Using Laptop Computers in Class: A Student Motivation Perspective

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ABSTRACT

This study examined the reasons why students choose to take laptop computers into college classes. The model involved the individual student choice involving opportunity, ability and motivation. The resulting model demonstrated how some (primary) factors, such as effective learning, directly impact the laptop usage choice, and other factors indirectly impact the choice, such as Internet activity and access to information. This study found that most students choose to bring computers to class for sound educational reasons, which contradicts what many instructors believe to be true.

INTRODUCTION

Much research today has focused on whether laptop use in class furthers the goals of the course from the instructor's perspective [Straub, 2009]. In contrast, this study investigates the goals of the students as they choose to use a laptop in a class. Are students taking laptops to class to have something to do during a boring lecture or to keep in touch with friends via Facebook? Or are they taking laptops to class because they expect doing so will enhance their learning experience? This paper looks at this issue from the student motivation perspective.

CONCEPTUAL FRAMEWORK

Technology in today's classrooms is accepted as commonplace, as the number of universities and colleges utilizing technology continues to increase (Weaver et al., 2005; Wagner, 2005; Campbell et al., 2003). Much research has been done to demonstrate that technology in the classroom has a notable impact on learning, and adoption, and diffusion theories have been researched for many years. Looking at the research from the computer science framework, technology adoption has been widely studied and modeled using Technology Acceptance Model (TAM) and its extension Universal Technology Adoption and Use Theory (UTAUT) (Venkatesh et al., 2003). These models examined and compiled variables in academia when considering laptop requirements at a major university, TAM focused on perceived usefulness and perceived ease of use for the student and UTAUT factors in extrinsic motivators (Elwood et al., 2006).

Results of research involving teaching practices and pedagogies using laptops have claimed that increased student-centered teaching, increased tool-based teaching, and increased amounts of meaningful uses of technology across a wide range of educational contexts were seen in conjunction with laptop implementation and professional development (Dawson et al., 2008; Skolnik et al., 2008; Baylor et al., 2002). An application of technology specific to a particular type of classroom setting (e.g. a macroeconomics course) and the subsequent pedagogical implications regarding active learning were found to be successful using laptops, tablet computers and clickers (Alexander, 2004; Campbell et al., 2003; Wagner, 2005; Demb et al., 2004; Ilacqua et al., 2007). Fried researched whether technology in and of itself is a help or hindrance in the academic learning process and the outcome of her work suggests the latter (Fried, 2008).

The question of whether technology, particularly mobile devices such as laptop computers, should be in the classroom has started to gather momentum (Bugeja, 2007; Fried, 2008; Young, 2009). Some schools require, or provide students with, laptop computers in order to promote their computer literacy (Rola, 2002; Olsen, 2001; Walters et al., 1998). An article in the Chronicle of Higher Education (Young, 2009) indicated that some faculty are moving rapidly to the other end of the spectrum and outlawing technology in their classrooms altogether. They noted the bombardment of students by external technologies and instead employ the Socratic discussion pedagogy, which has not been seen for years in some classrooms. Other schools leave it up to the student to choose whether to bring laptops to class.

Technology is a common element of the classroom experience, but research has shown that the impact made can be construed as positive or negative, depending upon the situation and environmental circumstances (Straub, 2009). Straub's compilation, analysis and synthesis, considers all prior research in this area and notes the limitation of many of these theories when applied in an academic setting. This paper looks beyond these issues and addresses Straub's question of why a student would choose to use technology in an academic setting.

What are the elements that influence the decision of some students to bring laptops to class? This question can be framed in the context of what motivates individuals to act. Managers are concerned with motivating people to perform at the highest possible levels to achieve the best results. In the field of management, motivation is thought to be the set of forces that causes people to engage in one behavior over an alternative behavior (Steers et al., 1996). The motivation can be extrinsic, where according to self-attribution theory, it is heuristically undesirable to look for internal causes for one's behavior, and instead reasons for engaging in activities are perceived and inferred from the environment, such as the instructor. (Bem, 1967) The motivation can also be intrinsic. According to the concept of personal causation, people are motivated to pursue activities when they must feel that they are the cause of their actions. (deCharms, 1968)

Some students may be motivated to use technology and consequently driven to bring laptops to class. What is it that prevents other students from using laptops in class? To investigate these sources of motivations, we proposed the following hypotheses:

Hypothesis 1: Students chose to bring laptops to class to enhance class related activities rather than to engage in Internet or other communication behaviors.

Hypothesis 2: The instructor's acceptance and use of technology will be a primary factor that affects a student's choice to use a laptop in class.

