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Performance in E-Learning Courses --Just What Makes It Happen?

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ABSTRACT

This paper reports the results of a study of college students in the US that examined specific learner characteristics affecting satisfaction with e-learning courses. It finds that satisfaction is largely governed by the degree to which one is confident in one's ability to regulate the factors that influence course work and one's goals in taking them. These goals can be both in terms of grades and results or a perception that the course has added value to their education experience. The findings suggest that not all people are suited to e-learning and institutions need to find ways to identify and encourage efficacious characteristics in the students. It also has some implications for those offering IS courses online.

Keywords: e-learning, online learning, satisfaction, self-regulated learning

I. INTRODUCTION

This study looks to improve understanding of performance in e-learning courses from a Self Regulated Learning (SRL) perspective. The purpose is to determine if self-regulatory attributes are predictors of learning outcomes in an e-learning context. In order to achieve this, the study aims to determine the existence, degree and direction, of relationships between self-regulatory attributes and e-learning course performance. The specific self-regulatory attributes initially identified include intrinsic goal orientation, extrinsic goal orientation, self-efficacy for self-regulated learning, computer self-efficacy, e-learning self-efficacy, time and environment management, and help seeking. Note that e-learning course performance is concerned with learners' mastery and retention of materials taught as well as their expected academic performance as a result of undertaking the e-learning course.

II. BACKGROUND

This paper extends the work reported in Sharma, Land and Dick (2006) at the IAIM conference in Milwaukee and focuses particularly on performance in e-learning courses. That paper reported on data collected in the corporate environment for a pilot study and gave a comprehensive outline of the relevant literature. As such a relatively brief overview will be given in this paper, focusing on the educational institution environment.

This section of the paper defines e-learning and SRL. It then goes on to provide an outline of each of the self regulation factors covered in detail in Sharma et al (2006).

E-learning has grown rapidly in all educational areas, from primary and high schools, traditional universities, exclusive on-line universities, to government and organizations (Capper, 2001, p.237). Various definitions of e-learning are presented throughout academic and practitioner literature. Terms such as computer-based learning/training, on-line learning, distributed learning, or web-based training are often used interchangeably. E-learning may also be considered a subset of distance education or distance learning (DL) (Reynolds, 2002; Urdan and Weggen, 2000). This study will employ a broad definition of e-learning: "*instructional content or learning experiences delivered or enabled by electronic technology*". (Commission on Adult Learning and Technology cited in

Gallaher, 2002, p.13; American Society for Trainers and Development (ASTD) cited in IsoDynamic, 2001, p.1). Electronic technology includes the Internet, intranet/extranet (LAN/WAN), audio and videotape, satellite broadcast, interactive TV, and CD-ROM (ASTD; Benninck, 2004; Gallaher, 2002).

SRL theory perceives learning as "*an activity that students do for themselves in a proactive way*" (Zimmerman and Schunk, 1989, p.1) rather than something that happens to students. Self-regulated learners are those who "*direct their learning processes and attainments by setting challenging goals for themselves…, by applying appropriate strategies to achieve their goals…and by enlisting self-regulative influences that motivate and guide their efforts*" (Zimmerman, Bandura, and Pons, 1992). Thus, they are active participants in the learning process and are generally more efficient and effective learners.

Motivation in learning is concerned with why learners choose to learn, allocate effort and persist. Numerous researchers view motivation as an essential dimension of SRL and one of the most important components of learning (Wolters, 2003; Winne, 2001; Miltiadou and Savenye, 2003; Zimmerman, 2002b; Hodges, 2005; Massa, 2003).

Research has identified two important components of motivation: a) "*beliefs about one's personal efficacy (ability) for mastering a specific task*", and b) "*the personal goal orientation one brings to a course of study*" (Lynch and Dembo, 2004). Research suggests that goal orientations are tied to learning outcomes, primarily through the effect of goal setting on "*one's intentions regarding effort and persistence*" (Winters and Latham, 1996, p.237).

Extrinsic goals include such things as course credit and grades while intrinsic goals refer to items beyond these, such as the course being valuable in itself or *worthwhile* to do. Ray et. al. (2003) found intrinsic goal orientation to be significantly correlated with achievement and extrinsic goal orientation was negatively related to achievement for developmental college students. Lin and McKeachie (1999) assessed the joint effects of intrinsic and extrinsic goal orientation on students' learning in an introductory psychology course and several biology, English, psychology and other social science courses. Results indicated students with a medium level of extrinsic motivation were more likely to achieve better course grades than students with either high or low levels of intrinsic motivation. Additionally, those students with a high intrinsic motivation and medium extrinsic motivation achieved very well.

