Research Article

Does Exam Formatting Affect Grades in Online Agricultural Marketing Courses?

Juan Pachon[a], Bachir Kassas[a], John Lai[a], Gulcan Onel[a]
[a]*University of Florida*

JEL Codes: A20, A22
Keywords: Bloom's Taxonomy, exam formatting, online learning, student performance

Abstract
Understanding factors affecting student performance in online exams can help improve the accuracy and equity of performance assessment tools. While there is a significant body of literature dating back to the 1980s on the accurate assessment of performance in traditional in-person exams, the literature evaluating online exams in online classroom settings has been scarce. During the COVID-19 pandemic, online course offerings along with online exams in these courses have surged, leading to a renewed interest in understanding the extent to which formatting of exam questions could affect students' grades. This study contributes to the literature on student exam performance in online classes by evaluating how scores are affected by two exam formatting treatments: ordering exam questions by chapter number and by question difficulty level. Two exams were administered in an online Agricultural Marketing class in two consecutive semesters. We investigate the treatment effects on average exam scores and exam grade distributions. The results show that neither type of exam formatting treatment has a significant impact on grade outcomes.

1. Introduction

Student performance in higher education institutions has been continuously monitored as the COVID-19 pandemic forced many in-person courses to be offered online (Rahim 2020; Clark et al. 2020). The pandemic has brought unforeseen consequences for universities across the United States, as instructors had to scramble and adapt their curriculum to a distance-based online environment. This dramatic shift has been coined as "emergency online learning" due to the unprecedented teaching adaptations that had to occur. Courses that were traditionally face-to-face have found new ways to teach and assess students. Information technology (IT) capacity at universities has been expanded, and teaching faculty have become "instructional MacGyver's" (Hodges et al. 2020). Universities were not alone in facing challenges adapting to the fast-paced changes in delivery; students from different socioeconomic backgrounds also faced distinct issues during the unprecedented times of the COVID-19 lockdowns (Rahim 2020). The "emergency online learning" ignited by the COVID-19 lockdowns has facilitated online teaching to become a more widely accepted form of educational delivery as the pandemic lingered for months (Manfuso 2020).

In this study, we leverage an experiment conducted during the COVID-19 pandemic to analyze whether instructors' exam formatting choices, with respect to the order of questions appearing in online exams, play any significant role in students' test performance. We investigate the impact of two specific formatting variations on student grades: (a) the ordering of questions by ascending vs. descending difficulty and (b) the ordering of questions chronologically vs. reverse chronologically by chapter. These formats are of interest because ascending vs. descending difficulty might differentially influence students' outlook and confidence during a test, while chronological vs. reverse chronological order of questions might influence students' performance on an exam through primacy (remembering earlier things learned) and recency (remembering last things learned). The findings of the study have

implications for addressing the accuracy and fairness of online assessments in evaluating student performance, which is an increasingly relevant issue given the prevalence of online teaching during and after the COVID-19 pandemic. To our knowledge, this study is the first to specifically focus on online exams and courses offered in agricultural economics, and to question whether exam formatting affects the performance of agricultural economics students taking online courses.

There are different reasons for why exam formatting could be consequential for student performance. Context cues that sequential (by chapter) exam questions carry can inherently give memory retrieval cues and impart an advantage to students. On the other hand, exam questions ordered by difficulty levels, from easier to harder, can boost confidence levels of students and provide another type of advantage to students (Russell et al. 2003). Another possibility, ordering the most difficult questions first on an exam, is that such initial questions can anchor a student's perception of an exam and affect their self-evaluation on the test (Bard and Weinstein 2017).

Exam formatting and its impact on student performance were first investigated when a psychology professor questioned whether anti-cheating techniques were detrimental to student grades (Norman 1954). Norman (1954) compared how students fared in exams that were formatted with questions ordered in a forward sequence by chapters versus those ordered in a reverse sequence by chapters. His experiment concluded that the order of questions did have a significant impact on student exam scores. A multitude of studies in the fields of psychology, economics, and STEM have followed, which replicate Norman's (1954) study, adding variations to his experiment along the way (e.g., Denny et al. 2019). Studies pertinent to agricultural economics are summarized in Table 1. The study by Perlini, Lind, and Zumbo (1998) added an interesting variation in analyzing exam formatting; they added the order of question difficulty (from easier to more difficult or vice versa) to the ordering by chapters. They concluded that none of the exam formats with which they experimented led to any significant advantages or disadvantages for student exam grades (Perlini et al. 1998). Other studies investigating the effects on student performance of ordering exam questions by difficulty and chronological coverage (or chapter) have been inconclusive (Davis 2017; Hauck, Mingo, and Williams 2017). The studies mentioned in this paper are relevant to the experimented exam formats, but there are also additional exam formats or variations of the ones tested here that could be further considered and are discussed in the Discussion section.

