

Course valuing, approaches to study and academic performance: the case of undergraduate Construction Management classes

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To improve student success, instructors need to understand how students feel about their own learning and how much responsibility they take for it. This information is crucial to teach and develop more effective courses. Yet, very often, instructors in higher education focus on content learning exclusively. While summative assessment of learning in these courses is important, content learning is not the only measure of educational outcomes. This study used the Course Valuing Inventory (CVI) (Nehari, 1978) adapted for Construction Management (CM) classes to evaluate cognitive-content, affective-personal and behavioral learning in students taking these classes. Furthermore, this study examined the relationship between course valuing scores, approaches to study (ASI) and course performance. Results indicated that the CVI can be adapted for use in CM classes. However multiple regressions run in this study predicting final course grade from seven predictor variables: student class standing, student self-reported GPA, whether or not the course was required for the student's major, likelihood of student continuing with their current major, grade that student anticipated receiving in the class, ASI score, and CVI score, revealed that CVI scores were not significant predictors of final course grades.

Key Words: value-based experience, course valuing inventory, learning, pedagogy, undergraduate

Introduction

Core courses in Construction Management curricula are essential to satisfy graduation requirements but they are perceived to be more difficult than other CM classes by CM students. Although these courses are primarily offered for CM majors, they may be offered for other majors as well (like Interior Design, business majors, and others). This study investigates student performance in the following core CM classes: Project Planning and Scheduling, Building Materials and Systems, International Building Codes and Site Construction.

There are many factors that can affect a student's performance in class, however, this study tried to understand how students feel about and evaluate their own learning in CM classes and how the affective component influences their study behavior and academic performance. The present study seeks to compare scores on factors from the Course Valuing Inventory (CVI) with scores on the Approaches to Study Inventory (ASI) and final grade among students in undergraduate core CM courses. The purpose is to investigate the relationship between course experience and approaches to learning and to examine their relative importance as predictors of academic achievement. In other words, the researchers were trying to find valid answers to the following questions/matters:

1. Can the CVI be successfully adapted to measure CM students' course valuing attitudes?
2. Is CVI a significant predictor of academic success (final grade) in CM classes, i.e. if students are valuing the class more, do they do better?
3. To investigate relationships between study approaches, students' perceptions of the value of the CM courses and academic achievement as exemplified by their final grades.

Literature Review

Nehari & Bender (1978) developed and tested the *Course Valuing Inventory (CVI)* to provide an additional measure (besides achievement measures) to evaluate the outcomes of educational efforts. The CVI is an inventory of 36 items (4 subscales, 9 items in each subscale) that measures the value and meaningfulness of a course and its effects on the learner as perceived by him/her (Nehari and Bender, 1978). The score on the combined CVI ranges from 36 to 144, with higher scores indicating higher levels of valuing.

- Scale 1. Course valuing: the extent to which a learning experience is judged to be valuable, meaningful, significant and positive. Ex: I consider this learning experience as time and effort well spent.
- Scale 2. Cognitive-content: the extent to which students feel they acquired information, knowledge and comprehension. Ex: The course helped me to acquire important basic information.
- Scale 3. Affective-personal: extent to which students feel the course has been a valuable personal experience (gained awareness, sensitivity, understanding of self and others). Ex: This learning experience helped me to become more aware of my own feelings and reactions.
- Scale 4. Behavioral: changes in skills both generally and in relation to the course. Ex: This course was useful in helping me develop new ways of learning.

Nehari & Bender's assumptions derived from the humanistic education theory that the learners' perceived meaningfulness of a learning experience is an important measure of the educational outcomes and that the learner is a legitimate evaluator of his own learning. They found the CVI to be a valid and reliable instrument and established the existence of a relationship between the perceived learning and its value. Their results indicated higher scores on course valuing and cognitive-content and also differentiated between graduate and undergraduate students, with graduate students having higher scores on the CVI than undergraduates.

The CVI has been used in multiple studies in the humanities and social sciences (Nehari, 1978), history of science classes (Lawless, 1982), first year experience of medical studies (Sobral, 1999 and 2001) and allied health students (Sturges, Maurer & Dobson, 2012). In these studies, the CVI emerged consistently as a reliable and valid instrument. In addition, cognitive-content and course valuing scored highest of the 4 subscales (Sturges, Maurer & Dobson, 2012; Lawless, 1982), graduate students provided higher scores than undergraduate students (Lawless, 1982), the allegedly more difficult course scored higher (Lawless, 1982) and there was a significant correlation between CVI responses and measures of course performance (Sturges, Maurer, and Dobson, 2012 and Lawless, 1982) with higher scores on the CVI predicting greater success in class (as measured by final grade). Prior research has also indicated a strong relationship of the CVI to GPA (Sobral, 2001 and 2008), stronger confidence as a learner, greater motivation to learn and higher scores for women (Sobral, 2008). Sobral (1995) also examined CVI as one measure to evaluate the quality of the learning environment in a PBL (problem-based learning) curriculum and showed significant increases in CVI scores from start to end of term in the PBL group, as compared to the traditional group. These results indicate that adaptation to a course experience as measured by affective responses is related to the helpfulness and value of such experience as perceived by the learners. In addition, course appeal is a factor that increases the students' tendency to continuing learning the contents of a course.