Bandura’s social cognitive theory suggests that an individual’s self-efficacy beliefs influence the choices made and the courses of action pursued (Pajares, 1996). As such, individuals are more likely to engage in tasks which they feel competent and confident about and avoid tasks where they do not (Trentham, 2005, p.17). Researchers have also suggested that high self-efficacy has positive effects on effort, persistence, and achievement (Bandura, 1977; Pajares and Schunk, 2001; Gist and Mitchell, 1992; Hodges, 2005; Terry, 2002; Miltiadou and Savenye, 2003; Whisler, 2004).

In Lynch and Dembo’s (2004) study, of the five self-regulatory attributes assessed to predict performance in a blended learning course (part online, part face-to-face), self-efficacy for learning performance and verbal ability were the best predictors of course grades. Self-efficacy for learning and performance alone was found to account for 7 percent of the variance in performance. A study by Joo et. al. (2000) also suggested that self-efficacy for self-regulated learning related significantly, though indirectly through more specific self-efficacy variables, to student performance. Similarly, Zimmerman et. al. (1992) found that self-efficacy for self-regulated learning was linked to self-efficacy for academic achievement. Therefore, students who believed in their ability to self-regulate also believed in their ability to achieve.

Although technology has been instrumental in generating many benefits of e-learning, one of the recognised problems associated with e-learning courses is the reliance on technology, specifically computers. Learners who feel uncomfortable using computers may experience difficulty undertaking the course, which could affect negatively their learning outcomes. Additionally, they may experience more frustrations or anxiety with e-learning courses than learners who are more comfortable with computers (Hong, K., Lai, K. and Holton, D., 2003). Furthermore, as learners focus on using the technology, they may ignore important self-regulation strategies (Zariski and Styles, 2000). This may have a detrimental impact on a learner’s performance.

Time management is concerned with the ability of a learner to manage his or her time, through scheduling, planning, goal-setting, and prioritizing (Miltiadou and Savenye, 2003; Lynch and Dembo, 2004; Russell, 1998; Chen, 2002). Additionally, time management involves both daily and long-term dimensions, e.g. daily planning as well as weekly planning. Of importance, it not simply the amount of time spent that leads to successful learning outcomes, but rather it is the effective use and management of time (Schmitz and Wiese, 2006; Whisler, 2004).

Environment management involves selecting environments in which the learner has control over possible distractions (Lynch and Dembo, 2004; Miltiadou and Savenye, 2003). Environment management strategies are typically “*conceptualized as decreasing the possibility of off-task behavior by reducing the probability of encountering a distraction or by reducing the intensity of distractions that do occur*” (Wolters, 2003, p.196).

Although self-regulation emphasizes individuals’ ability to manage their own learning, a key part of this is awareness of the significant role others can play in one’s learning. A number of researchers (Newman, 2002; Aleven, V., Stahl, E., Schworm, S., Fischer, F. and Wallace, R., 2003; Zimmerman, 2002a; Zimmerman, 2002b) have recognised that rather than self-dependence, it is more important and valuable for learners to “*self-regulate their dependence on others when information and assistance is needed*” (Zimmerman, 2002b, p.169). As Lynch and Dembo (2004) state, self-regulated learners possess the ability to “*determine where and how to seek help, and make decisions concerning the most appropriate sources for such help*”. As Miltiadou and Savenye (2003) state, help seeking is concerned with clarifying confusing course material.

The above factors that form the causal model addressed in this paper are summarised in Figure 1 below.