All exams evaluated in the aforementioned studies were given in the traditional classroom setting as traditional in-class exams. Only two studies have examined online exams in relation to how their formatting impacted student performance. One of these two studies was conducted online with more than 19,000 students from Latin America and Spain participating in short math exams that differed by the order of question difficulty (Anaya et al. 2021). Students were offered questions ordered in ascending and descending difficulty, as well as random patterns of easy and difficult questions at the beginning and end of the test (2 easy/1 difficult question at beginning and 1 easy/2 difficult questions at the end, and vice versa). Students who took the easy-to-difficult exam format had a higher probability of completing the exam and answering more questions correctly. In the second study by Lippi (2016), exams formatted by different question types (multiple choice or short response) were found to affect student performance significantly. We contribute to this segment of the literature by studying online exam performance in an agricultural economics course in relation to the ordering of questions by chapters covered and by difficulty level.

2 Experimental Design

Agricultural and Food Marketing is an undergraduate course in the Department of Food and Resource Economics at a land-grant university. It is held online in an asynchronous format. The course consists of nine modules that cover all aspects of traditional and agricultural marketing, dealing with all players in the food value-added supply chain. The course requires a total of four exams, with the first three exams

Table 1: Relevant Literature on Exam Formatting

Name	Year	Field	Question (treatment)	Results
Hambleton and Traub	1974	Mathematics	E-H (Easy to Hard), H-E (Hard to Easy)	E-H performed better.
Chidomere	1989	Marketing	Forward and Random-Ordered	No significant difference.
Heck and Stout	1991	Finance	Forward, Reverse, and Random-Ordered	No significant difference between Forward and Random; Reverse performed worse than Random.
Carlson and Ostrosky	1992	Microeconomics	Forward and Random-Ordered	No significant difference.
Geiger and Simons	1994	Accounting	Forward and Random-Ordered	No significant difference across 5 of 6 exams. Forward performed better on 6th exam.
Perlini, Lind, and Zumbo	1998	Psychology	Forward, Reverse, and Random Chapter Order. E-H, H-E, and Random Difficulty Order	Chapter Order had no statistically significant results; H-E performed better.
Russell et al.	2003	Marketing/Management	Forward, Reverse, and Random-Ordered	Forward and Reverse performed better than Random, but significance is not consistent.
Vander Schee	2009	Marketing	Forward, Reverse, and Random-Ordered	No significant difference.
Miller and Andrade	2020	Psychology (Online)	H-E, E-H, and other variations	Impacted completion

covering one third of the material each (i.e., three modules covered in each of the first three exams) and the fourth exam being cumulative over all modules covered in the semester (i.e., nine modules covered in the fourth exam). The data on the first two exams were used for the analyses in this study, which was checked for Family Educational Rights and Privacy Act (FERPA) compliance and approved by the Institutional Review Board (IRB) of the university. The study was conducted as a natural field experiment, where students completed the exams in the course without knowledge that they were taking part in a research study. This helps improve data quality because it avoids students' awareness of the study from unintendedly impacting their performance on the test. Students completed exams through an e-learning management system called Canvas. Each exam consisted of 25 multiple choice questions to be answered over a duration of 50 minutes. As expected from an agricultural marketing course, many exam questions are conceptual in nature, with a few involving mathematical calculations. Each exam was made available by the instructor on Canvas for a period of 24 hours, during which

students can log in to complete the test. Once a student starts the exam, they must complete the test within 50 minutes. Students are not allowed to pause the exam. To prevent cheating and academic dishonesty, each exam is proctored using Honorlock, which is an online proctoring service that requires each student to go through a process of identity verification and surrounding environment check. After the checkup process, Honorlock monitors the students' conduct during the exam by recording their activity and flags any suspicious behavior. The instructor can review Honorlock's video recording for each student to verify adherence to the academic honesty policy of the university. Honorlock can effectively detect cheating behavior (Dadashzadeh 2021; Chen et al. 2022), while also relying on artificial intelligence, rather than live monitoring through an agent, to provide a less intrusive environment that helps avoid additional stress or anxiety during the online-proctored exam.

