Comparing the Outcomes of the Different Teaching Modes; Face-to-Face, Hybrid, and Online, for Different Student Demographics in a Business School

Working Paper – Short Version

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Abstract

The concept of hybrid mode education is spreading. Far less research compares hybrid teaching modes to online and face-to-face (F2F) teaching modes. Nearly all this research assumes that there is no difference in the students entering F2F, hybrid, or online sections of a course. This study used data from four years of courses in the Coles College of Business at Kennesaw State University. The data set, which includes individual student and course section outcomes, included full student demographics and the student's university GPA at the start of the course. The results showed that for all demographics, students in hybrid course sections earned higher final course grades than those in online sections, which in turn, earned better final grades than those in F2F sections. However, students with instructors, who taught hybrid courses, also earned higher course grades for F2F sections than those students whose instructors did not teach hybrid sections.

Hybrid, Online, Teaching modes.

Introduction

The concept of hybrid mode education is spreading as a compromise between F2F and pure online teaching. Many studies have looked at the outcomes of pure online teaching compared to F2F teaching. Far less research has compared hybrid teaching to online and F2F teaching. Nearly all this research assumes that there is no difference in the students entering F2F, hybrid, or online sections of a course. Most research has considered a single course or instructor. Some research has considered student satisfaction with different modes, as well as academic outcome or grades.

As hybrid mode teaching is becoming more common, especially due to Covid class capacity limitations. There are many types of hybrid and online teaching modes. This research looks only at traditional hybrid (or flipped) teaching not rotational hybrids. The online sections were all asynchronous, not synchronous. This. is important to examine hybrid class results to see how the hybrid teaching mode rates against F2F and pure online. For example, if the hybrid teaching mode provides superior results for certain types of students, then institutions should encourage more instructors to use a hybrid mode. Also doing more hybrid sections has large implications for the number of classrooms that an institution needs.

This research will use the entering characteristics of students, a large sample of many instructors, and the final grade achieved for a large business college over several years, to see whether the benefits (including negative benefits) of hybrid and online modes over the F2F mode depends on the characteristics of the entering student.

Research Questions

Thus, the research questions that the research examines are:

1) Are there differences (both with demographics and with previous academic achievement) in the students using the different teaching modes?
2) Do different demographics have different student final grade outcomes in different modes? Outcomes here are either final course grade or the difference (grade gain) between final course grade and the student's GPA at the start of the course.

Literature Review

The literature will report on how previous research has examined the difference in the type of students taking different modes or whether the research assumed that students taking different were the same on average. We first examine the larger research output that does not include hybrid courses, then the smaller research that includes hybrid courses.

Online to F2F Comparisons

Many studies, with sample sizes ranging from very small to very large, have compared the outcomes of online versus F2F courses. The following is a selection of some of the latest studies.

No examination of student type

Stern (2004) examined online and F2F instruction for one course and concluded that online mode works as well as F2F if online instructors have enough time to do a thorough job. Sapp and Simon (2005) compared grades for online and F2F writing courses. They showed that more students thrived (defined as A or A-) in F2F courses than online courses (32% to 52%). Summers et al. (2005) examined grades for online versus F2F for a statistics course. They found no significant difference between modes of teaching. Kelly (2009) reported that she could find no significant difference between student grades for online and F2F modes. She did not control for entering GPA. Dell et al. (2010) found no differences between online and F2F sections of a graduate human development and an undergraduate psychology course. Ni (2013) found that there were no significant differences in outcome between online and F2F classes. Amparo et al (2018) used a very large sample (96,000 students) across two institutions to compare online and F2F results. They found that F2F students outperformed online students in course final GPA.

None of these studies examined pre-course GPA self-selection. In conclusion, most previous research, which compared online and F2F sections of courses, did not examine differences in any pre-course GPAs or demographics of students. They nearly all found no significant difference in final course grades or that online courses achieved worse final course grades than F2F ones.

Examination included student type

Cavanaugh and Jacuemin (2013) used a large sample size (5,000 courses) in one institution. They found no significant difference overall between online and F2F classes. They did find that students with good pre-course GPA did better those who did not. Online courses increased the effect of pre-course GPA. They also found that better students tended to do online courses, as the mean pre-course GPA was 3.41 for online students, while only 3.02 for F2F students.

Xu and Jaggers (2014) researched a very large data set of online and F2F courses (500,000 student-course sets). They did allow for differences in pre-course GPAs. They found that males, younger students, Black students, and those with lower pre-course GPAs did worse in online courses, while females and Asians had no significant differences, and older students did better in online courses. They also looked at subject matter and reported that computer science, communication, and health had no significant differences. All others had F2F doing better than online courses. The social sciences, business, law, and nursing showed the biggest differences. Teaching mode affected starting students more adversely than continuing students were.

Nguyen (2015) summarizes research comparing F2F and online teaching modes. He found that generally research considers online learning is better but that there were problems with much of this research. Amro et al. (2015) showed that for their algebra courses, F2F students got higher grades than students studying online did. Although they looked at age and gender factors, they did not look at pre-course GPAs to see if the students were similar in academic ability.

Bief and Brams (2016) compared student performance in online and F2F courses. They encountered mixed results; some studies showed the F2F course were better and some the online courses. Sun and Chen (2016) did a review of 47 papers comparing online and F2F teaching modes. They concluded that online teaching works as well as or better than F2F if done properly. That is well-designed content, motivated interaction, and well prepared and supported instructors.

Most studies did not look at the effect of demographic factors. However, Cavanaugh and Jacuemin (2013) found that better students tended to choose online courses. Xu and Jaggers (2014) showed that the difference between online and F2F depends on race, gender, previous GPA, and age. In fact, they showed that older students did slightly better in online courses. These two studies hinted that demographics and pre-course GPA might affect course outcomes.

Hybrid Comparisons

Studies did not examine student types

Several studies looked at comparing hybrid to either or both of F2F and online modes. McFarlin (2008) examined grade results for hybrid and online sections. He found that student learning, as represented by grades, increased in hybrid and online sections compared to F2F sections.

Lovern (2010) found no significant difference in outcomes between online, hybrid, and F2F sections of the same course. They did not examine pre-course GPA self-selection.

Studies that looked at student experience

Mansour and Mupinda (2007) looked at students' experiences rather than outcomes in online and hybrid classes. They found that students preferred hybrid classes, but some students preferred online courses. This maybe reflected the students' learning style.

Senn (2008) reported on student perceptions the three modes for one course. He concluded that students felt that hybrid sections were more difficult for this technology heavy course.

Larson and Sung (2009) looked at hybrid sections, as well as online and F2F. Unfortunately, they used student perceptions of learning effectiveness not actual learning achieved as a variable. They did not look at whether student self-select types of course by their pre-course GPA. They showed that students preferred hybrid to online and online to F2F. Sackett (2009) compared the three

modes' outcomes based on the training that the instructors had had. He found that online learners were older and had better computer competency.

Kemp and Grieve (2014) looked at student preferences and outcomes between F2F and online activities. They found no difference in learning outcomes but found students preferred online for written assignments and F2F for discussions. Goerke (2018) examined the three modes of training for one Air Force course. She found no difference of customer satisfaction between the three modes. Cathorall et al. (2018) assessed student performance in hybrid and online classes. They found no difference in student grades, but higher student evaluations in online courses.

