ASSESSING THE IMPACT OF STUDENT EFFORT AND CONTENT INTERACTION ON LEARNING FOR ON-CAMPUS AND ONLINE STUDENTS

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ABSTRACT

This research seeks to identify the student behaviors and course design features that foster student learning in a quantitative business course, and seeks to determine if successful teaching and learning practices differ for on-campus and online learning environments. Hypotheses connecting measures of student effort, course structure, student engagement, student background characteristics and student learning are developed and tested. Course components intended to promote learner-content interaction were developed and incorporated. Individual assignments and interactive study modules were required in both the campus-based and online sections while student discussions were required for the online sections. The results suggest learner-content interaction has a positive impact on student learning while student effort, measured as amount of time spent studying, is either negatively related or not related to this outcome. Further analysis reveals that students' perceptions of their performance ability mediate the relation between student effort and student learning.

INTRODUCTION

Much research has examined the question of how college affects students, including the student outcomes of learning, engagement, persistence, and satisfaction (Carini, Kuh, & Klein, 2006; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Tinto, 1993). The motivation to improve student outcomes has increased in recent years with concerns over the rising cost and perceived decreased value of a higher education degree (Abel & Deitz, 2014; Price, 2014; Jones, 2016). At the same time that stakeholders are examining the impact and outcomes of a college degree, options for attaining a post-secondary degree are expanding, particularly in the area of online learning. In 2012, 33.5 percent of all higher education students, or 7.1 million, were taking at least one online course, representing a 300 percent increase since 2003 (Allen & Seaman, 2014). An online quality assurance movement has grown alongside this expansion in online learning. Quality assurance efforts focus on, among other things, the course features that foster positive student outcomes. Still, failure rates for college students, particularly in quantitative courses including those online, continue at unacceptably high rates (Saxe & Braddy, 2015; Ganter & Haver, 2011).

Even without an external push to justify the public and personal investments in higher education, many college instructors strive to understand better the ways in which their students learn. Instructors wish to design their courses to include the experiences which best facilitate that student learning. To address these challenges faced by instructors, this study seeks answers to the following research questions: Which course design features foster student learning in a quantitative business course? Do successful teaching and learning practices differ for on-campus and online learning environments? And, what student behaviors foster learning? Informed by a review of the literature, the author develops hypotheses connecting measures of student effort, course structure,

student engagement, and student background characteristics with measures of student learning. The hypotheses are tested on data obtained from four on-campus and two online sections of a business finance course.

The results suggest learner-content interaction is important for learning; yet, not all course design components are created equal. Further, the impacts of course design are not the same across on-campus and online learners. The results also suggest that for one measure of effort, specifically time spent studying, students' perceptions of their performance ability mediate the association between effort and learning.

REVIEW OF PRIOR RESEARCH

Many researchers have studied the question of how college affects students (Astin, 1993b; Pascarella & Terenzini, 2005). Some of the earliest work on predictors of student success observed characteristics of the student combined with environment of the higher education institution to affect student success. In other words, it is the interaction between the experiences students have at college with the characteristics the student brings to college that impacts the student outcomes. Tinto (1993) described it as an *interactional* model while Astin (1993a) referred to it as an I-E-O (*input-environment-outcome*) model. *Input* refers to students' background talents and other qualities while *environment* refers to student educational experiences and *outcome* to the talents students are intended to acquire (Astin, 1993a).

To the extent college represents the environment of the I-E-O model, much value stems from identifying the key college experiences that facilitate higher student outcomes. Whether referred to as integration (Tinto, 1993), interaction (Chickering & Gamson, 1987), or engagement (Kuh, 2001), the environmental factor can be thought of as "the amount of physical and psychological energy that the student devotes to the academic experience" (Astin, 1993b, p. 518). More recent studies of student interaction have focused on the online learning environment (Chen, Gonyea, & Kuh, 2008; Dixson, 2010; Miller, 2012; Tello, 2007). Measuring the college experiences that foster desired student outcomes has become a marker of institutional quality (NSSE, 2017).

The I-E-O model provides a framework for assessment, whether studying outcomes at the institutional level, the programmatic level or, as in this study, the course level. At the course level, given the variation in student *input* backgrounds and abilities, the instructor works to establish the learning *environment* including course components that create the best opportunity for high-level student *outcomes*. The outcome of particular interest in this study is student learning.

Grade Point Average

At the course level, input variables include student background and abilities largely not influenced by the instructor. One input variable is the grade point average (GPA) a student brings to a course. Research has linked GPA to future academic success (Gupta & Maksy, 2014; Kuh et al., 2006; Maksy & Wagaman, 2015; Pascarella & Terenzini, 2005; Seiver, Haddad, & Do, 2014), to student behaviors of preparing for class and asking questions in class (Kuh et al., 2006), as well as to online student engagement (Miller, 2012; Robinson & Hullinger, 2008).

H1: *Student GPA is correlated with student learning.*

Student Effort

Several studies have linked student effort to student learning. Student effort in this study refers to the extent or degree to which students exert time and effort in educationally purposeful activities, and can include time on task (Kuh et al., 2006), number of hours spent studying (Astin, 1993b; Gupta & Maksy, 2014; Pascarella & Terenzini, 2005), and amount of personal effort invested in learning (Pascarella & Terenzini, 2005). Student effort has been linked to various measures of student learning, including student-reported increases in cognitive abilities (Astin, 1993b), positive effects on standardized critical thinking assessment tests (Pascarella & Terenzini, 2005), performance on test scores and course grades (Gupta & Maksy, 2014) and overall academic development (Kuh et al., 2006).

