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Relationship between Grades and Learning Mode

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ABSTRACT

A comparison of failure rates and grade distribution was conducted between four learning disciplines utilized by Embry-Riddle Aeronautical University-Worldwide: Eagle Vision Classroom (synchronous classroom to classroom), Eagle Vision Home (synchronous home to home), Online and traditional classroom learning environments. Researchers examined 20,677 Embry-Riddle end-of-course student grades from the 2012-2013 academic year. Significant relationships between failing grades and learning environment (modes) were noted in courses from the English, Economics and Mathematics disciplines. Online courses experienced more failures relative to other modes of instruction in Humanities, Mathematics and Economics courses. The traditional classroom-learning mode had fewer failures relative to other modes in English, Humanities and Mathematics courses. Grade distribution was significantly different among some of the learning modes in disciplines studied. Due to the continued technological advancements in course delivery, recommendations include continued research on the relationship of student performance and learning mode. Researchers should also conduct quantitative and qualitative research on faculty and student perceptions regarding learning mode preferences.

INTRODUCTION

Universities have deployed various types of instruction delivery systems for their students. The quality of instruction and success rates of students has always inferred a concern (Johnson, 2013). As technology continues to advance and students take more courses online and through video synchronous learning modes, the question of how well students learn in these environments solicit professional attention from researchers (Lou, Bernard & Abrami, 2006). To that end, Harstinsk (2008) conducted a meta-analysis of 535 studies that indicated no significant difference in learning outcomes between traditional classroom and online modes of instruction, as measured by grades and examination results. These studies generally compared online instruction with traditional classroom instruction. Video synchronous learning was a relatively small part of online instruction in those comparisons. Dunn (2013) examined 1,600 course grades among four disciplines noting differences in student performance based on learning modes. Her study included two video synchronous learning modes, and subsequently she recommended further research using a larger sample size.

SIGNIFICANCE

Universities are offering a greater number of courses over the Internet in a synchronous mode of instruction, utilizing headsets and webcams along with traditional classroom and online instruction (Foreman & Jenkins, 2005). In light of this continuing shift, this study replicates Dunn's (2013) earlier work, at least in concept, by examining the relationship between learning mode and student performance through analysis of 20,677 student grades.

LITERATURE REVIEW

Distance learning (DL) has been generally defined as "…institution-based, formal education where the learning group is separated, and where interactive telecommunications systems are used to connect learners, resources, and instructors" (Schlosser & Simonson, 2006, p. 1). The United States Distance Learning Association (USDLA) defines Distance Learning as, "…the acquisition of knowledge and skills through mediated information and instruction, encompassing all technologies and other forms of learning at a distance" (Holden & Westfall, 2010, p. 2). While the early iterations of distance learning included correspondence courses and media delivered through the mail system, web-facilitated online learning, or e-learning, has become the popular mode of distance learning delivery. Comparisons between traditional classroom delivery and e-learning modalities indicate that location, content, and personalization represent critical difference elements. Location suggests that e-learning can be accessed virtually anytime and anywhere, whereas traditional classes are dependent upon certain times and locations. E-learning that is distinguished by content indicates that it can be implemented through audio, animation, video, simulation, online resources and communities, whereas traditional classrooms often rely on presentation

slides, textbooks, and video. The element of personalization, as associated with e-learning, allows the learning pace and direction to be determined by the user, whereas traditional classrooms typically present one learning path for all students (Burgess & Russell, 2003).

With the advent of new web-enhanced network and communication technologies, the delivery of e-learning has expanded to include non-traditional venues that incorporate both synchronous and asynchronous modalities. Asynchronous distance learning refers to delivery modalities that do not require real-time communication between the instructor and students, but instead attempts to bridge the constraints of time and location by incorporating independent self-study and indirect communication tools such as discussion boards, wikis, blogs, e-mail and various multi-media. The USDLA (Holden & Westfall, 2010) cite the following characteristics of asynchronous learning environments: providing for more opportunity for reflective thought; not constrained by either time or location; delayed reinforcement of ideas; providing flexibility in delivery of content; potentially higher attrition rate; and possible extension of time for completion (p. 14).