Studies that examined student types

Brau et al (2010) reported on completion and success results in a course transitioning from F2F to hybrid and online modes. They found that completion rates increased significantly as did success rates. They did not think this was due to better students entering online and hybrid sections. Hybrid sections had higher completion rates than online sections.

Price et al (2016) looked at effect of factors on student performance and satisfaction across modes. They looked at age, sex, interaction, clarity, control and motivation. They found little correlation between age or sex and student outcomes. They found that course design (participant interaction, learner control, and course clarity) did affect student outcomes. Mode had no significant effect.

Kim and Keuegar (2017) compared hybrid and F2F courses. They concluded that using two modes, F2F and online, in the same course can be challenging to instructors.

Baum and McPherson (2019) examined learning in online and hybrid sections, taking account of the academic weakness of entering students. They suggested that students with weak academic backgrounds and other risk factors, including socioeconomic status, struggle in online classes. Hybrid classes do not exhibit these problems.

The research that include student differences showed it sometimes affected student outcomes. In addition, that hybrid sections often achieved better outcomes to either online or F2F.

Data Set

KSU provided every student-course record in KSU's Banner system from Fall 2015 to Summer 2019 for all Coles College of Business undergraduate courses.

The researcher removed from the data set all student-record data that had no grade awarded, or had a grade of I (incomplete), S (satisfactory), or U (unsatisfactory), as these grades did not give an indication of student learning.

Each student-course record set originally consisted of the following:

1) An arbitrary random number instead of student name. The researcher deleted this column from the working database as not useful.
2) Course grade in letters. This was converted to numbers; A = 4, B = 3, C = 2, D = 1, F = 0.
3) Previous overall GPA of student at start of course. This was missing for some students and I deleted student-course records with missing previous GPA for the change in GPA analysis sections of the analysis. GPA varied from zero to 4.

4) Age. This varied from 14 - 75. The study removed all those, a small number, under 18 for IRB reasons.

5) The analysis converted Teaching Mode – online (OL), hybrid (Hy), or face-to-face (F2F) - to zero, one variables. That is online is [1, 0, 0], hybrid is [0, 1, 0] and F2F [0, 0, 1] for columns online, hybrid, and F2F.

6) Term – Fall, Spring, or Summer. Some analysis used 1 for summer and 0 for Fall or Spring. This is because the summer term is a different length (8 weeks rather than 15 weeks).

7) Calendar year.

8) Course Discipline is either accounting [ACCT}, economics [ECON], entrepreneurship [ENTR], information systems [IS], information security assurance [ISA], management [MGT], or marketing [MKTG].

9) Course number. The first digit of course number gave Course Level (1, 2, 3, or 4)

10) Sex of student. This converted this to Male = 1, and Female = 0.

11) Ethnicity. This converted an ethnicity of Alien, Asian, Black, Hispanic, and White to 0 or 1 variables. For example, Alien was [1, 0, 0, 0, 0] for columns Alien, Asian, Black, Hispanic, and White. Other ethnicities, such as multicultural, unknown, or missing, would be [0, 0, 0, 0, 0] for Alien, Asian, Black, Hispanic, and White columns.

12) This analysis did not use Instructor ID. There were 232 instructors in this analysis. However, if one grouped data by instructor and removed all instructors who did not teach hybrid, then one could examine if there is a difference in grading for instructors who teach hybrid for other modes.

13) This analysis did not use previous enrolled term data.

This gave 118,280 student-course data records for the analysis.

Basic characteristics of the dataset.

Table 1 – Correlation of All Variables with Course Final Grade

Variable Name	Mean	Standard Deviation
Course Grade	**2.992**	1.004
Previous GPA	3.143	.5317
Age	22.43	5.162
Online Mode	21.1%	
Hybrid Mode	**2.23%**	
Face to Face Mode	76.67%	
Summer Term	8.97%	
Course Level	2.4138	
Sex – Male = 1 Female = 0	57.71%	
Alien	2.35%	
Asian	4.77%	
Black	17.31%	
Hispanic	9.47%	
White	59.57%	
Other	6.53%	

Note that hybrid student sections are a small part of the overall data.

Analysis

The analysis used the final grade awarded for the course as the predicted variable and all the other variables as predictor variables.

Table 2 – Correlation of All Variables with Course Final Grade

Variable	*Course Grade*	*Previous GPA*	*Age*	*Sex M = 1 F = 0*	*Online Mode = 1*	*Hybrid Mode = 1*	*Face to Face Mode = 1*	*Term Summer = 1 F, Sp = 0*	*Year*	*Course Level*
Previous GPA	0.422961	1								
Age	0.01301	-0.04057	1							
Sex M = 1 F = 0	-0.05131	-0.12098	-0.02239	1						
Online Mode = 1	0.08864	0.04160	0.25698	-0.10316	1					
Hybrid Mode = 1	0.06347	0.02686	0.03001	0.01231	0	1				
Face to Face Mode = 1	-0.10768	-0.04967	-0.2584	0.09522	0	0	1			
Term Summer = 1 F, Sp = 0	0.03420	-0.0022	0.07916	-0.0208	0.15873	-0.0221	-0.1454	1		
Year	0.01599	0.02523	-0.0674	-0.0126	-0.0037	-0.02166	0.01116	-0.0217	1	
Course Level	0.11361	0.11378	0.23266	-0.00668	0.29404	0.17934	-0.34628	.02257	-0.15089	1
Alien = 1 o/w = 0	0.02855	0.03443	0.01041	-0.0203	-0.0201	0.01775	0.01319	-0.003	-0.0178	.0286
Asian = 1 o/w = 0	0.01712	0.01107	-0.0075	-0.0200	-0.0117	0.00143	0.01080	0.0067	0.00620	-.004
Black = 1 o/w = 0	-0.12268	-0.1383	0.06163	-0.0750	-0.0102	-0.0055	0.01181	0.0059	0.01761	-.059
Hispanic = 1 o/w = 0	-0.0096	-0.0074	0.00374	-0.0178	-0.0278	-0.0019	0.02754	-0.0091	0.01795	-.013
White= 1 o/w = 0	0.08784	0.09822	-0.0615	0.08652	0.02930	-0.0009	-0.0279	-0.0014	-0.0203	.046

As expected, the highest correlation is between course grade awarded to student in the course and the student's previous GPA. One would expect student with high previous GPA to get a high grade on a course.

It also shows there is correlation between course level and online and hybrid modes. There is a low correlation between summer terms and online sections, as there are more online sections in the summer proportionally. Most of these extra online and hybrid sections are for junior and senior courses.

There is low correlation between age and online but not hybrid modes. This is probably because older students do more online courses. Female students tend to achieve higher grades in all cases.

There are low correlations between course level and final grade. There is also a negative correlation between course grades and previous GPA with black ethnicity.

This correlation analysis showed nothing unexpected.

Next, the study reports its regression analysis.

Table 3 – Regression on Course Grade using all Predictors including Previous GPA.