Since the purpose of this study was to better understand why college students choose to use laptop computers during their classes, it specifically looked at the factors involved from the students' points of view. This project focused on the extent to which various factors lead to the students' motivation to use a laptop in the classroom. Although student self-reporting here suggests it may introduce possible bias into the study, student self-judgments may actually be more accurate in gathering these types of internal reasoning because they may include relevant and valid information that is not available to others (Funder, 1989). The belief that self-perceptions typically correspond with perceptions by others has also served as a theoretical basis for the use of self-reports as data in psychological research (Cheek, 1982; McCrae & Costa, 1989). Over-estimates are also more likely to be found if the self-assessments contribute to the student's grade in a course (Boud & Falchikov, 1989), where in the current study they do not.

Opportunity (environment) was defined as the extent to which students have access to laptop computers usable in class. In addition, issues of appropriate software as well as classroom accommodations and classroom technology were included. Ability was defined in terms of technology self-efficacy. Self-efficacy is defined as students' beliefs about their capabilities to accomplish a task (Bandura, 1997). Self-efficacy has been defined by many researchers to apply specifically to the use of computers in various venues. Motivation was defined as the students' desire or readiness to take laptop computers to class and to use it during the class sessions.

This research was designed to understand and identify the relationships between multiple components of motivation. A student might choose to bring a laptop to class to enhance his or her learning. However, another source of motivation might be the student's desire to maintain social connections with friends during the class sessions.

METHODOLOGIES AND FINDINGS

A survey questionnaire was used to collect the data for this study. The questionnaire was administered in multiple classes. The respondents were undergraduate and graduate students in a business school within a private midwestern university. The classes were selected because the researchers observed that many students brought laptop computers to classes and the instructors neither required nor prohibited their use in the classes.

The survey questionnaire was constructed using question items to which respondents were asked to indicate level of agreement or disagreement on a seven-point Likert Scale. The items addressed the three elements of the study: opportunity, ability, and motivation. The dependent variable in this study is where respondents were asked to "estimate in how many class meetings you have used a laptop computer this semester." This will be subsequently referred to as Used in Class – UIC. The survey was administered during the eighth week of the semester with 393 students participating.

The research goal was to focus on discovering the motivation of respondents; therefore those who indicated that they had either low opportunity or low ability to bring a laptop to class were removed from the study by the researchers. This allowed for the focal point to stay on varying reasons of motivation that are not altered by those who may have a seemingly low level of motivation that is actually due to lack of opportunity or ability that restricts the student. Accordingly, a subset of the original dataset was used for analysis with only those respondents whose average opportunity score was a 7 out of 7 (identifying that they did in fact have access to a laptop that was available to be brought to class) and whose average ability score was a 6 out of 7 or higher (classifying them as high in the ability to know how to use the programs on their computer and how to access the university wireless internet). The items which were used to measure opportunity and ability are listed in Appendix A, along with their reliability coefficients, quantified as Cronbach's alphas (Cronbach, 1951). Both the opportunity and ability measures appeared reliable with alpha values well above the accepted 0.7 standard (Santos, 1999). The final dataset used for analysis of motivation factors included 194 respondents. This data was analyzed via the Statistical Package for the Social Sciences (SPSS) 15 and AMOS version 19. Significance throughout the analysis was determined using an alpha = 0.05.

The demographic summary of the sample is shown in Table 1. A question regarding demographics was whether there were any relationships between demographic factors and laptop use in class. The null hypothesis is that there are no relationships. The alternative hypotheses are that one or more demographic variables influence the use of a laptop in a class. The results are shown in Table 2.

The results show that these demographic variables have no significant differences among their groups in terms of laptop usage. Since there are no significant differences present among any subgroup, the data will remain combined for all subsequent analysis. Analysis of the dataset obtained in this study involved various descriptive statistics, ANOVA, factor analysis, correlation analysis, and structural equation modeling.

The responses to the various items were analyzed using factor analysis in order to achieve data reduction. The results of which led to nine components, which are summarized below and itemized by question in Appendix B. The reliability coefficients, Cronbach's alphas, which are measures that test the extent to which multiple indicators for a latent variable or component belong together, are provided below for each component.