In contrast, synchronous distance learning refers to a modality that incorporates live, real-time, two-way audio and/or visual communications between the instructor and the students through the use of various technologies such as audio response systems, interactive keypad devices that support both the exchange of data and voice; and/or video-conferencing platforms. According to the USDLA (Holden & Westfall, 2010), synchronous learning environments have the following advantages: providing a dialectic learning environment with varying levels of interactivity; encouraging spontaneity of responses; allowing for optimal pacing for best learning retention; allowing for immediate reinforcement of ideas; controlling the length of instruction when completion time is a constraint; and being constrained by time, but not location (p. 14).

With the continual advancement of technology and the development of more stable, robust venues online learning, has consistently experienced a steady growth rates. According to *Changing Course: Ten Years of Tracking Online Education in the United States* (Allen & Seaman, 2013), the tenth annual report on the state of online learning in U.S. higher education, online enrollments have increased dramatically. The number of students who have enrolled in at least one online class has more than quadrupled from 1.6 million in 2002 to 6.7 million as of 2011. The proportion of all students taking at least one online course has increased from 9% to an all-time high of 32% as of 2011 (Allen & Seaman, 2013). In addition to the proliferation of actual enrollments in online education, the report also found the proportion of academic leadership that cite online learning as critical to their long-term strategic goals is currently at 69.1% – the highest it has been for the entire ten-year period since the report's inception (Allen & Seaman, 2013). This level of administrative support and confidence in the online learning environment, coupled with the actual increase in enrollments, ensures that online learning will continue to play a major role in higher education. It remains a priority that equivalent learning outcomes are maintained across modalities in order to guarantee the quality and integrity of the degrees awarded.

Previous researchers have sought to determine the comparative equivalence of distance learning and traditional classroom instruction in order to establish the legitimacy of distance learning in the university setting (Bernard, Abrami, Lou, Borokhovski, Wade, et al., 2004). In 1999, Thomas Russell conducted a landmark meta-analysis that became widely known as the "No Significant Difference Phenomenon", where he analyzed 355 research studies and concluded that distance learning and classroom instruction modalities were not significantly different with respect to student outcomes when the course materials and teaching methodology were held constant. Since that publication, Russell has maintained a website repository (http://www.nosignificantdifference.org/) that includes studies that document *no significant difference* as well as those that document *significant differences* in student outcomes based on the mode of delivery. The *significant difference* entries on the website are further classified into three categories: *better results through technology* - improvement in outcomes when curriculum is delivered at a distance; *better results in the classroom* - improvement in outcomes when curriculum is delivered face to face; or m*ixed results* - some variables indicate improvement when curriculum is delivered at a distance. Others indicate improvement when curriculum is delivered face-to-face. Currently the site lists over 140 studies purporting to indicate no significant difference, 7 indicating better results for classroom instruction, 51 indicating better results through technology and 9 indicating mixed results.

Other researchers conducting similar meta-analyses include: Allen, Bourhis, Burrell, & Mabry (2002); Allen et al. (2004); Bernard, Abrami, Lou, Borokhovski, Wade, et al. (2004); Hrastinski (2008); Jahng, Krug, & Zhang (2007); Lou, Bernard, & Abrami (2006); Machtmes & Asher (2000); Shachar & Neumann (2003); Sitzmann, Kraiger, Stewart, & Wisher (2006); Ungerleider & Burns (2003); Zhao, Lei, Yan, Lai, & Tan (2005); Williams,

(2006). Specifically, Bernard et al. (2004) conducted a comprehensive analysis of 232 studies covering the period from 1985 -2002 where measures of achievement, attitude and completion rates were compared between distance learning and classroom instruction. Their analysis encompassed an examination of both asynchronous (including both correspondence and online courses) and synchronous (including teleconferencing and satellite-based delivery) but did not directly compare these two modalities. Results were mixed with distance learning yielding more positive results in terms of achievement and attitude but negative in terms of course completion. Hrastinski (2008) examined 535 studies and concluded no significant difference in learning outcomes as measured by grades and examination results between traditional classroom instruction and e-learning modalities.