Regression Statistics	
Multiple R	0.44022
R Square	0.19380
Adjusted R Square	0.19370
Standard Error	0.94911
Observations	109950

ANOVA	*df*	*SS*	*MS*	*F*
Regression	13	23805.55	1831.2	2202.3
Residual	109937	99031.37	0.901	
Total	109950	122836.9		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	0.4051	0.0274	14.7722	0.0000
Previous GPA	**0.8062**	0.0055	145.7140	0.0000
Age	0.0011	0.0006	1.8808	0.0600
Online Mode = 1	0	0	65535	0.0000
Hybrid Mode = 1	0.2122	0.0198	10.7442	0.0000
Face to Face Mode = 1	-0.1520	0.0076	-20.0079	0.0000
Term Sum = 1 F, Sp = 0	0.0966	0.0100	9.6160	0.0000
Course Level	0.0462	0.0036	12.8545	0.0000
Sex M = 1 F = 0	-0.0054	0.0059	-0.9119	0.3618
Alien = 1 o/w = 0	0.1254	0.0221	5.6608	0.0000
Asian = 1 o/w = 0	0.0845	0.0172	4.9038	0.0000
Black = 1 o/w = 0	-0.1115	0.0132	-8.4557	0.0000
Hispanic = 1 o/w = 0	0.0152	0.0146	1.0410	0.2979
White= 1 o/w = 0	0.0650	0.0118	5.5101	0.0000

This regression backed up correlation analysis. The biggest predictor of a student's course final grade was the student's previous GPA. However, hybrid mode was the second biggest correlator, with F2F a negative correlator. Online was neutral. This suggests that hybrid mode achieves higher course grade than online, which achieves higher than F2F.

As expected, Alien ethnicity followed by Asian ethnicity are higher predictors than White, whilst Black is a negative predictor. This shows that Alien and Asian ethnicities tend to get higher grades than Whites and Hispanics, who get higher grades than Blacks.

As the biggest correlation and predictor of course grade is previous GPA, I reran the regression without previous GPA below in Table 4. Again, hybrid mode was better than online, which was better than F2F. Aliens and Asians tended to get better grades than Whites or Hispanics, who tended to get better grades than Blacks.

Table 4 – Results of Regression of Course Grade without Previous GPA.

Regression Statistics	
Multiple R	0.1948
R Square	0.0380
Adjusted R Square	0.0379
Standard Error	1.0438
Observations	118279

ANOVA

	df	*SS*	*MS*	*F*
Regression	12	5083.39	423.62	424.12
Residual	118267	128865.67	1.09	
Total	118279	133949.06		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	2.989	0.022	134.760	0.000
Age	-0.004	0.001	-6.105	0.000
Online Mode = 1	0	0	65535	0.0000
Hybrid Mode = 1	0.2302	0.0216	10.6736	0.0000
Face to Face Mode = 1	-0.1644	0.0082	-20.1349	0.0000
Term Sum = 1 F, Sp = 0	0.0912	0.0108	8.4650	0.0000
Course Level	0.0974	0.0038	25.8812	0.0000
Sex M = 1 F = 0	-0.1177	0.0062	-18.9617	0.0000
Alien = 1 o/w = 0	0.2094	0.0231	9.0620	0.0000
Asian = 1 o/w = 0	0.1125	0.0183	6.1519	0.0000
Black = 1 o/w = 0	-0.2464	0.0140	-17.6593	0.0000
Hispanic = 1 o/w = 0	0.0085	0.0154	0.5500	0.5823
White= 1 o/w = 0	0.1083	0.0125	8.6516	0.0000

Hybrid was the biggest predictor in this case. When using only previous GPA as a predictor of course GPA, the regression had an adjusted R^2 of 90.9%, see Table 5 below.

As previous GPA is the best predictor of final course grade, The stduy looked at final course grade by previous GPA. Some student-course records had missing previous GPA, so they were eliminated form this sample.

Table 5 – Regression using only Previous GPA

Regression Statistics	
Multiple R	0.9534
R Square	0.9090
Adjusted R Square	0.9090
Standard Error	0.9596
Observations	109950

ANOVA	*df*	*SS*	*MS*	*F*
Regression	1	1011666	1011666	1098531
Residual	109949	101255	1	
Total	109950	1112921		

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Previous GPA	0.9518	0.0009	1048.1	0.0000

Analysis of Mode Effect

The initial analysis suggested that the teaching mode relates to the final course grade, so the study did more analysis. As Year and Age had no noticed effect on results the study deleted that information from the following result tables. The summer term and level columns are missing from most of the following tables, as the study did not consider them major factors.

Table 6 - Data for all students by Mode

Instructor Mode	N %	Course Grade	Previous GPA	Sex Male	Summer Term	Course Level	Alien	Asian	Black	Hispanic	White
Online	24958	3.174	3.184	47.9%	17.7%	2.913	1.8%	4.3%	16.6%	7.9%	62.3%
OL SD	21.1%	0.992	0.486			0.864					
Hybrid	2638	3.439	3.234	61.7%	4.8%	3.457	4.1%	5.0%	15.9%	9.1%	59.3%
Hy SD	2.2%	0.795	0.433			0.561					
Face2Face	90684	2.929	3.127	60.3%	6.7%	2.246	2.5%	4.9%	17.6%	9.9%	58.8%
F2F SD	76.7%	1.081	0.546			0.814					
All	118280	2.992	3.142	57.7%	9.0%	2.414	2.4%	4.8%	17.3%	9.5%	59.6%
All SD		1.064	0.532			0.878					

Note: the second row for each mode is the standard deviation for that mode for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row). Subsequent tables use this layout for standard deviations.

Separating results by teaching mode shows that the hybrid mode leads to higher course grades over online mode (8.34%), and online over F2F (8.38%). Although previous GPA for hybrid is higher than online (1.56%), which is higher than F2F (1.81%), it appears that hybrid mode leads to higher course grades for similar previous GPA. However, these results are for all students. To

examine the effect of different demographics, the analysis looked at results by various student characteristics.

Table 7 - Data for all students by Sex and Mode

N %	Sex	Instruct Mode	Course Grade	Previous GPA	Online	Hybrid	Face To Face	Alien	Asian	Black	Hispanic	White
35999	Female	F2F	2.98	3.21558				3.08%	5.41%	21.23%	10.84%	53.08%
30.44%	Female	F2F	1.066	0.52673								
1010	Female	Hybrid	3.509	3.27837				4.67%	5.76%	22.52%	9.63%	50.84%
0.85%	Female	Hybrid	0.762	0.45825								
13016	Female	Online	3.23	3.21776				1.56%	4.84%	18.82%	8.03%	59.13%
11.00%	Female	Online	0.96	0.48068								
50025	Female	All	3.056	3.21744	26.02%	2.02%	71.96%	2.71%	5.27%	20.63%	10.08%	54.61%
42.29%	Female	All	1.042	0.51354								
54684	Male	F2F	2.807	3.16018				2.38%	5.01%	21.56%	10.18%	54.01%
46.23%	Male	F2F	1.09	0.55084								
1628	Male	Hybrid	3.394	3.20528				3.81%	4.48%	11.86%	8.78%	64.50%
1.38%	Male	Hybrid	0.814	0.41971								
11943	Male	Online	3.114	3.14769				1.98%	3.68%	14.10%	7.75%	65.85%
10.10%	Male	Online	1.023	0.48791								
68255	Male	All	2.945	3.08727	17.50%	2.39%	80.11%	2.09%	4.40%	14.88%	9.02%	63.20%
57.71%	Male	All	1.078	0.53829								

Note: the second row for each case is the standard deviation for that case for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).