In examining reflective cognitive behaviors in medical students Sobral (2001) also looked at students' intended approach to learning (as measured by the ASI) and confirmed that learners' perceived outcomes, their approach to study, and reflection in learning are related.

The *Approaches to Study Inventory (ASI)* is an instrument that measures students' adopted approaches (deep, strategic, or surface) to studying and has been one of the most widely used surveys on student learning in higher education (Entwistle, Hanley, and Hounsell, 1979). The instrument has undergone multiple revisions that shorten the ASI to fewer questions such as 60, 48, 34, etc.

Multiple studies have investigated the relationship between students' perceptions of their academic environment, ASI, and academic outcomes in philosophy students (Karagiannopoulou & Christodoulides, 2005), distance education (Lawless & Richardson, 2002) and chemistry (Almeida et. al, 2011).

The students' scores on the individual scales on the ASI indicated that approaches to studying in distance education are strongly associated with students' perceptions of the academic quality of their courses (Lawless & Richardson, 2002). Karagiannopoulou & Christodoulides (2005) observed a pattern of relationships between deep approaches, perceptions of learning environment which encourage this approach, and outcomes. For the first year students, university grade was not associated with any of the explored variables but the level of satisfaction was predicted by relationships with tutors and fellows. For the fourth year students, good teaching predicted achievement both directly

and indirectly through the deep approach to studying. The findings indicate that fourth year students' perceptions of the current learning environment are a stronger predictor of academic achievement than prior academic ability.

Trigwell & Prosser (1991) reported on the relationship between qualitative differences in learning outcomes, perceptions and evaluations of the learning environment and approaches to study. The results of their study support previous research in identifying relationships between perceptions/evaluations of the learning environment and approaches to study and between approach to study and the quality of the learning outcomes. The study reported also identifies a relationship between perceptions, approaches and the quality of the outcomes. The results suggest that environments perceived to encourage deep approaches to learning are more likely to facilitate higher quality learning.

To further explore of the impact of affect in learning, the present study sought to investigate the relationship between course experience (CVI) and approaches to learning (ASI), and to examine their relative importance as predictors of academic achievement among students in undergraduate CM core courses. The specific aims of this paper were: to adapt the CVI to CM classes and validate it; to identify if CVI is a significant predictor of academic performance in class; and to identify whether there are relationships between students' perceptions of course experience, their approaches to study and academic performance.

Method

For this study, the authors created a survey by adapting and combining questions from previously validated surveys (CVI and ASI). Researchers chose the CVI for its affective component of learning, i.e., how much value students place on their learning, and the ASI for its value in examining academic behaviors related to studying. Both can potentially affect academic performance in class. We also wanted to target students that were not included in previous studies. This particular study used a shortened 18 question version of the ASI from the Enhancing Teaching-Learning Environments in undergraduate education (ETL project, 2002). CVI was adapted from a general higher education context to course-specific context.

Subjects

The study targeted 190 undergraduate students enrolled in four classes; Building Materials and Systems, Building Codes, Site Construction and Project Planning and Scheduling taught by the same two instructors in the CM program at our university. Interior Design students are required only to take one of the classes in discussion (Building Codes); given this limitation, they are not the focus of the study, however this limited subset of data was relevant as their perception of the respective class makes also the subject of the study.

Procedure

Students were recruited during the above listed CM classes and were asked to complete a survey consisting of three components: a demographic component (14 questions), a short version of the Approaches to Study Inventory (ASI, 18 questions) and the adapted Course Valuing Inventory (CVI, 36 questions). Surveys were distributed in-class during the last two weeks before the final exam after appropriate approval was gained from the IRB. Participation in the survey was voluntary and students were instructed that if they do not want to participate, they should work quietly on something else, such as reviewing their notes and return a blank survey. Data was collected using scantron sheets and no incentives were offered for participation in the study. Surveys were administered at the end of the spring 2012 and spring 2013 semesters, two weeks prior to the final exam. Names of students were collected on the surveys to track academic performance in the course and the data was linked and analyzed by authors after the semester was over and course grades were finalized.