The experiment was conducted over two semesters, Fall 2020 (August 30–December 9) and Spring 2021 (January 11–April 21), which were used to test two treatments related to exam formatting. Exam 1 was used to test whether the order of questions by difficulty level affected students' performance. Students in the Fall 2020 semester received a version of Exam 1 with ascending order of question difficulty, while students in the Spring 2021 semester received a version of Exam 1 with the same questions but in a descending order of difficulty. The difficulty of each question was assessed following Bloom's taxonomy to get an objective determination of relative difficulty when assigning questions to ascending and descending difficulty orders (Krathwohl 2002). Bloom's taxonomy organizes learning objectives in a pyramid in ascending order of complexity and specificity. The bottom-up order in this pyramid is recollection, comprehension, application, analysis, synthesis, and evaluation. We followed this framework to assign a difficulty level to each question based on its nature (i.e., whether it requires recollection, comprehension, application, etc., of course content to answer the question). Exam 2 was used to test whether the order of questions by sequence of chapters affected students' performance, where students in the Fall 2020 semester received a version of Exam 2 with a chronological order of questions by chapter, while students in the Spring 2021 semester received a version of Exam 2 with the same questions but in a reverse chronological order by chapter. Table 2 summarizes the experimental design.

Table 2: Summary of Experimental Design

Exam	Format	Sample Size	Mean (SE)	Min (Max)	Average Time Taken (Mins)	95% Confidence Intervals for Average Grade
Exam 1						
Fall 2020	Ascending Difficulty (Easier to Harder)	96	76.5 (1.84)	26 (100)	23.4	[72.9, 80.2]
Spring 2021	Descending Difficulty (Harder to Easier)	99	79.0 (1.69)	32 (100)	22.8	[75.6, 82.3]
Exam 2						
Fall 2020	Forward Sequence of Chapters	93	83.7 (1.36)	46 (100)	23.6	[81.0, 86.4]
Spring 2021	Reverse Sequence of Chapters	98	82.2 (1.66)	30 (100)	23.9	[78.9, 85.5]

The variables collected for the analysis were the exam grade and individual factors, including the students' major, GPA, gender, school year (i.e., freshman, sophomore, junior, or senior), and level of course activity preceding each exam (i.e., number of course content views during the period preceding each exam). The exam grade was used as an indicator of student performance, while individual factors were controlled for in the analysis to determine robustness of the results.

3 Results

The data were analyzed to determine the effects of differing exam formats on both average student performance as well as the distribution of grades. The two outcomes allow for a more in-depth assessment of the treatment effects that goes beyond direct comparison of means, as commonly done in previous studies.

3.1 Analyzing Average Exam Grades

Table 2 presents the average grades for each exam across the treatment groups. The average grade for Exam 1 was between 76 and 79 percent, while the average Exam 2 grade was between 82 and 84 percent. Exam 1 shows the average grades for the exam formats with ascending vs. descending order of question difficulty, while Exam 2 shows the average grades for the exam format with chronological vs. reverse chronological order of questions by chapter number. In both cases, we find no significant effect across the exam format (t-test, $p > 0.3$).[1] While chronology and order of difficulty had no significant impact on average exam grades, there was a significant difference in student performance between Exam 1 and Exam 2 in both semesters, with students performing significantly better on Exam 2 compared to Exam 1 (p value = 0.003). There are multiple possible explanations for this result. One possible explanation is that students have become generally more familiar with taking online exams and/or course structure after completing Exam 1, which may have helped them perform better on Exam 2. Another potential explanation is that students could have perceived Exam 1 as harder, due to the introduction of new vocabulary and methods earlier in the course.[2] One other explanation might lie in the differing exam formats in Exam 1 and Exam 2, as the order of questions varied by either difficulty in Exam 1 or by chapter/module in Exam 2.