First, notice that the overall sex balance is 57.7% male to 42.3%. Despite this, more females do more online courses than male students; 26.2% of female student-courses are online versus 17.5% for male. More male students (2.39%) do hybrid than female (2.02%).

Table 8 – Full Data for all students by Course Level and Mode

N %	Course Level	Instruct Mode	Course Grade	Previous GPA	Sex Male	Online	Hybrid	Face to Face	Alien	Asian	Black	Hispanic	White
7045	4000	F2F	3.182	3.227	59.42%				4.05%	4.10%	14.05%	9.75%	61.92%
5.96%		F2F	0.848	0.384									
1292	4000	Hybrid	3.437	3.275	65.56%				4.49%	3.56%	12.85%	9.52%	63.54%
1.09%		Hybrid	0.75	0.408									
6913	4000	Online	3.321	3.214	46.56%				1.87%	4.47%	14.44%	8.06%	64.21%
5.84%		Online	0.867	0.401									
15250	4000	All	3.267	3.225	54.11%	45.32%	8.48%	46.19%	3.10%	4.22%	14.13%	8.97%	63.09%
12.89%		All	0.853	0.396									
22840	3000	F2F	3.071	3.230	61.64%				3.19%	5.14%	14.97%	9.66%	60.63%
19.31%		F2F	0.941	0.424	48.63%								
1256	3000	Hybrid	3.493	3.213	59.24%				3.58%	6.21%	18.31%	8.92%	55.97%
1.06%		Hybrid	0.816	0.431									
10375	3000	Online	3.187	3.215	49.48%				1.92%	4.49%	15.38%	7.78%	63.43%
8.77%		Online	0.978	0.439									
34471	3000	All	3.121	3.225	57.89%	30.10%	3.65%	66.26%	2.82%	4.99%	15.22%	9.07%	61.31%
29.14%		All	0.952	0.429									
46178	2000	F2F	2.802	3.066	61.60%				2.01%	4.88%	18.20%	9.93%	58.69%
39.04%		F2F	1.146	0.564									
87	2000	Hybrid	2.69	2.883	42.53%				6.90%	6.90%	27.59%	5.75%	43.68%
0.07%		Hybrid	0.782	0.654									
6261	2000	Online	2.966	3.077	48.01%				1.37%	3.87%	19.93%	7.94%	59.10%
5.29%		Online	1.125	0.535									
52526	2000	All	2.822	3.067	59.95%	11.92%	0.17%	87.92%	1.94%	4.77%	18.42%	9.69%	58.71%
44.41%		All	1.164	0.587									
14619	1000	F2F	2.983	3.090	54.55%				1.98%	4.90%	21.27%	10.34%	54.85%
12.36%		F2F	1.044	0.646									
1409	1000	Online	3.287	3.254	41.45%				1.85%	3.69%	20.65%	7.74%	59.69%
1.19%		Online	0.882	0.601									
16028	1000	All	3.008	3.105	53.46%	8.80%	0.00%	91.20%	1.97%	4.80%	21.20%	10.09%	55.34%
13.55%		All	1.035	0.644									

Note: the second row for each case is the standard deviation for that case for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).

In senior and junior year students, hybrid (3.44, 3.49) has higher final grades than online (3.32, 3.187), which has higher than F2F (3.183, 3.02), Hybrid numbers in sophomore year are too small to use. Online (2.96, 3.287) is superior to F2F (2.8, 2.98) in sophomore and freshman years. Grades go slightly up with level for all modes except hybrid.

Table 9 – Percentage of Level Student-courses for all students by Course Level and Mode

Course Level	F2F	Hybrid	Online
4000	46.2	8.47	45.33
3000	66.21	3.69	30.1
2000	87.91	0.17	11.92
1000	91.2	0	8.8

In senior and junior year students, hybrid has higher final Grades than online, which has higher than F2F. Hybrid numbers in sophomore year are too small to use. Online is superior to F2F in sophomore and freshman years.

Table 10 – Percentage of Student-courses for all students by Course Level and Mode

Course Level	F2F	Hybrid	Online
4000	46.2	8.47	45.33
3000	66.26	3.64	30.1
2000	87.91	0.17	11.92
1000	91.21	0	8.79

In senior year students, there are almost as many online student-courses as F2F. In freshman year, there are very few (1.19%). So, both hybrid and online increase as a percentage of year's total student-courses. It is interesting that the overall mean final Grade for all student-courses is almost exactly a B (3.008).

Table 11 - Data for all students by Summer Term and Mode

N %	Term	Instruct Mode	Course Grade	Previous GPA	Sex Male	Online	Hybrid	Face to Face	Alien	Asian	Black	Hispanic	White
84632	F, Sp	F2F	2.921	21.611	60.43%				2.49%	4.85%	17.48%	9.95%	58.91%
71.56%	F, Sp	F2F	1.084	4.422									
2512	F, Sp	Hybrid	3.454	23.456	61.74%				4.26%	4.94%	15.90%	9.17%	59.19%
2.12%	F, Sp	Hybrid	0.769	4.958									
20530	F, Sp	Online	3.167	25.025	47.71%				1.64%	4.17%	16.43%	7.98%	62.45%
17.36%	F, Sp	Online	1.003	6.380									
107674	F, Sp	All	2.98	22.305	58.03%	19.07%	2.33%	78.60%	2.37%	4.72%	17.24%	9.55%	59.59%
91.04%	F, Sp	All	1.069	5.052									
6052	Summer	F2F	3.033	22.906	58.56%				2.07%	5.55%	18.69%	9.47%	57.42%
5.12%	Summer	F2F	1.038	5.638									
123	Summer	Hybrid	3.146	22.897	59.87%				1.97%	5.54%	18.60%	9.49%	57.57%
0.10%	Summer	Hybrid	1.143	5.580									
4426	Summer	Online	3.208	24.875	48.57%				2.33%	4.77%	17.17%	7.50%	61.94%
3.74%	Summer	Online	0.942	6.355									
10601	Summer	All	3.107	23.732	54.44%	41.74%	1.18%	57.08%	2.17%	5.23%	18.03%	8.62%	59.34%
8.96%	Summer	All	1.004	6.021									

Note: the second row for each case is the standard deviation for that case for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row). Note: the second row for each mode is the standard deviation for that mode for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).

Note how online has a far larger percentage in summer (41.75% versus 19.7%). Hybrid declines from 2.33% in spring to 1.16% in summer. Final mean course grades for online and F2F both very slightly increase in summer, whilst hybrid declines from 3.45 to 3.15.

