool of newly admitted freshmen students, and randomly assigned into two groups of 100 students.

G*power Analysis: In this study of two independent groups, the significance of the differences in two sample means is being evaluated using t-test. The probability of a beta error is 0.05 and the power is 0.80. Using G*Power, in the present study (d = .40), an n of approximately 100 would be needed to obtain statistical power at the recommended .80 level (Cohen, 1988).

Measures: The Motivated Strategies for Learning Questionnaire (MSLQ), developed by Pintrich et al. (1991), is a self-report, Likert-type (1 = not true of me, to 7 =very true of me) instrument designed to measure undergraduates' motivational orientations and their use of different learning strategies. In this study, sub-scales designed to assess students' intrinsic goal orientation. Responses to these subscales were provided by participants using a 7-point rating scale.

Procedures: Two groups of students of 200 students each (N = 100) are randomly selected from Syracuse University in North Eastern United States, who will take the same instructor's online course on Information Management. The course will be taught in different sections. The first group is taught by the instruction embedded SRL strategies. The second group is a control group which does not receive instruction on SRL strategies. At the end of the semester before the final exam, all students complete MSLQ. Results will be analyzed and compared.

Analysis

Null Hypothesis: H_0: $f_o=f_e$ (frequency observed is not different from frequency expected). There is no statistically significant difference between two groups regarding their intrinsic goal orientation levels (hypothesis of difference).

Data Analysis: The data are measured in the 7-point rating scale form and we are testing the hypothesis of difference for two independent groups; hence, we will use a 2 × 7 chi square test (χ^2). The collected data from the questionnaires will be transformed into a contingency table:

	MSLQ						
	Not at all true of me	2	3	4	5	6	Very True of me
Instruction embedded SRL strategies	$\frac{(f_o-f_e)^2}{f_e}$	$\frac{(f_o-f_e)^2}{f_e}$	$\frac{(f_o-f_e)^2}{f_e}$	$\frac{(f_o-f_e)^2}{f_e}$	$\frac{(f_o-f_e)^2}{f_e}$	$\frac{(f_o-f_e)^2}{f_e}$	$\frac{(f_o-f_e)^2}{f_e}$

No instruction	$\frac{(f_o - f_e)^2}{f_e}$	$\frac{(f_o - f_e)^2}{f_e}$	$\frac{(f_o - f_e)^2}{f_e}$	$\frac{(f_o - f_e)^2}{f_e}$	$\frac{(f_o - f_e)^2}{f_e}$	$\frac{(f_o - f_e)^2}{f_e}$	$\frac{(f_o - f_e)^2}{f_e}$

where f_o is frequency observed and f_e is frequency expected. There is no theory $\chi^2 = \sum \sqrt{\frac{(f_o - f_e)^2}{f_e}}$ to support claims that students are more motivated in intrinsic goal orientation or not, so we will consider the effect of chance when calculating the frequency $chance\ f_e = \frac{N}{k}$ expected (f_e):

,where N is the total number in our sample (N = 200) and k is the number of categories (k = 7), that is, 200/7 = 29. The χ^2 is the sum of all obtained values in each cell of the contingency table: The degrees of freedom (df) for an $r \times k$ chi square is $(r - 1)\times(k - 1)$, where r is the number of rows and k is the number of columns. For our case, $df = (2 - 1)\times(7 - 1) = 1\times7$ $C = \sqrt{\frac{\chi^2}{N+\chi^2}}$ = 7. We use this number to check our obtained value of chi square against the critical value of the chi square in the table at an alpha level of 0.05. The critical value of $\chi^2_{0.05(7)} = 14.067$. Our obtained χ^2 should be more than, or equal to, this critical value from the table in order to reject the null hypothesis, otherwise it will be rejected. The coefficient of contingency will be calculated: and used to interpret effect size: 0.10 small, 0.25 medium, 0.40 strong.

Results and Discussions

Expected results: The expectation is that the null hypothesis will be rejected and statistically significant difference will be found between the group with instruction embedded SRL strategies and the group with no such instruction. The theoretical input of the study is Self-regulated learning strategies are connected with students' perception of motivation when taking online courses. The implications for education practice in classrooms are students will improve their motivation in learning with instructors' effort by using instruction embedded SRL strategies.

