ISSN 2688-5999

Applied Economics TEACHING RESOURCES

Volume 2, Issue 5, December 2020

Special Issue on Online and Remote Learning and Teaching (During the COVID-19 Pandemic)

AAEA
Agricultural & Applied Economics Association

Contents

Applied Economics Teaching Resources (*AETR*) is an online, open access, and peer-reviewed professional publication series published by the Agricultural an Applied Economics Association (AAEA).

The aim of AETR is to provide an outlet for research, teaching, and Extension education scholarship encompassing but not limited to research articles, case studies, classroom games, commentaries, experiential learning, and pedagogy. The goal is advancing and supporting teaching and Extension education within applied and agricultural economics, and agribusiness. The scope of the journal extends to teaching and educational contributions and materials for undergraduate and graduate education, as well as Extension and adult education.

AETR welcomes submissions on:

1. Teaching and Extension education scholarship and research
2. Classroom and field educational innovation (e.g. classroom games, online teaching tools, Extension applications, and experiential learning activities, and other interactive learning innovations)
3. Case Studies in all areas of applied and agricultural economics, and agribusiness
4. Teaching and education commentaries (e.g. notes on pedagogy, evaluations of teaching effectiveness, evaluation and review of applied economics textbooks, and educational methodology).

Editor

Editorial Board

Teaching and Educational Methods

So You Want to Run a Classroom Experiment Online? The Good, the Bad, and the Different

Stephen N. Morgan[a], Misti D. Sharp[b], and Kelly A. Grogan[b]
USDA Economic Research Service[a], University of Florida[b]

JEL Codes: A22, A23, A29
Keywords: Active learning, economic experiments, online teaching, pit market, prisoner's dilemma, public goods

Abstract
Agricultural economics has a rich history of using experiments in the classroom to teach applied topics and illustrate how economic theory translates into real-world phenomena. Despite the widespread attention classroom experiments in economics have received, relatively little attention has been devoted to whether and how instructors may use experiments as a teaching tool in the online classroom. We review the essential elements of three popular classroom experiments (public goods, prisoners dilemma, and pit market) and discuss how these experiments may be adapted or used in both the synchronous and asynchronous online classroom. Additionally, we discuss several online platforms and tools to make experimental games accessible with distance learning.

1 Introduction

Using economic experiments as teaching tools in the classroom setting can unlock core economic concepts for students and illustrate how economic theory translates into real-world phenomena. Experiments as teaching tools have been shown to increase learning (Dickie 2006), improve attitudes toward economics (Durham, Mckinnon, and Schulman 2007), and increase information retention for multiple types of learners (Durham, Mckinnon, and Schulman 2007).

Agricultural economics has a rich history of using experiments in the classroom to teach applied topics. In a survey of agricultural economics faculty, Barnett and Kriesel (2003) found that 90 percent of surveyed instructors had some knowledge of classroom economic experiments, and 60 percent had some experience implementing an experiment in their own course. Across departments, experiments were most frequently implemented in microeconomics, environmental/natural resource, and agribusiness courses (Barnett and Kriesel 2003).

In Wilson and Nelson (2009), the authors present three examples of adaptable games for the applied economics classroom including the double auction/pit market experiment (Davis and Holt 1993; Holt 1996), monopolistic production (Nelson and Beil 1995), and oligopolistic competition (e.g., Wilson and Nelson 2008). All three experiments can be played to illustrate and test different features of market structures, supplementing standard microeconomic theory with hands-on experience.

Despite the widespread attention classroom experiments in economics have received, relatively little attention has been devoted to whether and how instructors may use experiments as a teaching tool in the online classroom. Many classic experiments and accompanying resources are designed for in-person synchronous instruction that require significant adaptation to be run online.[1]

[1] EconPort (econport.org) and Games Economists Play (http://w3.marietta.edu/~delemeeg/games/) host online repositories of resources for using economic experiments in teaching and research. These games have built on the basic games referenced in this article and provide additional context and potential extensions. Their teaching modules are an especially good resource

In this article, we discuss ideas for how instructors can adapt three popular classroom experiments (pit market, public goods, and prisoner's dilemma) for the online classroom. Each section will proceed as follows. First, we briefly highlight the content and purpose of the original classroom versions of these popular games.[2] Second, for each original experiment, we identify the essential components of the game that should be captured in any online adaptation. Third, we then propose ideas for how each game can be modified to implement these essential components in both a synchronous and an asynchronous online classroom. For online implementation, tangible rewards such as money or gifts become challenging, so we recommend using class bonus points as the payoff to induce economic behavior. Fourth, we propose discussion questions that can be used to facilitate student learning outcomes related to their experience playing the games. These discussion questions can be implemented via a learning management system (LMS) discussion board or via synchronous discussion. Fifth, we identify some possible sticking points that we have encountered and how to troubleshoot these common problems and concerns with implementation. Finally, we discuss several online platforms and learning tools to make experimental games more accessible with distance learning.

2 Pit Market Experiment

Illustrating the concepts of supply, demand, and the competitive pressures driving market equilibrium are important to introduce students to the economic way of thinking. The purpose of this game is to illustrate how individuals with private valuations can interact in an open market to achieve an equilibrium. Students are able to see the forces of supply and demand in action by taking on the roles of buyers and sellers of a good. By trading goods and locking in negotiated prices, students are able to see how their trades correspond with both supply and demand curves and how an equilibrium price of a good emerges.

Building on the pioneering work of Chamberlain in experimental economics and Smith's double auction, Holt (1996) designed the "pit" market experiment where students interact to exchange playing cards in a competitive environment. Using the playing cards, the number of the card represents the private value or cost to the student (i.e., induced value), and the color of the card represents whether an individual is a buyer or a seller.

The game can be run in a single session or in smaller groups/markets to provide all students with the same experience. For large in-person classes, Holt (1996) suggested that the market can also be run with spectators who are provided full information on the distribution of values to increase their engagement in the activity. The pit market experiment can be easily modified to incorporate several different economic concepts in the context of the competitive market. This can include the implementation of price controls, government taxes, or even a monopoly/monopsony setting (e.g., Holt 1996; Ruffle 2003).

2.1 Essential Components

Types: There are two types of market actors: buyers and sellers. Students need to know their type to understand their action. Students should have the same type throughout multiple rounds of trading sessions to avoid confusion.

Induced Values: Each student needs to know their private value for a unit of a good. The distribution of induced values among buyers and sellers will correspond to the demand and supply curves, respectively. The distribution of the induced values will depend on the number of participants where the market needs

for classroom instructions, guidance, templates, and even modules to be used with clicker software in the classroom. These are great starting points for finding in-person games that may be adaptable for online experiments.

[2] We provide citations for each of the original classroom games and encourage interested readers to refer to the published article for full details and instructions for in-person implementation that can be modified for the online classroom.

Table 1. Payoff Calculation for Pit Market Trading

	Buyers Payoff			Sellers Payoff		
Period	Value	Price	Earnings	Price	Cost	Earnings
1						
2						
3						

a few extreme values (e.g., low and high numbers) and a larger number of moderate values. If working in a large course, it is possible to set up several "small" markets, which all use the same distribution of induced values across groups.

Payoffs: For buyers, they can only earn rewards (we recommend bonus points) if they purchase the good at a price lower than their private valuation (payoff = value – price). Similarly, sellers only earn points if they sell a good at a price higher than their private valuation/cost (payoff = price – cost). Table 1 (taken from Holt [1996]) is used to record payoffs during a three-period game.

Timed Trading Period: Students should have a set amount of time to interact and complete their trades. The trading process works through an open outcry process. Individuals who have a good with an induced value make offers to sell a good to buyers who have their own private value. Each individual wants to get the best deal, which provides the most consumer or producer surplus to the individual. Once two players decide to make a deal, they go to the instructor to record their trade and exit the market. Depending on group size, trades should be able to be completed in well under 5 minutes. The game should be repeated several times to illustrate the emergence of a market equilibrium.

2.2 Synchronous Online Implementation Considerations

Meeting with students in an online platform makes it relatively straightforward to permit students to engage in the game as well as the search and bargaining process between buyers and sellers using built-in chat functions. You can let students know their private value for a good by posting a list with anonymous student identifiers or by creating a nongraded assignment in the LMS gradebook and letting students know that their point total will be their value for this "fake" assignment. The latter method has the benefit of being private as well as easy to monitor and change for the instructor.

By making open offers to buy or sell in chat, students could then accept a trade in the group chat or continue negotiating in a side chat with one specific individual. Once students want to lock in a trade, they can message their induced values and trade price to the facilitator. Because instructors may be managing a relatively large class size, the use of breakout rooms can help accommodate students in smaller markets. For example, providing students with instructions, induced values, and market groups before the class session can speed the process of dividing students into individual breakout rooms to run the experiment.[3] This procedure has the added benefit of allowing a facilitator to remove students from

[3] Classroom participants can be preassigned to breakout rooms by accessing the meeting options for any scheduled Zoom meeting (using the desktop client or web portal). Instructors can assign students using a CSV file of student email addresses or by manually clicking and dragging students into the correct group.

an individual market and back into the general course room once a trade has been locked in or time has expired. One facilitator per market is strongly recommended.