Table 12 - Data for all students by Term and Mode

N %	Term	Instruct Mode	Course Grade	Previous GPA	Sex Male	Online	Hybrid	Face to Face	Alien	Asian	Black	Hispanic	White
41009	Fall	F2F	2.9	3.122	61.18%				2.59%	4.81%	17.31%	9.74%	59%
34.67%	Fall	F2F	1.1	0.537									
1141	Fall	Hybrid	3.366	3.219	60.56%				5.52%	5.17%	16.56%	9.38%	57.58%
0.96%	Fall	Hybrid	0.81	0.444									
10073	Fall	Online	3.152	3.184	48.14%				1.67%	4.04%	15.52%	7.69%	63.79%
8.52%	Fall	Online	1.015	0.478									
52223	Fall	All	2.959	3.137	58.65%	19.29%	2.19%	78.53%	2.47%	4.67%	16.95%	9.34%	59.99%
44.15%	Fall	All	1.085	0.524									
43623	Spring	F2F	2.941	3.135	59.71%				2.40%	4.88%	17.63%	10.14%	58.71%
36.88%	Spring	F2F	1.068	0.554									
1370	Spring	Hybrid	3.528	3.255	62.63%				3.21%	4.74%	15.33%	9.05%	60.51%
1.16%	Spring	Hybrid	0.725	0.421									
10459	Spring	Online	3.181	3.187	47.28%				1.62%	4.31%	17.31%	8.25%	61.13%
8.84%	Spring	Online	0.991	0.483									
55452	Spring	All	3.001	3.147	57.44%	18.86%	2.47%	78.67%	2.27%	4.77%	17.51%	9.76%	59.21%
46.88%	Spring	All	1.054	0.539									
6052	Summer	F2F	3.033	3.109	58.56%				2.07%	5.55%	18.69%	9.47%	57.42%
5.12%	Summer	F2F	1.038	0.539									
125	Summer	Hybrid	3.135	3.143	62.70%				1.59%	5.56%	16.67%	7.14%	61.11%
0.11%	Summer	Hybrid	1.097	0.536									
4426	Summer	Online	3.209	3.178	48.55%				2.33%	4.77%	17.17%	7.50%	61.93%
3.74%	Summer	Online	0.941	0.509									
10603	Summer	All	3.107	3.138	54.43%	41.73%	1.20%	57.07%	2.17%	5.22%	18.03%	8.62%	59.35%
8.96%	Summer	All	1.004	0.528									

Note: the second row for each case is the standard deviation for that case for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).

There does not appear to be much differences in mode percentages or mode course final grades between Fall and Spring terms, so the study does not use that data further.

Table 13 - Data for all students by Discipline and Mode

N %	Course Discipline	Instruct Mode	Course Grade	Previous GPA	Sex Male	Online	Hybrid	Face To Face	Alien	Asian	Black	Hispanic	White
15215	ACCT	F2F	2.66	3.06	61.66%				1.93%	4.81%	18.51%	9.99%	58.46%
13.75%	ACCT	F2F	1.23	0.57									
1345	ACCT	Online	2.87	3.10	47.36%				1.12%	3.20%	20.67%	7.81%	59.48%
1.22%	ACCT	Online	1.16	0.58									
16560	ACCT	All	2.67	3.06	60.50%	8.12%	0.00%	91.88%	1.86%	4.68%	18.68%	9.81%	58.54%
14.97%	ACCT	All	1.23	0.58									
6963	BLAW	F2F	3.19	3.04	62.92%				1.92%	4.78%	17.78%	10.20%	59.40%
6.29%	BLAW	F2F	1.07	0.61									
663	BLAW	Online	3.10	3.06	47.06%				1.66%	4.07%	20.97%	6.79%	59.13%
0.60%	BLAW	Online	1.08	0.63									
7626	BLAW	All	3.18	3.04	61.54%	8.69%	0.00%	91.31%	1.90%	4.72%	18.06%	9.90%	59.38%
6.89%	BLAW	All	1.07	0.61									
38036	ECON	F2F	2.82	3.10	58.23%				2.11%	4.94%	18.94%	9.96%	57.57%
34.38%	ECON	F2F	1.10	0.59									
94	ECON	Hybrid	2.79	2.94	45.74%				7.45%	6.38%	26.60%	7.45%	43.62%
0.08%	ECON	Hybrid	0.83	0.66									
3783	ECON	Online	3.17	3.16	43.38%				1.82%	4.20%	20.30%	7.98%	58.58%
3.42%	ECON	Online	0.96	0.58									
41913	ECON	All	2.85	3.11	56.86%	9.03%	0.23%	90.75%	2.09%	4.87%	19.08%	9.77%	57.63%
37.88%	ECON	All	1.10	0.59									
4713	FIN	F2F	2.87	3.26	61.69%				3.50%	5.62%	13.88%	10.12%	60.70%
4.26%	FIN	F2F	1.03	0.42									
702	FIN	Hybrid	3.18	3.27	70.23%				5.56%	4.42%	11.54%	10.68%	62.11%
0.63%	FIN	Hybrid	0.80	0.43									
731	FIN	Online	2.78	3.21	48.29%				2.05%	3.83%	16.01%	7.39%	63.34%
0.66%	FIN	Online	1.04	0.45									
6146	FIN	All	2.89	3.25	61.08%	11.89%	11.44%	76.67%	3.56%	5.27%	13.86%	9.86%	61.17%
5.55%	FIN	All	1.02	0.43									
6970	IS	F2F	3.30	3.15	64.88%				2.83%	5.44%	17.26%	10.01%	57.92%
6.30%	IS	F2F	0.91	0.53									
249	IS	Hybrid	3.64	3.19	59.04%				6.02%	7.63%	19.68%	8.43%	53.82%
0.23%	IS	Hybrid	0.75	0.44									
4729	IS	Online	3.05	3.15	52.08%				1.63%	4.00%	16.37%	8.35%	62.42%
4.27%	IS	Online	1.11	0.54									
11948	IS	All	3.21	3.15	59.69%	39.57%	2.09%	58.33%	2.42%	4.91%	16.96%	9.32%	59.62%
10.80%	IS	All	1.00	0.53									
473	ISA	F2F	3.01	3.13	55.77%				1.59%	4.40%	17.42%	7.89%	61.12%
0.43%	ISA	F2F	1.07	0.52									
347	ISA	Online	3.16	3.21	67.44%				0.86%	7.49%	18.73%	8.36%	54.18%
0.31%	ISA	Online	0.96	0.46									
820	ISA	All	3.07	3.19	76.44%	42.38%	0.00%	57.62%	0.98%	7.56%	19.63%	6.34%	55.13%
0.74%	ISA	All	1.02	0.45									
9995	MGT	F2F	3.23	3.23	62.70%				3.76%	4.53%	14.56%	9.71%	60.96%
9.03%	MGT	F2F	0.83	0.41									
1592	MGT	Hybrid	3.56	3.24	59.36%				3.02%	4.71%	16.65%	8.61%	59.80%
1.44%	MGT	Hybrid	0.75	0.41									
8694	MGT	Online	3.37	3.23	49.71%				2.06%	4.68%	15.02%	7.80%	64.02%
7.86%	MGT	Online	0.82	0.42									
20281	MGT	All	3.32	3.23	56.87%	42.86%	7.85%	49.28%	2.97%	4.61%	14.92%	8.81%	62.18%
18.33%	MGT	All	0.83	0.41									
8315	MKTG	F2F	3.09	3.22	56.28%				3.14%	4.34%	15.11%	9.69%	61.88%
7.51%	MKTG	F2F	0.85	0.41									
4665	MKTG	Online	3.09	3.18	42.47%				1.52%	4.07%	14.71%	7.76%	63.94%
4.22%	MKTG	Online	1.04	0.42									
12980	MKTG	All	3.09	3.20	51.32%	35.94%	0.00%	64.06%	2.56%	4.24%	14.96%	9.00%	62.62%
11.73%	MKTG	All	0.92	0.41									

Note: the second row for each case is the standard deviation for that case for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).