H_2: *Student effort is correlated with student learning.*

Learner-Content Interaction

Beyond student effort, course design features also foster student learning and other positive outcomes. Both the on-campus and online course sections in this study employed student assignments and interactive study modules, which represent active learning methods. In their review of previous findings, Pascarella and Terenzini (2005) estimated active learning pedagogies to have a positive impact on subject matter learning.

Within higher education, online quality assurance research has focused on determining the types of student interactions that foster positive student outcomes. Three types of interaction impact student outcomes, including learner-instructor, learner-learner, and learner-content (Anderson, 2003; Miyazoe & Anderson, 2010; Moore, 1989). Miyazoe and Anderson (2010) found on-campus students placed a higher value on learner-instructor interaction while online students placed a higher priority on learner-content interaction. Of the three types, learner-content interaction has been most consistently associated with student learning (Miyazoe & Anderson, 2011). Informed by past research on links between course activities and measures of student performance (Englander, Wang, & Betz, 2015; Fatemi, Marquis, & Wasan, 2014; Gupta & Maksy, 2014), this research labels student progress in structured course activities as "learner-content interaction."

H_3: *Learner-content interaction is correlated with student learning.*

Student Engagement

A number of studies have linked student engagement with student learning. Student engagement has come to mean many things, but in this study refers to student involvement and participation in effective educational practices recognized to promote learning and other positive outcomes (McCormick, Kinzie, & Gonyea, 2013). Measures of student learning associated with student engagement include improved reasoning and problem solving (Pascarella, Seifert, & Blaich, 2009) and self-reports of cognitive gains and learning (Pike, Kuh, McCormick, & Ethington, 2007). In an evaluation of college student engagement on student learning, Carini et al. (2006) found positive links between measures of student engagement and measures of student learning, including standardized exams on critical thinking, college GPA, and student self-measures of learning. Further research showed student engagement benefitted student grades and

persistence, even more so for lower ability students (McCormick et al., 2013; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008).

H4: *Student engagement is correlated with student learning.*

Differences in Models for On-Campus and Online Students

New research measuring the effectiveness of online learning has accompanied the increase in online learning opportunities. While much research has concluded that distance students achieve learning outcomes similar to those of campus students (Bernard et al., 2004; Palloff & Pratt, 2001), Chen et al. (2008) found online students generally scored higher than campus students in measures of general education and measures of reflective thinking, one component of deep learning seeking underlying meanings. Means, Toyama, Murphy, Bakia, and Jones (2010) concluded online students perform modestly better than face-to-face students in terms of learning outcomes but also noted online students spent more time on task, thus complicating the interpretation of results.

More recent studies of student engagement have focused on the online learning environment. Some research into comparisons of online student engagement with on-campus student engagement found that online students demonstrated more engaging behaviors across a number of educational practices (Robinson & Hullinger, 2008) while others found online students demonstrated lower collaborative behaviors (Dumford & Miller, 2016).

H5: *Measures of student effort, learner-content interaction, engagement, GPA, and learning differ between on-campus and online students.*

Overall Model

The overall model will be tested with the following hypothesis.

H6: *Student learning can be predicted with measures of student effort, learner-content interaction, student engagement, and GPA.*

METHODOLOGY

Data Collection

The subjects for this study were students enrolled in six sections of a junior-level, business finance course during fall semesters in 2014 and 2015 at a state university in the upper-Midwest region of the U.S. The six sections included two entirely online and four on-campus, face-to-face. Beyond the difference in course delivery mode and additional "discussion" items required in the online sections, the curriculum, instructor, assignments, and remaining course requirements were the same between the on-campus and online sections. The instructor administered the online section through the Brightspace DesireToLearn (D2L) course management system.

Thirty-nine students completed an online section of the course while 130 students completed an on-campus section. Twenty-nine online students and 115 on-campus students completed the survey. A test of differences in means suggested no difference in the direct measure of learning between students who participated in this study and those who did not, for either on-campus students ($t=1.026$, $df=128$, $p=.307$) or online students ($t=1.248$, $df=35$, $p=.220$).

Measures

Measures for this study included graded points awarded for different class activities, student responses to a survey administered through D2L, and instructor notation of student course enrollment either online or on campus. Descriptions of measures follow.

Student Effort

The extent or degree to which students exerted time and effort in educationally purposeful activities served as the measure of student effort. Two indirect measures included students' self-reported hours spent preparing and their effort at working hard to meet the instructor's expectations.

Hours Preparing. Students responded to the open-ended question regarding the amount of time they spent preparing for this class. "About how many hours did you spend in a typical week preparing for this class (studying, reading, writing, doing homework, and other academic activities)?"

Work Hard. Students responded to a second survey question regarding how hard they worked in class. "As a student in this Financial Management class, how often have you engaged in the following behavior: I worked hard to meet the instructor's expectations." Response categories included: 1 = "never"; 2 = "rarely"; 3 = "occasionally"; 4 = "often"; and 5 = "very often".

Learner-Content Interaction

Student success with learner-content activities served as the measure of learner-content interaction. The three direct measures of learner-content interaction included points achieved on homework, points achieved on interactive study modules, and, for online students, points achieved on discussions.

Homework Points. Students could earn up to 100 homework points over the term through assignment completions. Each chapter assignment contained a due date. Students submitted homework assignments through the publisher's online homework program (McGraw Hill's CONNECT program) which automatically graded their work. Students had immediate access to homework scores.

LSSM Points. Students could earn a total of 45 points over the term through completion of interactive study modules, called Learn Smart Study Modules. The Learn Smart Study Modules provided interactive assessments and delivered customized learning content based on students' performance levels.

Discussion Points. Online students could earn a total of 20 points over the term through participation in four substantive discussions. Each discussion required responses to a number of questions as well as a reply to at least one classmate's post. The instructor applied a grading rubric to score each discussion and provided detailed comments to each student through the course management system.