2.3 Asynchronous Online Implementation Considerations

The pit market experiment can be performed asynchronously by placing students into small groups or discussion boards in the LMS and giving them a specific amount of time (e.g., 24 hours) to lock in a trade. One drawback to this approach is that students may have time to learn complete market information, which could affect the equilibrium prices across rounds. Additionally, students who fail to participate could leave crucial transactions out of the market (e.g., a high value buyer who just does not participate). However, it is possible to schedule smaller groups of the market with as few as six people (three buyers and three sellers), which may make it possible to schedule a synchronous market activity in an asynchronous course.

2.4 Suggested Debriefing Questions[4]

(1) What does economic theory predict the equilibrium price and quantity to be?
(2) How much consumer and producer surplus was generated by the market outcomes you observed? Is this market efficient?
(3) Were there any profitable trades that were not executed in the market? Why or why not?

Additional questions related to price controls, taxes, or any other features of the market could easily be added to relate to the concepts being studied.

2.5 Troubleshooting Common Problems

Time: Restricting students to make trades within the given amount of time is important. Conducting the experiment manually online may add some time due to messaging and reporting back to the facilitator. Instructors may want to experiment with different time periods and share a timer with all participants.

Repeated and Incorrect Transactions: Because of the finite supply of units to trade, students may want to try to enter into the market a second time to make a transaction in a given round. This is especially true when extra credit points are at stake for the highest earners. The facilitator should take care to write down student names involved in recorded transactions or remove students from the market after a transaction is made (perhaps to the waiting room or the main room) to ensure this is not an issue. Additionally, the facilitator should check that only mutually beneficial trades occur, so the agreed-on price should be greater than the seller's private value and lower than the buyer's private value.

3 Public Good Games

Since Holt and Laury (1997) first implemented a public good game in a classroom environment, it has become a mainstay in courses of economics, particularly those that emphasize market failure and behavioral economics. The idea of the public goods game is that students are asked to choose whether to voluntarily contribute resources from a private endowment to the provision of a public good (nonexcludable, nonrival). Any resources kept in the private endowment only benefits the student they are assigned to. However, all contributions to the public good provide some smaller benefits that are shared by all, regardless of contribution to the provision of the good. Real-life examples of public goods include parks, clean air, and national defense. While economic theory predicts zero contributions to the public good by students playing the game, students are sometimes able to coordinate and sustain continued contributions over time. This experiment is a great example of the tension between individual and group incentives. The game itself can be easily adjusted to any classroom setting and has been

[4] See Holt (1996) for more detailed guidance for instructors on how to analyze the step-wise supply and demand curves to motivate discussion questions.

further formalized into a learning module by the Georgia State University Experimental Economics Center on EconPort (Swarthout n.d.). The original game requires the use of playing cards and is thus limited to face-to-face classes.[5] As will be shown, this exercise can be easily adapted for online play.

3.1 Essential Components

Endowment: In the original form of the game (Holt and Laury 1997), students are endowed with 4 playing cards. Two of these cards have value, and two are placeholders. Each round, a student submits two of their four cards.

Contribution: Each round, students choose how much to contribute (from their endowment) to the public good. Submitting two placeholder cards means the student contributed nothing to the public good. Submitting two value cards means the student contributed the maximum amount to the public good, and submitting one value card and one placeholder card mean that the student has contributed half of the maximum contribution to the public good.

Public Good: Using the results of the cumulative contributions, the instructor counts up the units contributed to the public good by students. Then, using the predetermined conversion rate, the instructor announces how much of the public good was provided by students.

Calculation of Private Benefits: A student's private benefit is the sum of the public good plus however much of their endowment, if any, they kept that round. Students should keep track of their private benefits each round (Table 2).

Table 2. Public Good Game Payoff Calculation Table

Endowment (e)	Contribution (c)	Public Good (pg)	Total Private Benefit (e – c + pg)
Game 1: *n* units	Decided by each student	Determined based on collective contributions	This can be transformed in any way appropriate for your class.

3.2 Synchronous Implementation Considerations

In an online setting, students can be endowed with any amount of the private good because the game is not constrained to playing card parameters.[6] The private good benefits only the student; however, their contributions can fund the provision of a public good that benefits the class as a whole. Students can submit their public goods contributions through a simple poll. If, for example, students are endowed with 4 units, the poll would allow contributions 0, 1, 2, 3, or 4 units to the public good. The poll should be anonymous to peers, but not anonymous to the facilitator. If students are not anonymous to peers, they will face social pressures to contribute (reducing free riding) or may be ostracized by peers for not contributing (if the platform is open). It is interesting to play this game multiple times with the same simple poll but with different parameters. For example, Holt and Laury (1997) propose changing the group sizes or allowing students to revise contribution decisions. Other variations may involve changing the conversion rate associated with the public good (see EconPort variations) or allowing students to vote or discuss contribution rules (e.g., Kroll, Cherry, and Shogren 2007).

[5] Leuthold (1993) and Swarthout (n.d.) expand the framework to accommodate larger class sizes.
[6] Based on the instructor preferences, you could also endow students with a resource (e.g., tokens) and allow them to contribute to a public account while keeping anything not contributed. The outcomes will be the same.

3.3 Asynchronous Implementation Considerations
In an asynchronous context, the contribution should be made privately through an assignment within a given time frame (typically 24 hours) in your LMS.[7] If the assignment is a "practice quiz," it will not appear in the gradebook. To demonstrate free riding, a one-off public good game would be sufficient. Once all contributions are made, the instructor communicates back to the students the amount of public good that was provided. Students then can calculate their own private benefit (see Table 2). This game can be repeated many times over the course of the semester to illustrate complexities within the public good game such as unequal endowments, threshold games, rulemaking, and so on.

3.4 Suggested Debriefing Questions
(1) What real-world phenomena do these games best represent?
(2) What sorts of behavior did you notice from yourself and your peers? Why do you think that behavior emerged?
(3) Can you think of a way to alter the environment in order to induce socially preferred outcomes (such as altruism) or reduce privately preferred outcomes (such as free riding)?

Create questions that address any adjustments you made to the game including the impacts of repeating games, threshold good (or bad) games, and larger/smaller endowments. Any discussion questions that get students thinking about individual welfare versus social welfare are appropriate and engaging.

3.5 Troubleshooting Potential Problems
Facilitating a productive and positive conversation around this game is key. If information is public and stakes are high (bonus points are sometimes a hot commodity), students may get very upset about the behavior of their peers. As economists know, this is part of the point of the game, but that angst can detract from learning if left unchecked. Some students may disengage entirely and ignore the social dynamics going forward if they feel like the game is "unfair" or if they write off their peers as awful people. It can be tempered by keeping contributions private so that students cannot identify the optimizers in the group and thus focus on the aggregate outcomes rather than individual behavior. In addition, the instructor can remind the students that only one game will be binding so if one game is particularly hard for students, they still have hope for a positive outcome.

4 Prisoner's Dilemma Games
In microeconomics classes, the prisoner's dilemma is a classic game used to illustrate the concept of a Nash equilibrium and highlight the idea that Nash equilibria are not always socially optimal. The prisoner's dilemma applies to many scenarios where two individuals interact and their payoffs are interdependent on one another's behavior. Examples may include the canonical confession and punishment of two prisoners, strategic pricing of duopoly firms, arms races, common-pool resources, and so on. The prisoner's dilemma arises from the idea that in a duopoly for example, firms have the potential to collude with each other and make monopoly profits; to compete with each other driving the market to the perfectly competitive outcome if both compete; or to a lucrative outcome for the competitor if the other party chose to collude. Playing this game, we expect students to have heterogeneous outcomes where some pairs of players are able to achieve a cooperative equilibrium, and some are driven to the Nash equilibrium. Students will learn how individual incentives may drive noncooperative behaviors and how there is potential to coordinate on improved outcomes.

Holt and Capra (2000) outline a classroom version of the prisoner's dilemma utilizing playing cards, pairs of students, and actual monetary incentives received by students based on their actions in the

[7] If the assignment is a "practice quiz," it will not appear in the gradebook.

game. To use this game in an online classroom, the instructor can use points (actual points on an assignment or bonus points) instead of money to induce equilibrium.[8]

4.1 Essential Components

Point Incentives: This game can be played for points on a homework assignment or for bonus points on an assignment or exam.

Student Actions: Each round, students will choose whether or not they would like to compete or collude with their classmates. For in-person classes, students are given one red (compete) and one black (collude) playing card and turn in their chosen card, face down.

Payoffs: An easy parametrization of the payoffs is illustrated below in Table 3 and are arranged so that the payoffs in each cell should correspond (Player A, Player B). When structuring payoffs, the cooperative equilibrium for an individual should provide a level of benefits (e.g., 5 points) greater than the noncooperative equilibrium (e.g., 2 points) and less than the unstable equilibrium where the individual competes and their partner colludes (e.g., 10 points). Each student's payoff per round depends on their chosen action as well as the action chosen by their partner. If only one round of the game is played, students can earn as many as 10 points or as few as zero.

Game Flow: Students are paired into groups of two and provided with the payout table (Table 3) and the designated way for them to submit their decisions. Instructors can choose to frame the problem and or modify Table 3 as they see fit. For example, in an introductory microeconomic course the prisoner's dilemma is often used to describe imperfect competition in a duopoly setting. One possible framing may make students executives at two firms that must decide if they are going to compete or collude on product pricing during a particular year.