Table 14 – Percent of Student-courses in each Discipline taught in each Mode

Discipline	F2F	Hybrid	Online
ACCT	91.9	0	8.1
BLAW	91.5	0	8.7
ECON	90.7	0.2	9
FIN	76.7	11.4	11.9
IS	58.3	2.1	59.6
ISA	58.3	0	42.3
MGT	49.3	7.8	42.9
MKTG	64.1	0	35.9

Table 15 – Mean Final Grade Awarded in each Discipline taught in each Mode

Discipline	F2F	Hybrid	Online
ACCT	2.66.		3.87
BLAW	3.19		3.1
ECON	2.82	2.99	3.17
FIN	2.87	3.18	2.78
IS	3.3	3.64	3.21
ISA	3.01		3.15
MGT	3.23	3.56	3.37
MKTG	3.09		3.09

All disciplines have online sections but only IS, ISA, MGT, and MKTG have as many online as F2F students-courses. All disciplines have online mean grades similar or superior to F2F sections.

Only ECON, FIN, IS, and MGT have hybrid sections. In all disciplines with hybrid sections, the mean final grade for hybrid is superior to online or F2F.

As some students were N/A for unknown for Ethnicity and thus I deleted them. The resulting total data sets was 115358 student-course records.

Table 16 - Data for all students by Ethnicity, Mode and Sex

N %	Ethnicity	Instructor Mode	Sex	Course Grade	Previous GPA	Sex Male	Online	Hybrid	Face to Face
1075	Alien	F2F	Female	3.2456	3.363				
0.93%	Alien	F2F	Female	0.9331	0.473				
1040	Alien	F2F	Male	3.1029	3.193				
0.90%	Alien	F2F	Male	1.0933	0.55				
2115	Alien	F2F	All	3.1744	3.279	49.1%			
1.83%	Alien	F2F	All	1.018	0.523				
46	Alien	Hybrid	Female	3.6087	3.38				
0.04%	Alien	Hybrid	Female	0.6824	0.413				
59	Alien	Hybrid	Male	3.4576	3.254				
0.05%	Alien	Hybrid	Male	0.7502	0.543				
105	Alien	Hybrid	All	3.498	3.279	55.1%			
0.09%	Alien	Hybrid	All	0.766	0.569				
190	Alien	Online	Female	3.4105	3.35				
0.16%	Alien	Online	Female	0.72	0.568				
208	Alien	Online	Male	3.1683	3.183				
0.18%	Alien	Online	Male	0.9709	0.49				
398	Alien	Online	All	3.2778	3.257	52.1%			
0.35%	Alien	Online	All	0.875	0.551				
2618	Alien	All	All	3.2	3.27	49.9%	15.2%	4.1%	80.7%
2.27%	Alien	All	All	0.9932	0.541				
1947	Asian	F2F	Female	3.0832	3.265				
1.69%	Asian	F2F	Female	1.0897	0.547				
2462	Asian	F2F	Male	2.9549	3.08				
2.13%	Asian	F2F	Male	1.078	0.547				
4409	Asian	F2F	All	3.0111	3.161	55.8%			
3.82%	Asian	F2F	All	1.0851	0.556				
58	Asian	Hybrid	Female	3.4138	3.319				
0.05%	Asian	Hybrid	Female	0.8793	0.447				
70	Asian	Hybrid	Male	3.4571	3.198				
0.06%	Asian	Hybrid	Male	0.716	0.385				
128	Asian	Hybrid	All	3.4176	3.23	54.3%			
0.11%	Asian	Hybrid	All	0.8165	0.482				
629	Asian	Online	Female	3.3291	3.266				
0.55%	Asian	Online	Female	0.9349	0.459				
435	Asian	Online	Male	3.223	3.072				
0.38%	Asian	Online	Male	0.99	0.599				
1064	Asian	Online	All	3.2835	3.184	40.8%			
0.92%	Asian	Online	All	0.9606	0.535				
5601	Asian	All	All	3.072	3.165	53.0%	19.0%	2.3%	78.7%

4.86%	Asian	All	All	1.0629	0.555				
7642	Black	F2F	Female	2.7249	3.062				
6.62%	Black	F2F	Female	1.158	0.57				
8279	Black	F2F	Male	2.5743	2.89				
7.18%	Black	F2F	Male	1.1545	0.576				
15921	Black	F2F	All	2.6465	2.972	52.0%			
13.80%	Black	F2F	All	1.1586	0.58				
227	Black	Hybrid	Female	3.2907	3.085				
0.20%	Black	Hybrid	Female	0.9612	0.481				
193	Black	Hybrid	Male	3.3316	3.111				
0.17%	Black	Hybrid	Male	0.8378	0.476				
420	Black	Hybrid	All	3.3039	3.091	45.8%			
0.36%	Black	Hybrid	All	0.9108	0.494				
2449	Black	Online	Female	2.9388	3.016				
2.12%	Black	Online	Female	1.0901	0.494				
1684	Black	Online	Male	2.7838	2.97				
1.46%	Black	Online	Male	1.1434	0.566				
4133	Black	Online	All	2.8752	2.997	40.7%			
3.58%	Black	Online	All	1.1148	0.498				
20474	Black	All	All	2.706	2.98	49.6%	20.2%	2.1%	77.8%
17.75%	Black	All	All	1.1522	0.563				
3901	Hispanic	F2F	Female	2.9277	3.167				
3.38%	Hispanic	F2F	Female	1.0507	0.529				
5091	Hispanic	F2F	Male	3.4406	3.264				
4.41%	Hispanic	F2F	Male	0.869	0.368				
8992	Hispanic	F2F	All	3.4555	3.27	59.1%			
7.79%	Hispanic	F2F	All	0.828	0.415				
97	Hispanic	Hybrid	Female	3.2	3.182				
0.08%	Hispanic	Hybrid	Female	0.9177	0.433				
143	Hispanic	Hybrid	Male	3.0941	3.173				
0.12%	Hispanic	Hybrid	Male	1.051	0.537				
240	Hispanic	Hybrid	All	3.1491	3.176	46.9%			
0.21%	Hispanic	Hybrid	All	0.9726	0.467				
1045	Hispanic	Online	Female	3.1971	3.182				
0.91%	Hispanic	Online	Female	0.923	0.433				
925	Hispanic	Online	Male	3.0941	3.173				
0.80%	Hispanic	Online	Male	1.051	0.537				
1970	Hispanic	Online	All	3.1491	3.176	46.9%			
1.71%	Hispanic	Online	All	0.9726	0.467				
11202	Hispanic	All	All	2.9589	3.128	55.0%	17.6%	2.2%	80.2%
9.71%	Hispanic	All	All	1.0622	0.54				
1551	Multi	F2F	Female	2.8885	3.197				
1.34%	Multi	F2F	Female	1.1398	0.587				
2235	Multi	F2F	Male	2.8421	3.026				