Student Engagement

A number of different instruments exist to measure student engagement. For online learning, Dixson (2010) reviewed several measures of interaction within online courses, and developed an engagement survey for use in an online environment. Dixson's Online Student Engagement Scale (OSE) served as the foundational measure for engagement for this study. Slight changes to some questions, highlighted below, improved the survey's applicability to on-campus students. The OSE subscales of engagement include skill engagement, emotional engagement, and participation engagement.

Skill Engagement Index. Skill engagement includes measures of good organizational and study skills, and how students interact with the course content (Miller, 2012; Miller, Rycek, & Fritson, 2011). Students' mean responses to five items from Dixson's instrument comprised their Skill Engagement Index. Each student indicated the degree the following behaviors described his or her experience in this class: "1) Making sure to study on a regular basis; 2) Staying up on the readings; 3) Looking over class notes between getting online to make sure I understand the material; 4) Taking good notes over readings, PowerPoints, or video lectures; 5) Listening/reading carefully." The response categories include "1 = not at all characteristic of me; 2 = not really characteristic of me; 3 = moderately characteristic of me; 4 = characteristic of me; 5 = very characteristic of me." This five-item scale yielded a Cronbach's alpha score of .796.

Emotional Engagement Index. Emotional engagement refers to efforts by students to make the course materials interesting and relevant to their own lives (Miller et al., 2011). Students' mean responses to four items from Dixson's instrument comprise their Emotional Engagement Index. Each student indicated the degree the following behaviors described his or her experience in this class: "1) Finding ways to make the course material relevant to my life; 2) Applying course material to my real life; 3) Finding ways to make the course interesting to me; 4) Really desiring to learn the material." This four-item scale yielded a Cronbach alpha score of .889.

Participation Engagement Index. Similar in meaning to student-to-student interaction, participation engagement measures how a student works with and gets to know other students (Miller, 2012). Slight adjustments to the wording of a couple questions improved the survey's applicability to on-campus students. Students' mean responses to five items from Dixson's instrument comprise their Participation Engagement Index. Each student indicated the degree the following behaviors described his or her experience in this class: "1) Having fun in online chats, discussions or via email with the instructor or other students/Having fun in class with the instructor or other students (campus version); 2) Participating actively in small-group discussion forums/Participating actively in class activities and discussions (campus version); 3) Helping fellow students; 4) Engaging in conversations online (chat, discussions, email)/Engaging in class activities and discussions (campus version); 5) Getting to know other students in class." The Cronbach alpha score for this five-item scale was .843.

Student Learning

This study included one direct and four indirect measures of student learning.

Test Average. Each student's average test score, computed from the semester's three, 100-point tests, served as the direct measure of student learning.

Each student's response to four survey questions served as the indirect measures of student learning. Response categories employed the six-level responses of Strongly Disagree (1) to Strongly Agree (6).

Critical Thinking Skills. "This course helped me improve my analytical and critical thinking skills."

Work Skills. "This course helped me to acquire work-related skills and knowledge."

Team Skills. "This course contributed to my ability to work effectively with others."

Problem Solving Skills. "This course helped me develop my skills in solving real-world problems."

Student Perception of Performance Ability

Students' responses to the following survey question indicated their perception of test performance ability.

Do Well. Students responded to the question: "While considering your experiences in this class, please indicate the degree the following behavior describes you: Doing well on the tests/quizzes." Response categories included: "1 = not at all characteristic of me; 2 = not really characteristic of me; 3 = moderately characteristic of me; 4 = characteristic of me; 5 = very characteristic of me."

Based on a frequency distribution of student responses for on-campus students, approximately one-third of the respondents (n=39) reported "3" or less, and were coded as "low" while the remaining respondents (n=74) reported "4" or higher and were coded as "high." Applying the same coding scheme to online students, approximately one-quarter of the respondents (n=8) were coded as "low" while the remaining respondents (n=21) were coded as "high".

Learning Location

Creating a separate variable, the instructor noted whether the student completed the course on campus or online.

Location. The instructor coded "location" as "1" for students who completed the course on campus and "0" for students who completed the course online.

Background Characteristic

An indirect measure of students' prior academic success served as a background characteristic for this study.

GPA. Students responded to the following survey question: "While you are taking this online class, what would you estimate is your GPA? (0=less than 2.0; 1=2.0-2.4; 2=2.5-2.9; 3=3.0-3.4; 4=3.5-3.9; 5=4.0.)"

Analyses

Correlations measure the relationship between variables and were used to test the univariate hypotheses (**H_1, H_2, H_3, and H_4**). Pearson correlation is appropriate for the continuous-level direct measure of student learning, while spearman correlation is appropriate for ordinal-

level indirect measures of student learning variables (Field, 2009). Welch's t-test measures the statistical significance of differences in means and was used to test the differences between students completing the course on campus versus online (**H_5**). Welch's t-test is particularly useful for measuring statistical significance of differences for samples of unequal size (Delacre, Lakens, & Leys, 2017; Ruxton, 2006).

Multiple regression provides a description of a model's overall fit as well as the relative contribution of each of the independent variables in explaining the model's total explained variance (Tabachnick & Fidell, 2013). Multiple regression was used to determine the degree the entire variable set accounted for the variance in direct student learning (**H_6**). With all variables entered into the model, the results identified those variables that contributed to the model's overall fit. Ordinary Least Squares (OLS) regression analysis was appropriate based on the continuous nature of the dependent variable. Multicollinearity did not emerge as a concern in the resulting regression models as the Variance Inflation Factor (VIF) values of the independent variables were below the level of five (Field, 2009).