Limitations: This study has several limitations. One limitation is that of sample size. It also lacks pre-test on MSLQ , which is a threat to external validity. The post-test only design does not

consider previous experiences of students who may have developed stronger SRL strategies back in high schools. Construct validity is under threat: students in the control group may communicate with the experimental group, which also affects the explanation of causal mechanisms in the study.

Design 3

Association between Students' Perception of Motivation, Affect and Instruction embedded Self-regulated Learning Strategies

Rationale and importance: Within this higher education context, it is well established that the strategies students employ to self-regulate their learning impact their academic performance (Richardson et al.,2012). Self-regulated learning (SRL) strategies are important when taking online courses to motivate students in learning (Wijekumar, Ferguson, & Wagoner, 2006). According to theories on SRL both affect and motivation play an important role in SRL (e.g., Winne and Hadwin, 1998; Pintrich, 2004; Efklides, 2011). According to Efklides (2011), the interaction between metacognition, motivation, and affect is the basis of students' SRL. Therefore, it will be useful to see whether explicit instruction embedded SRL strategies tied with students' perceptions of affect can predict their academic success. This study should establish the correlation between the three variables and, if found, can be used to improve instruction.

Research Question: Is there a relationship between students' perception of motivation, affect and instruction embedded self-regulated learning strategies?

Research Hypothesis: Students' perception of motivation is correlated with affect and instruction embedded self-regulated learning strategies.

Methods Design: Experimental design (between-group; post-test only)

Sampling: 80 students will be randomly sampled from the pool of newly admitted freshmen students, and randomly assigned into two groups of 40 students.

G*power Analysis: In this study of two independent groups, the significance of the differences in three sample means is being evaluated using Regression. The correction ρ H1=0.3, the probability of a beta error is 0.05 and the power is 0.80, the correction ρ H0=0. Using G*Power, in the present

study, an n of approximately 84 would be needed to obtain statistical power at the recommended .80 level (Cohen, 1988).

Measures: At the end of the course, students will self-rate using the adapted Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich et al., 1991). The Motivated Strategies for Learning Questionnaire (MSLQ; (Paul R. Pintrich, Smith, Garcia, & McKeachie, 1993) is a self-report instrument designed to assess college students' motivational orientations and their use of different learning strategies for a college course. The original MSLQ is an 81-item questionnaire with a 7-point Likert-like scale (1 = not at all true of me, 7 = very true of me) assessing students' motivations and learning, or metacognitive strategies. Thirty items from a motivation section for self-reported learning strategies will be used in this study. In addition, at the end of the course, all students filled out the 20-item Positive Affect and Negative Affect Scale (i.e., PANAS) on a 5-point scale (Watson et al., 1988). For both the positive affect scale (10-items) and the negative affect scale (10-items) an average score was calculated per participant. The reliability for the positive affect scale and negative affect scale will be measured.

Procedures: Two groups of students of 40 students each (N = 80) are randomly selected from Syracuse University in North Eastern United States, who will take the same instructor's online course on Information Management. The course will be taught in different sections. The first group will be taught with instruction embedded SRL strategies. The second is a control group which does not receive instruction embedded SRL strategies. At the end of the semester before the final exam, all students complete two questionnaires (MSLQ and PANAS). Results will be analyzed and correlated.

Analysis

Variables: Y—Perception of motivation (scale 1–7), X_1—Affect (scale 1– 5), X_2— instruction

embedded SRL strategies (binary: 0=no instruction, 1=instruction).

Null Hypothesis: H_0: $\rho=0$ (hypothesis of association) There is no correlation between Perception of motivation(M), Affect (A), and instruction embedded SRL strategies (I).

