BEYOND ONLINE VERSUS FACE-TO-FACE COMPARISONS: THE INTERACTION OF STUDENT AGE AND MODE OF INSTRUCTION ON ACADEMIC ACHIEVEMENT

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ABSTRACT

While it is well-established that nontraditional students are more likely to take online courses than their traditional-age counterparts, investigations of the learning equivalence between online and campus-based instruction typically fail to consider student age as a mediating factor in the learning experience. To examine learning outcomes as a function of student age (traditional versus nontraditional) in relation to mode of instruction (online versus face-to-face), the current study examined cumulative outbound assessment scores of 1,276 students enrolled in an undergraduate business program. The results revealed that traditional-age students, regardless of whether they take courses on campus or online, performed similarly on the outbound Peregrine assessment; in contrast, there was a marked difference in the performance of nontraditional-age students as those learning online scored significantly higher than those taking classes on campus. Recognizing that nontraditional students who choose to take online courses (as compared to campus-based alternatives) likely do so because of practical factors associated with active work schedules, it is possible that active work experience contributed to increased learning gains. Strategies to allow online programs to utilize this information to better serve their students are discussed.

INTRODUCTION

Considerable research has examined the relationship between traditional and nontraditional student learning outcomes as well as the relationship between learning outcomes in online versus traditional, face-to-face learning environments (Nguyen, 2015). While nontraditional students make up a large percentage of online enrollments, existing research on the effectiveness of online learning typically fails to examine learning outcomes as a function of age in relation to mode of instruction. Student age serves as a basis for understanding student motivation, such as a traditional student wanting to earn a high grade versus a nontraditional student wanting the practical application elements of education, but research examining the function of student age relative to modes of instruction is lacking. The purpose of the current research is to examine learning outcomes as a function of student age (traditional versus nontraditional) and mode of instruction (online versus face-to-face) and examine the possible interactions.

There appears to be a unique relationship between age and mode of learning; as such, comparisons of learning modes are often flawed due to the assumed equivalence between student populations. Age serves as only one metric in determining the traditional and nontraditional status of students. It is essential to note that some students are currently employed, have children, or took a break in their educational pursuits, which are factors that colleges and universities do not record.

Because colleges and universities have access to student age, using age to determine traditional and nontraditional status is essential for the topic under investigation. There is, however, considerable research that shows that nontraditional students are more likely to take online courses, as their stage in life (e.g., career, marital status, etc.) may restrict them from taking courses in traditional classrooms. Comparisons between traditional and nontraditional students may, by default, be confounded by these two variables. While nontraditional students are more likely to take online courses, there is the opportunity to study their success in traditional classrooms and compare their learning outcomes with their traditional student counterparts in both online and face-to-face environments. This research seeks to better understand the relationship between modes of learning and student age and to examine the possible interactions between them.

LITERATURE REVIEW

Mode of Instruction

Since the proliferation of online education in the mid to late 1990s, numerous research studies have been conducted regarding online learning and its comparison to traditional classroom learning regarding student achievement (Nguyen, 2015; Russell, 1999; Russell, 2001; Wilson & Allen, 2011). The long-held assumption is that traditional classroom learning leads to better student performance, but results from the research suggests that equivalent learning activities occur in both online and traditional classroom settings. Russell (2001) analyzed 355 research reports that compared the relationship between delivery modes and student outcomes and found no statistically significant differences. Neuhauser (2002) compared two sections of the same course, one online and one face-to-face, taught by the same instructor using the same instructional materials and found no significant differences in test scores, participation grades, or final grades, which suggests that online and traditional classroom settings are equally effective. A meta-analysis from 86 studies and student outcome data of more than 15,000 students showed a strong positive correlation suggesting that online education proves to be an effective form of instruction (Shachar & Neumann, 2003).