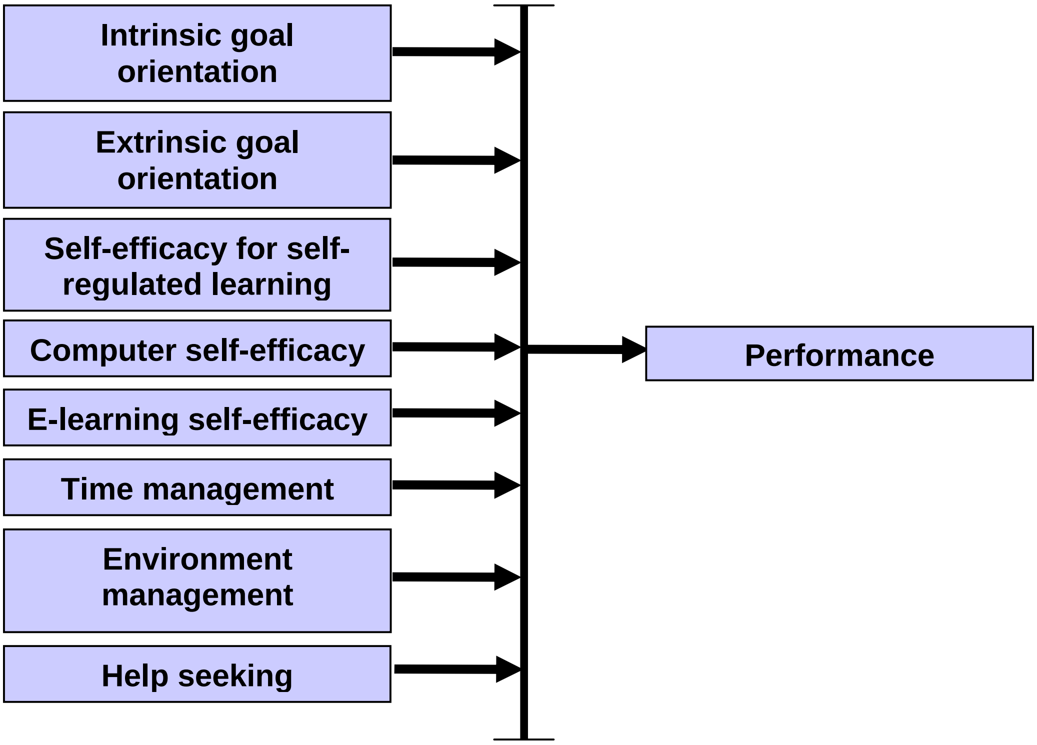

Figure 1 – The research model

Hypothesis: The greater one's intrinsic goal orientation, extrinsic goal orientation, self-efficacy for self-regulated learning, computer self-efficacy, e-learning self-efficacy, time management, environment management and help seeking behaviour, the more likely she/he will achieve better performance in e-learning courses.

III. METHODOLOGY

Certain specific self-regulatory attributes have been modeled as constructs with formative indicators. Formative indicators measure the different aspects that form the particular self-regulatory attribute. Reflective indicators, on the other hand, measure the same underlying concept and have been used to model the constructs representing the overall self-regulatory attributes (Chin 1998). When modeled, the formative constructs are linked to their corresponding reflective constructs, which are then linked to performance. Including formative and reflective measures allows evaluation of both overall self-regulatory attributes as well as specific underlying causes of the self-regulatory attributes that learners believe are essential in forming their overall level of a particle attribute of self-regulation (Mathieson & Peacock & Chin 2001, p. 86). The Motivated Strategies for Learning Questionnaire (MSLQ) was used as the main basis for questionnaire items for this study to assess the specific self-regulatory attributes (formative items) of intrinsic goal orientation, extrinsic goal orientation, and help seeking. The MSLQ has been validated through factor analyses, reliability analyses, and correlations with measures of achievement (Pintrich & Smith & Garcia & McKeachie 1991 cited in Lynch et al. 2004). Other instruments employed to measure specific self-regulatory attributes in this study are the computer self-efficacy scale (Murphy & Coover & Owen 1989 cited in Spence 2004), the self-efficacy for SRL scale (Gredler & Schwartz 1996 cited in Morris 1997), and the time management behaviour scale (Trueman et al. 1996). Questions designed to measure the overall self-regulatory attributes (reflective items) and performance, were newly created by authors, based on construct definitions identified in the literature. (Note: based on a pilot test of the survey, formative constructs where there was not a strong link to the corresponding reflective construct for self-regulatory attributes were not retained for the main study).

Performance and environment management have been modelled as second order factors (representing constructs at a higher level of abstraction), made up of a number of first-order factors or dimensions. Mastery, retention and job performance reflect performance. Controlling and avoiding form environment management. Performance has been modelled as a molecular second order factor, as a change in one of the first order factors was considered to result in similar in changes in the other factors (Chin & Gopal 1995). Environment management has been modelled as a second order factor as a change in one of the first order factors may not necessarily result in a similar change in other first order factors. Second order factors have been measured using the repeated indicators approach, in which the second order factor is directly measured using all the indicators for each of the first order factors (Wold cf. Lohmöller 1989, pp. 130-133 cited in Chin, Marcolin & Newsted 1996).