Table 1
Survey Sample Demographics – OPP + ABILITY cases only, n=194

Demographic	Category	Number	(%)
Gender	Female	87	44.8
	Male	107	55.2
Education Level	Freshman	14	7.2
	Sophomore	24	12.4
	Junior	68	35.1
	Senior	45	23.2
	Graduate	43	22.2
Residential Status	On-Campus	48	24.7
	Off-Campus	118	60.8
	At Home	28	14.4

Table 2
Laptop Use – OPP + ABILITY cases only, n=194

Demographic	Category	Average times used	ANOVA F	Significance
Gender	Female	8.126	0.96	0.329
	Male	6.383		
Education Level	Freshman	6.143	2.13	0.079
	Sophomore	3.333		
	Junior	5.574		
	Senior	11.089		
	Graduate	8.047		
Residential Status	On-Campus	4.792	1.86	0.159
	Off-Campus	8.517		
	At Home	5.536		

Effective Learning (alpha = .958)—consists of 14 items, examination of these suggests that all are part of what most would consider positive items regarding learning in the classroom. They include working with and organizing materials, communication with the instructor, elements of learning, and effective use of time.

Internet Activity (alpha = .884)—consists of four items, all of which involve using the laptop in class to visit the Internet to do things not typically part of the classroom activity. These include reading email, communicating with others, and visiting web sites.

Access to Information (alpha = .897)—includes three items, which involve information searching, accessing, and processing.

Embarrassment (alpha = .785)—includes three items, which involve the student's perception should something go wrong or should others be watching.

Instructor (alpha = .702)—consists of four items, all of which involve the students' classroom instructors. Elements include permission to use, encouragement to use, and instructor use of the technology.

Expectations (alpha = .633)—consists of three items, these involve others, friends, parents/family, and the school, and the norm for using a laptop in class.

Distraction (alpha = .787)—consists of three items, which include an assessment of distraction for the student, the instructor, or a classmate.

Network Issues (alpha = .798)—includes only two items, both of which deal with risk and reliability of using networks in the classroom.

Laptop Loss (alpha = .713)—includes only two items, both of which involve risk of loss of the laptop due to damage or theft.

One component, Expectations, had an alpha lower than preferred, but it was not unexpected with only three factor items. It also met the requirements of the loading levels set forth by Hair et al. who call loadings above .6 "high" and those below .4 "low" (Hair et al.,1998). The alpha was not improved by any item's deletion, so we included all items.

Component variables as the averages of the individual items in each component were then created. A correlation matrix, showing the strength and direction of the correlations between these nine components and the dependent variable of UIC, were created. These correlations are shown below in Table 3. It can be seen from this table that there were a number of significant relationships that existed between the components and UIC as expressed by the correlation values shown. Several expected correlations were evident. For example, the correlation between UIC and Embarrassment was negative. It is expected that if the anticipated outcome of using a laptop in class would be embarrassment, that students would be less likely to use a laptop in class. The components typically considered objectionable by an instructor (engaging in Internet Activity during class to email or visit web sites and causing a Distraction for themselves or others) have significant negative correlations with UIC and with Effective Learning.

Effective Learning also had significantly positive strong correlations with Access to Information, Expectations, and Used in Class. Access to Information implies that when students feel they have increased information available, they will have a raised level of organization and will be able to effectively use their time in a way that will maximize learning. Expectations leads us to see that when others encourage the student to bring their laptop to class, they believe that these outside persons have the expectation that this will lead to Effective Learning, thus the student does as well. Effective Learning had a strong positive relationship to the frequency with which the student used a laptop In Class. When their beliefs are strong that the laptop will better their ability to locate, organize, and process the information that is presented in class, they are more likely to bring the laptop.

Our final analysis was to look at how all of the components come together to predict Used In Class (UIC). Structural Equation Modeling (SEM) was done to predict classroom laptop usage through a structural model that maps out the relationships between the nine latent variables that were identified using factor analysis and the Ability component (Kline, 2005). The benefit of structural equation modeling was that it could incorporate more complex relationships than ordinary regression and that individual variables could act as independent (or exogenous) and dependent (or endogenous) variables simultaneously. These structural equations are designed to represent all causal relationships among the variables in the model. Maximum likelihood estimates are arrived at through an iterative procedure that attempts to maximize the likelihood that values of the criterion variable will be correctly predicted. Unlike ordinary least squares (OLS), SEM also could account for non-causal covariance between exogenous variables. The fact that the interaction of two normally distributed variables is often itself not normally distributed causes problems in most estimation methods that have normality as a basic distributional assumption, such as maximum likelihood, which we are using in SEM (Schumacker et al, 1995). Although interaction terms are therefore not modeled in our equations, the model did take into account all mediation effects between any variables that may be present. This mediation allowed for more causal relationships between variables than OLS and it captured the total effects of one variable on another

Table 3
Correlations and descriptive statistics – OPP + ABILITY cases only, n=194