More recently (Means, Toyama, Murphy, Bakia & Jones, 2010), the U.S. Department of Education conducted a comprehensive review of over 1,000 studies of online learning. The researchers concluded that the mastery of learning outcomes for online learning students exceeded, on average, those of students receiving traditional face-to-face instruction. The study also showed that combining online and face-to-face instructional elements produced a greater advantage relative to face-to-face instruction than did exclusively online instruction. These results were shown to apply broadly across both varied content and learner types. The effectiveness of online learning was demonstrated for both undergraduate and graduate students in a wide range of academic fields. Based on their analysis, the researchers concluded that it was not merely the learning modality that was solely responsible for the increase in positive learning outcomes, but rather a combination of elements. These included additional learning time, varied materials and opportunities for collaboration that were made possible by the online learning environment. The aforementioned *Changing Course* (Allen & Seaman, 2013) report have consistently found most chief academic officers rate the learning outcomes for online education "as good as or better" than those for face-to-face instruction. This view was held by 77% of Chief Academic Officers in 2012. Only 57.2%expressed this view in the 2003 report.

While numerous studies support the integrity and relevance of distance learning as an alternative to the traditional classroom, one theme regularly underlies the claims of effectiveness – the importance of student engagement through meaningful interaction (Anderson, 2003a, 2003b; Bates, 1990; Daniel & Marquis, 1979, 1988; Fulford & Zhang, 1993; Jaspers, 1991; Juler, 1990; Laurillard, 1997; Lou et al., 2006; Moore, 1989; Muirhead, 2001a, 2001b; Sims, 1999; Sutton, 2001; Wagner, 1994). This is consistent with the more general notion of the integral role of interaction between and among students, instructors and course content (Chickering & Gamson, 1987; Garrison & Shale, 1990). Nipper (1989) emphasized the importance of creating a sense of "synchronous presence" in the online learning environment. This reduces the social distance between students and instructors. He further suggested the need to create a sense of real time collaboration even in asynchronous learning environments by keeping interaction lively and active. Nipper considered this social aspect as important as the curricular content to the success of an online learning environment. Numerous studies since Nipper's research have demonstrated the relationship between social presence and both increased student satisfaction as well as learning outcomes (Picciano, 2002; Richardson & Swan, 2003; Rovai & Barnum, 2003). Relating this to specific learning modalities, Holden and Westfall (2006) argued that synchronous and blended e-learning incorporate innate opportunities for interaction. These must be specifically built into the design of the technology applications in asynchronous environments. E-learning is clearly a viable part of the future of education. It is therefore the challenge of educators to harness the technology and effectively manage the various modalities in order to help ensure students successfully meet the learning objectives. It is also important to keep in mind that the available technology is merely a tool – a means to that end (Holden & Westfall, 2010).

RESEARCH QUESTION

The purpose of this research was to determine if there is a significant difference in student performance among four different modes of learning; classroom (traditional lecture) Online, EagleVision (EV) Classroom (classroom to classroom video synchronous learning) and EagleVision (EV) Home (residence to residence video synchronous learning) with regard to failure rates and grade distribution. In other words, was there a relationship between student performance and learning mode?

Hypotheses Tested

Ha_1. Student failure rates in classroom, on-line and video synchronous learning modes of instruction are not equivalent.

Ha_2. Grade distribution in classroom, on-line and video synchronous learning modes of instruction are not equivalent.

METHODOLOGY AND PROCEDURES

Embry-Riddle Aeronautical University student course grades were mined from the Campus Solutions database through the ERNIE Dashboard Portal. Data in the form of end of course grades (n=20,677) for the academic year 2012-2013 were examined to test the hypotheses. No individual student identification was obtained, nor were any student names known or reported in this study. Atypical grades including withdraws, incompletes or individual tutorials, accounted for less than one percent and were excluded from the analysis. Some percentages were reported in the results, while not used to statistically test any study hypotheses. The researchers used Chi Square tests at the appropriate degrees of freedom (α=.05) to evaluate the data (Gay, Mills, & Airasian, 2006). Four tests were run for each course discipline (Economics, English, Humanities and Mathematics). The first two tests were run to evaluate the hypothesis regarding equivalency of failures for all modes of instruction. The first statistical test compared the number of students who passed versus the number who failed for all for modes (EV Home, EV Classroom, On-line and Classroom) of learning. A second statistical test was conducted comparing just two modes at a time using a 2X2 contingency table to determine if modes and grades were related. Additional tests were run to evaluate the hypothesis regarding equivalent grade distribution across the learning modes for each discipline. The third test compared all the modes for each discipline to determine if learning mode and grades were related. The fourth test was run comparing two modes at a time using a 2X2 contingency table to determine if modes and grades were related.