Instructors can decide whether or not to allow communication before the start of the game and in between rounds. No communication generally leads to a faster convergence on the Nash equilibrium solution of compete/compete, while communication tends to allow collusion to last for several rounds. The game continues for 10 rounds, and students keep track of their payouts each round. Total points can be summed across rounds and then scaled accordingly to achieve the instructor's target point amount. If students manage to sustain collusion for all 10 rounds, they will earn 50 points. However, if they quickly collapse to the Nash equilibrium, they will earn closer to 20 out of the 50 possible points.

Table 3. Prisoner's Dilemma Game Payoff Matrix

		Player B	
		Compete	Collude
Player A	Compete	2, 2	10, 0
	Collude	0, 10	5, 5

4.2 Synchronous Online Implementation Considerations

When meeting with students synchronously, students can be preassigned to breakout rooms of twostudents for play of the game or randomly paired by the instructor to have their decisions matched

[8] Use of real money as a reward mechanism is not a requirement for students to play classroom games or to learn from them. In our experience, when using either no reward mechanism or bonus points, students still find the experience valuable. Before using real money in the classroom, we would caution instructors to ensure they are complying with all relevant university guidelines because money, even in a classroom experiment, may be strictly regulated.

against one another by an instructor or TA. A simple poll (e.g., Zoom/LMS/iClicker) with the options to compete or collude can be used to collect student decisions each round, and then displayed to students after all decisions have been entered. The instructor can choose to keep student names associated with their polling decisions so that they can confirm student points after the game has finished. Alternatively, if working on the honor system, students can submit their collected points after class using the same mechanism they are using to submit other assignments. Furthermore, if an instructor would like to allow student communication to illustrate how individuals can coordinate decisions, breakout rooms could be used similar to the pit market experiment to allow direct messaging or communication.

Another option avoiding breakout rooms would be to allow each student to submit an individual decision and allow the second player (Player B in Table 3) to effectively be determined by the majority of the class decisions. This would be simple for the instructor to implement by looking at poll totals. For example, if the majority of the class voted to collude then the Player B decision would be recorded as collude for every member of the class.

4.3 Asynchronous Online Implementation Considerations

This game can be implemented within any LMS. The decision for each round of play should be made privately through an assignment within a given time frame (typically 24 hours). When using a "practice quiz," the assignment will not appear in the gradebook. The number of rounds can be modified to as few as one round to accommodate the longer time horizon needed to collect decisions.

Similar to the individual vs. class format discussed above (Section 4.2), an identical approach (or a team-based approach) could be taken in the asynchronous format. However, to facilitate communication the instructor may want to allow students to make decisions as teams (perhaps following a majority vote of team members). Teams could have their own private discussion boards to discuss their vote as well as a class-wide discussion board to facilitate communication across the two teams.

4.4 Suggested Debriefing Questions

(1) What does economic theory suggest about decisions students should have made?
(2) If student decisions differed from theory, why did this occur? Do students think similar patterns would have occurred in a room full of strangers? In a room full of family members or close friends?
(3) Do students think their decisions would have differed if playing for bonus points (if choosing actual homework points or vice versa otherwise)?
(4) What decisions in real life have attributes of the prisoner's dilemma?

4.5 Troubleshooting Common Problems

Time: If communication is allowed, students may spend excessive time discussing strategy. A timer with a loud alarm helps to keep everyone on track in person. Online, the instructor can recall individuals from breakout rooms after a specific amount of time has passed.

Points: Some classes will end up with the compete/compete solution very early in the game, and students will start to get anxious about their points. When points in the game are linked to an assignment grade, students take the game more seriously, which can more closely mimic a true prisoner's dilemma scenario. The instructor should consider the general classroom dynamics, congeniality, and so on, before deciding how high to make the stakes in terms of assignment points. Similarly, some classes manage to sustain collusion for all ten rounds, the full 50 points.

5 Online Tools for Classroom Experiments

In addition to directly adapting experimental instructions for online teaching, there are many new tools that can be used to run and host experiments directly for students. We review several alternatives for running and customizing online experiments as well as alternatives for online polling software that may be used alongside classroom games.

5.1 Prepackaged Online Classroom Experiments

vEconLab software (veconlab.econ.virginia.edu/) provides a comprehensive and accessible set of experimental games that can be easily integrated into an online course. Designed in conjunction with the text *Markets, Games, and Strategic Behavior: An Introduction to Experimental Economics* (Holt 2007, 2019), the software includes over 60 games related to diverse topics including auctions, markets, finance, and public goods. Instructors are able to create an account to manage an experiment, while students log in separately as participants. All results from synchronous experiments are exportable for summary and analysis in class. These games are easy to use and take very little time or prior experience to operate.

Built on the oTree platform (Chen, Schonger, and Wickens 2016), economics-games.com provides a comprehensive set of experiments that can be initiated and run entirely online. Games include classic experiments, as well as more recent published experiments (e.g., Dissanayake and Jacobson 2016). Instructors simply set the parameters for the game (e.g., number of players) and then receive login information to distribute to students. Game data is available for download and analysis. In addition to interactive experiments, economics-games.com has several single player simulations on topics including monopoly and perfect competition, which could be effectively used in an asynchronous setting. Overall, this software is great for handling large numbers of students who may be in different locations; however, it may be less accessible and some more recent or more complicated experiments may take much more time to understand and to navigate the interface.

MobLab (moblab.com) is a paid learning management platform integrating experimental games with discussion boards, lesson plans, and an online gradebook. Access to economics games and related software requires a flat fee per student per class. This would likely require adding course lab fees to your offering. MobLab games cover experiments including auctions, markets, common pool resources, and more. These experiments are designed with graphics to match the play of the game. In addition to the cost, these built-in games may not be complex enough for more advanced students.

5.2 Design Your Own Experiment

As discussed above, oTree (Chen, Schonger, and Wickens 2016) is an open-source platform that allows you to customize and design behavioral experiments. Accessible for beginners, the oTree Studio platform has a point-and-click interface that aids in project design and learning platform syntax. In addition to oTree Studio, advanced users can program experiments directly in Python using the text editor of their choice.

LIONESS Lab is another free web-based platform for designing interactive economic experiments. LIONESS Lab also implements a point-and-click interface to aid in the design of customized experimental pages. JavaScript is used to make calculations in the experiment based on user decisions. Similar to oTree, LIONESS Lab can also be downloaded and run on your own local server.

In both cases, designing your own experiment is a significant time investment and may require a high degree of programming skill depending on what you are trying to achieve. With some experience, many basic experiments can be replicated in a day. For beginners, the process may take much longer. In our experience, this approach is best undertaken if you (or a graduate student) are also interested in doing research using the above software tools for economic experiments.

5.3 Online Polling Options

Zoom, the ubiquitous online communication platform in the COVID-19 era, has built-in polling software that is simple to use and already integrated into any classroom environment being hosted on the platform. While this polling option is free and easy to use for classroom participants, all questions in a single poll are displayed at once, and all questions have to be answered before they are submitted. This means that when separate sequences of questions are needed for different parts of a game, the instructor has to restart the poll or preprogram multiple polls. Preprogramming the polls takes place in the online settings for the scheduled class. You can also create polls in the moment, but it takes up precious online time.

Most LMS platforms (e.g., Canvas/Blackboard) have built-in quiz features that can be used to create polls that are either graded or ungraded. Using a LMS for polling is a strong option because individual student responses are stored for the instructor, and students have easy/free access to the platform, while likely being more familiar with its operation. The main drawback to LMS polling is that students have to be directed to access the poll at the correct time from the instructor, and there is less control over when it is presented to students.

Finally, there is a whole suite of third-party platforms integrating polling that are free (e.g., Mentimeter) or paid educational/survey platforms (e.g., TopHat, iClicker, TurningPoint, Qualtrics, etc.) that enable different features for real-time polling and feedback. Pending relevant university approval and/or subscriptions, instructors can choose a more personalized polling software that captures the functionality they need for their classroom balancing features, ease of use, and costs to students.

6 Conclusion

Classroom experiments are an important tool to promote active learning experiences among economics students at all levels. In the above discussion, we have shown how three classic experimental designs can be adapted for online teaching in both synchronous and asynchronous settings. Additionally, new tools to allow classroom games to be hosted online allow instructors with new ways to efficiently run an experiment and download the data from individual decisions.

While our experience with running classroom games online is continuously evolving, initial experiences and feedback from students during the switch to online instruction seem positive and provide interaction with peers that feels significantly different from a discussion board or other LMS tool. Collecting student feedback and preferences across different platforms, tools, and modalities of running the experiments will be an important step for future research. However, several important themes emerge across all three games. The first is the need to provide students with clear instructions on how to communicate and submit decisions in the game environment. This is the biggest request from students who enjoy experiments, but can have a negative experience if they are confused. Because games are focused on individual decisions, confusion among even one participant can even delay outcomes for the entire class. Second is the need to manage rewards and incentives to participate in the game. As economists, we focus on individual incentives and having students play games with bonus points at stake can help to create competitive pressures and motivate discussions surrounding incentive compatibility. Finally, there is the need to provide a framework for discussion and debriefing surrounding the behavior that goes on in the game. The equilibrium solutions to many classroom games involve noncooperative solutions, which may leave students with negative feelings about the outcomes. In face-to-face instruction, this is usually an opportunity for discussion surrounding the incentives that drive competitive behaviors. Instructors should ensure that these discussion options remain well-defined to guide experiential learning in an online setting.