Stepwise multiple regression provided a second analysis of the overall model (**H_6**). Stepwise multiple regression simplifies an overall model by identifying and including only the most efficient set of independent variables as predictors. At each step in an iterative process, variables are added to the model based on the variable's predictive capacity, and are subject to removal from the model if the variable no longer make a statistically significant contribution to the model's prediction (Tabachnick & Fidell, 2013). The result is an efficient model that uses the fewest independent variables to describe the most variation in the dependent variable. Again, multicollinearity did not emerge as a concern in the resulting regression models based on VIF values (Field, 2009).

An examination of the variable distributions revealed four of the independent variables were skewed: LSSM Points, Homework Points, Hours Preparing, and Discussion Points. Consequently, logarithmic adjustments were made to each of these variables, and the tests of significance used throughout this study were based on their logarithmic values.

RESULTS

The test results on the hypothesis regarding student background and learning (**H_1**) indicate a positive correlation between GPA and the direct measure student learning, Test Average, for both on-campus students ($r=.640$, $p<.001$) and online students ($r=.477$, $p<.01$). (Table 1 presents all correlations with measures of learning.) The correlations between GPA and the indirect measures of student learning (Critical Thinking Skills, Work Skills, Team Skills, and Problem Solving Skills) were not statistically significant for either on-campus or online students.

The test results on the hypothesis regarding student effort and student learning (**H_2**) demonstrate a number of significant correlations. For on-campus students, the correlations for Hours Preparing was negative with Test Average ($r= -.209$, $p<.05$) and positive with Critical Thinking Skills ($r=.225$, $p<.05$). (Note negative correlation with Test Average). The correlations for Work Hard was positive with all five measures of student learning: Test Average ($r=.310$, $p<.01$), Critical Thinking Skills ($r=.385$, $p<.01$), Work Skills ($r=.281$, $p<.01$), Team Skills ($r=.227$, $p<.05$), and Problem Solving Skills ($r=.352$, $p<.01$). For online students, Hours Preparing was correlated with only one measure of student learning: Critical Thinking Skills ($r=.462$, $p<.05$); and, Work Hard was correlated with two measures of student learning: Critical Thinking Skills ($r=.554$, $p<.01$), and Problem Solving Skills ($r=.453$, $p<.05$).

Table 1
CORRELATIONS WITH MEASURES OF STUDENT LEARNING

	On-Campus Student (n=115)				
	Student Learning				
Variable	Test Average[a]	Critical Thinking Skills[b]	Work Skills[b]	Team Skills[b]	Problem Solving Skills[b]
Background:					
GPA	.640***	.030	.082	-.011	.132
Effort:					
Hours Preparing	-.209*	.225*	.096	.184	.017
Work Hard	.310**	.385**	.281**	.227*	.352**
Learner-Content:					
Homework Points	.430***	.170	.077	-.042	.043
LSSM Points	.286**	.245**	.038	.159	.142
Engagement:					
Skill Engagement	.146	.529**	.427**	.293**	.416**
Emotional Engagement	.263**	.446**	.360**	.361**	.472**
Participation Engagement	.001	.380**	.208*	.501**	.335**
	Online Students (n=29)				
	Student Learning				
	Test Average[a]	Critical Thinking Skills[b]	Work Skills[b]	Team Skills[b]	Problem Solving Skills[b]
Background:					
GPA	.477**	-.031	.184	.304	-.040
Effort:					
Hours Preparing	-.086	.462*	.163	.074	.207
Work Hard	-.271	.554**	.354	-.143	.453*
Learner-Content:					
Homework Points	.580**	.036	.130	.307	-.027
LSSM Points	.176	.150	.163	.113	.018
Discussion Points	.346	.021	.241	.324	.172
Engagement:					
Skill Engagement	-.242	.494**	.315	.041	.403*
Emotional Engagement	.142	.236	.387*	.437*	.366*
Participation Engagement	-.154	.314	.148	.256	.260

Notes: *p=<.05, **p=<.01, ***p=<.001, [a]=Pearson's correlation; [b]=Spearman's correlation

Given the negative association between Hours Preparing and Test Average for on-campus students and no association for online students, correlations were run separately for students with high perceptions of performance ability and students with low perceptions of performance ability. (See Table 2). For on-campus students, the correlation coefficient between Hours Preparing and Test Average for students with high perception of performance ability was negative and significant (r= -.319, p=.006, n=74) while the correlation coefficient for students with low perception of performance ability was positive and nonsignificant (r=.065, p=.694, n=39). The difference in correlation coefficients between on-campus students with high perceptions and low perceptions of performance ability was significant at p<.10 (Z= -1.93, p=.0536). For online students, the correlation coefficient between Hours Preparing and Test Average for students with high perception of performance ability was negative but nonsignificant (r= -.298, p=.189, n=21) while the correlation coefficient for students with low perception of performance ability was positive and significant (r=.758, p=.029, n=8). The difference in correlation coefficients between online students with high and low perception of performance ability was significant at p<.05 (Z= -2.57, p=.0102). Consideration of these results will be included in the discussion section.

Table 2
PEARSON'S CORRELATIONS WITH TEST AVERAGE

	On-Campus			
Variable	Overall n=115	High Ability n=74	Low Ability n=39	Z-score difference
Hours Preparing	-.209	-.319**	.065	-1.93[s]
Homework Points	.430***	.372**	.209	.87
	Online			
	Overall n=29	High Ability n=21	Low Ability n=8	Z-score difference
Hours Preparing	-.086	-.298	.758*	-2.57*
Homework Points	.580**	.603**	.266	.84

Notes: [S]=<.10*=<.05; **=<.01; ***=<.001.

The test results on the hypothesis regarding learner-content interaction and student learning (**H_3**) revealed the following. Homework Points was positively correlated with Test Average for both on-campus students (r=.430, p<.001) and online students (r=.580, p<.01). LSSM Points was correlated with two measures of student learning for on-campus students, Test Average (r=.286, p<.01) and Critical Thinking Skills (r=.245, p<.01), but had no correlation with any measure of learning for online students. Finally, Discussion Points was not correlated with any measure of learning for online students.