We use regression analysis to estimate the following model of exam grades:

$$Exam\ Grade = \beta_1 \times Format + \beta_2 \times Ag.Econ.Major + \beta_3 \times GPA + \beta_4 \times Activity + \beta_5 \times Male + \beta_6 \times School\ year\ + Constant + \varepsilon \quad (1)$$

Two specifications were estimated for each exam, one serving as a baseline model containing only the treatment variable (see columns [1] and [3] in Table 4). The other model controls for individual factors (see columns [2] and [4] in Table 4). A Tobit model was estimated for each specification to account for censoring of observations at the upper and lower ends of the dependent variable (0 and 100). The treatment variable for each model was a dummy variable. For Exam 1, ascending order of difficulty equals 1, and descending order of difficulty equals 0, while for Exam 2, forward order of chapter/module equals 1 and reverse order of chapter/module equals 0. The individual factors include the student's GPA, online course activity preceding each exam (i.e., number of course content views during the period preceding each exam), gender (male or female), major (whether they are an economics or agricultural economics major), and school year they were in when they took the exam (freshman, sophomore, junior,

[1] The comparison of exam formats across ascending and descending order of difficulty resulted in a p value = 0.320, while the comparison of exam formats across chronological and reverse chronological order of questions resulted in a p value = 0.503.
[2] The content across Exam 1 and Exam 2 are similar in terms of difficulty of questions, as both exams' questions have similar Bloom's taxonomic levels. However, it is possible that students found the material in Exam 2 easier, which could explain the higher average grade on Exam 2 compared to Exam 1.

Table 3: Summary Statistics of Subjects' Individual Factors

Variables	Fall 2020 Mean (Std. Dev)	Spring 2021 Mean (Std. Dev.)	*p* value
Economics or Agricultural Economics Major	0.469 (0.502)	0.414 (0.495)	0.443
GPA	3.157 (0.438)	3.259 (0.504)	0.131
Number of Course Content Views	350.705 (192.883)	350.684 (185.363)	0.999
Male	0.646 (0.481)	0.556 (0.499)	0.198
School Year	3.510 (0.562)	3.455 (0.558)	0.453
Observations	96	99	

Notes: Standard errors are in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

or senior). Summary statistics for the individual factors are presented in Table 3, showing balance in all variables between semesters. This demonstrates well-balanced treatment groups, which supports the internal validity of the study.

As shown in the regression results in Table 4, we find no evidence of a significant treatment effect for neither Exam 1 nor Exam 2. The coefficient estimates on order of difficulty in Exam 1, and order of chronology in Exam 2, were not statistically significant under either specification. Therefore, results from Table 4 suggest no significant effects of either chronology or order of question difficulty on average exam performance in an online agricultural economics course.

Looking at individual factors, we observe that being in an agricultural economics major was positively correlated with performance on Exams 1 and 2. This result is intuitive, considering that students in agricultural economics are more frequently exposed to similar concepts in other classes, which can improve their performance compared to non-majors. GPA was also positively correlated with student performance on both exams, which is again intuitive, and suggests that students with a higher GPA performed better on the exams in this course compared to students with a lower GPA. Notably, a student's level of course activity in the period preceding each exam was not significantly correlated with performance on either exam. One possibility here is that the number of course content views made by a student is indeed not correlated with their performance in the course. Another possible explanation is that students could have downloaded the online course content on their personal computer to access offline at a later time, which could mean that they made offline course content views that were not captured in the data. School year was only significantly correlated with exam performance in Exam 2, where the correlation was positive. On the other hand, gender was not significantly correlated with performance on either exam.

Next, we analyze how the exam letter grades are affected by each exam formatting treatment. Exam scores for each student were converted to a letter grade following the letter grade breakdown implemented by the university, but only focusing on letter grades and not on the plus/minus system to avoid a large loss in degrees of freedom in the model (for further information on course grading scale and assignment weights, please see the Appendix). Given the ordered categorical nature of this variable, an Ordered Logit model was estimated using the same covariates in Table 4. The results of the Ordered Logit estimations are reported in Table 5. Consistent with the previous analysis, we find no significant

Table 4: Tobit Regressions Analyzing Effect of Question Difficulty Order and Chronology Order on Average Exam Score