About the Authors: Stephen N. Morgan is a Research Agricultural Economist at the USDA Economic Research Service. Corresponding Author (stephen.morgan@usda.gov). Misti D. Sharp is a Lecturer in Food and Resource Economics at the University of Florida. Kelly A. Grogan is an Associate Professor in Food and Resource Economics at the University of Florida.
Acknowledgements: The findings and conclusions in this publication and supplementary online materials are those of the authors and should not be construed to represent any official USDA or U.S. Government determination or policy. This work was conducted while Stephen Morgan was an Assistant Professor in the Food and Resource Economics Department at the University of Florida.

References

Barnett, B.J., and W. Kriesel. 2003. "Agricultural Economists' Use of Classroom Economic Experiments." *Journal of Agricultural and Applied Economics* 35(2):321–335.

Chen, D.L., M. Schonger, and C. Wickens. 2016. "oTree—An Open-Source Platform for Laboratory, Online, and Field Experiments." *Journal of Behavioral and Experimental Finance* 9:88–97.

Davis, D.D., and C.A. Holt. 1993. *Experimental Economics*. Princeton NJ: Princeton University Press.

Dickie, M. 2006. "Do Classroom Experiments Increase Learning in Introductory Microeconomics?" *The Journal of Economic Education* 37(3):267–288.

Dissanayake, S.T.M., and S.A. Jacobson. 2016. "Policies with Varying Costs and Benefits: A Land Conservation Classroom Game." *The Journal of Economic Education* 47(2):142–160.

Durham, Y., T. Mckinnon, and C. Schulman. 2007. "Classroom Experiments: Not Just Fun and Games." *Economic Inquiry* 45(1):162–178.

Holt, C.A. 1996. "Classroom Games: Trading in a Pit Market." *Journal of Economic Perspectives* 10(1):193–203.

Holt, C.A. 2007. *Markets, Games, & Strategic Behavior*. Boston: Pearson Addison Wesley.

Holt, C.A. 2019. *Markets, Games, and Strategic Behavior: An Introduction to Experimental Economics*, 2nd ed. Princeton NJ: Princeton University Press.

Holt, C.A. and M. Capra. 2000. "Classroom Games: A Prisoner's Dilemma." *The Journal of Economic Education* 31(3): 229-236.

Holt, C.A., and S.K. Laury. 1997. "Classroom Games: Voluntary Provision of a Public Good." *Journal of Economic Perspectives* 11(4):209–215.

Kroll, S., T.L. Cherry, and J.F. Shogren. 2007. "Voting, Punishment, and Public Goods." *Economic Inquiry* 45(3):557–570.

Leuthold, J.H. 1993. "A Free Rider Experiment for the Large Class," 12.

Nelson, R.G., and R.O. Beil. 1995. "A Classroom Experiment on Oligopolies." *Journal of Agricultural and Applied Economics* 27(1):263–275.

Ruffle, B.J. 2003. "Competitive Equilibrium and Classroom Pit Markets." *The Journal of Economic Education* 34(2):123–137.

Swarthout, J.T. "Public Goods Experiment Teaching Module." *EconPort*. Available at: https://econport.org/content/teaching/modules/PublicGoods.html.

Wilson, N.L.W., and R.G. Nelson. 2008. "Leader of the Pack: An Oligopoly Experiment with a Stackelberg Leader."

Wilson, N.L.W., and R.G. Nelson. 2009. "A Laboratory Science Approach to Teaching in the Agricultural Economics Curriculum." *Review of Agricultural Economics* 31(2):331–343.

2(5) doi: 10.22004/ag.econ.308055

Teaching and Education Commentary

No Honor Among Cheaters: A "Prisoner's Dilemma" Approach to Reduce Cheating in Online Classes

Jeffrey S. Young
Murray State University

JEL Codes: A130, A22, A29, C72
Keywords: Cheating, incentive structure, online higher education, Prisoner's Dilemma

Abstract
Online higher education is growing at a rapid pace. Although beneficial in many regards, many studies find greater opportunity for student dishonesty. Unethical practices facilitated by e-learning include copying answers, trading solutions, or students taking turns as first mover on assignments to obtain and distribute question details or even solutions to their peers. However, if an incentive structure existed in which a student could be enticed to anonymously betray his or her peers and collaborate with the instructor, it seems reasonable that cheating could be reduced substantially. This framework resembles Prisoner's Dilemma. The objective of this study is to stylize the Prisoner's Dilemma game in the digital classroom context and propose instructor applications to set up an effective incentive structure. It is shown that a generous grade lift is a theoretically sufficient incentive to tip students toward defecting from collusion with their peers.

1 Introduction

Online higher education is growing globally at an accelerating pace (Allen and Seaman 2011; Arnold 2016), and the field of economics certainly is no exception (Harmon and Lambrinos 2008). Some courses adopt a composite or "hybrid" model of face-to-face classroom lectures (either part-time or full-time during a given semester) and list any handouts, lecture slides, homework assignments, quizzes, and even exams on an online portal (e.g., Canvas or Blackboard). Although an obvious benefit to such a system is a potential easing of the burden of grading placed on instructors, another is this allows universities to provide distance learning to students who choose not to or cannot relocate to an institution for their studies, such as military service members stationed overseas. In the recently familiar case of a pandemic, when face-to-face education suddenly becomes a nonviable option for an extended period of time, online distance learning is the logical alternative. However, online or hybrid class structures also can present additional time and effort for instructors, as well as open the door for a host of other problems, including: cheating; buying and selling of solutions to assignments; and exploitation of bugs in online tests, quizzes, and submission portals without notifying the instructor.

One issue with the increasing share of course material and assignments being moved online is the possibility of gaps in the integrity of the online system being utilized by the institution (Lanier 2006; King et al. 2009; Watson and Sottile 2010). Students are increasingly exploiting these gaps to provide personal relief to their academic workload or a host of other reasons (Ashworth et al. 1997; Hard, Conway, and Moran 2006). This is particularly true in courses with students who actively collude on assignments, quizzes, and tests, which is difficult for instructors to prevent.[1] Some have suggested a possible remedy of creating exceptionally large banks of questions and answers, assigning different sets to different students

[1] Studies find evidence of reduced cheating when proctoring is available for tests and quizzes (Rovai 2001; Deal 2002), but this is not always the case because of resource constraints.

(Simha, Armstrong, and Albert 2012). This undertaking is difficult in many cases for faculty whose duties increasingly extend much beyond teaching.[2]

Another pertinent issue facing faculty is the remarkable creativity of students to devise different avenues of cheating. For example, one such cheating method observed by the author was the "scapegoat method" of taking quizzes. Students would form study groups as encouraged but would seemingly elect one member to be a first mover in taking the quiz. This forerunner would take the quiz and document the questions encountered and the answers he or she selected for each question, inevitably making a less than perfect score. If the correct answers were readily displayed, the rest of the group would document them. If not, then a process-of-elimination scheme would ensue until each question's answer was confidently recorded, paving a safe pathway for the group members to take the quiz and achieve either perfect or near perfect scores. By taking turns as the first mover for each assignment, quiz, or exam, no one student in the group remains permanently disadvantaged.

Other, similar instances of student unethical completion tactics in online and hybrid courses were observed by other instructors interviewed by the author (e.g., one student completes the work and directly sells the solution to nonworking students, or students record postexam walkthroughs without the instructor's permission and trade with other students across courses). Because many undergraduate students are exceptionally reluctant to reveal their secrets[3]—which is a common trait of cheating frameworks in general (Dufwenberg and Dufwenberg 2018)—there is no information available on what incentive structure would tip a student toward a decision to divulge their sources and materials. It is worth noting that no question posed to a student with the goal of collecting such data would compel a student to name names, but rather name methods for obtaining and using assignment aids.

Hence, the objective of this work is to propose and describe a stylized incentive structure that could reduce cheating. This study offers a conceptual game theoretic framework for analyzing how to do so practically. The means for this would be to offer something to students that induces them to forsake any peer-collusion agreements—stated or tacit—and anonymously reporting to the instructor the presence of and solutions to students' cheating. A hypothesis to test would be whether it is possible to incentivize students to defect from colluding with their peers, and thereby reduce cheating. Indeed, there is valuable future work in collecting the data appropriate for testing this hypothesis empirically. Given the present unavailability of such data, an initial analysis using a familiar, stylized game theory model follows.

2 Model

The situation presented above closely resembles a Prisoner's Dilemma game. In this widely studied problem, one of two agents receives a reward for not cooperating at the expense of the other. But if they both do not cooperate, they both lose any reward by cooperating. The Nash Equilibrium for a single game is for both agents to not cooperate. In terms of undergraduate students, a student involved in a collusion scheme either can continue cooperating, while risking that another student confesses to the instructor before they do (presumably for some sufficiently enticing reward—such as a generous grade lift), or by making a deal for themselves to receive a reward, turning on their group, and showing the instructor documented evidence of the cheating. Without this potential of noncooperation, an instructor may not know which assignments require alteration and need to be modified in such a way that student collusion does not result in unethically inflated scores. This single-game structure assumes no penalty associated with noncooperation (considering pressure from other students).[4]

[2] Some platforms have built-in mechanisms to help with this, such as randomizers to change multiple choice ordering, random samplers for large question banks, and others. This is, of course, only useful after many hours have been invested in preparing the material required to utilize such tools.