	UIC	LEARN	INT	INFO	EMB	INST	EXP	DIST	NET	LOSS
Used in Class (UIC)										
Motivation Constructs										
Effective Learning (LEARN)	.379[a]									
Internet Activity (INTACT)	-.185[a]	-.338[a]								
Access to Information (INFO)	.161[b]	.478[a]	.058							
Embarrassment (EMB)	-.151[b]	-.127[c]	.295[a]	-.069						
Instructor (INST)	.055	.023	.059	-.115	-.013					
Expectations (EXP)	.134[c]	.472[a]	-.054	.268[a]	-.097	.294[a]				
Distraction (DIST)	-.301[a]	-.557[a]	.388[a]	-.236[a]	.426[a]	-.031	-.229[a]			
Network Issues (NET)	-.158[b]	-.152[b]	.194[a]	-.127[c]	.294[a]	-.105	-.057	.289[a]		
Loss of Laptop (LOSS)	-.179[b]	-.209[a]	.247[a]	-.117	.431[a]	-.041	-.093	.399[a]	.348[a]	
Mean	7.16	4.77	4.89	6.25	2.52	4.80	3.36	3.49	2.51	2.34
Std. Deviation	12.34	1.30	1.56	1.01	1.34	1.01	1.22	1.53	1.48	1.41

[a] $p<0.01$; [b] $p<0.05$; [c] $p<0.10$.

through any possible direct or indirect effects that may occur.

The final structural model shown was built by starting with all direct effects in the original model, model trimming by removing insignificant paths, then model building by adding any recommended paths from modification indices, changing only one parameter at a time. Modification indices are statistics that recommend path arrows that are absent from the model that would lead to better model fit by reducing the Chi-square. Maximum likelihood estimation was used to produce the standardized coefficient estimates, with similar interpretations as regression coefficients, for each path in the model. Total effects are found by adding together a factor's direct and indirect effects that contribute to an endogenous variable. As an example, in our model, let's suppose that we wanted to compute the total effect that Access Information has on Effective Learning (see Figure 1):

We see that some of these equations must be solved and their values substituted into other formulas to resolve the

Figure 1
An Example of the Model

Direct Effect: AccessInfor --> EffectiveLearn = 0.33

Indirect Effects: AccessInfor --> Distraction --> EffectiveLearn = (-.26)*(-.32) = 0.08

AccessInfor --> Distraction --> Expectations --> EffectiveLearn = (-.26)*(-.16)*(.30) = 0.01

AccessInfor --> Expectations --> EffectiveLearn = (.27)*(.30) = 0.08

Total Effect: 0.33 + 0.08 + 0.01 +0.08 = 0.50

In addition, if we wanted to write out the structural equations that would create UIC, they would look like this:

UIC = 0.38*(EffectiveLearn)

EffectiveLearn = 0.33*(AccessInfor) – 0.32*(Distraction) + 0.30*(Expectations) – 0.21*(InternetAct)

Distraction = -0.26*(AccessInfo) +0.40*(InternetAct)