In a meta-analysis, Sitzmann, Kraiger, Stewart, and Wisher (2006) compared the effectiveness of web-based instruction (WBI) and classroom instruction (CI) based on the results of 10,910 learners. Across all studies examined, the results that both WBI and CI were equally effective in teaching procedural knowledge, which refers to the steps needed to perform a task, but WBI was 6% more effective than CI in teaching declarative knowledge, which relates to remembering facts and accessing and applying knowledge (Sitzmann et al., 2006). Allen, Mabry, Mattrey, Bourhis, and Titsworth (2004) previously examined the effectiveness of distance education, including various methods of instruction, relative to traditional classroom instruction. They found little distinction between distance education and traditional classroom instruction, with only a slight difference favoring distance education on the basis of student performance.

Summers, Waigandt, and Whittaker (2005) examined differences between online and traditional classroom learning in an undergraduate statistics course and found no significant difference in student performance in either learning context. Allen, Bourhis, Burrell, and Mabry (2002) conducted a meta-analysis and concluded that no significant differences exist in student performance in either online or traditional formats. Other researchers suggest that online learning can be as effective as traditional learning (Zhao, Lei, Yan, Lai, & Tan, 2005) and that there is no statistically significant difference between online and traditional learners (Bernard et al., 2004). They found that pedagogy and sound instructional practice facilitated student learning and served as a predictor of student achievement (Johnson, 2008) and that online pedagogical approaches can prove as effective as traditional classroom methods (Ledman, 2008). From the literature, it appears that student performance in online and traditional classrooms is less dependent on whether students are traditional or nontraditional age.

Student Age

Research suggests that traditional-age undergraduate students (18–23 years) and nontraditional-age undergraduate students (24–64 years) vary in their level of motivation to achieve academic success (Jinkens, 2009; Justice & Dornan, 2001). Traditional students place significant emphasis on getting high grades while nontraditional students, while desiring high grades,

concern themselves more with practical application of the knowledge they learn from a class (Jinkens, 2009). Wooten (1998) noted that nontraditional students' self-expectation affected their motivation independent of their grade history while traditional students' motivation was affected by grade history as a reflection of their aptitude, their self-expectation was a reflection of grade history and their familial expectations. Older students enroll in higher education because of intrinsic motivation (e.g., self-esteem, cognitive interest) whereas younger students note external motivations, such as social relationships or parental expectations (Justice & Dornan, 2001). For both traditional and nontraditional students, factors like academic efficacy, self-regulation, and social support serve as predictors of academic performance (Spitzer, 2000). More recent research suggests that an attribution of ability and variables related to value compared to costs predict traditional students' academic success, while variables of self-efficacy and peer support predict nontraditional students' academic success (Johnson, Taasoobshirazi, & Clark, 2016).

While age is a point of distinction between traditional and nontraditional students, other factors have been studied that relate to student academic achievement. Demographic information, such as gender, race, ethnicity, and marital status, have been studied to assess undergraduate student success, and these basic demographic variables relate significantly to student performance (Kaighobadi & Allen, 2008). Spitzer (2000) found that female students, either traditional or nontraditional, earned higher grade point averages (GPA). Women and older students possess a higher achievement orientation than younger students and men (Justice & Dornan, 2001). Further, cognitive development differences between traditional and nontraditional students, such as academic and real-world experience, affect learning and academic performance. The expectation is that older students adopt learning strategies geared toward comprehension of course material while younger students use learning strategies aimed at rote recall (Justice & Dornan, 2001).

Purpose of the Current Study

Recognizing that nontraditional students are more likely to take online courses and that nontraditional students are likely to have more "real world" experience, it is possible that our understanding of the effectiveness of online learning is distorted due to these confounding variables. Early educational research focusing on traditional and nontraditional students emphasized age as a differentiating factor, but recent research has not focused on age related to mode of instruction on academic achievement. The purpose of the current study is to examine learning as a function of student age (traditional versus nontraditional) and mode of instruction (online versus face-to-face) to examine the independent and combined influence of these factors on student learning. We hypothesize that nontraditional students will score higher than traditional students on summative assessments, regardless of instructional mode, due to increased "real world" experience.