[3] For example—and of particular interest to the author—how is(are) the scapegoat(s) chosen before each quiz?

[4] This is, of course, confined to a single class. In an infinitely repeated game, for instance where students A and B take every class together for the entirety of college, the Nash Equilibrium is for them to maintain their collusion for all classes in the long run (any noncooperation can be penalized in the next game).

A point raised previously is that the reward for the defecting student should be sufficiently worthwhile to induce a tip toward anonymous[5] noncooperation. Conversely, the prospect of the potential damage dealt to the grade of the colluding students left behind must be sufficiently menacing to entice them not to want being turned against by the defector, further incentivizing noncooperation. This problem faced by the students can be represented by a payoff function. Institutional regulations for faculty generally discourage taking severe measures for seemingly "lesser" violations of the student code of conduct or agreement of academic integrity (which, in turn, limits the instructor's options to exercise these severe game-ending measures like failing the student, or calling for their suspension or expulsion). Corner solutions to this problem involve those more serious violations of academic integrity, which, if resulting in permanent expulsion, end the game. Although an instructor can fail a student for cheating, those cases are nearly always appealed by the accused student to the university's committee for disciplinary actions on academic dishonesty and academic appeal. Additionally, many universities also have policies in place to discourage faculty as much as possible from doing anything that negatively affects student enrollment (Thomas 2017), commonly for the clear reasons of maintaining student headcount and tuition revenue (Guyette, King, and Piotrowski 2008).

3 Example and Solution

Consider a numeric example of the game and resulting relevant class policy applications to aid instructors in combatting cheating. Assume a two-student case (student A and B), which is easily generalized to a finite, arbitrary number of students. Next, let the incentive provided by the instructor be a 5-percent boost to the noncooperative student's final grade. Further, let the average value of student collusion (e.g., adopting the scapegoat method) be 7 percent of the students' final grade, but upon the instructor's correcting the problem, the cooperative students' grades drop by 10 percent. This is realistic to assume. It is without question that students who regularly engage in cheating end up with substantially less understanding of the course material, and, having lost this form of support, would therefore perform worse on assignments for which they did not study. Also assume that if, simultaneously, student A betrays student B, and B betrays A, then both their course grades get a 1-percent boost as an "honesty bonus." Finally, assume that, initially, either student is indifferent toward cheating, and the decisions are uniformly distributed with $P(collude) = P(defect) = 0.5$.

Proceeding from these assumptions, consider the game represented in the payoff matrix in Table 1. For either student, the expected payoff under collusion is:

$$V_{Collude} = (0.5) * (7) + (0.5) * (-10) = -1.5,$$

and the expected payoff for reporting the cheating to the instructor is :

$$V_{Defect} = (0.5) * (5) + (0.5) * (1) = 3.5.$$

Table 1. Example Game

		Student B	
		Collude	Defect
Student A	Collude	(7,7)	(−10,5)
	Defect	(5, −10)	(1,1)

Note: The numbers in parentheses denote (A's payoff, B's payoff)

[5] A guarantee of anonymity and protection of the defector should be provided in the course syllabus.

The expected payoff is highest for a student to defect by anonymously betraying their colluding classmate. Choosing to cheat lowers student A's course grade by 1.5 percentage points, while choosing to accept the instructor's offer raises the course grade by 3.5 percentage points. The Nash Equilibrium solution is for a student to defect and abandon the cheating strategy, given this incentive structure.

Consider, as an exercise, a hypothetical class utilizing an online system for assignments, quizzes, and exams that operates on a strict letter grade system (that is, no +/- grades). Suppose that there are two cheating students who actively collaborate (in some unspecified, general form of academic dishonesty) in this class, which has the proposed incentive structure in place. Let the students' grades both be 65 percent (that is, a "D") because of their collusion—without the ability to cheat at all, both their grades would suffer by 10 percent and be a "fail" at 55 percent (assuming they did not resolve themselves to begin studying the material). Both students would rather make a C (starting at 70 percent), but as a result of cheating rather than honest studying, neither has a C-level understanding of the course material. After it becomes clear that their grades are doomed to be so low or even lower, two thoughts occur: (1) the enticement of a 5-percentage point boost which, in this example, yields the desired letter grade; and (2) potential fear exists of being abandoned to a failing grade with the loss of the unspecified cheating mechanism. Then the standard outcome follows and at least one student defects—both for the hope of a better grade and the fear of failing the class in the event of betrayal.

4 Conclusions and Discussion

Online augmentation of college courses leads to increased risk of students cheating and looking for loopholes in the assignments to reduce the workload necessary for succeeding in a given course, though the degree to which this occurs remains uncertain (Etter, Cramer, and Finn 2006; Grijalva, Kerkvliet, and Nowell 2006; Stuber-McEwen, Wiseley, and Hoggatt 2009). However, the moral argument meant to persuade students that cheating is wrong appears to be an increasingly insufficient motivator for many students—graduate or undergraduate—to complete coursework ethically (Etter et al. 2006; Larkin and Mintu-Wimsatt 2015).

As a result, further examination of the growing problem is warranted—especially in an economic context. This study addressed the issue as an example of distorted incentives and proposed a solution developed using simple game theory. In particular, the solution is borne out by the well-known Prisoner's Dilemma game. The numeric example earlier provides a viable solution for instructors to combat cheating in such a way that students see their expected payoff as being considerably higher when they choose to perform according to the expectations laid out in a university-approved course syllabus. Additionally, the likelihood of any fallout against the instructor is small. A noncooperating cheater is not going to complain about the grade boost he or she receives for abandoning a cheating ring, and the cooperators whose grades suffer as a result of not acting first will not lodge a complaint to the department chair that the instructor took away their favorite method of cheating on assignments and exams. Any administrators concerned with maintaining enrollment should be amiably disposed to this type of solution as well.

The example solution proposed herein, if simple, is an analysis easily carried out, and the steady state Nash Equilibrium—that is, a student defecting—holds. However, doing so requires further considerations. For instance, a grade boost after midterms may be a more desirable incentive than one before midterms when a student's grade is uncertain and the student is less prone to anxiety about the effect on his or her GPA. A discounting term could account for this pre-post effect. Moreover, parameterizing a discounting factor in the analysis allows for the incentive to erode as the semester progresses (e.g., the grade boost is 5 percentage points if cooperation occurs before midterms, reduces to 2 percentage points if after; alternatively, a continuous discounting factor could be employed).

Further research should include classroom experiments closely resembling the numeric example given earlier. In the case of the author's teaching, such an experiment was recently underway. Indeed, many students openly acknowledged the general presence of cheating. In the Spring 2020 semester when this study was initiated, only a few of these appeared to harbor interest in defecting to receive the grade boost—likely waiting to see how their grades fared throughout the semester until midterm grades had posted. However, it was around the time of midterms when universities responded to the coronavirus pandemic by moving instruction to an online format. Institutions also switched to a pass-fail grading system as a concession to the students (Leingang 2020). Unsurprisingly, the students who expressed an interest in defecting—in the hope of moving a letter grade higher—ceased to show that interest, and hurriedly applied for a pass-fail grade conversion.

A limitation of using the Prisoner's Dilemma game is the reliance on preselected values of the parameters, which is unavoidable in the absence of any real classroom data. A follow-up study to the one herein could collect and analyze data from multiple courses adopting the proposed framework and determine whether and by how much cheating diminished. Moreover, values for some of the analysis' parameters could be better approximated with such data, chiefly the latent probability of the students' decision to cooperate or defect, and a subsequent Monte Carlo-type analysis could enrich both the understanding of the conditions affecting students' decision making and practical application in university teaching.

About the Authors: Jeffrey S. Young is an Assistant Professor in Agribusiness Economics in the Hutson School of Agriculture at Murray State University. (Corresponding Author: jyoung6@murraystate.edu).
Acknowledgement: The author is grateful to Dr. Michael Wetzstein and Dr. Brian Parr for their feedback on the earliest drafts of the work.

References

Allen, I.E., and J. Seaman. 2011. *Going the Distance: Online Education in the United States*. Newburyport MA: Sloan Consortium.

Arnold, I.J.M. 2016. "Cheating at Online Formative Tests: Does It Pay Off?" *The Internet and Higher Education* 29:98–106.

Ashworth, P., P. Bannister, P. Thorne, and Students on the Qualitative Research Methods Course Unit. 1997. "Guilty in Whose Eyes? University Students' Perceptions of Cheating and Plagiarism in Academic Work and Assessment." *Studies in Higher Education* 22(2):187–203.

Deal, W.F., III. 2002. "Distance Learning: Teaching Technology Online." *Technology Teacher* 61(8):21–27.

Dufwenberg, M., & Dufwenberg, M. A. 2018. "Lies in Disguise–A Theoretical Analysis of Cheating." *Journal of Economic Theory* 175:248-264.

