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ABSTRACT

Two studies concerning the self-regulated learning of graduate students are reported. In the first, the responses of 96 graduate students in education to an inventory of self-regulated learning were compared to those of 294 undergraduates previously assessed. It was found, contrary to expectation, that the graduate students scored lower on the inventory than undergraduate students on all five subscales, with the greatest difference found on the scale of metacognition. These findings were also examined in relation to student grade point average. The instrument was found to be reliable overall, with one scale found unreliable. The second study investigated whether these results would persist on a revised version of the inventory, and whether degree completion served as an appropriate alternative to grade point average as a criterion variable. Subjects were 219 undergraduate and 62 graduate students in education. Results indicated a significant correlation between inventory scale scores and degree completion. In addition, graduate students scored higher on the inventory than students in this case, and suggested that metacognition was more necessary for success for graduate students than for undergraduates, and that motivation is an important element of success on both levels. (Contains 13 references.) (MSE)

Are graduate students better self regulated learners than undergraduates? A follow-up study.

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Over the past five years we have been inquiring into the degree and nature of self-regulated learning in college students. Our investigation originated with a modest goal: the design and development of a self-regulated learning inventory. Impressed with the strong reported correlation between academic success and the use of self regulated learning strategies (Zimmerman & Martinez-Pons 1986, 1988), and having, on a personal basis, experienced the frustration of working with passive and highly instructor-dependent (other-regulated) students, we concluded that a means of quickly and effectively assessing for level of self regulated learning could prove advantageous in defining useful instructional interventions.

Our findings indicate self-regulated learning is a meaningful and measurable construct which is clearly related to academic performance. Furthermore, accumulating results indicate that our instrument and the model upon which it is based represent a workable framework for exploring and assessing, and perhaps remediating, academic learning (Lindner & Harris, 1992, 1993, 1995). These results, however, are based on assessments of primarily undergraduate students. There were few graduate students (11) in our original samples. In fact, to our knowledge, no studies other than ours, to date, have examined self regulated learning in graduate student samples. Because the few graduate students in our sample scored higher on average than our undergraduates and given the difficulty of predicting successful performance and degree completion in this population, it would seem an important finding if the construct of self regulated learning could be fruitfully employed in understanding the dynamics of successful academic performance in this population.

Study One
Method

Subjects. Our subjects (N=96) in study one were all masters level candidates in the College of Education at a medium sized, midwestern university. Participation in the study was entirely

voluntary. It should be noted that although our subjects were all enrolled in degree programs, they primarily represent part-time students who also hold full-time jobs (mostly in the area of teaching). The results from these subjects were compared to those from a previously assessed group of (N=294) undergraduates attending the same institution (see table 1).

Procedure. The *Self-Regulated Learning Inventory* (version 2) was administered in every case by one of the three researchers. A standard set of instructions was read to intact classes who then filled out the inventory as instructed. Along with responses to the 75 item inventory, information was obtained regarding age, sex, graduate program, and grade point average.

Results

Results of our study are presented below in tabular form. Table 1 provides descriptive statistics which reveal the number of students represented by each class rank as well as by gender. It can be seen that slightly more than 75% of our subjects were female. Table 2 presents mean scores for graduates and undergraduates on the subscales and inventory as a whole. It can be

***Table 1**: Descriptive statistics*

	Freshm	Soph	Jr	Sr	Grad
Male	1	12	37	17	22
Female	3	40	119	54	74

***Table 2**: Mean scores on 5 subscales and total score on the inventory for undergraduate and graduate students*

	MCS	MOT	LSS	ECS	CSS	SRLTOT
UG	49.98	48.49	50.66	46.26	48.08	243.25
GR	39.71	48.29	46.01	44.23	44.27	222.67

UGR-N = 294
GR-N = 96

***Table 3:** Correlations of inventory scores with gpa for undergraduate and graduate students*

	MCS	MOT	LSS	ECS	CSS	SRLTOT
UG	.29**	.26**	.22**	.18*	.27**	.30**
GR	-.19	.04	-.04	.03	-.02	-.06

* p< .01, **p<.001

***Table 4**: Reliability Coefficients (Cronbach's Alpha) on 5 subscales and total score on the inventory for undergraduate and graduate students*