The test results on the hypothesis regarding student engagement and student learning (**H_4**) revealed differences for on-campus and online students. For on-campus students, only Emotional Engagement was correlated with the direct measure of learning (p=.263, r<.01) while each of the three engagement indices was related to indirect measures of learning: Skill Engagement Index was positively correlated with Critical Thinking Skills (p=.529, r<.01), Work Skills (p=.427, r<.01), Team Skills (r=.293, p<.01), and Problem Solving Skills (r=.416, p<.01). Emotional Engagement Index was positively correlated with Critical Thinking Skills (r=.446, p<.01), Work Skills (r=.360, p<.01), Team Skills (r=.361, p<.01), and Problem Solving Skills (r=.472, p<.01). Finally, Participation Engagement Index was positively correlated with Critical Thinking Skills

(r=.380, p<.01), Work Skills (r=.208, p<.05), Team Skills (r=.501, p<.01), and Problem Solving Skills (r=.335, p<.01). For online students, no measure of engagement was significantly correlated with the direct measure of student learning, Test Average. However, two of the three engagement measures demonstrated multiple links to indirect measures of learning. Skill Engagement Index was positively correlated with Critical Thinking Skills (r=.494, p<.01) and Problem Solving Skills (r=.403, p<.05). Emotional Engagement Index was positively correlated with three measures of student learning: Work Skills (r=.387, p<.05), Team Skills (r=.437, p<.05), and Critical Thinking Skills (p=.366, r<.05). Participation Engagement Index demonstrated no significant correlation with any indirect measure of learning.

A test for equality of means compared levels of student GPA, effort, learner-content interaction, engagement and learning between the students in the online sections and students in the on-campus sections (**H_5**). The results (Table 3) indicate only three significant differences: online students had higher GPA (t=3.579, df=50, p=.001), spent more Hours Preparing (t=2.198, df=47, p=.033), and had higher Test Average (t=2.388, df=50, p=.021).

Table 3
TEST OF DIFFERENCES BETWEEN ONLINE AND ON-CAMPUS STUDENTS

	Online Students (n=29)	**On-Campus Students (n=115)**		
Variable	*Mean (S.D.)*	*Mean (S.D.)*	*t* (df)[a]	*p*-value*
Background:				
GPA	3.55(.827)	2.91(.974)	3.579 (50)	.001
Effort:				
Hours Preparing	5.07 (2.542)	4.15 (3.333)	2.198(47)	.033
Work Hard	4.34 (.936)	4.06 (.881)	1.476 (41)	.147
Learner-Content Interaction:				
Homework Points	83.80 (16.269)	86.79 (15.310)	-.917 (43)	.364
LSSM Points	37.28 (7.862)	32.21 (12.590)	1.420(54)	.161
Engagement:				
Skill Engagement Index	3.552 (.839)	3.455 (.747)	.565 (40)	.576
Emotional Engagement Index	3.664 (.780)	3.387 (.976)	1.613(53)	.113
Participation Engagement Index	3.10 (.999)	3.40 (.846)	-1.452 (39)	.155
Learning Outcomes:				
Test Average	74.10 (12.202)	67.79 (14.613)	2.388 (50)	.021
Critical Thinking Skills	4.72 (.996)	4.65 (1.068)	.342 (46)	.734
Work Skills	4.83 (1.037)	4.61 (1.240)	-.974 (50)	.335
Team Skills	3.34 (1.045)	3.58 (1.370)	-.1.024 (55)	.310
Problem Solving Skills	4.62 (1.015)	4.31 (1.320)	1.367 (55)	.177

*Notes: [a]Welch's t-test; *=two-tailed test of significance.*

Multiple regression analysis revealed the degree the variable set accounted for the variance in student learning (**H_6**). The independent variables included GPA, student effort, learner-content interaction, and student engagement. The direct measure of student learning, Test Average, served as the dependent variable. The regression results (Table 4) for the on-campus students showed a good fit (R^2 = 53.8%) of the variance in student learning and a model that was highly significant ($F(8,103) = 14.973$, $p<.001$). The variables that emerged as positive predictors of student learning included GPA (b=.457, p<.001) and Emotional Engagement Index (b=.248, p=.009) while Participation Engagement Index (b= -.250, p=.003) and Hours Preparing (b= -.190, p=.009) were negative predictors of student learning. The regression results for the online students showed a good fit (R^2 = 56.8%) of the variance in student learning and a model that was significant ($F(9,19) = 2.779$, $p<.029$). The only variable that emerged as a statistically significant predictors of online student learning was Homework Points ($b=.708$, $p=.018$).

Stepwise regression identified the most efficient set of predictors of student learning. Table 5 provides the stepwise regression results for the on-campus students (R^2 = 52.0%, F(5,106) = 22.990, p<.001) and for the online students (R^2 = 37.4%, $F(2,26) = 7.757$, p<=.002). For on-campus students, the variables that emerged as positive predictors of student learning included GPA (b=.466, p=.000), Homework Points (b=.212, p=.007), and Emotional Engagement Index (b=.310, p=.000). Negative predictors of student learning included: Participation Engagement Index (b= -.193, p=.015) and Hours Preparing (b= -.164, p=.021). For online students, the only statistically significant predictor of student learning was, again, Homework Points (b=.456, p=.021).

DISCUSSION

This study examined on-campus and online student learning across six sections of a junior-level business finance course in a state university in the upper-Midwest region of the U.S. A key research question was to identify the course design features that foster student learning and to determine if successful teaching and learning practices differ for on-campus and online learning environments. Another key research question was to identify the student behaviors that foster learning. Astin's (1993a) I-E-O framework for assessment served as a conceptual model for this study.