METHODS

Participants

Institutional records revealed a total of 1,276 undergraduate students (675 males, 572 females, 29 no gender reported) who completed the Peregrine Outcomes Assessment as a portion of their required coursework. All students were majoring in business at a regionally accredited university in the southwest United States. Student age was determined via institutional records. Site authorization was obtained to access and utilize relevant program and student data; all data were stripped of personal identifiers prior to analysis. Students are classified at the institution as either online or campus-based. Students who take any classes at the campus are classified as campus-based students regardless of whether they supplement campus courses with online courses, while online students exclusively take all courses online. Overall mean student age was 26.59 (SD = 7.66); analyzed a function of instructional mode, online students mean age (27.24; SD = 8.11) was slightly older than campus-based students (24.54, SD = 5.61). Student age was recoded as traditional (22 years of age or younger) or nontraditional (23 years of age or older). Table 1 overviews the number of students in each age group by instructional mode.

Procedures

The data were gleaned from outbound scores on the Peregrine Outcomes Assessment, specifically for assessment scores of business students. Business students must complete the outbound Peregrine

Table 1: Number of Students by Age Group and Instructional Mode			
Student Age	**Instructional Mode**		**Total**
	Campus	**Online**	
Traditional	145	331	476
Nontraditional	166	634	800
Total	311	965	1276

Outcomes Assessment prior to graduating, which occurs during the last academic year of their program. The data do not represent every student at the university or every business student in the business college, as uncontrollable factors may have not allowed it, such as students changing majors or transferring out of the university. Data were pulled from the outbound Peregrine Outcomes Assessment for the period 11/15/13 to 7/18/16 and participants included 1276 undergraduate business students in their final year of the business program. Only the aggregated assessment scores for both traditional and nontraditional students were used in the data analysis. Individual sublevel scores were omitted for the purposes of this study.

Materials

The majority of business programs in higher education require seniors to complete an exit exam as part of an accreditation requirement for on-going assessment and they are used by colleges and universities to assess whether programmatic changes are needed to increase student performance (Chowdhury, 2016). The Peregrine Outcomes Assessment is a nationally normed, summative assessment exam institutions of higher education use for internal and external academic program evaluation and benchmarking (Peregrine Academic Services, n.d.) in the areas of economics, finance, marketing, management international business, accounting, and other business disciplines. The exam satisfies programmatic requirements as outlined by accrediting agencies like AACSB, ACBSP, and IACBE. Due to these accreditation requirements, which relate to the assessment of learning outcomes, ensuring academic quality, and externally benchmarking relative to other schools, college and universities are required to provide assurance of learning (AOL) of their students and programs. The ACBSP and IACBE recognize the Peregrine Outcomes Assessment as appropriate for the AOL assessment (Green, Stone, & Zegeye, 2013).

RESULTS

A two-way ANOVA revealed a significant interaction between instructional mode and student age ($F(1, 1272) = 9.938$, $p = .002$) as well as main effects for instructional mode ($F(1, 1272) = 8.520$, $p = .004$) and student age ($F(1, 1272) = 5.309$, $p = .021$); Table 2 shows complete ANOVA results with effect sizes. Table 3 provides mean outbound Peregrine percentile scores, with a maximum of 100, as a function of instructional mode and student age.

Traditional-age students, regardless of whether they take courses on campus or online, performed

Table 2: ANOVA of Instructional Mode and Student Age					
Source	**df**	**F**	**Sig.**	**Partial Eta Squared**	**Effect Size Interpretation**
Corrected Model	3	7.189	.000		
Intercept	1	12638.49	.000		
Mode	1	8.520	.004	.007	Small
Age	1	5.309	.021	.004	Small
Mode x Age	1	9.938	.022	.008	Small
Error	1272				
Toral	1276				
Corrected Total	1275				