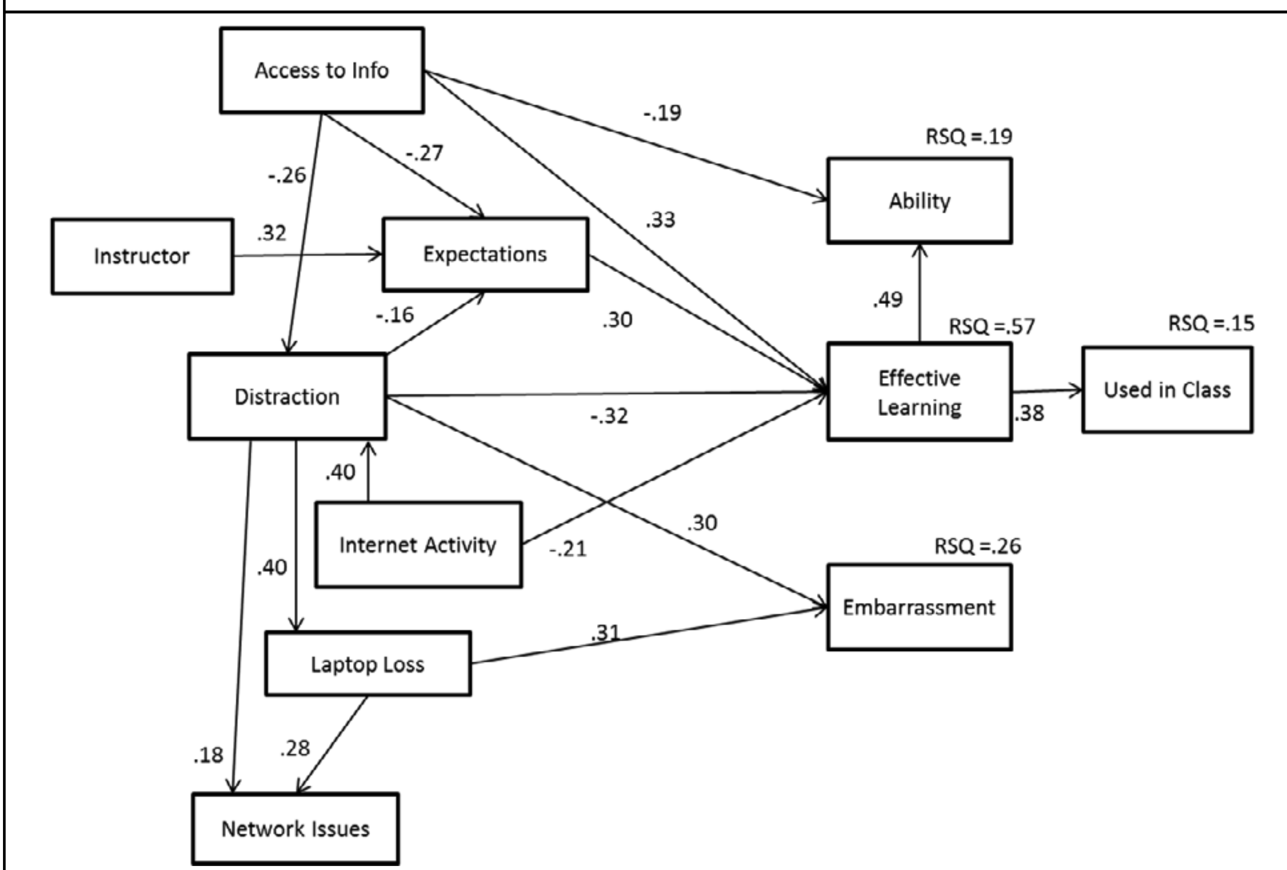
Expectations = -0.16*(Distraction) +0.27*(AccessInfor) +0.32*(Instructor) complete picture of the effect that individual variables have and then proceed with sequential substitution until we end with UIC.

The final model was evaluated using multiple goodness-of-fit statistics to ensure good fit. Chi-square is a measure of discrepancy in SEM and thus good model fit is illustrated when the p-value is high (above 0.05) (Kline, 2005). The p-value for the Chi-square of our model was 0.27, indicating good model fit. The comparative fit index (CFI) compares the existing model fit with a null model which assumes the variables in the model are uncorrelated. The CFI ranges from 0 to 1 and a value greater than 0.9 implies excellent model fit (Bentler et al., 1987). The CFI for our model was 0.989, indicating excellent model fit for the variables shown. Root mean square error of approximation (RMSEA) is a discrepancy measure per degree of freedom that does not require comparison with a null model. Good model fit is indicated when RMSEA is less than or equal to 0.05 (Schumacker et al, 2004). The RMSEA for the existing model was 0.026, indicating that the amount of error present was quite small.

We begin with a few noteworthy attributes of the resulting model shown in Figure 1. First, the only motivation component that is directly related to UIC was Effective Learning. This relationship was positive, as expected. This supported our first hypothesis that students bring laptops to class for the goal of accomplishing class related activities, Effective Learning, and not to engage in Internet or other communication behaviors. This will be discussed further below, as well as a probe of other components of the motivations to this behavior.

The second significant feature of the model was the relationship between Effective Learning and four other components. When Effective Learning was considered as a dependent variable, it was discovered that other components had strong relationships with this dependent, or endogenous, variable. Access to Information, Distraction, Expectations, and Internet Activity all have significant relationships with Effective Learning as shown. Access to Information and Expectations were both positive. Not surprisingly, the components Distraction and Internet Activity were both negative.

Figure 2
Structural Equation Model
Showing Significant Causal Relationships
between Components and Used in Class.



This result suggested that four components, Access to Information, Distraction, Expectations, and Internet Activity, do not directly relate to UIC, but rather they appear to relate indirectly to UIC through their relationship with Effective Learning. For example, students reporting higher Internet Activity would be students reporting lower Effective Learning, which would, in turn, lower the likelihood of taking and using a laptop in class. Students reporting higher Distraction would be students reporting lower Effective Learning, which would, in turn, lower the likelihood of taking and using a laptop in class. In the same way, students reporting higher Access to Information and Expectations would report higher Effective Learning and an increased likelihood of taking and using a laptop in class.