Course design features included homework assignments, interactive study modules and, for the online section, online discussions. With regard to the direct measure of test scores, the results suggest homework points were significantly correlated to student learning for both on-campus and online students, interactive study module points were significantly correlated to student learning for on-campus students, and discussion points were not significantly correlated to student learning for online students.

Student behaviors included effort (hours spent preparing and student perceptions of working hard) and engagement (skill, emotional, and participation). For on-campus students, hours spent preparing was negatively correlated to test scores while student perception of having worked hard was positively correlated to test scores. For online students, neither measure of effort was correlated to the direct measure of test scores. The only engagement measure significantly correlated with test scores, for either group of students, was emotional engagement for on-campus students. For both on-campus and online students, numerous correlations were significant between the student effort, student engagement, and indirect measures of learning.

Table 4
MULTIPLE REGRESSION PREDICTING STUDENT LEARNING

On-Campus Students (n=115)			
Variable	*Standardized Coefficients*	*t -Statistic*	*P-value*
Constant	-	6.277	.000
GPA	.457	5.721	.000
Hours Preparing	-.190	-2.647	.009
Work Hard	.136	1.612	.110
Homework Points	.139	1.581	.117
LSSM Points	.054	.673	.502
Skill Engagement	.051	.533	.595
Emotional Engagement	.248	2.645	.009
Participation Engagement	-.250	-2.996	.003
Dependent variable: Test Average; Total model R^2 = .538; Total model F value = 14.973; Total model p>F= .000.			
Online Students (n=29)			
Variable	*Standardized Coefficients*	*t -Statistic*	*P-value*
Constant	-	5.144	.000
GPA	.015	.069	.946
Hours Preparing	.177	.975	.342
Work Hard	-.102	-.366	.718
Homework Points	.708	2.602	.018
LSSM Points	-.391	-1.760	.095
Discussion Points	.219	1.062	.302
Skill Engagement	-.275	-.854	.404
Emotional Engagement	.206	.796	.436
Participation Engagement	-.227	-1.083	.293
Dependent variable: Test Average; Total model R^2 = .568; Total model F value = 2.779; Total model p>F=.029.			

Regression analyses run on average test scores revealed homework points to be the only significant factor in predicting student learning for online students. Results were much different for the on-campus learners, who had lower GPAs, spent less time studying, and had lower test scores than the online students. For the on-campus learners, the significant variables that increased predicted student learning included GPA, homework points and emotional engagement while the variables that decreased predicted learning included hours spent preparing and participation engagement. The further analysis discussed below on the moderating effect of students' perceptions of their performance ability (as high or low) may help explain the negative sign on the hours spent preparing variable. As for the negative sign on participation engagement, it may be that student effort toward getting to know other students does not contribute to direct measures of student learning.

Table 5
STEPWISE REGRESSION PREDICTING STUDENT LEARNING

On-Campus Students (n=115)			
Variable	*Standardized Coefficients*	*t -Statistic*	*P-value*
Constant	-	8.540	.000
GPA	.466	5.883	.000
Homework Points	.212	2.772	.007
Emotional Engagement	.310	3.825	.000
Participation Engagement	-.193	-2.480	.015
Hours Preparing	-.164	-2.352	.021
Dependent variable: Test Average; Total model R^2 = .520; Total model F value = 22.990; Total model p>F= .000.			
Online Students (n=29)			
Variable	*Standardized Coefficients*	*t -Statistic*	*P-value*
Constant	-	5.789	.000
GPA	.229	1.236	.228
Homework Points	.456	2.464	.021
Dependent variable: Test Average; Total model R^2 = .374; Total model F value = 7.757; Total model p>F= .002.			

This study builds upon previous research regarding the importance of homework completion in explaining and predicting levels of learning. These results substantially agree with those of Englander et al. (2015) who concluded features of homework points significantly predicted learning, and with those of Gupta and Maksy (2014) who found homework points to be significantly correlated with student test scores. This current study expands upon these earlier works by incorporating measures of student effort not included in Englander et al. (2015), and in finding homework points to be significant for learning of online students, a student group not studied in either Englander et al. (2015) or Gupta and Maksy (2014).

This study expands upon previous research regarding the importance of student effort in explaining levels of student learning. While Gupta and Maksy (2014) identified student hours spent preparing for class as a significant predictor for test scores for on-campus students, this study found hours spent preparing to be a negative predictor of test scores (on-campus students) or not predictive of test scores (online students). The mediating influence of students' perceptions of test performance ability on the relationship between effort and performance is an important contribution to our understanding in this area. Once students' perceptions of test performance ability was introduced, the connection between time spent preparing and the direct measure of student learning became clear. Those with high perceptions of their test performance ability had a negative correlation between hours studied and test scores, but a positive correlation between homework points and test scores. Students who reported low perception of performance ability had a positive correlation between hours studied and test scores, as well as a positive correlation between homework points and test scores. These findings held for both online and on-campus students. In essence, these results suggest the effect of time spent studying is conditional on ability. For those students who report lower perception of performance ability, spending more hours

working on course-related materials improves their test scores. On the other hand, for those students who report higher perceptions of performance ability, spending less time preparing still results in good test scores, as long as the learner-course interaction materials are accomplished.

Finally, this study builds on previous research that suggests successful teaching and learning practices differ for on-campus and online learning environments. In substantial agreement with the conclusions of Means et al. (2010), this study found online students demonstrated higher test performance and higher hours spent preparing than on-campus students. Although this study did not reveal significant differences between on-campus and online student measures of engagement, an additional analysis of the items that comprise each engagement index (available in Table 6) does reveal important differences between on-campus and online student behaviors. On-campus students demonstrated higher levels of getting to know other students and helping fellow students, while online students demonstrated higher levels of staying up on readings, applying course materials to their lives, and finding ways to make the course materials personally relevant. Such findings support the conclusions of Chen et al. (2008) that, contrary to Robinson and Hullinger's (2008) conclusion that online students had higher levels of active and collaborative learning than on-campus students, online students have higher active learning but lower collaborative learning than on-campus students. Similarly, the results of the current study are in line with those of Dumford and Miller (2016) who found higher proportions of classes taken online related to lower levels of collaborative learning engagement.