The researchers used a disclosure statement in the beginning of each survey which was approved by the IRB (Institutional Review Board): "Completing the survey is optional and will in no way affect your grade in the course. The only grades collected will be the final grades in this class, which will not be collected until after they have been submitted to the Registrar. Data from this survey may be used in research/publications on this topic. If it is used, it will be used anonymously and there will be no way to identify you from the data. If you would like to complete the survey, please transfer all answers to the Scantron form provided and write your name on it. I will assume that I have your consent to use your responses to the survey. If you do not wish to have your data published, you should

turn in a blank survey and a blank Scantron form. Therefore, if you do not wish to complete the survey, please sit quietly while your classmates complete theirs. Please be sure to turn in your blank survey and the Scantron form when the rest of the class turns in theirs, so that there will be no way to identify that you have not completed yours. Also, you may choose not to answer some of the questions or may opt out early."

One observation is noted: the students knew their grades throughout the course, so scores for assignments/labs were not withheld during the semester; they were constantly updated on the existing LMS (Learning Management System) within the university portal where students, faculty and staff may post their materials to share. One question in the survey addressed their probable grade: "What grade do you anticipate to get in this class?"

Results

A total of 165 surveys were returned, representing an 87% response rate. 83.6% students were Construction Management (CM) majors and 14.5% Interior Design (ID) majors and 1.8% other majors. The majority of respondents were white (92%), male (83.6%) and had a junior (37%) or senior (36%) standing in the class. These results are presented in Figure 1.

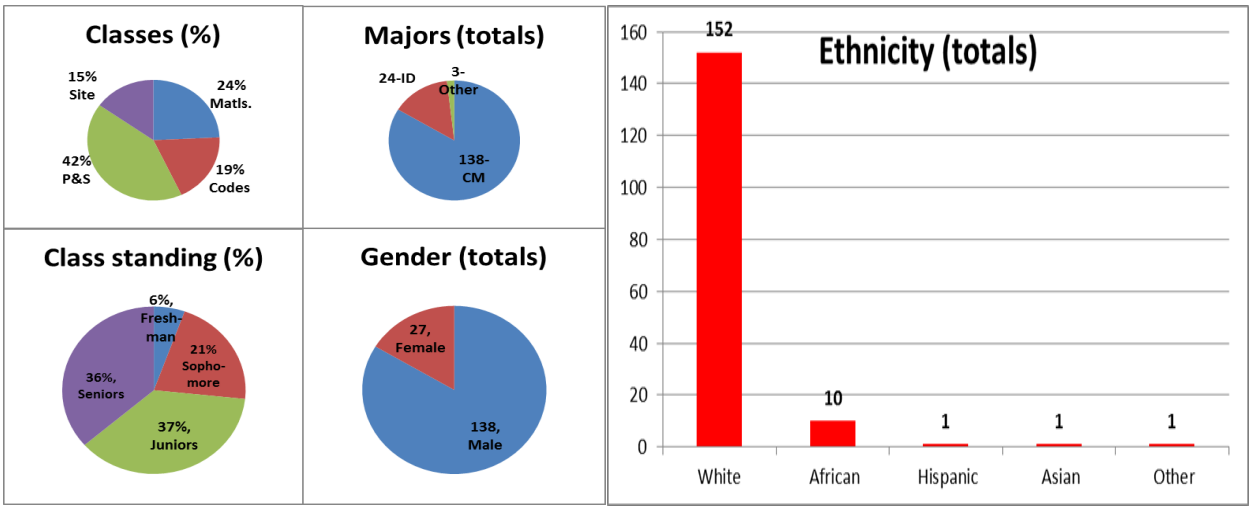

Figure 1: Demographics on the courses and student sample data

The under-represented minority was illustrated in Figure 1 only to reveal the fact that the survey instrument has the capability to fully collect demographics for potential further analysis. However, the numbers collected in this sample data was overwhelming on the first category ("white" counted for 152 students).

See Table 1 for descriptive information on the four CVI subscales.

Table 1

Descriptive Statistics for CVI Subscales

CVI Subscale	*M*	*SD*	Cronbach's alpha

Cognitive-Content	27.69	4.92	.89
Course Valuing	26.59	5.27	.90
Affective-Personal	22.68	5.70	.89
Behavioral	22.65	4.20	.78

After an initial correlation matrix was created to verify significant relationships between the variables, a forward-entry multiple regression was run. This regression predicted final course grade from seven predictor variables: student class standing, student self-reported GPA, whether or not the course was required for the student's major, likelihood of student continuing with their current major, grade that student anticipated receiving in the class, ASI score, and CVI score. The final regression model was significant, adjusted $R^2 = .46$, F (7, 156) = 20.76, $p < .001$. In the final model, all predictors except CVI were significant. See Table 2 for results.