Variables	Exam 1 [1]	Exam 1 [2]	Exam 2 [3]	Exam 2 [4]
Question Order by Difficulty	-3.302	-2.954		
	(2.739)	(2.647)		
Question Order by Chapter/Module			0.889	1.002
			(2.392)	(2.340)
Agricultural Economics Major		6.249**		5.384**
		(2.851)		(2.466)
GPA		11.648***		9.596***
		(2.968)		(2.625)
Level of Course Participation		-0.009		-0.012
		(0.011)		(0.017)
Male		2.625		0.798
		(2.880)		(2.512)
School Year		-0.127		4.289**
		(2.373)		(2.049)
Constant	80.377	41.857	83.444	36.186
	(1.933)	(13.099)	(1.677)	(11.711)
Observations	195	193	191	189
Log Likelihood	-785.173	-766.504	-738.753	-719.005

Notes: Standard errors are in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

effect of either treatment on exam letter grades. The results in Table 5 also show a positive correlation between course grade and both GPA and being an economics or agricultural economics major. Moreover, we find a lack of significant correlation between exam letter grades and individual factors related to school year and gender, which indicates lack of robustness in the influence of these factors on student exam performance.

3.2 Analyzing Distributions of Exam Grades

To further understand the extent of the treatment effects, we analyze how the order of question difficulty and chronology affects the distribution of exam grades. Figure 1 presents the cumulative distribution functions (CDFs) of the grades in Exams 1 and 2. The panels include two CDFs, one for each order variation within the respective treatment. Panel A shows the figures where the exam formatting treatment was question order by difficulty, and Panel B shows the figures where the exam formatting treatment was chronological order of questions by chapter number. Both panels show no statistically significant differences in the cumulative distribution of student grades across groups (Kolmogorov-Smirnov test, Exam 1 p value = 0.738, Exam 2 p value = 0.904). This implies that manipulating the order of question difficulty or the chronological order of questions on the exam does not impact the distribution of student grades in an online agricultural economics/marketing course.

4 Discussion and Conclusion

The results of this study show that students perform similarly when questions in online exams are ordered in ascending vs. descending difficulty, and also when questions are ordered forward vs. backward in chronology (i.e., chapter order). This could indicate that the ordering of exam questions by difficulty or chronology does not affect student performance, which would benefit the robustness of

Table 5: Ordered Logit Regressions Analyzing Effect of Question Difficulty and Chronology Order on Exam Letter Grades

Variables	Exam 1 Odds Ratio (Std. Error) [1]	Exam 1 Odds Ratio (Std. Error) [2]	Exam 2 Odds Ratio (Std. Error) [3]	Exam 2 Odds Ratio (Std. Error) [4]
Question Order by Difficulty	-0.246	-0.273		
	(0.256)	(0.263)		
Question Order by Chapter/Module			0.129	0.194
			(0.262)	(0.275)
Agricultural Economics Major		0.543*		0.542*
		(0.282)		(0.295)
GPA		0.926***		0.860***
		(0.298)		(0.303)
Level of Course Participation		-0.001		-0.003
		(0.001)		(0.002)
Male		0.208		0.221
		(0.283)		(0.290)
School Year		0.050		0.284
		(0.235)		(0.247)
Cutoff 1 (F to D)	-1.680***	1.462	-2.284***	1.376
	(0.230)	(1.298)	(0.284)	(1.363)
Cutoff 2 (D to C)	-1.082***	2.084	-1.354***	2.343*
	(0.205)	(1.303)	(0.223)	(1.366)
Cutoff 3 (C to B)	-0.359*	2.873**	-0.819***	2.920**
	(0.193)	(1.315)	(0.205)	(1.372)
Cutoff 4 (B to A)	0.787***	4.080***	0.365*	4.184***
	(0.202)	(1.328)	(0.196)	(1.386)
Observations	195	193	195	193
Log Likelihood	-301.211	-290.293	-272.902	-261.508

Notes: Standard errors are in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

online exams as an assessment tool. However, another possibility is that the effects of question ordering by difficulty and chronology on student online exam performance are nonlinear and follow some kind of a U-shaped relationship. This could be determined in future studies by comparing performance on both ascending and descending difficulty exams (or forward and backward chapter-ordered exams) with a version where questions are randomized. Under this setting, a U-shaped relationship would be manifested as a significant treatment effect in the same direction for both orders compared to the randomized version.