1.94%	**Multi**	**F2F**	**Male**	1.1598	0.63				
3786	**Multi**	**F2F**	**All**	2.8606	3.096	59.0%			
3.28%	**Multi**	**F2F**	**All**	1.1518	0.62				
45	**Multi**	**Hybrid**	**Female**	3.3778	3.206				
0.04%	**Multi**	**Hybrid**	**Female**	3.364	3.191				
70	**Multi**	**Hybrid**	**Male**	3.4286	3.187				
0.06%	**Multi**	**Hybrid**	**Male**	0.7722	0.46				
115	**Multi**	**Hybrid**	**All**	3.408	3.194	60.3%			
0.10%	**Multi**	**Hybrid**	**All**	0.7868	0.459				
633	**Multi**	**Online**	**Female**	3.0758	3.122				
0.55%	**Multi**	**Online**	**Female**	1.0345	0.553				
473	**Multi**	**Online**	**Male**	3.0042	3.042				
0.41%	**Multi**	**Online**	**Male**	1.0354	0.459				
1106	**Multi**	**Online**	**All**	3.0434	3.085	42.7%			
0.96%	**Multi**	**Online**	**All**	1.0428	0.522				
5007	**Multi**	**All**	**All**	2.9124	3.094	55.5%	22.1%	2.4%	75.6%
4.34%	**Multi**	**All**	**All**	1.1269	0.601				
19108	**White**	**F2F**	**Female**	3.0738	3.274				
16.56%	**White**	**F2F**	**Female**	1.0088	0.488				
34224	**White**	**F2F**	**Male**	2.964	3.108				
29.67%	**White**	**F2F**	**Male**	1.0547	0.529				
53332	**White**	**F2F**	**All**	3.0033	3.167	64.2%			
46.23%	**White**	**F2F**	**All**	1.0399	0.521				
513	**White**	**Hybrid**	**Female**	3.6238	3.351				
0.44%	**White**	**Hybrid**	**Female**	0.6162	0.412				
1050	**White**	**Hybrid**	**Male**	3.3971	3.215				
0.91%	**White**	**Hybrid**	**Male**	0.8071	0.407				
1563	**White**	**Hybrid**	**All**	3.4698	3.257	67.1%			
1.35%	**White**	**Hybrid**	**All**	0.7601	0.419				
7696	**White**	**Online**	**Female**	3.3245	3.282				
6.67%	**White**	**Online**	**Female**	0.901	0.455				
7865	**White**	**Online**	**Male**	3.1828	3.191				
6.82%	**White**	**Online**	**Male**	0.9821	0.47				
15561	**White**	**Online**	**All**	3.2527	3.236	50.5%			
13.49%	**White**	**Online**	**All**	0.9456	0.465				
70456	**White**	**All**	**All**	3.0686	3.185	61.2%	22.1%	2.2%	75.7%
61.08%	**White**	**All**	**All**	1.0214	0.508				

Note: the second row for each case is the standard deviation for that case for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).

Table 17 – Grade Data for all students by Ethnicity, and Mode

Ethnicity	F2F	Hybrid	Online	All
Alien	3.174	3.478	3.278	3.2
Asian	3.011	3.418	3.284	3.072
Black	2.647	3.304	2.875	2.706
Hispanic	3.114	3.149	3.049	3.128
Multiracial	2.861	3.408	3.043	2.912
White	3.003	3.47	3.253	3.069

Note that for all ethnicities, hybrid mode produces the highest grade, and for all except Hispanics, online is better than F2F. The study uses the White mean as the base case in the next table, as it is the largest ethnicity.

Table 18 – Final Grade data compared to Whites. for all students by Ethnicity, and Mode

Ethnicity	F2F	Hybrid	Online	All
Alien	**0.171**	0.008	0.025	**0.131**
Asian	0.008	**-0.052**	0.031	0.003
Black	**-0.356**	**-0.166**	**-0.378**	**-0.363**
Hispanic	**0.111**	**-0.321**	**-0.204**	0.059
Multiracial	**-0.142**	**-0.062**	**-0.21**	**-0.157**
White	0	0	0	0

Aliens and Hispanics do the best relatively in F2F sections, and in hybrid. However, for Blacks, they come closest to Whites in hybrid sections, halving their deficit as do Multiracial.

Results using only multi-mode teachers

The study then deleted all data with instructors that only taught in one mode, which gave 53,556 data sets.

Table 19 – Grade gain data for all students by Mode using only Multi-Mode Instructors

N %	Instructor Mode	Grade Gain	Course Grade	Previous GPA	Male	Alien	Asian	Black	Hispanic	White
32875	F2F	-0.179	2.95	3.13	61.8%	2.4%	5.0%	17.8%	9.6%	58.9%
61.4%	F2F	0.970	1.08	0.52						
2603	Hybrid	0.206	3.44	3.24	62.1%	3.8%	4.9%	16.0%	9.1%	59.5%
4.9%	Hybrid	0.735	0.79	0.42						
18078	Online	-0.036	3.16	3.19	47.9%	1.8%	4.3%	16.5%	7.9%	62.3%
33.8%	Online	0.926	1.01	0.47						
53556	All	-0.112	3.04	3.15	57.1%	2.2%	4.8%	17.3%	9.0%	60.1%
	All	0.950	1.06	0.50						

Note: the second row for each mode is the standard deviation for that mode for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).
As can be seen, the table shows the same results as in previous analysis. That is that hybrid is better than online, which in turn is better than F2F.

Results using only those instructors who taught hybrid mode
The study then looked at data sets with instructors who taught hybrid, with 9834 data sets with 16 instructors (about 7% of all instructors). With this data, hybrid is a far larger proportion of courses.

Table 20 – Grade Gain for all students by mode using only Instructors who teach Hybrid

N %	Instruct Mode	Grade Gain	Course Grade	Previous GPA	Male	Alien	Asian	Black	Hispanic	White
4154	F2F	0.045	3.26	3.22	63.9%	3.6%	5.4%	15.0%	10.3%	59.4%
42.2%	F2F	0.881	0.93	0.45						
2601	Hybrid	0.208	3.44	3.24	62.1%	3.8%	4.9%	16.0%	9.1%	59.5%
26.4%	Hybrid	0.731	0.79	0.42						
3079	Online	0.228	3.48	3.26	49.1%	2.2%	5.0%	14.7%	8.1%	63.2%
31.3%	Online	0.820	0.84	0.42						
9834	All	0.146	3.38	3.23	58.8%	3.2%	5.2%	15.1%	9.3%	60.6%
	All	0.829	0.87	0.44						

Note: the second row for each mode is the standard deviation for that mode for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).

Table 21 – GPA Gain and Course GPA data for all students by Instructor Type and Mode

Instructor Type	*Do Hybrid*	*All*
F2F	3.26	2.937
Hybrid	3.44	3.443
Online	3.48	3.182
All	3.38	3.003

Generally, instructors who teach some hybrid courses have higher grade gains and award higher grades in all modes than those that do not. With these multi-modal instructors, there is little difference between online and hybrid results. Though both are better than F2F results. This would tend to suggest that while hybrid is better than F2F, it is may be equivalent to online, not better as all the other data suggest. This may be because the instructors just award better grades, or that the students learn more.