Table 2

Regression Analysis Summary for Student Variables Predicting Final Course Grade

Variable	*B*	*SE B*	β	*t*	*p*
Class standing	.11	.05	.13	2.15	.033
GPA	.24	.06	.27	4.56	.000
Required	-1.37	.43	-.16	-3.18	.002
Continue with Major	.17	.07	.15	2.46	.015
Anticipated Grade	-.52	.08	-.42	-6.71	.000
ASI	-.22	.11	-.14	-1.99	.048
CVI	.00	.00	.01	.19	.849

Note. (*N* = 165). Required, Anticipated Grade, and ASI were reverse-coded.

The statistical notations for the scores obtained are as follows:
B: b (raw weight of the variable)
SE B: Standard Error of b (measure of the variability across subjects within the variable, adjusted for sample size)
β: Beta (statistical notation for the standardized weight of the variable)
t: t-test statistic
p: p-value (statistical notation for the probability of falsely "finding" an effect by chance alone; .05 was considered the accepted threshold)

Results indicated that students' final grades were positively predicted by class standing, GPA, if the course was required, likelihood of continuing with their major, anticipated grade in the course, and ASI scores. CVI did not emerge as a significant predictor of course grade in the final model, despite a small but significant zero-order correlation. Not surprisingly, students' anticipated grades and GPA were the strongest predictors of actual final

grade. However, even after accounting for the influence of those variables, student ASI scores still exerted a modest but significant effect on final grade, roughly equivalent to the effect of class standing, likelihood of continuing with major, and if the class was required. The researchers were observed the ASI scores generally and did not investigate an in-depth cause for approach to study low effect on final grade, which in itself can potentially make a different investigation. Interventions aimed at discouraging surface approaches to learning in the hope of improving the quality of learning, while not explicitly encouraging deep approaches, are not supported by the results of this study. Therefore, higher quality learning outcomes are not investigated and associated with surface approaches to learning in this study.

Conclusions and Discussion

The CVI can be adapted to CM to evaluate students' own learning. In this investigation, students showed stronger preferences for the Course Learning and Course Valuing subscales than the Personal Learning or Behavioral Learning subscales, consistent with Nehari & Bender's (1978) findings. All four subscales had sufficient reliability, as measured by Chronbach's alpha.

Prediction of the final course grade from the seven predictor variables mentioned above was significant; the only exception was the CVI. The regression analysis performed was based on cases with no missing values for any variable used. Correlation statistics were run for each pair of variables and were based on all cases with valid data for that pair. Multiple regressions were run to measure the model parameters useful for determining model adequacy. Results of the regression model indicate that the CVI had no predictive power for final course grades after accounting for the other six significant predictors in the model.

In a previous research study in HAP (Human Anatomy and Physiology) classes among the same university's students, the CVI was the most significant predictor of final grades; however, our hypothesis that a similar relationship might be found in students taking CM classes was not supported. However, the CVI is not just used to predict final grades; it reflects students' perceptions about the value of the course. These results indicate a meaningful difference between classes and majors at the same institution using essentially the same type of surveying tool. We looked at CVI because it examines the affective component of learning, and how much value students place on their learning, which can affect their performance in class. The ASI examines behaviors, which also affect performance. We were interested to know how the affective component and the behavioral component affect student performance. Our interpretation of our data is that the CVI does not predict final course grades because the CVI may not be relevant to students in these classes. Reflection about emotions and feelings on topics covered in these classes might be useful to help students' quest for hands-on types of practical problems used to enhance their learning.

Final grades were correlated with class standing, GPA, if the course was required, likelihood of continuing with their major, anticipated grade in the course, and ASI scores. We saw similar data on GPA with the other studies in HAP. The higher the GPA, the higher the final grade. HAP classes have mostly women and women showed higher scores on CVI in Sobral's studies. Could it be that gender influences the results, since CM majors (mostly males) evaluate differently? This question may be addressed in a comparison, follow-up study. The "hands-on" type of environment as evaluated or perceived by these students is one in which the lecturer gives adequate and helpful feedback, stating clear objectives and clear assessment criteria expected of students. This demonstrates the relevance of the course and attempts to make it interesting, creating opportunities for questions and time for consultations. Making an effort to understand students' difficulties and giving students the opportunity to decide what and how they learn may create occasions for interventions.

Overall, these conclusions in turn can help educators in CM classes enhance students' success. At the same time, they can better address the students' needs in the development of effective courses. Special attention may be given in the future on the particular cases where students have prior industry experience or special interest in the subject, before running the correlation. While there are many factors that can affect a student's performance in class, this study only looked at correlations between approaches to study, student's meaning and performance. By understanding how students feel about the topics covered in class and evaluate students' own learning, instructors in CM classes have the opportunity to enhance their success and further develop effective courses that would improve student learning outcomes sought by the curricula.

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