CONCLUSIONS

While students are responsible for the time and effort they dedicate to their learning, instructors can design learning environments, both on campus and online, that foster student learning. The results of this study suggest student success in structured learner-content activities, particularly structured homework assignments, is probably the most important learner-content course feature to impact learning for both on-campus and online students.

The results of this study also suggest time spent studying is more important for some students than others**.** For both online and on-campus students, hours spent preparing for class was positively related to student learning for those students who had low perceptions of test performance ability, but was negatively related to student learning for those students who had high perceptions of performance ability. At the same time, success in homework assignments was a strong predictor of student learning. Combined, these findings seem intuitive: students with lower abilities might take longer, but accomplishing the learner-content interaction is important to all students.

When predicting student learning, online learners differ from on-campus learners in a number of ways. For on-campus students, positive predictors of student learning include background grades and student efforts to make the course materials interesting and relevant to their own lives, while negative predictors of learning include getting to know other students and the number of hours spent preparing for class. The common predictor of student learning, for both online and on-campus learners, is achieving success in homework assignments.

Table 6
TEST OF DIFFERENCES BETWEEN ONLINE AND ON-CAMPUS STUDENTS ENGAGEMENT INDICES COMPONENTS

	ONLINE (n=29)	ON-CAMPUS (n=115)		
	Mean (S.D.)	*Mean (S.D.)*	*t* (df)[a]	*p*-value*
SKILL ENGAGEMENT				
SE1: Regular study	3.55 (.985)	3.38 (.972)	.854 (43)	.398
SE2: Staying up on Readings	3.66 (.936)	2.80 (1.032)	4.307 (47)	.000
SE3: Looking over notes	3.48 (1.153)	3.22 (1.092)	1.101 (42)	.277
SE4: Taking good notes	3.28 (1.066)	3.98 (1.009)	-3.219 (42)	.002
SE5:Listening/reading carefully	3.79 (.940)	3.90 (.866)	-.569 (41)	.573
EMOTIONAL ENGAGEMENT				
EE1:Making materials relevant	3.83 (.928)	3.42 (1.144)	2.005 (52)	.050
EE2: Applying materials to life	3.76 (.988)	3.29 (1.134)	2.226 (49)	.031
EE3: Making course interesting	3.55 (.985)	3.37 (1.062)	.864 (46)	.392
EE4: Desiring to learn	3.52 (1.056)	3.47 (1.119)	.217 (45)	.829
PARTICIPATION ENGAGEMENT				
PE1: Having fun in discussions	3.21 (1.264)	3.42 (1.084)	-.851 (39)	.400
PE2: Active in discussions/forums	3.52 (1.214)	3.35 (1.157)	.652 (42)	.518
PE3: Helping fellow students	3.21 (1.236)	3.64 (.983)	-1.739 (38)	.090
PE4:Engaging in conversations	3.21 (1.236)	3.48 (1.086)	-1.079 (40)	.287
PE5: Getting to know others	2.38 (.862)	3.14 (1.166)	-3.926 (57)	.000

*Notes: [a]Welch's t-test; *=two-tailed test of significance.*

LIMITATIONS AND FUTURE STUDIES

The small sample size for the online students prevented comparison of regressions between student groups with high and low perceptions of performance ability, as well as other multivariate analyses. Repeating the study with a larger group of students might allow for the identification of additional predictors of learning. This study focused on student performance in a course with a quantitative content, and the results reflect a quantitative course design. Repeating the study using a different group of students may allow for cross validation of the model. Finally, since the results of this study suggest student perception of performance ability moderates the relationship between student effort and student learning, identifying the student background variables and experiences associated with perception of performance ability, as well as any biases in self-evaluation, could provide significant additional explanation. One such background variable could be student performance in prerequisite courses. Another might be student choice of major. Insights into the interaction between student inputs and the course environment that results in the highest learning can help both college instructors and institutions of higher education answer the question of what helps students learn.

REFERENCES

Abel, J., & Deitz, R. (2014). Do the benefits of college still outweigh the costs? *Current Issues in Economics and Finance, 20*(3), 1–12.

Allen, I., & Seaman, J. (2014). *Grade change: Tracking online education in the United States.* Retrieved August 6, 2016, from http://www.onlinelearningsurvey.com/reports/gradechange.pdf.

Anderson, T. (2003). Modes of interaction in distance education: Recent developments and research questions. In M.G. Moore, & W.G. Anderson (Eds.), *Handbook of distance education* (pp. 120-144). Mahwah, NJ: Lawrence Erlbaum.

Astin, A. (1993a). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education*. Phoenix: The Oryx Press

Astin, A. (1993b). *What matters in college? Four critical years revisited.* San Francisco: Jossey-Bass.

Bernard, R. M., Abrami, P. C., Lou, Y., Borokhovski, E., Wade, A., Wozney, L., Wallet, P. A., Fiset, M., & Huang, B. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of Educational Research*, *74*, 379–439.

Carini, R. M., Kuh, G. D., & Klein, S. P. (2006). Student engagement and student learning: Testing the linkages. *Research in Higher Education*, *47,* 1-32.

Chen, P., Gonyea, R., & Kuh, G.(2008). Learning at a distance: Engaged or not? *Innovate: Journal of Online Education, 4*(3), 1-8.