To test the hypotheses, a total of 20,677 Embry-Riddle Aeronautical University Worldwide Campus student grades were reviewed among four different disciplines of courses for Academic year 2012 to 2013; Economics (n= 3725), English (n=5198), Humanities (n=2769) and Mathematics (n=8,985). Table 1 shows the differences in failures between the four modes in Economics courses.

Table 1: Economics Courses (Ha_1 Difference in Failures between the Four Modes)

	EV-H	**EV-C**	**Online**	**Classroom**	
Pass	559	548	1604	843	
Fail	27	27	91	26	
% fail	5%	5%	5%	3%	p=.0594
Direct Mode Comparison					
	EV-C	**Online**	**Classroom**		
EV-H	p=0.9432	p=0.4733	p=0.1067		
EV-C		p=0.5298	p=0.0919		
Online			p=0.0063*		

Note. n=3725. p values followed by an asterisk* were significant (α=.05).

The data did not yield enough evidence to reject the null hypothesis. Failing grades and mode of learning did not appear to be related to a statistically significant degree with the exception of traditional Classroom and Online (p=.0063). The failure rate of students taking Online Economics courses was 5%, significantly higher than the rate of traditional Classroom students who exhibited the lowest failure rate of the four modes (3%). The overall grade distribution of Economics courses yielded a significant result however, as shown in Table 2.

Table 2: Economics Courses (Ha_2 Differences in Grade Distribution between the Four Learning Modes)

	EV-H		**EV-C**		**Online**		**Classroom**	
Grade	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
A	312	53%	340	59%	802	47%	515	59%
B	164	28%	136	23%	546	32%	230	26%
C	71	12%	56	10%	201	12%	75	9%
D	12	2%	16	3%	55	3%	23	3%
F	27	5%	27	5%	91	5%	26	3%
								p=.000*
Direct Mode Comparison								
	EV-C	Online	Classroom					
EV-H	p=0.1951	p=0.0823	p=0.0440*					
EV-C		p=0.0001*	p=0.3654					
Online			p=0.0000*					

Note. n= 3725. p values followed by an asterisk* were significant (α=.05).

Grade distribution and learning mode appeared to be related (p=.000). This result provides enough evidence to reject the null hypothesis regarding grade distribution equivalence between the four modes of instruction. Two of the six direct comparisons yielded significant findings. Online yielded different grade

distributions than the EV Classroom (p=0.0001) and traditional Classroom (p=0.0000) learning modes. Table 3 shows the differences in failures between the four modes in English courses.

Table 3: English Courses (Ha_1 Difference in Failures between the Four Modes)					
	EV-H	**EV-C**	**Online**	**Classroom**	
Pass	456	255	2983	882	
Fail	53	45	440	84	
% fail	10%	15%	13%	9%	p=.0011*
Direct Mode Comparison					
	EV-C	Online	Classroom		
EV-H	p=0.0534	p=0.1206	p=0.2802		
EV-C		P=0.2897	p=0.0016*		
Online			p=0.0004*		

Note. n=5198. p values followed by an asterisk* were significant (α=.05).

Based on the data shown in Table 3, learning mode and failure rate were related (p=0.0011). There is evidence to reject the null hypothesis. The EV Classroom learning mode had the highest failure rate (15%), and the traditional classroom learning mode had the lowest (9%). Two of the six tests in the mode-by-mode comparison showed significance. Classroom was different from both the EV Classroom (p=0.0016) and Online (p=0.0004) learning modes. In analyzing the overall grade distribution, the data yielded more significant results in Table 4.

Table 4: English Courses (Ha_2 Differences in Grade Distribution between the Four Learning Modes)								
	EV-H		**EV-C**		**Online**		**Classroom**	
Grade	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
A	262	51%	150	50%	1895	55%	462	48%
B	133	26%	62	21%	714	21%	250	26%
C	47	9%	36	12%	287	8%	137	14%
D	14	3%	7	2%	87	3%	33	3%
F	53	10%	45	15%	440	13%	84	9%
								p=.000*
Direct Mode Comparison								
	EV-C	**On-line**	**Classroom**					
EV-H	p=0.1242	p=0.0499*	p=0.0617					
EV-C		p=0.1570	p=0.0098*					
Online			p=0.0000*					

Note. n= 5198. p values followed by an asterisk* were significant (α=.05).