Perceived performance consists of a learner's perceived performance within the e-learning course as well as perceived performance in further academic pursuits, as a result of taking the e-learning course. Perceived performance within the e-learning course is concerned with "*how well students retain, as well as attain, mastery of materials studied*" (Russell, 1998, p.85). Actual performance levels would provide greater reliability to this study. However, privacy reasons prevent such information from being gathered. As such, perceived performance was assessed using 6 items- 2 academic performance items, 2 mastery items and 2 retention items, on a 5-point Likert scale ranging from strongly agree to strongly disagree.

The self-report questionnaire employed in this study consists of questions for demographics, intrinsic goal orientation, extrinsic goal orientation, self-efficacy for self-regulated learning, computer self-efficacy, e-learning self-efficacy, time management, environment management, help seeking, e-learning course completion, performance, and learner satisfaction. The instrument was adapted from that used by Sharma et al (2006) to relate it to college students taking classes on-line. Negatively worded items, included to encourage respondents to read the questions carefully, were reverse scored before data analysis. A high score for a particular item indicates that the learner has a high level of the corresponding self-regulatory attribute whereas a low score indicates the learner has low levels of the particular self-regulatory attribute.

The data was collected from three courses, referred to here as Class A, B and C. Class A (n = 31) is a higher level Information Systems course for predominantly business seniors, who are not doing an IS major. After an introductory face-to-face lecture, the course was conducted almost completely on-line using WebCT and email. Students were required to attend a WebCT chat session each week, make occasional contributions to discussion topics, complete a series of chapter quizzes (open book) and do an on-line (but supervised) exam. Also, each week they were required to submit an assignment of approximately one page, on a case study or text book topic/question via email, which was graded and returned. Assessment was 20% for chat and discussion participation, 30% for Quizzes, 30% for the weekly assignments and 20% for the final exam. Class B (n = 99) is a required three credit hour lower-level computer concepts class. This online class was comprised of 70% of freshmen and sophomore students from different colleges; of these, 68.37% were females and 31.63% were males. Students were required to attend a WebCT classroom on a regular basis to obtain weekly modules for various learning materials and to do learning activities including a weekly one-hour online quiz of 20 questions and discussions for each week's module. Assessment was 75% for face-to-face exams, 22% for online weekly quizzes, and the rest was online discussion participation, an email and self-introduction assignments to encourage students to be familiar with WebCT tools at the beginning of the semester. Class C (n = 499) is a 4-credit hour course that's taught with one, relatively small face-to-face group with the lecture is streamed to students in the other sections. There are primarily juniors in the course, with a significant number of seniors. It's part of the business core. Assessment includes online discussion, an exam, which is taken in a testing lab and a significant ERP project. The combined n for all classes was 629. Across all classes, gender was evenly split 51/49 male/female; age under 21, 26 %, 21 – 30, 68% and 6% over 30; regarding computer use, 36% had been using a computer for between 5 and 10 years 48% more than 10.

Data analysis was conducted using two statistical software tools, namely PLSGraph Version 3.00 and SPSS V14.0. Descriptive statistics were utilized to provide an overview of the demographic data for this study. The structural equation modelling (SEM) technique called partial least squares (PLS) was selected as: a) this study focuses on causal-predictive analysis, b) formative measures have been used, and c) its ability to simultaneously model the structural paths (i.e., relationships among constructs) and measurement paths (i.e., relationships between a construct and its indicators). Although, data is being obtained from a number of classes, the data is analysed at an overall level to obtain more general findings. Results are also provided on a class by class basis so consistency can be compared.

IV. RESULTS

THE MEASUREMENT MODEL

As Chin (1998) identifies, composite reliability is a closer approximation than Cronbach's alpha since composite reliability does not assume equal weighting for indicators. Internal consistency reliability or examination of correlations is irrelevant to constructs with formative measures as each formative indicator causally impacts the latent variable. Thus, the construct can be viewed as an effect rather than a cause of the item responses and no interdependencies among items can be assumed (Mathieson et al. 2001, p. 94). With the exception of overall extrinsic goal orientation and academic performance, all Cronbach's alphas were in the acceptable to excellent range indicating good internal consistency reliability. For overall extrinsic goal orientation and academic performance, although Cronbach's alpha was low, composite reliability was acceptable. Composite reliability was above 0.70 for all constructs with reflective indicators except for overall extrinsic goal orientation for Class A only results, perhaps due to the small sample size. Additionally, Average Variance Extracted (AVE) was above the acceptable 0.50 for all constructs with reflective indicators with the same exception for overall extrinsic goal orientation for Class A only results. These results indicate high convergent validity. However, it must be noted that overall extrinsic goal orientation and overall performance reported low AVE, only just above 0.50. With all class data combined, results also indicated minimal collinearity for items – with R-Square below 0.80 and a variance inflation factor (VIF) below 5 for formative indicators. Discriminant validity was assessed as adequate for constructs with reflective items by examining intercorrelations and AVE and cross loadings.