Table 3: Mean Outbound Peregrine Scores by Instructional Mode and Student Age

Student Age	Instructional Mode										Overall Mean
	Campus					Online					
				95% Confidence Interval					95% Confidence Interval		
	Mean	SD	n	Lower Bound	Upper Bound	Mean	SD	n	Lower Bound	Upper Bound	
Traditional	56.42	15.44	145	54.00	58.83	56.19	16.20	331	54.59	57.79	56.26
Nontraditional	51.06	14.77	166	48.80	53.32	57.02	13.93	634	55.86	58.18	55.78
Overall Mean	53.56	15.30	311			56.73	14.74	965			55.96

Table 4: Mean Outbound Peregrine Score by Cohort Decade and Instructional Mode

Student Cohort Decade	Instructional Mode						Overall Mean
	Campus			Onine			
	Mean	SD	n	Mean	SD	n	
Teens	54.16		1			x	54.16
Twenties	52.98	15.49	275	55.89	15.01	711	55.08
Thirties	57.11	14.80	26	59.85	13.87	164	59.48
Forties	60.69	9.07	6	60.47	14.14	56	60.49
Fifties	61.39	5.67	3	53.89	11.31	30	54.57
Sixties				47.29	3.69	4	47.29
Overall mean	53.56	15.30	311	56.73	14.74	965	55.96

similarly on the outbound Peregrine assessment. In contrast, there was a marked difference in the performance of nontraditional age students as those learning online scored significantly higher than those taking classes on campus.

Analyzing student age as a continuous variable, there was a significant (but small) correlation between student age and outbound Peregrine score ($r = .066$, $p = .019$).

To more closely examine the impact of student age in relation to instructional mode, student age was reclassified according to cohort decade. Table 4 shows the mean Peregrine score as a function of cohort decade and instructional mode.

Due to the lack of a comparison group between instructional mode for participants in the teen and sixties cohorts, these groups were eliminated from further analysis. An analysis of variance of the remaining cohort decades by instructional mode found a significant main effect for cohort ($F(3, 1263) = 3.173$, $p = .023$), but failed to detect a significant interaction between cohort and instructional mode ($F(3, 1263) = .514$, $p = .673$) or a main effect for instructional mode ($F(1, 1263) = .032$, $p = .858$).

As indicated in Table 5, post hoc analysis identified a number of significant differences in outbound Peregrine performance as a function of student cohort decade. Students in their thirties and forties performed similarly on the outbound Peregrine assessment; these groups performed significantly better than students in their twenties or fifties (which performed similar to each other).

DISCUSSION

A direct comparison of both traditional and nontraditional students completing the Peregrine Outcomes Assessment was utilized to examine learning outcomes as a function of student age (traditional versus nontraditional) in relation to mode of instruction (online versus face-to-face). The narrow scope of the research, limiting it to fully online versus fully face-to-face programs, was

Table 5: Post Hoc Between-Group Differences in Outbound Peregrine Score by Cohort Decade			
Cohort Decade	**Cohort Decade**	**Mean Difference**	**p**
Twenties	Thirties	-4.40*	<.001
	Forties	-5.41*	.005
	Fifties	0.51	.845
Thirties	Forties	-1.01	.640
	Fifties	4.91**	.079
Forties	Fifties	5.92**	.064
* indicates significant between-group difference at the .05 level **indicates data approaching significance			

intentional to determine the interaction of age and mode of instruction on the academic achievement of students. The Peregrine Outcome Assessment serves as a summative measure of business student achievement, which allows for a more accurate comparison when examining traditional and nontraditional student success. Contrary to the hypothesis that, regardless of instructional mode, nontraditional students will score higher than traditional students on summative assessments (due to increased business industry experience), the results suggest that age performed differently for campus students, particularly in the twenties cohort relative to the thirties, forties, and fifties cohorts. Accordingly, the hypothesis is not rejected in the latter cohorts, which may signify that having 10–20+ years of business experience aided them in learning course information and/or completing a summative assessment, such as the Peregrine Outcomes Assessment. This experience may also serve to enhance the overall comprehension of both course and program related business principles and concepts and give potentially higher levels of intrinsic motivation to learn beyond simply receiving a grade. Conversely, the hypothesis is rejected for the twenties cohort, as related business experience did not assist them in achieving higher learning outcomes, perhaps due to an emphasis on receiving grades in lieu of understanding the practical application of business principle and concept or a lack of practical experience.