Data Analysis: First, we need to find correlations between three pairs of variables: (1) M and A = $r_{y,1}$, (2) M and I = $r_{y,2}$, (3) A and I = $r_{1,2}$. Correlation formula (Pearson r) is this: $r = \frac{\frac{\sum XY}{N} - (M_x)(M_y)(N)}{SD_x \times SD_y}$

Our prediction regarding M can be expressed with the regression linear equation: $Y_{pred} = a + b1X1 + b2X_2$, where Y_{pred} is the predicted value of Y, a is the point of intercept $(M - bM_X)$, b is a beta coefficient of the regression line slope (rSD_y/SD_X), M is a sample mean, SD is a sample standard deviation, X is a known value. However, the formula for a and b1 here apply only when we have two variables; when we have three variables, then a different formula is used. Using multiple correlation, we can find how much information about Y is contained in X1 and X2. We then use the multiple R equation to conduct a multiple correlation, in which we combine variables in order to establish their cumulative effect: $R_{y\cdot1,2} = \sqrt{\frac{r_{y,1}^2 + r_{y,2}^2 - 2r_{y,1}r_{y,2}r_{1,2}}{1 - r_{1,2}^2}}$

After determining the multiple R, we can determine the coefficient of determination R^2—proportion of the variance in Y that can be explained by two predictor variables ($X1$, $X2$). Then, we will test multiple R for significance and find an F ratio using the formula: $F = \frac{R^2(N-3)}{2(1-R^2)}$,where N is sample size. We must also determine the degrees of freedom for the multiple R: the number of variables minus 1 (for the numerator) and $N - 3$ (for the denominator). In our case, N = 80 and we have three variables, so our degrees of freedom are 2 for the numerator and 77 for the denominator. Hence, the F ratio should be equal to, or higher than, 3.20 at alpha level set at 0.05 to be statistically significant and to reject the null hypothesis. The value of the significant multiple R will be compared to the three internal correlations that associate with the Y. If the multiple R is higher than all internal correlations with Y, then it can be used to make predictions. To make

predictions, then, we will use the multiple regression equation ($Y_{pred} = a + b_1X_1 + b_2X_2$). In the rearranged form with a and b unpacked, the formula will look like this:

$$Y_{M\ pred} = (M_y - b_1M_{x1} - b_2M_{x2}) + X_1 \times \left(\left(\frac{SD_y}{SD_1}\right) \times \left(\frac{r_{y,1} - r_{y,2} \times r_{1,2}}{1 - r_{1,2}^2}\right)\right) + X_2 \times \left(\left(\frac{SD_y}{SD_2}\right) \times \left(\frac{r_{y,2} - r_{y,1} \times r_{1,2}}{1 - r_{1,2}^2}\right)\right)$$

This prediction can be followed by calculating a standard error of multiple estimate to assess the accuracy of the results (especially because our $N = 80$): $SE_{est} = SD_y\sqrt{\frac{N}{N-2} \times (1 - r^2)}$

This data will help identify the confidence interval (CI)—the range of possible Y values within which the parameter Y value is likely to fall: $CI = \pm t \times SE_{est} + Y_{pred}$ (the degrees of freedom are the number of pairs minus 2). According to Cohen (1988, 1992), the effect size is low if the value of r varies around 0.1, medium if r varies around 0.3, and large if r varies more than 0.5. The Pearson correlation is computed using the following formula: $r = \frac{N \sum xy - \sum (x)(y)}{\sqrt{N \sum x^2 - \sum (x^2)][N \sum y^2 - \sum (y^2)]}}$

Results and Discussions

Expected results: The expectation is that the null hypothesis (ρ=0) will be rejected and statistically significant correlation will be established between the three variables: M, A and I. The value of the study in perception of motivation can be predicted by affect and instruction embedded SRL strategies. The practical implication is that instruction can be designed to maximize students' use of SRL strategies and positive affect, which will increase students' perception of motivation and ultimately, their performance and achievement scores will be improved.

Limitations: As for the external validity, the sample size ($N = 70$) and the setting of this online course in such a large private university are the main limitations of this study. Also, there are three threats to internal validity. First, both MSLQ and PANAS are self- reporting instruments, which is not a guarantee of accurate measurements, because students may over- and underestimate their levels. Second, sampled students' characteristics are a threat to internal validity: students' prior

experiences in terms of SRL strategies have not been ruled out. Third, maturation effects, the experiment can’t be done with a short period. Students may change based on a range of physical, social, behavioral, and psychological factors during the experiment.

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