Etter, S., J.J. Cramer, and S. Finn. 2006. "Origins of Academic Dishonesty: Ethical Orientations and Personality Factors Associated with Attitudes About Cheating with Information Technology." *Journal of Research on Technology in Education* 39(2):133–155.

Grijalva, T.C., J. Kerkvliet, and C. Nowell. 2006. "Academic Honesty and Online Courses." *College Student Journal* 40(1).

Guyette, R.W., Jr., C.G. King, and C. Piotrowski. 2008. "Business Faculty Views of Online Course Cheating: Evidence for a Cohort Effect." *Organization Development Journal* 26(4).

Hard, S.F., J.M. Conway, and A.C. Moran. 2006. "Faculty and College Student Beliefs About the Frequency of Student Academic Misconduct." *The Journal of Higher Education* 77(6):1058–1080.

Harmon, O.R., and J. Lambrinos. 2008. "Are Online Exams an Invitation to Cheat?" *The Journal of Economic Education* 39(2):116–125.

King, C.G., R.W. Guyette, Jr., and C. Piotrowski. 2009. "Online Exams and Cheating: An Empirical Analysis of Business Students' Views." *Journal of Educators Online* 6(1):n1.

Lanier, M.M. 2006. "Academic Integrity and Distance Learning." *Journal of Criminal Justice Education* 17(2):244–261.

Larkin, C., and A. Mintu-Wimsatt. 2015. "Comparing Cheating Behaviors among Graduate and Undergraduate Online Business Students." *Journal of Higher Education Theory and Practice* 15(7):54.

Leingang, R. 2020, Apr. 2. "College Students Want to Change How They're Graded as Coronavirus Pandemic Disrupts Everything." *USA Today*.

Rovai, A.P. 2001. "Online and Traditional Assessments: What Is the Difference?" *Internet and Higher Education* 3(3):141–151.

Simha, A., J.P. Armstrong, and J.F. Albert. 2012. "Who Leads and Who Lags? A Comparison of Cheating Attitudes and Behaviors Among Leadership and Business Students." *Journal of Education for Business* 87(6):316–324.

Stuber-McEwen, D., P. Wiseley, and S. Hoggatt. 2009. "Point, Click, and Cheat: Frequency and Type of Academic Dishonesty in the Virtual Classroom." *Online Journal of Distance Learning Administration* 12(3).

Thomas, A. 2017. "Faculty Reluctance to Report Student Plagiarism: A Case Study." *African Journal of Business Ethics* 11(1).

Watson, G.R., and J. Sottile. 2010. "Cheating in the Digital Age: Do Students Cheat More in Online Courses?"

2(5) doi: 10.22004/ag.econ.308056

Teaching and Educational Methods

Insights from Asynchronous Lecture Viewing Behavior

Michael Black
Texas A&M University

JEL Codes: A20, A22
Keywords: Asynchronous lectures, educations, learning experience

Abstract
The COVID-19 pandemic forced many applied economics courses to switch from synchronous, face-to-face instruction to an online format. A strategy for some instructors is to pre-record lectures for asynchronous viewing by students. I provide commentary on observed viewing behavior of pre-recorded lectures in an applied economics course and suggest ways to improve construction of asynchronous material. I observe students delaying viewing until assignments are due, skipping over lecture material and scrubbing to the "hands-on" portions of the videos, losing attention after approximately 20 minutes, and watching primarily on larger screens. Instructors may wish to consider posting lecture notes separately, with shorter videos covering only hands-on activities to improve student engagement.

1 Introduction

An asynchronous learning network (ALN) is a type of instruction where students consume learning materials and communicate or collaborate with each other from a distance (Wieland 2012). The defining characteristics of ALNs are the ability for students to listen to a lecture, for example, at different times and to communicate with each other and the instructor. Traditional courses may have synchronous lecture delivery, with the expectation that students collaborate on their own time. An ALN "flips" the traditional classroom[1] so that the opposite occurs: students enjoy asynchronous lecture delivery with potentially synchronous opportunities for collabroation. Flipping the classrom has received much attention, with high-profile evidence that student learning may drastically improve with the different format (Berrett 2012; Khan 2012).

There are several benefits to the asynchronous course structure. For students that may struggle to understand the language of instruction, ALNs offer the ability to re-watch or slow down instruction to improve understanding (Simpson 2006). For courses that emphasize data access or management, ALNs can help students get hands-on experience (Jaffee 1997). ALNs can also encourage student-to-student collaboration (Arbaugh 2000; Marmon, Gordesky, and Vanscoder 2013) and improve student satisfaction (Wu, Bieber, and Hiltz 2019).

During the COVID-19 outbreak in the spring semester of 2020, many universities abruptly shifted to online instruction as campuses were closed to prevent the spread of the virus. While the timing of the pandemic did not allow for full development of a new ALN, instructors faced the decision whether to continue with synchronous instruction on digital platforms, or develop prerecorded material for asynchronous consumption.

This paper reveals insights from student viewing data on ansynchronous lecture videos to learn more about student engagement with classroom material. Specifically, the paper explores the duration, timing, and engagement with lecture videos that consist of a traditional lecture and a hands-on portion

[1] The traditional classroom in this context is one with synchronous lecture delivery. Many other classroom formats exist along the gradient from totally synchronous to totally asynchronous, but those distinctions are not explored here.

with a data analysis tool. Analytic viewing data from lecture videos is used to understand when and how students watch prerecorded material, and what parts of the lecture were skipped or replayed. Several lessons are apparent and are explored in the last section.

2 Initial Synchronous Course Structure

The course analyzed in this paper is a junior undergraduate level course in econometric analysis taught at a large four-year public university (hereafter referred to as “the course”). There were 76 students enrolled in the course. Prerequisites include calculus, economic theory, and a class on economic analysis held in a local computer lab. Students are introduced to basic data management and analysis using Microsoft Excel (Microsoft Excel 2020).

The course has a modular structure that covers mathematic and statistical reviews, linear regression, multivariate regression, basic nonlinear regression, application of regression analysis optimization to demand and supply analysis, and personal finance and forecasting. Specifically, the modules are:

1. Statistics Review
2. Mathematics Review
3. Linear Regression
4. Multiple Regression
5. Advanced Model Specification
6. Applied Production Economics
7. Applied Demand Analysis
8. Personal Finance and Forecasting

Modules 1–5 are designed to be technical in nature, with small applied problems accompanying mathematical derivations. Modules 3–5 focus on the derivation of ordinary-least-squares (OLS) estimators using principles from calculus and linear algebra. Students are exposed to the Gauss-Markov Theorem and are taught how to spot potential endogeneity problems. There are eight problem sets corresponding to each module. With the exception of problem set 2 (focused on calculating derivatives and solving systems of equations), the problem sets are completed in Excel and submitted to a secure course management site.

The course initially met twice a week, for 1 hour and 15 minutes each session. Lectures were face-to-face and synchronous. Examples of regression or data analysis were performed in Excel using a projector system in a traditional classroom. Students were expected to either own laptops and follow along themselves, or to take notes and perform the analysis later at their convenience.

In the spring of 2020, the rapid spread of COVID-19 resulted in the closure of campus. Instructors across the university were given a week to prepare material to switch to an online format. The course had just concluded Module 5. Based on midterm feedback I received from the students, I had decided to focus more on hands-on examples in Excel to improve the learning process. With the forced move to an online structure, I decided to change the format of the class from a synchronous to an asynchronous format. The next section describes the asynchronous course structure and methods for gathering information from student consumption of classroom material.

3 Asynchronous Course Structure

The new asynchronous course structure changed how students consume the lecture material and interact with each other. Specifically, I prerecorded a single lecture video for each remaining module and expected the students to watch the video prior to coming to a synchronous class session. The synchronous portion of the class still met at the normal time as set by the university, though virtually through a popular web conferencing service. However, the synchronous session was split into three groups to decrease the likelihood of bandwidth issues, and to encourage discussion by keeping the number of peers on the call capped at one third of the original class size. During the synchronous session, I answered questions from students, addressed any confusing material from the lecture videos, or introduced tangential or additional material to supplement the learning process. After watching the prerecorded videos and attending the sessions for clarification, students were expected to be able to complete the problem set corresponding to the week's module. Students had one week to complete the problem set and were given a window of 24 hours to complete the final exam. Both the problem sets and the exam were Excel-based, and were submitted to a secure course management site.

I uploaded recorded lectures to YouTube,[2] which provides a variety of analytic measures.[3] YouTube gathers information on views, watch time, engagement, audience retention, and ad performance metrics. The owner of any video hosted on the platform is automatically provided with this core set of metrics, and the data can either be visualized on the platform or downloaded for further analysis.

Uploading the lecture videos to YouTube provides the benefit of data collection, which is explored in the next section. However, there may be some legal considerations for individual instructors. Some departments or universities might wish to keep lecture videos private and available only to registered students. A simple solution may be to keep the uploaded videos "unlisted," which only allows people with the video link to watch the video; it is not searchable or discoverable to the general public. For courses entirely online, unlisted videos may be desirable. With only three modules left in the course, I kept my videos as "listed," to encourage students to access the material in whatever way they chose. The following section provides insights from data collected by YouTube on viewer behavior.