	MCS	MOT	LSS	ECS	CSS	SRLTOT
UG	.75	.63	.77	.80	.72	.91
GR	.79	.30	.66	.52	.62	.86

seen that undergraduates generally outscored graduate subjects. This result was contrary to expectation. Table 3 provides a summary of correlation between inventory scores and gpa for both graduate students and undergraduates. No significant correlations between graduate student scores on the inventory and gpa was found. This was anticipated given the restricted range of gpa in this population. However, we did not expect negative correlations. Table four presents the reliability coefficients for both groups for inventory subscales and the inventory as a whole. In general, these appeared acceptable for the undergraduates. However, the environmental control subscale and particularly the motivation subscale were problematic for the graduate student sample.

A one-way ANOVA was also performed comparing the means of total score for sophomores (there were too few freshman to include in the analysis), juniors, seniors and graduate students. The results were highly significant ($F = 11.17$, $p<.001$). Post-hoc analysis revealed that graduate students differed from all other groups. None of the other comparisons were significant.

Discussion. The results of this study were surprising in several respects. In the first place, the graduate students had a considerably lower total mean score when compared to the undergraduates (227.67 vs. 243.25, respectively). Not only was the graduate mean total score lower than the undergraduates, it was also considerably lower than that of the 11 graduate students in the original study utilizing mainly undergraduates (Lindner & Harris, 1993). In fact, on all of the five subscales the undergraduate students scored higher than the graduate students, with the greatest difference appearing on the metacognition subscale (49.94 vs. 39.71, respectively). This finding is counterintuitive to what one would expect; that is, graduate students, due to the very nature of the work required (becoming more independent in their learning, and developing the skills necessary to complete a large scale independent project or thesis), should, logic would dictate, be scoring higher in both metacognitive skills, and in self-regulating behavior than the undergraduate students. These puzzling results are further exacerbated by the negative correlation (-.19, $p< .07$) found between the graduate students mean gpa (3.81) and their mean score on the metacognitive subscale. This result

would seem to indicate that the less metacognitive one was, the higher one's level of achievement in graduate school as defined by gpa. Or, to put it another way, the more metacognitive a graduate student is, the less successful academically they are.

One possible explanation for these counterintuitive findings may be found in the restricted range, and lack of variance, in the gpa of the graduate students (range 3.4 to 4.0). However, this seems unlikely due to the fact the correlation between gpa and metacognition is negative, rather than being positive. A second, and perhaps more plausible explanation, could be the unique setting of the institution and/or the students involved in the study--education majors. Quite possibly, once education students have entered their graduate program and have discovered what is expected of them in order to do well, they do not need to be particularly reflective with regard to their approach to coursework. This, added to the fact that the vast majority of grades given are A's and B's, seems to indicate that once the students have learned the "rules of the game" they can simply continue to perform successfully with little or no need to engage in metacognitive reflection in order to adapt their learning. The fact that scores on the learning strategy subscale correlated negatively with gpa would furthermore suggest that a high level of strategic processing is not needed to succeed.

It may also be true that since the majority of our subjects were part-time students holding down full-time jobs, their responses reflect the fact that they simply lack the time and energy to engage in self-examination with regard to their learning. This fac' combined with the apparent lack of necessity for self-regulation in their coursework may explain the unexpectedly low scores on the inventory. Since greater independence and self-direction is required in the process of completing a culminating project (e.g., thesis or practicum), perhaps a better test of self-regulation in this population would involve program completion rather than gpa. Theories of self-regulated learning applied to graduate student populations will, in any case, need to take into consideration the situatedness of learning in attempting to apply this construct toward prediction of learning outcomes.

Results of the reliability and validity check of the instrument for use with graduate students (based on responses) showed the *Self-Regulated Learning Inventory* was overall a reliable instrument. The Cronbach's Alpha for the total score for graduate students was .86, suggesting that overall the instrument is quite reliable. Cronbach's alpha for the metacognition subscale was .79, thus exhibiting a reasonable degree of reliability for an instrument of this type. This adds further

puzzlement to the results, since this indicates that the subscale yields reliable scores. The fact that the motivation subscale reliability score was unacceptably low for the graduate student sample indicates that graduate students interpret the items on this scale differently than do undergraduates.