With all class data combined, all loadings, with the exception of Q25_OV_EGO (Generally, participating in the e-learning course is a means to an end (such as course credit, approval from others or grades)), were significant at the 0.01 (T-stat > 1.96) level and in the acceptable to excellent range with the majority above 0.9. Overall, these high loadings suggest that the items tend to strongly reflect their respective constructs. If the problematic question is to be used in future research, it may be beneficial to consider its wording to determine any potential problems. For formative indicators, the weights rather than loadings are examined (Chin 1998). With all class data combined, all indicators had significant weights with the exception of Q7_HS (Generally, I try to work things out on my own if I have problems learning the e-learning course material).

THE STRUCTURAL MODEL

The following model illustrates the overall results from PLS (Figure 2). The results presented in this model will be discussed below. Additionally, bootstrapping with 1000 sample cases was performed and the results will be presented with all path estimates.

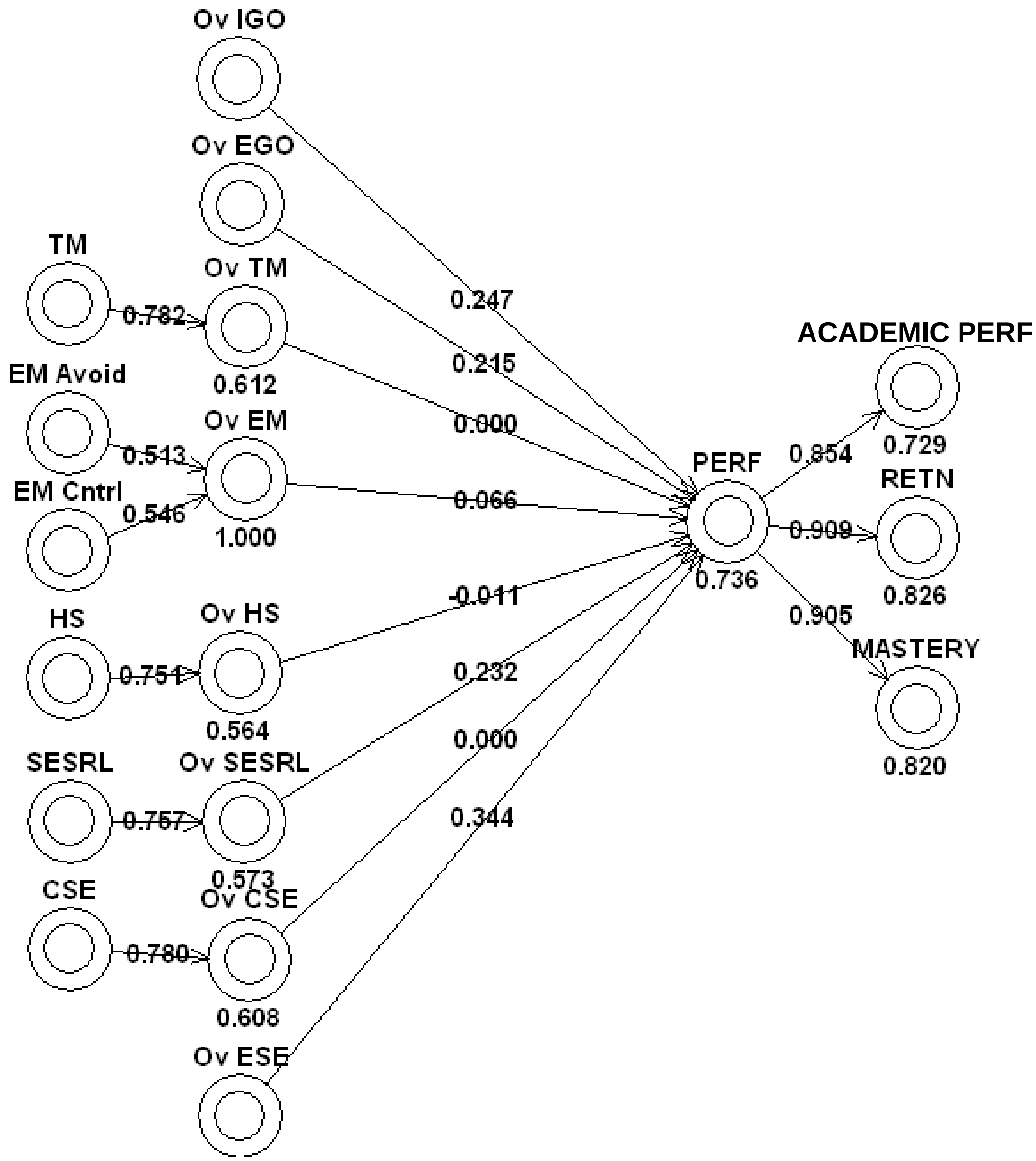

Figure 2: PLS Model from the Main Study (All Classes)