Table 22 – Course Grade data for all students by Instructor Mode and Previous GPA

Instruct Mode	Prev GPA	N %	Course Grade	Male	Alien	Asian	Black	Hispanic	White
F2F	1.58	1633	1.884	69.5%	1.2%	3.6%	31.4%	10.6%	44.3%
F2F	<2	1.49%	1.332						
F2F	2.28	7370	2.153	70.6%	1.4%	5.0%	25.6%	9.7%	50.9%
F2F	2<2.5	6.72%	1.238						
F2F	2.76	19910	2.570	67.9%	2.0%	4.7%	21.3%	10.2%	55.8%
F2F	2.5<3	18.16%	1.123						
F2F	3.22	31893	3.002	58.5%	2.1%	4.5%	16.1%	9.9%	61.5%
F2F	3<3.5	29.08%	0.934						
F2F	3.74	22241	3.512	52.3%	3.3%	5.6%	11.8%	9.3%	62.9%
F2F	3.5-4	20.28%	0.714						
F2F	3.14	83047	2.937	60.4%	2.3%	4.9%	17.3%	9.8%	59.2%
F2F	All	75.73%	1.072						
Hybrid	1.53	8	2.625	37.5%	12.5%	0.0%	37.5%	0.0%	25.0%
Hybrid	<2	0.01%	0.916						
Hybrid	2.32	96	2.711	66.0%	4.1%	7.2%	20.6%	4.1%	51.5%
Hybrid	2<2.5	0.09%	1.099						
Hybrid	2.79	602	3.076	68.3%	3.2%	4.5%	24.1%	8.3%	53.7%
Hybrid	2.5<3	0.55%	0.943						
Hybrid	3.24	1155	3.469	63.6%	3.3%	4.7%	13.9%	10.1%	62.2%
Hybrid	3<3.5	1.05%	0.715						
Hybrid	3.74	742	3.792	55.3%	5.0%	4.9%	11.7%	8.9%	62.1%
Hybrid	3.5-4	0.68%	0.481						
Hybrid	3.62	2603	3.562	62.1%	3.8%	5.5%	11.9%	9.8%	61.5%
Hybrid	All	2.37%	0.729						
Online	1.59	162	2.216	51.9%	0.6%	7.4%	35.2%	6.8%	39.5%
Online	<2	0.15%	1.395						
Online	2.30	1526	2.372	53.7%	1.5%	5.5%	31.7%	5.2%	47.4%
Online	2<2.5	1.39%	1.256						
Online	3.19	5714	3.006	59.0%	2.4%	4.9%	17.1%	9.6%	59.6%
Online	2.5<3	5.21%	2.125						
Online	3.23	10056	3.237	46.8%	1.8%	3.9%	14.7%	8.5%	64.6%
Online	3<3.5	9.17%	0.886						
Online	3.74	6550	3.654	43.7%	2.2%	4.9%	9.6%	7.2%	69.2%
Online	3.5-4	5.97%	0.603						
Online	3.19	24008	3.181	48.0%	1.8%	4.3%	16.4%	7.9%	62.5%
Online	All	21.89%	0.986						
All	3.15	109658	3.003	57.7%	2.2%	4.8%	17.1%	9.4%	60.0%
All	All		1.055						

Note: the second row for each case is the standard deviation for that case for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).The second row for the previous GPA column is previous GPA range for that case.

Table 23 – Course GPA data for all students by Instructor Mode and Previous GPA

Mean Course Final Grade				
PrGPA	**F2F**	**Online**	**Hybrid**	**All**
<2	1.88	2.216	2.63	1.58
2<2.5	2.15	2.373	2.71	2.29
2.5<3	2.57	3.005	3.08	2.77
3<3.5	3.00	3.238	3.47	3.23
3.5-4	3.51	3.654	3.79	3.74
All	2.94	3.003	3.56	**3.15**

This shows that for all previous GPA, the mean final grade is better for hybrid is better than online, which is better than F2F.

Table 24 – Course GPA data for all students by Previous GPA

Prev GPA	**N %**	**Course Grade**	**Male**	**Alien**	**Asian**	**Black**	**Hispanic**	**White**
1.58	1803	**1.917**	**68%**	**1%**	**4%**	**32%**	**10%**	**44%**
<2	**1.6%**	**1.340**						
2.28	9000	**2.196**	**67.7%**	**1.4%**	**5.1%**	**26.6%**	**8.9%**	**50.3%**
2<2.5	**8.2%**	**1.265**						
2.76	26227	**2.628**	**64.7%**	**1.9%**	**4.6%**	**21.6%**	**9.8%**	**55.7%**
2.5<3	**23.9%**	**1.118**						
3.22	43104	**3.069**	**55.9%**	**2.1%**	**4.4%**	**15.7%**	**9.6%**	**62.3%**
3<3.5	**39.3%**	**0.926**						
3.74	29533	**3.551**	**50.5%**	**3.1%**	**5.5%**	**11.4%**	**8.9%**	**64.3%**
3.5-4	**26.9%**	**0.689**						
3.15	**109667**	**3.003**	**57.7%**	**2.2%**	**4.8%**	**17.1%**	**9.4%**	**60.0%**
All		**1.055**						

Note: the second row for each mode is the standard deviation for that mode for that column. The second row for number of records (N) column is the percentage of total records used in this analysis (**All** row).

Conclusions

The base data set has only 2.23% of all student-course data sets in hybrid sections. This may mean that the results are heavily biased towards online and F2F modes. However, due to the large number of data sets, I consider this analysis gives out useful information. There are two

possible output measure of a course, the course final grade or the improvement of course final grade over the mean GPA of the student when they start the course. The latter gives some useful information despite it being difficult for entering good students to improve their grade. The analysis also showed there was little difference in type of student who did each mode, except older students tended to do more online courses. This research basically replicates most of the previous studies with larger student populations, but with more information of how student types affect the results.

Detailed Results for Course Final Grade

Previous GPA
The biggest predictor of a student's grade in a course was their previous GPA at the start of the course.

Sex
Generally, female students tend to get higher grades than male students.

Ethnicity
Alien followed by Asian students tend to get the highest course grades. Black students tend to get lower grades than other ethnicities. Hybrid gives the highest course grades for all ethnicities. However, the hybrid advantage is largest for Blacks and least for Hispanics.

Mode
Overall, hybrid grades were higher than online grades, which were higher than F2F grades. Hybrid courses tend to be junior or senior courses.

Discipline
Only half the disciplines use hybrid modes. It could be argued that this may affect results. However, in all disciplines with hybrid courses, the hybrid mean course grade is higher than that for online or F2F.

Are there differences (both with demographics and with previous academic achievement) in the students using the different teaching modes?
There is little large variations between the demographics of students doing the different modes. Do different demographics have different student final grade outcomes in different modes?

Outcomes here are either final course grade or the difference (grade gain) between final course grade and the student's GPA at the start of the course.

There are clear difference between outcomes for different teaching modes, and different demographics affect these outcomes.

Future Work

One should repeat the same analysis again using only data from those instructors who teach hybrid as one of their modes and ignore all data from instructors who do not teach in the hybrid mode. It could be that better or easier grader instructors tend to teach hybrids. One should also do the analysis for all colleges at KSU; not just those in the business school to see if these trends are replicated across other subject matter. It may be these conclusions are unique to

business schools. One should also do a similar analysis for all sections over this period for KSU not just one college.
As courses are no due to Covid taught using the rotating hybrid and synchronous modes, then there should be research to examine how these new modes affect results.

While this study showed hybrid mode teaching had better results than F2F, it did not show why. One line of interesting research would be to find out why hybrid does better. One theory could be is that hybrid only does interesting interactive stuff in person, while less interesting basic learning is done online. Another theory might be that would also explain knowledge acquisition, is best done using a student's preferred learning times and speed, whilst more advanced learning is best done in an interactive in person manner.

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