Chickering, A., & Gamson, Z. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3-7.

Delacre, M., Lakens, D., & Leys, C. (2017). Why psychologists should by default use Welch's t-test instead of student's t-test. *International Review of Social Psychology, 30*(1), 92-101.

Dixson, M. D. (2010). Creating effective student engagement in online courses: What do students find engaging? *Journal of the Scholarship of Teaching and Learning*, *10*, 1-13.

Dumford, A. D., & Miller, A. L. (2016). Learning online: Unintended consequences for engagement? Paper presentation at Hawaii International Conference on Education. Honolulu, HI.

Englander, F., Wang, Z., & Betz, K. (2015). Predictors of performance in introductory finance: Variables within and beyond the student's control. *Higher Education Studies, 5*(4), 119-130.

Fatemi, D., Marquis, L., & Wasan, S. (2014). Student performance in intermediate accounting: A comparison of the effectiveness of online and manual homework assignments. *The Accounting Educators' Journal, 14*, 1-19.

Field, A. (2009). *Discovering statistics using SPSS (3rd ed.).* London: Sage Publications.

Ganter, S., & Haver, W. (Eds, 2011). *Partner discipline recommendations for introductory college mathematics and the implications for college algebra.* Washington, DC: Mathematical Association of America.

Gupta, K., & Maksy, M. M. (2014). Factors associated with student performance in an investments course: An empirical study. *Journal of Finance and Accountancy, 16*, 1-31.

Jones, D. (2016). Financial data at the crossroads of cost containment and educational innovation. In L. Soares, P. Steele, & L. Wayt, Evolving higher education business models (pp. 46-60). Washington D.C.: American Council on Education.

Kuh, G. (2001). Assessing what really matters to student learning inside the National Survey of Student Engagement. *Change: The Magazine of Higher Education, 33*(3), 10-17.

Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., & Gonyea, R. M. (2008). Unmasking the effects of student engagement on college grades and persistence. *Journal of Higher Education, 79,* 540-563.

Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2006). *What matters to student success: A review of the literature?* Washington, DC: National Postsecondary Education Cooperative.

Maksy, M. M., & Wagaman, D. D. (2015). Factors associated with student performance in advanced accounting: A comparative study at commuter and residential schools. *Journal of Accounting and Finance, 15*(1), 72-94.

McCormick, A. C., Kinzie, J., & Gonyea, R. M. (2013). Student engagement: Bridging research and practice to improve the quality of undergraduate education. In M. B. Paulsen (Ed.), Higher education: Handbook of theory and research, *28* (pp. 47-92). Dordrecht, The Netherlands: Springer.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies.* Washington, D.C.: U.S. Department of Education, Office of Planning, Evaluation, and Policy Development. Retrieved October 10, 2017, from https://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf.

Miller, J. M. (2012). Finding what works online: Online course features that encourage engagement, completion and success (Doctoral dissertation). Retrieved August 6, 2016, from http://scholarworks.csun.edu.

Miller, R. L., Rycek, R. F., & Fritson, K. (2011). The effects of high impact learning experiences of student engagement. *Procedia Social and Behavioral Sciences, 15*, 53-59.

Miyazoe, T., & Anderson, T. (2010). The interaction equivalency theorem. *Journal of Interactive Online Learning, 9*(2), 94-104.

Miyazoe, T., & Anderson, T. (2011). The interaction equivalency theorem: Research potential and its application to teaching. Proceedings of the 27th Annual Distance Teaching & Learning, Madison, WI.

Moore, M. (1989). Three types of interaction. *The American Journal of Distance Education, 3*(2), 1-7.

NSSE. (2017). *NSSE regional accreditation toolkits.* Bloomington, IN: Indiana University School of Education Center for Postsecondary Research. Retrieved 9/25/2017 from: http://nsse.indiana.edu/html/regional_accred_toolkits.cfm.

Palloff, R. M., & Pratt, K. (2001). *Lessons from cyberspace classroom.* San Francisco: Jossey-Bass.

Pascarella, E., & Terenzini, P. (2005). *How college affects students: A third decade of research (Vol. 2).* San Francisco: Jossey-Bass.

Pascarella, E. T., Seifert, T. A., & Blaich, C. (2009). *Validation of the NSSE Benchmarks and deep approaches to learning against liberal arts outcomes.* Iowa City: University of Iowa Center for Research on Undergraduate Education.

Pike, G. R., Kuh, G. D., McCormick, A. C., & Ethington, C. A. (2007). *If and when money matters: Direct and indirect relationships between expenditures and student learning.* Paper presented at the annual meeting of the Association for the Study of Higher Education, Louisville, KY.

Price, M. (2014, December 17). How over-hyping a college education destroyed the millennials. [Blog post]. Retrieved from https://www.huffingtonpost.com/michaelprice/how-overhyping-a-college-_b_6000134.htmled.

Robinson, C. C., & Hullinger, H. (2008). New benchmarks in higher education: Student engagement in online learning. *Journal of Education for Business, (Nov/Dec),* 101-108.

Ruxton, G. D. (2006). The unequal variance *t*-test is an underused alternative to Student's *t*-test and the Mann–Whitney *U* test. *Behavioral Ecology, 17*(4), 688–690.

Saxe, K., & Braddy, L. (2015). *A common vision for undergraduate mathematical sciences in 2025*. Washington, DC: Mathematical Association of America.

Seiver, D. A., Haddad, K., & Do, A. (2014). Student learning styles and performance in an introductory finance class. *American Journal of Business Education, 7*(3), 183-190.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics (6th ed.).* Boston: Pearson Education.

Tello, S. (2007). An analysis of student persistence in online education. *International Journal of Information and Communication Technology Education, 3*(3), 47-62.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition (2nd ed.)*. Chicago: University of Chicago Press.