The first step in evaluating the structural model involves examining the path between constructs with formative measures and the corresponding constructs with reflective measures. The paths for computer self-efficacy, self-efficacy for self-regulated learning, time management and help seeking are all reasonably high, above 0.70 which suggests that the formative set has reasonably good coverage. Ideally, the paths should be above 0.80 for adequate coverage in the formative set. These paths are given in Table 1 below, including paths per class. As the numbers in brackets indicate, all paths were significant at 0.01. This (and Tables 2 and 3 below) gives some support to the authors decision to amalgamate the data across the 3 classes and consider the results as a whole.

Table 1: Path Estimates and Significance for Formative to Reflective Constructs

CLASS		**SESRL - Ov SESRL**	**CSE - Ov CSE**	**TM - Ov TM**	**HS - Ov HS**
ALL	**R^2**	0.573	0.608	0.612	0.564
	PATH	0.757 (38.0240)	0.780 (40.6564)	0.782 (50.4056)	0.751 (39.4772)
A	**R^2**	0.426	0.703	0.675	0.540
	PATH	0.652 (7.0643)	0.838 (20.0543)	0.821 (19.8236)	0.735 (8.2908)
B	**R^2**	0.670	0.599	0.680	0.652
	PATH	0.818 (23.7012)	0.774 (15.6905)	0.825 (24.2593)	0.808 (24.1186)
C	**R^2**	0.565	0.610	0.609	0.545
	PATH	0.752 (30.8117)	0.781 (37.0881)	0.780 (44.8316)	0.738 (32.3163)

Table 2 reports all path estimates and the significance of these estimates of all second order and first order factors. All paths have significance at the 0.01 level. The three dimensions that form overall performance – academic performance, retention and mastery – all have strong paths to overall performance, with a minimum of 0.854 (for all class data combined). The results suggests that the most important factor reflecting overall performance is retention, followed by mastery and then academic performance (for class B data only, mastery is slightly stronger than retention). The paths from the two dimensions avoiding distractions and controlling distractions to environment management are not as strong but are still relatively high, with controlling distractions being more important than avoiding distractions.

Table 2: Path Estimates and Significance for Second Order and First Order Constructs

CLASS	Ov EM		Ov PERF		
	EM Avoid	EM Control	PERF ACAD	PERF RET	PERF MAS
ALL	0.5130 (81.4495)	0.5460 (80.8754)	0.8540 (63.9051)	0.9090 (104.9059)	0.9050 (97.0640)
A	0.5090 (9.9127)	0.5550 (12.7347)	0.7730 (2.8119)	0.9400 (33.1963)	0.8980 (22.4905)
B	0.5140 (29.9240)	0.5220 (31.6998)	0.8730 (27.5509)	0.9070 (46.2006)	0.9080 (37.5799)
C	0.5130 (73.5188)	0.5490 (68.7720)	0.8510 (62.0423)	0.9080 (91.8669)	0.9050 (89.8306)

Paths between the overall constructs and dependent variables are indicated in Table 3. The numbers in brackets indicate the significance obtained for path estimates from Bootstrapping with 1000 samples. Significant paths at the 0.01 level are shaded.

Table 3: Path Estimates and Significance for Self-Regulatory Attributes and Learning Outcomes

	ALL (R2 = 0.736)	CLASS A (R2 = 0.718)	CLASS B (R2 = 0.816)	CLASS C (R2 = 0.728)
Ov IGO	0.2470 (8.8094)	0.2200 (0.7805)	0.1870 (2.6595)	0.2406 (7.9469)
Ov EGO	0.2150 (6.1490)	-0.0870 (0.2521)	0.1990 (2.7421)	0.2245 (5.7211)
Ov SESRL	0.2320 (7.8617)	0.1180 (0.5628)	0.1290 (1.7312)	0.2415 (7.7422)
Ov CSE	0.0000 (0.0000)	0.0330 (0.1618)	0.0760 (1.0197)	-0.0218 (0.7675)
Ov ESE	0.3440 (8.2301)	0.5890 (2.4377)	0.4090 (4.6371)	0.3479 (6.9759)
Ov TM	0.0000 (0.0000)	-0.0780 (0.3116)	-0.0980 (1.2250)	0.0123 (0.3340)
Ov EM	0.0660 (2.2439)	0.4850 (1.6648)	0.0650 (0.7664)	0.0519 (1.7346)
Ov HS	-0.0110 (0.4363)	-0.0240 (0.1438)	0.1690 (2.5605)	-0.0305 (1.0765)