Looking at Embarrassment, we see that Laptop Loss and Distraction had direct relationships with it. Both had the expected positive relationship, indicating that the more likely the student was to be either experiencing or causing a distraction during class or likely to lose their laptop, the more likely they are to feel embarrassed. However, Embarrassment does not have a direct relationship with UIC, neither do Laptop Loss or Distraction. Neither Laptop Loss nor Embarrassment has any effect, direct or indirect, with UIC. This implies that the student's perceived embarrassment due to other students' judgment is minimal. Distraction also had only an indirect effect on UIC through its negative effect on Effective Learning.

The final aspect of the model in Figure 2 to be discussed is in regards to our second hypothesis, the Instructor component. Notice that this component only connected to the model through a relationship with Expectations, which is positive. During the analysis, we were struck with the fact that Instructor seemed not to have any direct significant relationship with UIC, Effective Learning, or with any other components. Rather, the values show a positive impact on Expectations, which in turn positively impacts Effective Learning, which finally positively impacts UIC. These results show partial support for our second hypothesis that the Instructor's usage of technology and perceived desire for students to use technology will be a factor that affects students using laptops in class. The Instructor effect was felt upon the students through their perceived external Expectations which can increase their desire to achieve Effective Learning and thus bring their laptop to class. This Instructor effect was merely felt by UIC in an indirect and not a direct way.

The R-squared values are shown in Figure 2 for endogenous variables in the model. These R-squared values represent the proportion of variance that is being explained for that variable by our model. Although the model was found to be significant, only 15% of the variation in UIC is being explained by our model. This implies that there may be additional variables that affect whether a student brings a laptop to class that are not currently being considered. Understanding these additional variables will be a focus of future research. We do see a high level of explained variation for Effective Learning using our model through its high R-square value of 0.57. This shows that the survey questions and subsequent components chosen are successful at encompassing the attributes that are present in this Effective Learning variable. It is noted here that an index labeled AIC (Akaike's Information Criterion) was used to compare various models' goodness of fit. The model with the lowest AIC value is considered to have the best fit (Burnham et al., 1998). Our model, with Instructor in the front of the structural model, was chosen because it has an AIC of 98.862; other plausible models with the effect of Instructor expressed in varying locations all had higher AIC values, such as 108.311 and 110.375.

Conclusions

This study found that, when viewed from the student's perspective, instructor behavior seems not to be the primary driver in the student's decision to bring a laptop for use in class. The students in this study appear to have been motivated more by their own drive to achieve effective learning habits during the class period and any components that would enable that goal to be accomplished. They saw the usefulness of the laptop as enhancing their own participation in the course. As instructors, perhaps providing tips on how to incorporate their technology to enhance their in-class learning, would further serve to encourage the students to maximize their effective learning potential.

One possible limitation to the current study is that it surveyed only students within a college of business and thus would not be representative of the college student population as a whole. Further study may benefit from focusing on whether different pedagogies or instructor motivators might further impact, either positively or negatively, laptop use in class from the student's perspective. Another area to study further would be laptop loss and networking issues as these relate to the Embarrassment component and whether there are issues not currently investigated related to these topics that would in fact negatively impact laptop use in class.

These results have revealed that motivations of students to bring the computer to class include personal preference, wanting to take notes on the computer, looking up information on specific material, and the like. Students seem not to be motivated by a desire to access social functions that would be a distraction to the class. That is, many students choose to bring computers to class for sound educational reasons, which contradict what many instructors believe to be true.

REFERENCES

Alexander B. (2004), "M-Learning: Emerging Pedagogical and Campus Issues in the Mobile Learning Environment," EDUCAUSE Center for Applied Research (ECAR) Bulletin, 16.

Bandura, A. (1997), Self-efficacy: The Exercise of Control. W.H. Freeman, New York.

Baylor, A.L., and D. Ritchie (2002), "What Factors Facilitate Teacher Skill, Teacher Moral, and Perceived Student Learning in Technology – Using Classrooms?" Computers and Education, 39, pp. 395 – 414.

Bem, D.D. (1967), "Self-perception: An Alternate Interpretation of Cognitive Dissonance Phenomena," Psychological Review, 74, 183-200.

Bentler, P.M., and C.P. Chou (1987), "Practical Issues in Structural Modeling," Sociological Methods and Research, 16, pp. 78-117.

Boud, D. and Fachikov, N. (1989), "Quantitative Studies of Student Self-Assessment in Higher Education: A Critical Analysis of Findings," Higher Education, 18, 529-549.

Bugeja, M. (2007), "Distractions in the Wireless Classroom," Chronicle of Higher Education, 53 (21), pp. C1-C4, 1-26.