This study adds to the literature on exam formatting by extending this research to online testing environments and to courses in agricultural economics. While some previous studies have documented significant effects, this study finds no evidence of such effects in an online exam environment. It is still important to understand why previous studies find significant results to fully grasp the divergence in findings in the literature. There is a variety of potential explanations for why exam performance could be impacted by superficial factors (Kolski and Weible 2018; Arora, Chaudhary, and Singh 2021). One explanation relates to the role of anxiety and the environment the student is in. Stowell and Bennett (2010) demonstrated how the students who experienced test anxiety in a traditional exam would not experience test anxiety when a similar exam was administered online. Another explanation relates to

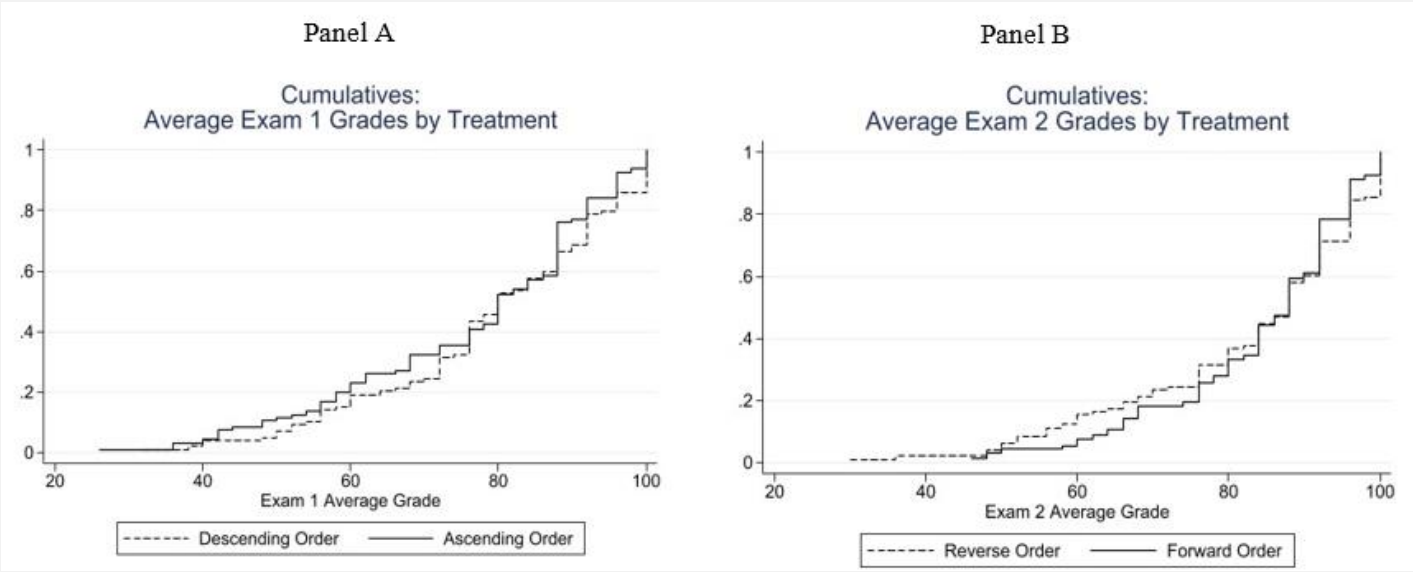

Figure 1: Cumulative Distribution Function for Exam 1 and Exam 2

anchoring and its effect on student perception of exam performance. Weinstein and Roediger (2012) demonstrated that people tend to anchor their exam performance in the beginning of the exam, and this affects their post-diction feedback. They argue that exam formatting could indeed affect students because these "inaccurate self-evaluations are critical for students to identify gaps in their knowledge"; therefore, this can have an effect on study habits or test anxiety (Bard and Weinstein 2017).

Our study has some limitations, which present an opportunity for further research on this topic. The implementation of the experiment consisted of students taking the exams online. Although the questions on each exam were presented separately on individual pages, which increases the salience of the treatments, there were no restrictions on how the students could move between questions in an exam, allowing them to move forward or backward from question to question. A more controlled version of this experiment, which prevents students from moving back and forth between questions, could also lead to different results. However, implementing such a controlled environment in an online course carries logistical and administrative challenges because students would be denied the right to review answers on previous questions. The exams were also implemented in two separate semesters; although both semesters were during the height of the COVID-19 pandemic (therefore, students across both semesters were experiencing the same environment), an experiment where exam formats were tested within the same semester would improve the robustness of a similar study. Additionally, our data set did not include information on all sociodemographic characteristics of the students or other behavioral factors like study habits, which should be considered in future research because they can provide great insights through sub-analyses over different student groups.