The results indicate considerable support of the model with an R-Square value of 0.736 for performance (for all class data) and the influence of certain key factors, represented by the path values. A number of significant paths were found in this study. These are summarised in Figure 3.

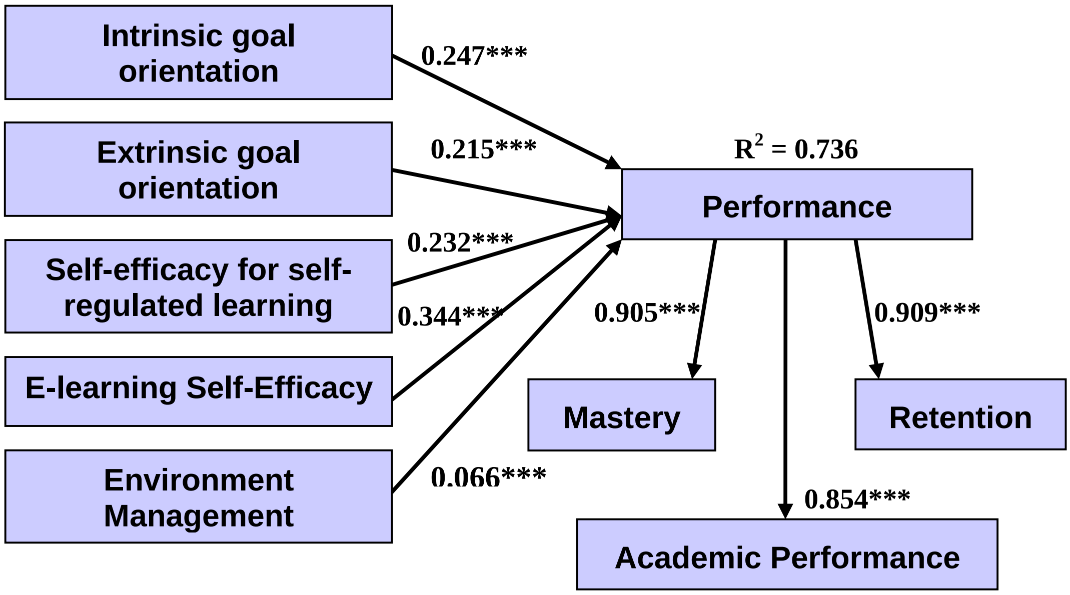

Figure 3: Research Model with Significant Paths from the Main Study

To assess the predictive relevance of the structural model, blindfolding procedure with an omission distance of 25 was run. A Q^2 above 0 implies the model has predictive relevance (Chin 1998). The results confirm that the structural model has satisfactory predictive relevance, with all Q^2 values above 0.39.

V. DISCUSSION

Before examining the relationships between self-regulatory attributes and performance, it is important to examine the three dimensions comprising performance. The results indicated that three dimensions identified – academic performance, retention and mastery – all strongly reflected the overall measure of Performance. The most important dimension identified is retention, closely followed by mastery and then academic performance. The lower importance of academic performance may be because the courses taken by the students are not directly related to their degree. As such, this dimension may not be as important as the others in reflecting a learner's overall performance.

Of the eight self-regulatory attributes under study, only five were identified to have a significant relationship to performance. The eight self-regulatory attributes accounted for 74% of the variance in performance.

Five self-regulatory attributes – e-learning self-efficacy, intrinsic and extrinsic goal orientation, self-efficacy for self-regulated learning, and environment management – were found to positively impact performance. Computer self-efficacy and time management reported no relationship with performance. Help seeking had negative non-significant relationship with performance and was minimal in magnitude. The most important self-regulatory attribute appeared to be e-learning self-efficacy, then intrinsic goal orientation, closely followed by self-efficacy for self-regulated learning and extrinsic goal orientation and finally, environment management.