Burnham, K. P., and D.R. Anderson (1998), Model Selection and Inference: a Practical Information-Theoretic Approach. New York: Springer-Verlag.

Campbell, A.M. and R.P. Pargas (2003), "Laptops In the Classroom," Proceedings of the 34th SIGCSE technical symposium on Computer Science education, February 19-23, Reno, Nevada, USA.

Cheek, J.M. (1982), "Aggregation, Moderator Variables, and the Validity of Personality Tests: A Peer-Rating Study," Journal of Personality and Social Psychology, 43, 1254-1269.

Christou, C., M. Eliophotou-Menon, and G. Phillippou (2004), "Teachers' Concerns Regarding the Adoption of a New Mathematics Curriculum: An Application of CBAM," Education Studies in Mathematics, 57, pp.157-176.

Cronbach, L.J. (1951), "Coefficient Alpha and the Internal Structure of Tests," Psychometrika, 16(3), pp. 297-334.

Dawson, K., C. Cavanaugh, and A. D. Ritzhaupt (2008), "Florida's EETT Leveraging Laptops Initiative and Its Impact on Teaching Practices," Journal of Research on Technology in Education, 41 (2), pp. 143-159.

deCharms, R. (1968), Personal Causation. New York: Academic Press (1968).

Demb A., D. Erickson, and S. Hawkins-Wilding (2004), "The Laptop Alternative: Student Reactions and Strategic Implications," Computer and Education, 43 (4), pp. 383-401.

Elwood, S., Susan, C. Changchit, and R. Cutshall, (2006), "Investigating Students Perceptions on Laptop Initiative in Higher Education – An Extension of the Technology Acceptance Model," Campus Wide Information Systems, 23 (5), pp. 336-349.

Fried, C.B. (2008), "In-Class Laptop Use and Its Effect on Student Learning," Computers and Education, 50, pp. 906-914.

Funder, D.C. (1989), "Accuracy in Personality Judgment and the Dancing Bear." Personality Psychology: Recent Trends and Emerging Directions, 213-223.

Griffin, R.W., and G. Moorhead (2010), Organizational Behavior, (9th ed.), South-Western, Mason, OH.

Hair, J.F., R.E. Anderson Jr., R.E., R. L. Tatham, and W. C. Black (1998). Multivariate Data Analysis, (5th ed.), Englewood Cliffs, NJ: Prentice-Hall.

Ilacqua, J., E. Park, D. Gannon, and J. Allen (2007), "Fostering an Active Learning Environment Through Technology," Proceedings of the Northeast Business and Economics Association, pp. 223-226.

Kline, R.B. (1998), Principles and Practice of Structural Equation Modeling, (2nd ed.), New York: Guilford Press.

Macinnis, D., C. Moorman, and B.J. Jaworski (1991), "Enhancing and Measuring Consumers' Motivation, Opportunity, and Ability to Process Brand Information from Ads." Journal of Marketing, 55 (4), pp. 32-53.

McCrae, R.R. and Costa, P.T., Jr. (1989), "Different Points of View: Self-Reports and Ratings in the Assessment of Personality," In J.P. Forgas & J.M. Innes (Eds.), Recent Advances in Social psychology: An International Perspective, 429-439. New York: Elsevier Science.

Olsen, F. (2001), "Colleges Differ on Costs and Benefits of Ubiquitous Computing." Chronicle of Higher Education, 47 (20), p. A45.

Pfeiffer, J. (1998), The human equation, Harvard Business School Press, Boston, MA.

Rogers, E. (1995), Diffusion of innovations (4th ed.), Free Press, New York, NY.

Rola, M. (2002), "Building IT into Lesson Plans." Computing Canada, 28, (22), p. 28.

Santos. J., and A. Reynaldo (1999), "Cronbach's Alpha: A Tool for Assessing the Reliability of Scales," Journal of Extension, 37, (2).

Schumacker, R.E. and R.G. Lomax (2004), A Beginner's Guide to Structural Equation Modeling (2nd ed.), Mahwah, NJ: Lawrence Erlbaum Associates.

Schumacker, R.E. and Rigdon, E. (1995), "Testing Interaction Effects in Structural Equation Modeling," Paper presented at the Annual Meeting of the American Educational Research Association.

Skolnick, R., and M. Puzo (2008), "Utilization of Laptop Computers in the School of Business Classroom," Academy of Educational Leadership Journal, 12 (2), pp. 1-10.

Steers,R.M., G.A. Bigley, and L.W. Porter (1996), Motivation and Leadership at Work, (6th ed.), McGraw-Hill, New York, NY.