English course grade distribution and learning mode appear to be related (p=.000). This result provides enough evidence to reject the null hypothesis. Of the six direct comparisons between modes of instruction, three yielded significant findings. Online yielded significantly different grade distributions than the EV Home mode of learning (p=0.0499) and traditional Classroom learning mode (p=0.0000). EV Classroom also differed from the traditional Classroom setting (p=0.0098). Table 5 shows the analysis of pass to fail ratios in Humanities courses.

Table 5: Humanities (Ha_1 Difference in Failures between the Four Modes)					
	EV-H	**EV-C**	**Online**	**Classroom**	
Pass	250	162	1513	586	
Fail	27	17	166	48	
% fail	10%	9%	10%	8%	p=.3916
Direct Mode Comparison					
	EV-C	**Online**	**Classroom**		
EV-H Vs.	p=0.9296	p=0.9425	p=0.2716		
EV-C Vs.		p=0.8679	P=0.4014		
Online Vs.			p=0.0864		

Note. n=2769.

There was no relationship between learning mode and failing grades in the Humanities courses studied (p=0.3916). There was not sufficient evidence to reject the null hypothesis. The EV Home and Online learning modes had the highest failure rates (10%), while the traditional Classroom learning mode resulted in the lowest failure rate (8%). Failing grades and mode of learning did not appear to be related to a statistically significant degree in any of the six tests in the mode-by-mode comparison. In analyzing the overall grade distribution of Humanities courses, however, the data yielded significant results shown in Table 6.

Table 6: Humanities (Ha_2 Differences in Grade Distribution between the Four Learning Modes)

	EV-H		EV-C		Online		Classroom	
Grade	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
A	148	53%	122	68%	814	48%	341	54%
B	65	23%	23	13%	487	29%	182	29%
C	25	9%	15	8%	173	10%	55	9%
D	12	4%	2	1%	39	2%	8	1%
F	27	10%	17	9%	166	10%	48	8%
								p=.000*
Direct Mode Comparison								
	EV-C		Online		Classroom			
EV-H	p=0.0071*		p=0.0976		p=0.0227*			
EV-C			p=0.0000*		p=0.0006*			
On-line					p=0.0595			

Note. n= 2769. p values followed by an asterisk* were significant (α=0.05).

Grade distribution and learning mode appear to be related (.000). This result provided enough evidence to reject the null hypothesis regarding grade distribution equivalence among the four modes of instruction for Humanities courses. Four of the six comparisons yielded significant findings. Online yielded a significantly different grade distribution than EV Classroom (p=.0000). Eagle Vision Home also significantly differed in grade distribution from EV Classroom (p=0.0071). The traditional Classroom learning mode differed from both EV Home (p=0.0227) and EV Classroom (p=0.0006). Table 7 shows the analysis regarding failure rates between the four modes of learning in Mathematics courses.

Table 7: Mathematics (Ha_1 Difference in Failures between the Four Modes)

	EV H	**EV-C**	**Online**	**Classroom**	p=.000*
Pass	998	795	4302	2173	
Fail	69	31	510	107	
% fail	6%	4%	11%	5%	
Direct Mode Comparison					
	EV-C	**Online**	**Classroom**		
EV-H	p=0.0089*	p=0.0000*	p=0.0322*		
EV-C		p=0.0000*	p=0.2613		
Online			p=0.0000*		

Note. n=8985. p values followed by an asterisk* were significant (α=0.05).

Learning mode and failure rate were related for Mathematics courses (p=.000). There is evidence to reject the null hypothesis. The Online learning mode had the highest failure rate (11%), and EV Classroom learning mode had the lowest (4%). Failing grades and mode of learning appeared to be related to a statistically significant degree in five of the six tests in mode-by-mode comparisons. The On-line learning mode was significantly different (higher ratio of failing grades) than EV Home (p=.000), EV Classroom (P=.000) and traditional Classroom (p=.0000) settings. EV Home was significantly different (higher failure rate) than EV Classroom (p=0.0089) and traditional Classroom (p=0.0322) modes. In analyzing the overall grade distribution of mathematics courses, the data yielded more significant results shown in Table 8.