The results, as counterintuitive and puzzling as they were, did provide evidence, with the exception of the motivation subscale, for reliability of the instrument. The surprising fact that graduate students scored significantly lower than the undergraduate students indicated to us the need for further investigation.

Study two

The primary objective of this study, as noted, was to follow-up on a preliminary investigation of self-regulated learning in graduate students. As noted, on the basis of a limited earlier sample, we had expected graduate students to reveal more of a self-regulated learning orientation. However, our results did not support this expectation. Instead, and to our surprise, graduate students actually scored lower on the inventory than undergraduates. One of our subscales (dealing with motivation) also proved to be unreliable ($r = .30$) with our graduate student sample.

The present study sought to determine (1) if the findings of the first study would hold up (2) to test a revised version of the inventory with the hope of obtaining improved reliability, particularly with regard to the motivation subscale and (3) to determine if a relationship between score on the inventory and an alternative criterion variable, degree completion, existed (gpa, a useful variable with undergraduates, was not expected to work well with graduate students due to the restricted range of gpa in this population).

Revision of the inventory. Version three represents both an attempt to improve the technical properties of the inventory and an effort to clarify and sharpen the model upon which it is based. With regard to the model, we saw a need to clarify the meaning of different forms of processing involved and for a clearer and more focused differentiation between model components. The fact that constructs employed to describe cognitive processing as they exist in the contemporary literature are often confusing and contradictory is well documented (Alexander, Schallert, & Hare, 1991). Thus, for example, we saw the need to more clearly differentiate executive (metacognitive) processing and strategies from cognitive processing of a more automatic variety. The result of our attempt at refinement produced a model of self regulated learning with four subcomponents (executive processing, cognitive processing, motivation, and environmental control/utilization).

Reflecting our present working model of self regulated learning, the inventory in its present form consists, thus, of four subscales. Each scale is comprised of 20 items.

Method

Subjects. The current investigation (employing version 3 of the *Self-Regulated Learning Inventory*) was carried out at a medium sized university located in the midwest. It involved a sample of 281 students, all enrolled in courses in the college of education. There were 191 (68.0%) females, 81 (28.8%) males, and 9 (3.2%) who elected not to respond. The sample contained 248 (88.3%) Whites, 10 (3.6%) African Americans, 7 (3.2%) Hispanics, 2 (.7%) Asians, 2 (.7%) Native Americans, 6 (2.1) other, and 6 (2.1%) who did not respond. There were 219 (77.9%) undergraduates (1 freshman, 18 sophomores, 97 juniors, 103 seniors), and 62 (22.1%) graduate students, overall ranging in age from 19 years old to 53 years old, with a mean of 24.89 (sd=7.24) years old. The age range for the undergraduate students was from 19 yeas old to 46 years old, with a mean age of 22.71 (sd=4.82) years old; graduate students ranged in age from 20 years old to 53 years old, with a mean age of 32.5 (sd=8.96) years old. Their gpa ranged from a 2.00 to a 4.00; the mean gpa was 3.22 (sd=.53). Undergraduate students gpa ranged from 2.00 to 4.00, with a mean of 3.11 (sd=.50); graduate students gpa ranged from 2.50 to 4.00, with a mean of 3.72 (sd=.37). Over half (55.5%) of the students came from a rural setting (n=156), while 27.4% came from a suburban setting (n=77), and 13.9% from a urban setting; nine (3.2%) did not respond.