Straub, E.T. (2009), "Understanding Technology Adoption: Theory and Future Directions for Informal Learning," Review of Educational Research, pp.79; 625.

Venkatesh, V., M.G. Morris, G.B. Davis, and F.D. Davis (2003), "User Acceptance of Information Technology: Toward a Unified View," MIS Quarterly, 27 (3), pp. 425-478.

Wagner, E.D. (2005), "Enabling Mobile Learning," EDUCAUSE Review, 40 (3), pp. 40-52.

Walters, C., M. Conley and C. Alexander (1998), "The Digital Agora: Using Technology for Learning in the Social Sciences," Communications of the ACM, 41 (1), pp. 50-57.

Weaver, B.E., and L.B. Nilson (2005), "Laptops in Class: What are They Good For? What Can You Do With Them?" New Directions in Teaching and Learning, 101, pp. 3-13.

Young, J.R. (2009), "When Computers Leave Classrooms So Does Boredom." Chronicle of Higher Education., 55 (42), p. 1A.

APPENDIX A

Opportunity – Alpha =.901

- I have access to a laptop computer that I can take to my classes.
- I have software on my laptop computer that I could use during my classes.

Ability – Alpha = .874

- I feel confident that I could better record information during a class using a laptop computer.
- I feel confident setting up and using a laptop computer during a class.
- I feel confident using the networking facilities in a classroom to connect a laptop.
- I feel confident choosing the appropriate software to use on a laptop during a class.
- I feel confident using a laptop to connect to the Blackboard system during a class.
- I feel confident using a laptop to download and/or access class materials during a class.
- I feel confident using Microsoft Word to record notes of a class discussion.
- I feel confident using Microsoft PowerPoint to follow a class presentation.
- I feel confident using Microsoft PowerPoint to record notes of a class discussion.
- I feel confident using Microsoft Excel to follow a class presentation.

APPENDIX B

Effective Learning – Alpha = .958

- Using a laptop computer during a class would allow me to more easily locate relevant materials.
- Using a laptop computer during a class would allow me to more easily use relevant materials.
- Using a laptop computer during a class would allow me to better capture all of the information presented.
- Using a laptop computer during a class would allow me to better process the information presented.

- Using a laptop computer during a class would allow me to better summarize the most important information presented.
- Using a laptop computer during a class would allow me to better communicate with the instructor.
- Using a laptop computer during a class would enhance my learning of the subject matter of the class.
- Using a laptop computer during classes would enhance my learning in general.
- Using a laptop computer during classes would improve my problem solving skills.
- Using a laptop computer during classes would improve my critical thinking skills.
- Using a laptop computer during classes would improve my analysis skills.
- Using a laptop computer during a class would allow me to better organize and process information.
- Using a laptop computer during a class would give me an opportunity to better participate in the class.
- Using a laptop computer during a class would allow me to better use my time to get everything done.

Internet Activity – Alpha = .884

- If I used a laptop computer during a class, I would be likely to read email messages.
- If I used a laptop computer during a class, I would be likely to create and send email messages.
- If I used a laptop computer during a class, I would be likely to visit one or more web sites.
- If I used a laptop computer during a class, I would be likely to exchange text messages with others.

Access to Information – Alpha = .897

- Using a laptop computer during a class would give me access to more information.
- Using a laptop computer during a class would give me easier access to information.
- Using a laptop computer during a class would allow me to more quickly search for information.

Embarrassment – Alpha = .785

- Using a laptop computer during a class would be embarrassing if something were to go wrong.
- Using a laptop computer during a class would be embarrassing if another student were to see what was on my screen.
- Using a laptop computer during a class would be difficult because of other students watching me.

Instructor – Alpha = .702

- My instructors allow students to use a laptop during class.
- My instructors encourage students to use a laptop during class.
- My instructors are adept in the utilization of information technology in their classes.
- My instructors integrate information technology into their courses.

Expectations – Alpha = .633

- Many of my friends use their laptop computers during a class.
- My parents and/or family expect me to use a laptop during class.
- My university, college, or school encourages the use of laptop computers during a class.

Distraction – Alpha = .787

- I feel that my using a laptop in a class would be a distraction for me personally.
- I feel that my using a laptop in a class would be a distraction for other students in the class.
- I feel that my using a laptop in a class would be a distraction for the instructor

Network Issues – Alpha = .798

- I feel that network connections available in classrooms are risky to use.
- I feel that network connections available in classrooms are not reliable.

Laptop Loss – Alpha = .713

- I feel that I could damage or lose track of a laptop if I took one to a class.
- I feel that someone could steal a laptop from me if I took one to class.