4 Insights from Viewing Behavior

I focus on three videos in particular: the lecture material for Modules 6, 7, and 8. These videos are similar in format, in that they cover the lecture notes and one or two hands-on examples in Excel. The data I focus on are number of unique viewers, device type, timing and duration of views, and audience retention over time. As mentioned above, the videos are listed on YouTube, so it is possible that viewers outside the course accessed the material throughout the window of analysis. I assume the number of viewers outside the course are negligible, since a direct search of the exact video title does not yield the video on the first page of results.[4]

Table 1 summarizes general viewing patterns for the 76 enrolled students across the three lecture videos. The total number of views for a video is the number of times it was played, but there may be instances where the video is played multiple times on one device. The number of *unique* views is the count of views from unique individuals.[5] It may be possible that a student watches the video once on a laptop, and again on a tablet. It may also be possible that a student does not consistently stay logged onto a single YouTube/Google account, which would increase the number of unique views.[6] A useful metric is the total views for a video divided by the number of unique views: the average number of views per viewer. Students viewed Module 6 an average of 1.75 times, Module 7 an average of 2.01 times, and Module 8 an average of 2.50 times. The increasing trend over the three lectures could likely be a function of video length: Module 6 is just over 46 minutes long, and more consumable in one sitting than the 93-minute Module 8.

Despite the fact that students may be splitting their viewings into multiple sessions, the average view duration also increases with the longer lecture videos. The average student watched Module 6—a 46-minute video—for an average of 14 minutes before navigating away or closing the video. The average student watched the 93-minute Module 8 for a longer 25 minutes before navigating away. Importantly,

[2] https://www.youtube.com

[3] https://developers.google.com/youtube/analytics/metrics

[4] To find the lecture videos, the search term must include the exact name of the video, plus my name. Otherwise, the video is buried on the second page or higher on YouTube search results.

[5] https://support.google.com/youtube/answer/7577916?hl=en

[6] There were 76 students enrolled in the course; the larger number of unique views suggest students were either not consistently logged onto a single YouTube/Google account, consumed the videos across platforms, or some views originated from individuals outside the class. Given the difficulty of finding the video without the link, the latter is unlikely.

Table 1. Viewing Behavior for Lecture Videos			
	Module 6: Applied Production Economics	Module 7: Applied Demand Analysis	Module 8: Personal Finance and Forecasting
Total Views	217	219	258
Unique Views	124	109	103
Video Length	46:15	1:11:22	1:33:03
Average View Duration	14:13	17:25	25:00
Device Type (percent of views)			
Computer	92.6	94.1	98.1
TV	0.9	0.9	0.8
Mobile Phone	4.2	4.1	0.8
Tablet	2.3	0.5	0.4

multiplying the average view duration by the average number of views per student falls short of the full video length. For example, the average number of views per student for Module 6 is 1.75, and when multiplied by 14, we see that the average total viewing duration across the multiple viewing attempts is approximately 25 minutes: half the length of the full lecture video. For Module 8, the corresponding metric is 62.5 minutes, still significantly shorter than the full lecture length.

Across all three lecture videos, a large majority of students watched the lecture videos on a computer (over 92 percent for all videos). A small share of approximately 4 percent viewed the video on their mobile phones, which is a more popular device than either TVs or tablets.

The aggregated viewing data suggests that students are not, on average, viewing the entire lecture video. The lecture videos are long, but still shorter (with the exception of Module 8) than a single traditional class period. Each Module took 2–4 class periods to cover, so the asynchronous lecture videos are significantly shorter than their face-to-face alternatives would have been, should they have occurred. In line with midterm survey feedback, I see evidence that students are skipping to key sections of video and are delaying viewing until a related assignment is due.

Information on audience retention is shown in Figure 1. For any given point in the video, measured by percent of the video completed, the vertical axis measures audience retention: the number of views at a given position as a percentage of total views.[7] A measure of 25 percent at video position 50 percent means that 25 percent of views occurred at the halfway point of the video. Audience retention below 100 percent means some students did not watch a particular part of the video and skipped or scrubbed to other parts of the video. Audience retention above 100 percent means that on average, all students watched that moment of video, plus some students skipped or scrubbed *back* to that position. In Figure 1, the shaded regions of the video indicate the Excel portion of the video. For each lecture video, I read over the lecture notes, and then added a hands-on example in Excel. The vertical green line indicates when I started the Excel portion of the video, and the vertical red line indicates when I ended the Excel portion of the video. In Modules 6 and 7, there was only one Excel portion, while in Module 8, there were two Excel portions. The trends across the videos are striking; audience retention drops significantly at the start of each video and remains low during the lecture notes portion of the video. During the Excel portions, audience retention jumps significantly and, in some cases, exceeds 100 percent. These results suggest that most viewers are skipping directly to the Excel portion(s) of the video and skipping over the part of the video where I discuss the lecture notes.

[7] https://support.google.com/youtube/answer/9314415?hl=en

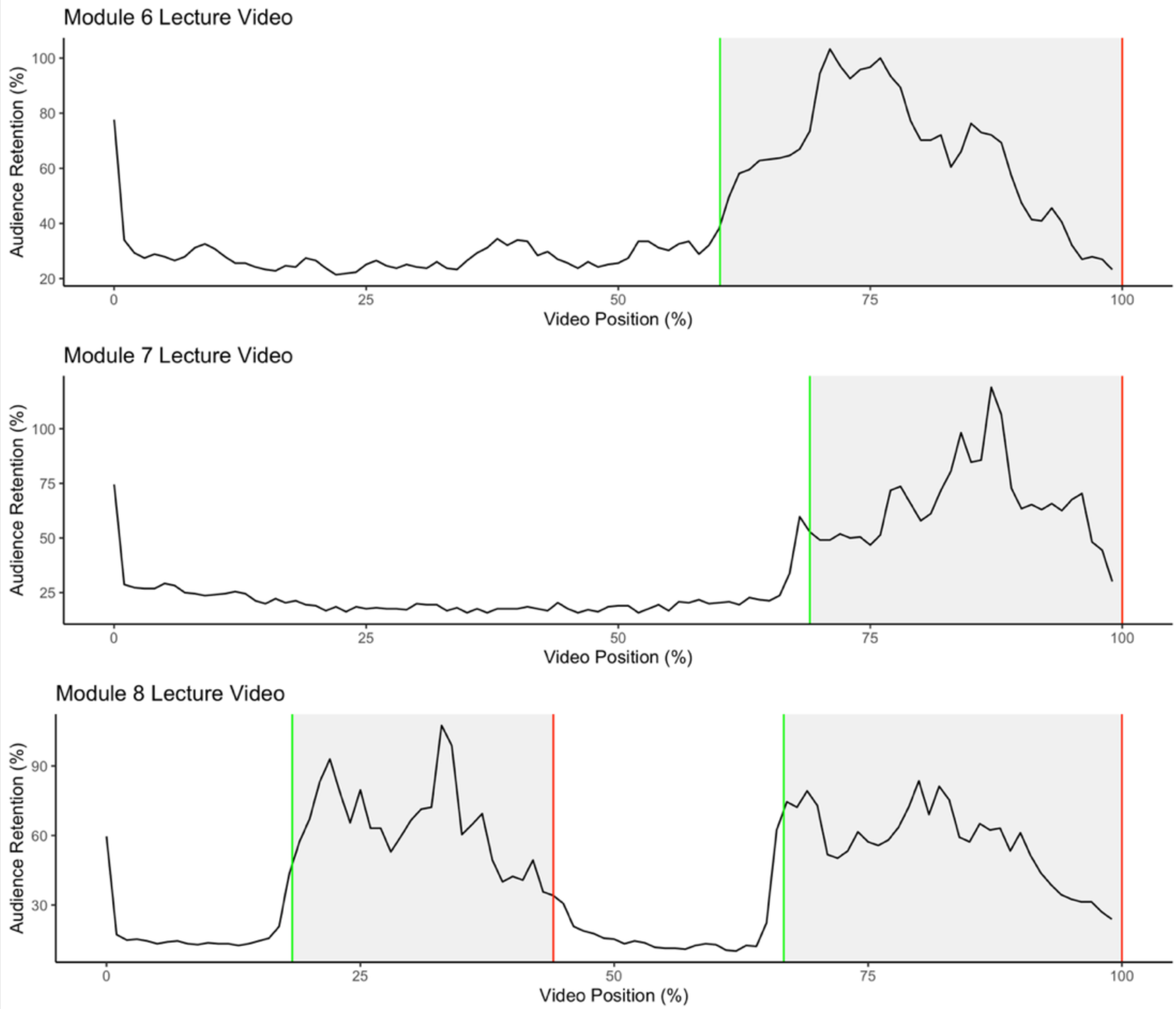

Figure 1. Audience Retention

Information on the timing of views is shown in Figure 2. The horizontal axis is the date, and the vertical axis is the number of *unique* views. As mentioned above, a unique view is a measure of the number of new viewers of the video. The vertical dashed line indicates when the problem set for that module was due, and the vertical solid line indicates the day of the exam. There is a spike in unique views the day a problem set is due, and again during the final exam. There is also a smaller spike soon after the video is posted, which suggests three general categories for students: (1) those who watch the video prior to the due date of the assignment; (2) those who watch the video on the due date of the assignment; and (3) those who watch the video on the day of the final exam. Remember these are unique views, so the third type of student is watching the video for the first time on the day of the final exam. This suggests that this group submitted their problem set without having watched the lecture material at all.