Table 8: Mathematics (Ha_2 Differences in Grade Distribution between the Four Learning Modes)

	EV-H		EV-C		Online		Classroom	
Grade	n	%	n	%	n	%	n	%
A	537	50%	472	57%	1904	40%	1120	49%
B	289	27%	217	26%	1433	30%	656	29%
C	139	13%	89	11%	716	15%	310	14%
D	33	3%	17	2%	249	5%	87	4%
F	69	6%	31	4%	510	11%	107	5%
								p=.000*
Direct Mode Comparison								
	EV-C		Online		Classroom			
EV-H	p=.0058*		p=.000*		p=.1629			
EV-C			p=.000*		p=.0006*			
Online					p=.0000*			

Note. n= 8985. p values followed by an asterisk* were significant (α=.05).

Grade distribution and learning mode appeared to be related (p=.000). This result provides sufficient evidence to reject the null hypothesis regarding grade distribution equivalence between the four modes of instruction. Five of the six direct comparisons yielded significant findings. Online had a significantly different

grade distribution than the other three modes of learning (p=0.0000). EV Classroom had a significantly different grade distribution when compared to EV Home (p=0.0058) and traditional Classroom (p=0.0006).

CONCLUSIONS

Failure rate was not related to learning mode for Economics courses in the comparison of all four modes (Table 1, p=0.0594). One of six direct comparisons yielded a significant result. Mode and failure rate were related when comparing Online (higher failure rate) and classroom learning modes (p=0.0063). Economics courses did not have the same grade distribution between modes of learning (p=.000). Online was significantly different (fewer "A" and more "B" and "C" grades) than EV Classroom (p=.0001) and classroom (p=.000). Failure rate and mode were related for English courses (p=0.0011). Two of six paired comparisons yielded significant results. The number of classroom failures was significantly lower than both EV Classroom (p=.0016) and Online (p=.0004). English course Grade distributions were not equivalent (p=.000). Online differed (more "A"s and fewer "B" and "C" grades) with EV Home (p=.0499) and classroom (p=.000). EV Classroom also differed (more "A"s, fewer "B" and "C" grades) from traditional classroom (p=.0098). Humanities courses exhibited no relationship between failure rates and modes of learning. Grade distributions between the modes of instruction were not equivalent however. On-line yielded a significantly different (fewer "A"s, more "B" and "C" grades) distribution than EV Classroom (p=0.000). Eagle Vision Home also significantly differed (fewer "A"s, more "B," "C" and "D" grades) from EV Classroom (p=0.0071). The classroom grade distribution differed (more "B"s, fewer "D" and "F" grades) from EV Home (p=0.0227). Traditional classroom grades also differed (fewer "A"s, more "B" grades) from EV Classroom (p=0.0006). Failure rate and learning mode were related for Mathematics courses (p=.000) Five of six paired comparisons yielded significant results. Online had a significantly higher failure rate than EV Classroom, EV Home or Classroom (p=.000). EV Home was significantly different (higher failure rate) than EV Classroom (p=0.0089) and traditional classroom (p=0.0322) modes. Online (11%) and EV Home (6%) had the highest failure rates of the four learning modes. With regard to grade distribution, only EV Home and traditional classroom learning mode grade distributions were statistically similar. The five remaining paired comparisons of mode grade distributions were significantly different. EV Classroom students earned a higher proportion of "A"s than their counterparts. Online students earned a higher proportion of "B"s (30%), "C"s (15%), "D"s (5%), and "F"s (11%) than students in any other learning mode.

Failure rate and learning mode were not related in Economics and Humanities courses in this study. This finding is in line with findings in previous studies by Hrastinski (2008) and Lou, et al., (2006). Failure rate and learning mode were related in English and Mathematics courses similar to findings made by Bernard et al., (2004) and Dunn 2013. Economics, English, Humanities and Mathematics courses all had significantly different grade distributions when the four modes of learning were compared within each discipline. Online had the lowest proportion of "A" grades and the highest failure rate in Economics, Humanities and Mathematics courses. Online had the highest proportion of "A" grades for English courses. EV Classroom had the highest failure rate in English courses.

RECOMMENDATIONS

Most previous study results have shown that there is little meaningful difference in student performance based on mode of learning. The results of this study do not support that conclusion. Two of four disciplines examined showed a relationship between learning mode and failure rates. All four disciplines showed significantly different grade distributions. A question for further research is whether face to face instruction provides more of a personal relationship with individual students, while non-face to face instruction creates a more clear cut objective grading system. The technological changes in the way courses are delivered necessitate continued research on the relationship between student performance and delivery mode. Researchers should also continue the quantitative and qualitative analysis of faculty and student perceptions with regard to learning modes.

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