Procedure. The *Self-Regulated Learning Inventory V3.0* was administered in every case by one of the three researchers in a variety of standard courses offered in the college of education. A standard set of instructions was read to intact classes who then completed the inventory as instructed. Each item is responded to on a 5-point Likert scale ranging from *Almost always typical of me* (5) to *Not at all typical of me* (1). To help prevent students from simply marking all fives, a number of items on each scale were negatively worded. These items were recoded in the data analysis so that a 1 became a 5, a 2 became a 4, 3 stayed a 3, 4 became a 2, and a 5 became a 1. This resulted in that each factor had a range of scores from a low of 20 to a high of 100; the total self-regulated learning (SRLTOT) scale ranged from a low of 80 to a high of 400. Completion of the inventory was strictly voluntary, though in some of the undergraduate classes the students were given one extra credit point for participating in the study.

Results

Follow-up analysis of our previous graduate student data revealed a significant canonical correlation (.44, p<.007) between scores on the inventory scales and degree completion. This we considered an important success. It would appear that the inventory may prove useful in predicting likelihood of degree completion in graduate students. This finding, however, will require follow-up analysis based on a larger sample.

Table 5 contains the reliabilities (Cronbach's alpha) for undergraduates (UG), graduate students (GR) and for the two groups combined. Reliabilities are at their highest in the latest version of the inventory. Furthermore, all four subscales appear to be reliable at acceptable levels for both graduate and undergraduate students.

Table 5: *Reliability Coefficients (Cronbach's Alpha) on 4 subscales and total score on the inventory for undergraduate and graduate students*

	EXPS	COGS	MOTS	ECUS	SRLTOT
ALL	.83	.82	.78	.83	.93
UG *	.82	.85	.78	.82	.93
GR **	.86	.85	.75	.84	.94

*N = 218
**N = 62

Correlations with gpa are presented in table 6. Tables 7 and 8 present descriptive statistics for the two groups of students. It can be seen that unlike with our previous sample, graduate students in this group outscored undergraduates in every category including total score on the inventory. This is the direct opposite of our previous finding and bears further examination. Furthermore, it should be noted that the motivation subscale appears to be reliable with our revised instrument and represents the subscale with the highest raw score for both groups as well as correlation with gpa in undergraduates.

Table 6: *Correlations of inventory scores with gpa for undergraduate and graduate students*

	EXPS	COGS	MOTS	ECUS	SRLTOT
UG	.17**	.24**	.44***	.19**	.30**
GR	.28*	.15	.31*	.22	.32*

*p<.05; **p<.01 N(UG) = 218
*** p<.001 N(GR) = 62

Table 7: *Summary descriptive statistics for undergraduate students*

Variable	Mean	Std Dev	Minimum	Maximum
gpa	3.11	.50	2.00	4.00
EXPS	66.35	10.13	39	97
COGS	68.24	9.48	39	93
MOTS	71.24	9.13	48	92
ECUS	64.41	11.28	30	93
SRLTOT	270.09	33.37	185	367

N = 218

Table 8: *Summary descriptive statistics for graduate students*

Variable	Mean	Std Dev	Minimum	Maximum
gpa	3.72	.37	2.50	4.00
ECUS	69.10	11.37	45	93
EXPS	69.75	10.98	45	98
COGS	74.40	9.92	36	90
MOTS	74.88	8.15	52	93
SRLTOT	287.46	34.71	187	369

N = 62

Discussion. The results of our follow-up study produced very different results than our first study. In study one, the graduate students actually scored lower than the undergraduates in our sample. In study two, they scored higher. This is more in line with what we originally expected. Revision of the inventory subscales also appears to have been successful in that the subscales now appear to indicate acceptable reliabilities for graduate students as well as undergraduates. Correlations between subscale scores and gpa also indicate some differences of emphasis in the processing of graduate and undergraduate students. That is, results suggest metacognitive processing may be more necessary for success at the graduate level than the undergraduate level. Motivation appears an important element in student success at both levels.

While our sample is relatively small and the type of graduate students in the program we studied are, at best, reflective only of students in similar institutions, our findings do suggest that the construct of self-regualted learning and the Self-Regulated Learning Inventory could prove useful with graduate level students. Certainly further investigations are indicated. Nevertheless, the fact that reliabilities of the inventory scales now appear acceptable and given the surprising fact that

inventory scores correlated with graduate gpa, it would seem that the construct of self regulated learning could be fruitfully employed in understanding the dynamics of successful academic performance in this population.

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