Other extensions of this study include adding variations of the exam formats utilized here, such as changing the difficulty order of questions within chapters or having multiple exam formats tested simultaneously. Future studies can also use exams that cover a larger portion of the course content (e.g., cumulative final exams). Our study utilized the first two exams taken during the semester, each of which spanned one third of the course material over six weeks of study. While this is a reasonable load to think that concepts like primacy and recency might create a significance between exams ordered forward vs. backward in chapters, extending this study to an exam that spans heavier material over the duration of the entire semester can further improve the robustness of our results. Additionally, our study analyzes the impact of exam formatting in only one course, and extending this research to multiple courses within agricultural economics could improve statistical validity of the results. This also implies that our results may or may not generalize to other courses in agricultural economics and across departments. However,

the fact that students in the course come from diverse majors puts this as a possibility, which warrants future investigations of the treatment effects across different courses and student populations.

Our analysis of online exam formatting, specifically ascending vs. descending difficulty and forward vs. backward chapter order, suggests that university systems and professors who have made the transition to online courses can vary the format of their exams across these versions without worrying about unintended effects on overall performance of students in their class. This allows professors, specifically those within agricultural economics departments, to focus on other factors that could possibly affect online student learning outcomes and to continue to resort to switching exam formats to help add a barrier to cheating in online exams.

About the Author: Juan Pachon is an Undergraduate Student with the Department of Food and Resource Economics at the University of Florida. Bachir Kassas is an Assistant Professor with the Department of Food and Resource Economics at the University of Florida. (b.kassas@ufl.edu). John Lai is an Assistant Professor with the Department of Food and Resource Economics with the University of Florida. Gulcan Onel is an Associate Professor with the Department of Food and Resource Economics at the University of Florida

Acknowledgments: This study was approved by the Institutional Review Board of the University of Florida (Study Number: IRB202000232, Status: Exempt).

Appendix

Excerpt from Agricultural and Food Marketing Syllabus:

Grading Policies

Final Score:

Your final grade will be calculated based on the following weights:

Assignments	32%
Exams	36%
Discussion Posts	10%
Project	22%

The letter grade will be determined using the following grading scale

Points	Letter Grade
92%-100%	A
89%-91.9%	A-
86%-88.9%	B+
82%-85.9%	B
79%-81.9%	B-
76%-78.9%	C+
72%-75.9%	C
69%-71.9%	C-
66%-68.9%	D+
62%-65.9%	D
59%-61.9%	D-
Below 59%	E

Figure A1: Grading Policies for Agricultural and Food Marketing Class

References

Anaya, L., N. Iriberri, P.R. Biel, and G. Zamarro. 2021. "Understanding Performance in Test Taking: The Role of Question Difficulty Order." CEPR Discussion Paper No. DP16099. *SSRN*.

Arora, S., P. Chaudhary, and R.K. Singh. 2021. "Impact of Coronavirus and Online Exam Anxiety on Self-Efficacy: The Moderating Role of Coping Strategy." *Interactive Technology and Smart Education* 18(3):475–492. doi:10.1108/ITSE-08-2020-0158.

Bard, G., and Y. Weinstein. 2017. "The Effect of Question Order on Evaluations of Test Performance: Can the Bias Dissolve?" *Quarterly Journal of Experimental Psychology* 70(10):2130–2140. doi:10.1080/17470218.2016.1225108.

Carlson, J.L., and A.L. Ostrosky. 1992. "Item Sequence and Student Performance on Multiple-Choice Exams: Further Evidence." *The Journal of Economic Education* 23(3):232–235.

Chen, C., K.T. Jones, M. Lawrence, and J.M. Simpson. 2022. "Can Educators Prevent a 'Wild West' Scenario in Giving Online Exams?" *Quarterly Review of Distance Education* 23(2):43–48.

Chidomere, R.C. 1989. "Test Item Arrangement and Student Performance in Principles of Marketing Examination: A Replication Study." *Journal of Marketing Education* 11(3):36–40.

Clark, T.M., C.S. Callam, N.M. Paul, M.W. Stoltzfus, and D. Turner. 2020. "Testing in the Time of COVID-19: A Sudden Transition to Unproctored Online Exams." *Journal of Chemical Education* 97(9):3413–3417. doi:10.1021/acs.jchemed.0c00546.