One possible explanation for why the twenties cohort performed significantly worse relates to the amount of business experience relative to their thirties, forties, and fifties counterparts. Accordingly, the latter cohort enrolling in an undergraduate business program was able to obtain work experience prior to getting a college education, which behaves differently than in other professions. For example, a person cannot be a high school teacher without having first earned a college degree in education. Additionally, a counselor cannot counsel patients unless they earn a degree in psychology and obtain state licensure. In business, however, a person does not need a business degree to gain experience in business, and the experienced gained by the thirties, forties, and fifties cohorts aligned with higher learning outcomes. The twenties cohort, however, likely does not possess the same level of practical experience, as they may be full-time students who either work part-time or do not work at all. Students in the twenties cohort that work part-time likely are not able to apply what they are learning in their courses directly to their jobs. For example, a student majoring in accounting or finance disciplines that works in a retail organization as a cashier likely does not have the opportunity to gain practical experience in the accounting or finance department of the company. Thus, their work experience does not relate directly to what they are learning in their academic courses.

Another possible explanation for why the twenties cohort performed significantly worse could relate to military service. While servicemen and servicewomen gain practical experience during their time in the military, the experience is specific to the branch of the military and the specific job held, which may not relate to the business world. For example, a nontraditional student that just completed a tour in the military may enroll in college and not possess business experience. A twenties cohort student may enroll immediately following his/her military service and have little context for the business principles and concepts being taught, as military and civilian organizations tend to behave differently. This may be further

compounded if these students do not have the ability to directly apply what they are learning in their courses, which could help explain why nontraditional students taking online courses fared better on the Peregrine Outcomes Assessment then their campus counterparts, as they likely work in industry.

CONCLUSION

The results of the study have application in higher education, especially for the students in the thirties, forties, and fifties cohorts. Given their greater amount of business experience, universities may consider developing competency-based programs that account for their experience. Further, while graduates of business programs must all arrive at the same place in terms of competency, universities could cater to more experienced students through mastery learning, where the focus is on feedback and mastery of content prior to moving to the next set of content (Slavin, 1987); this would also allow nontraditional students to pace and sequence their education more quickly. Further, universities might consider programmatic and curriculum design changes for nontraditional students given the different levels of business experience. For example, the type of classes offered or assignment options could be set up differently than those for traditional students while still achieving the same competencies. Additionally, the use of group projects could be modified so that nontraditional students could feature their varied perspectives and experiences in topical areas. University administrators and curriculum design teams may benefit from similar changes knowing that student age is irrelevant to mode of instruction.

Due to test restrictions, accessing sample questions to glean a more comprehensive understanding of discipline specific questions was not possible. The Peregrine Outcomes Assessment does, however, provide questions to business students across all business disciplines (e.g., accounting, finance, management, etc.). This research emphasized a holistic view and did not seek to examine whether students from specific disciplines outperformed other students. Future research is needed to determine whether students from specific disciplines outperform others. Further, this scope of this research did not account for other factors, such as gender, race, ethnicity, or student grade point average. Future research is needed to determine the interaction of factors other than age and mode of instruction that impact student achievement.

The implications of these findings illustrate the interaction between student age and mode of instruction and show that simply looking at online versus face-to-face learning environments as a comparison suggests a this-or-that mindset. A myriad of dynamics exists with respect to assessing learning outcomes, such as age, motivation, etc., which covers far more than assessing learning outcomes by mode of instruction alone. Additional research is needed to provide insight into assessing students' content knowledge and their ability to apply their knowledge, as reflected in students' ability to write and communicate using disciplinary language. Further examination is needed, such as retrieving student artifacts using a standardized rubric to gauge critical thinking, disciplinary language, and the application of disciplinary content, so as to assess if there is any correlation between outbound Peregrine Outcomes Assessment scores to written artifacts as a function of content knowledge and disciplinary discourse.

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