The relationship between e-learning self-efficacy and performance deserves some consideration. The definition of e-learning self-efficacy is a learner's belief in their ability to learn with e-learning courses. As such, it seems obvious that e-learning self-efficacy is identified as a key factor in determining performance. A learner's confidence in their ability to learn is highly likely to affect their actual ability to learn. Learners who are not confident may not feel they are capable of learning and this negative motivation may discourage them from allocating effort towards learning and subsequently performing with e-learning courses. It may also be the case that students generally are very confident of their abilities to learn in this mode of instruction – indeed for a generation brought up on MSN, MySpace and Facebook and where "google" is a verb, they probably see it in many ways as a more appropriate mode than a traditional classroom. Considering the demographics of this group (young and frequent computer usage), the lack of significance reported between computer self-efficacy and all learning outcomes is not surprising. This suggests that learners may be reasonably comfortable using computers and as such their confidence would be relatively high. Thus, they may not perceive e-learning courses as threatening in terms of the technology itself. As such, computer self-efficacy may not be an important factor determining a learner's success in terms of performance.

The strong relationship between intrinsic goal orientation and performance is not surprising as two of the dimensions of performance are retention and mastery. These are concerned with learning the actual e-learning course content and materials taught. A learner with an intrinsic goal orientation is one who "*participates in a learning task in order to meet a personal challenge, satisfy personal curiosity, and/ or attain personal mastery over the elements of the task*" (Lynch and Dembo, 2004). This definition emphasizes the learning process rather than the end result from undertaking e-learning courses. This indicates an emphasis on gaining knowledge. This strong motivation may then enhance a learner's performance with e-learning courses as they are more engaged in the course and allocating effort towards learning the e-learning course material may then lead to better retention and mastery of the materials and subsequent academic performance. There is another possibility too, common to all three courses. The classes are focused on the use of information systems in business – it may very well be the case that it appears to the students that at least some understanding of information systems will be essential in whatever business they move into. As such while the extrinsic goals (discussed below) are important it is a realisation by these (predominantly) senior students that the course has a lot to offer to potential graduates – perhaps a useful finding for those trying to market IT courses.

Learners were asked to identify their top three reasons for taking e-learning courses. The most frequent response (47% for combined class data) identified as the top reason was because the e-learning course was a degree requirement or was mandatory. The significant relationship between extrinsic goal orientation and performance, suggests that a learner with an extrinsic goal orientation is concerned with the outcomes of e-learning rather than the learning process itself. Put another way – students like good grades and to complete their study programs on time. It may well be that e-leaning offers students the opportunity to fit in an extra class to enable them to graduate earlier, on time, or to deal with otherwise distracting elements such as caring for children or work commitments.

Given the importance of the above three self-regulatory attributes for performance, the positive relationship between self-efficacy for self-regulated learning and performance is not surprising. A learner's belief in his or her ability to self-regulate may suggest that they believe they are active learners who believe they are able to take control of their learning. Note that performance measures are from the perception of the learner rather than actual measures. As such, learners' confidence and beliefs that they have greater control over their learning efforts could lead to greater perceived performance. Again, significant factors in these classes could be the age and maturity of the students and for most, that the end of their program is in sight.

The time and location flexibility benefit of e-learning means that student e-learners may often undertake e-learning courses at any time and from any location (not just in a specially designed training room or during set hours). This may mean the learner is susceptible to distractions from their social surroundings which can reduce the effort allocated by a learner to the task at hand. Thus managing one's environment may be key attribute contributing to a learner's performance with e-learning courses.

One issue that deserves further study relates to the type of course. These were all IS classes and required for the degree. These (and the difference between the courses) are clearly limitations of this study. Different disciplines and non-mandatory classes may reveal different results. Nevertheless it seems that as e-learning courses become pervasive, course designers will need to build into courses ways to promote self-efficacy in particular. Examples of possible methods for improving self-regulatory attributes identified through existing literature include providing computer skills practice in training/orientation classes, learners may engage in their own computer use prior to taking e-learning courses, provisions of time management training; organizational encouragement of the relevance and value of e-learning including tying e-learning course completion and/or performance to employee evaluations or creating an organizational culture that fosters lifelong learning; and provisions of advice or training on self-regulation strategies. Future research should investigate how to improve self-regulation in e-learning environments and identify predictors of SRL attributes which may provide a theoretical foundation for organizations, educational institutions and learners looking for methods to improve SRL attributes.

In summary, the data reported here suggests that a learner who is confident in his or her ability to learn in this manner, sees the intrinsic and extrinsic benefits of doing a course and can manage the learning environment is more likely to perform well in e-learning courses.

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