Dadashzadeh, M. 2021. "The Online Examination Dilemma: To Proctor or Not to Proctor?" *Journal of Instructional Pedagogies* 25:1–11.

Davis, D.B. 2017. "Exam Question Sequencing Effects and Context Cues." *Teaching of Psychology* 44(3):263–267. doi:10.1177/0098628317712755.

Denny, P., S. Manoharan, U. Speidel, G. Russello, and A. Chang. 2019. "On the Fairness of Multiple-Variant Multiple-Choice Examinations." *Proceedings of the 50th ACM Technical Symposium on Computer Science Education*: 462–468.

Geiger, M.A., and K.A. Simons. 1994. "Intertopical Sequencing of Multiple-Choice Questions: Effect on Exam Performance and Testing Time." *Journal of Education for Business* 70(2):87–90.

Hambleton, R.K., and R.E. Traub. 1974. "The Effects of Item Order on Test Performance and Stress." *The Journal of Experimental Education* 43(1):40–46.

Hauck, K.B., M.A. Mingo, and R.L. Williams. 2017. "A Review of Relationships between Item Sequence and Performance on Multiple-Choice Exams." *Scholarship of Teaching and Learning in Psychology* 3(1):58–75. doi:10.1037/stl0000077.

Heck, J.L., and D.E. Stout. 1991. "Initial Empirical Evidence on the Relationship between Finance Test-Question Sequencing and Student Performance Scores." *Financial Practice and Education* 1(1):41–47.

Hodges, C., S. Moore, B. Lockee, T. Trust, and A. Bond. 2020. "The Difference Between Emergency Remote Teaching and Online Learning." *EDUCAUSE Review*. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning.

Kolski, T., and J. Weible. 2018. "Examining the Relationship between Student Test Anxiety and Webcam Based Exam Proctoring." *Online Journal of Distance Learning Administration* 21(3). Available at: https://ojdla.com/archive/fall213/kolski_weible213.pdf.

Krathwohl, David R. 2002. "A revision of Bloom's taxonomy: An overview." *Theory into practice* 41(4): 212-218.

Lippi, S. 2016. "The Effects of an Online Program and Test Format on Student Performance." *Innovations in Teaching & Learning Conference Proceedings* 8:2. doi:10.13021/g8sc76.

Manfuso, L.G. 2020. "How the Remote Learning Pivot Could Shape Higher Ed IT." *EdTech Magazine*. https://edtechmagazine.com/higher/article/2020/04/how-remote-learning-pivot-could-shape-higher-ed-it.

Miller, R.M., and M.S. Andrade. 2020. "The Effects of Test Question Order on Task Persistence." *Research & Practice in Assessment* 15(1):1–8.

Norman, R.D. 1954. "The Effects of a Forward Retention Set on an Objective Achievement Test Presented Forwards or Backwards." *Journal of Educational & Psychological Measurement* 14(3):487–498.

Perlini, A.H., D.L. Lind, and B.D. Zumbo. 1998. "Context Effects on Examinations: The Effects of Time, Item Order and Item Difficulty." *Canadian Psychology* 39(4):299–307. doi:10.1037/h0086821.

Rahim, A.FA. 2020. "Guidelines for Online Assessment in Emergency Remote Teaching during the COVID-19 Pandemic." *Education in Medicine Journal* 12(2):59–68. doi:10.21315/eimj2020.12.2.6.

Russell, M., M.J Fischer, C.M. Fischer, and K. Premo. 2003. "Exam Question Sequencing Effects on Marketing and Management Sciences Student Performance." *Journal for Advancement of Marketing Education* 3:1–11.

Stowell, J., and D. Bennett. 2010. "Effects of Online Testing on Student Exam Performance and Test Anxiety." *Journal of Educational Computing Research* 42(2):161–171. doi:10.2190/EC.42.2.b.

Vander Schee, B.A. 2009. "Test Item Order, Academic Achievement and Student Performance on Principles of Marketing Examinations." *Journal for Advancement of Marketing Education* 14(1): 23–29.

Weinstein, Yana, and Henry L. Roediger. 2012. "The effect of question order on evaluations of test performance: how does the bias evolve?." *Memory & Cognition* 40: 727-735.

5 (4) DOI: 10.22004/ag.econ.339193