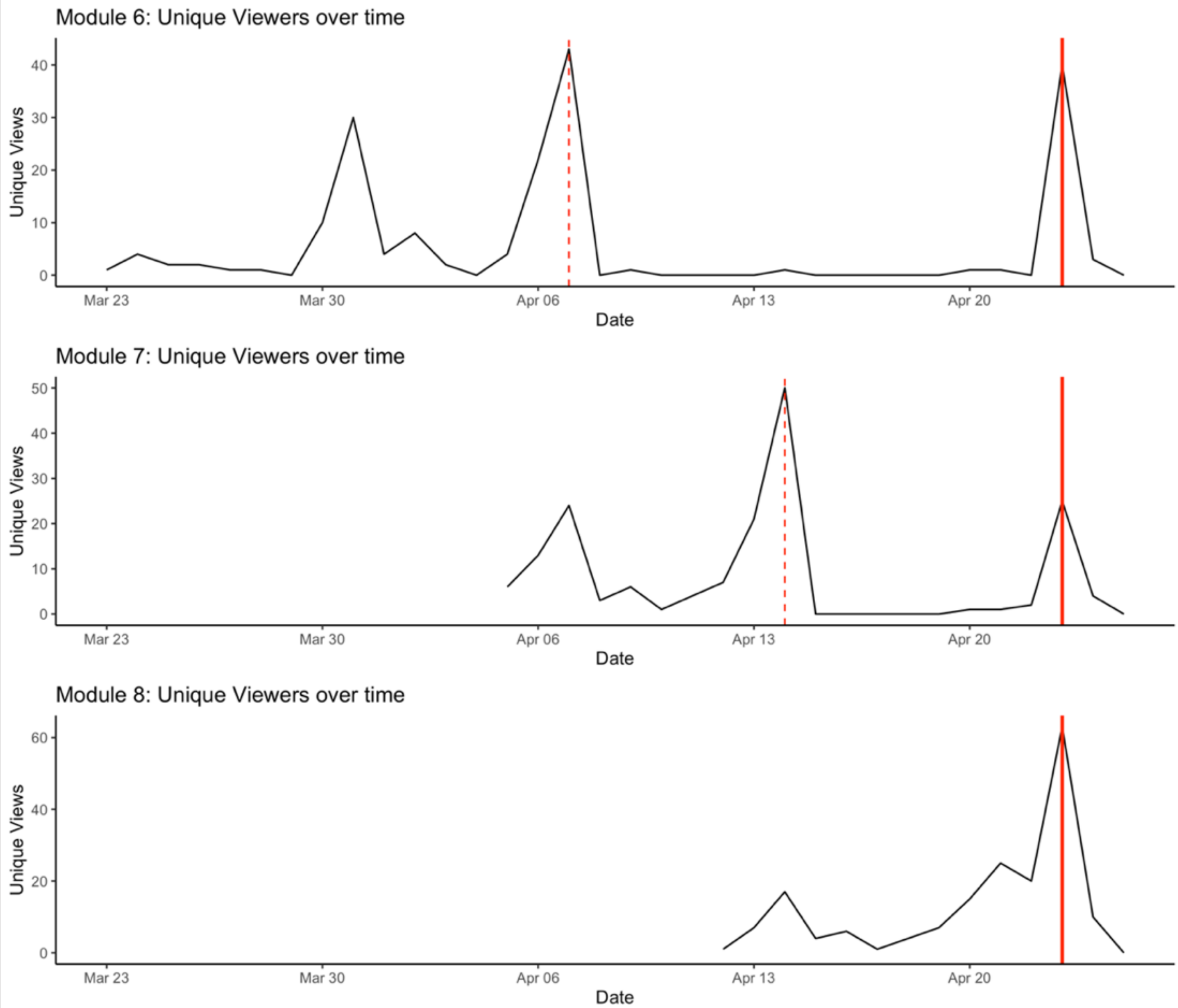

Figure 2. Views Over Time

5 Conclusions

For an applied economics or statistics course that is taught asynchronously, the insights from YouTube viewing behavior can be useful. I have several suggestions for instructors considering the switch to an asynchronous format. First, consider the length of the lecture video. My lectures were approximately one hour on average, though the average duration of a single viewer was significantly less than that. The average duration was approximately 20 minutes, so students may not have the patience to "sit" through an asynchronous lecture with the same length as its synchronous counterpart. While there may not be a single optimal length for a lecture video, evidence from similar work suggests that audience retention consistently declines over time (Lau et al. 2018), so in general shorter videos should be preferred to longer videos. Second, the vast majority of students in the course watched the videos on computers. Despite the variety of devices available to view the material, students opted for the largest screen. However, there is no data on how large the viewing pane for the viewers was. There are several options ranging from the default to theatre to full-screen mode, so even with the larger screens there is still unobserved heterogeneity in the size of the actual viewing window. Third, most viewers skipped the portions of the video covering the technical lecture notes. Most viewers jumped to the hands-on Excel portions of the video. For courses with available lecture notes or slides, it may be worth considering only posting videos of hands-on activities, with the expectation that students simply read through the lecture notes on their own. It appears they are doing this already. Instructor-provided self-guided notes for students may be preferable to videos for portions of the lecture that are not hands-on. Fourth, viewers are apparently delaying their views of the course videos until an assignment or test is due. Coupled with the fact that most viewers are skipping to the hands-on portions of the video, this reinforces the idea that the students are reading the lecture notes on their own and using the videos to learn about how to *apply* tools like regression and optimization to real-world examples. Finally, hosting lecture videos on YouTube provides substantial benefits in the form of analytic information. The free information provided by YouTube can tell instructors how, where, and when students are listening to lectures. Instructors can also see when students lose attention or get stuck within a lecture by analyzing audience retention rates. For instructors who are willing and able to adapt their lessons to serve student learning outcomes, YouTube is a powerful partner.

Instructors should be cautious to interpret the results presented here as causal or even rigorous. The data is from three lecture videos for a single course during a particularly tumultuous period of uncertainty for students. The behavior shown here may not extend to other courses, departments, or universities. It may also be unique to this period when students are seeking to minimize time spent on classroom activities. Nonetheless, the patterns are clear and worth considering for any instructor who is interested in establishing an asynchronous course structure.

About the Authors: Michael Black is a PhD Candidate in the Department of Agricultural Economics at Texas A&M University (Corresponding Author: black.michael@tamu.edu).
Acknowledgments: Original course material developed with Dr. Jim Mjelde (Texas A&M University) and Mr. Justin Machado (Texas A&M University). The author has no conflicts of interests.

References

Arbaugh, J.B. 2000. “Virtual Classroom versus Physical Classroom: An Exploratory Study of Class Discussion Patterns and Student Learning in an Asynchronous Internet-Based MBA Course.” *Journal of Management Education* 24:213–233.

Berrett, D. 2012. “How ‘Flipping’the Classroom Can Improve the Traditional Lecture.” *The Chronicle of Higher Education* 12:1–3.

Jaffee, D. 1997. “Asynchronous Learning: Technology and Pedagogical Strategy in a Distance Learning Course.” *Teaching Sociology*:262–277.

Khan, S. 2012. *The One World Schoolhouse: Education Reimagined* (Twelve).

Lau, K.H.V., P. Farooque, G. Leydon, M.L. Schwartz, R.M. Sadler, and J.J. Moeller. 2018. “Using Learning Analytics to Evaluate a Video-Based Lecture Series.” *Medical Teacher* 40:91–98.

Marmon, M., J. Gordesky, and J. Vanscoder. 2013. “Online Student Satisfaction: An Examination of Preference, Asynchronous Course Elements and Collaboration among Online Students.” In *E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*. Association for the Advancement of Computing in Education (AACE), pp. 380–386.

“Microsoft Excel.” 2020. Microsoft Corporation.

Simpson, N. 2006. “Asynchronous Access to Conventional Course Delivery: A Pilot Project.” *British Journal of Educational Technology* 37:527–537.

Wieland, K. 2012. “Asynchronous Learning Networks.” In N.M. Seel, ed. *Encyclopedia of the Sciences of Learning.* Boston MA: Springer US.

Wu, D., M. Bieber, and S.R. Hiltz. 2019. “Engaging Students with Constructivist Participatory Examinations in Asynchronous Learning Networks.” *Journal of Information Systems Education* 19:9.

2(5) doi: 10.22004/ag.econ.308057

Teaching and Educational Commentary

Adapting to the Nontraditional Classroom: Lessons Learned from Agribusiness and Applied Economics Classes

Erik Hanson[a] and Cheryl Wachenheim[a]
[a]*North Dakota State University*

JEL Codes: A22, Q00
Keywords: Classroom, distance learning, hybrid-flexible, teaching

Abstract
COVID-19 altered instruction in spring 2020 and continues to affect teaching during the 2020–2021 academic year. This commentary reflects the experiences of two instructors of agribusiness and applied economics classes during the recent period of distance education. Strategies and considerations for future instruction are discussed.

1 Introduction

As rumors and reports about the suspension of face-to-face classes first entered conversations in March 2020, it was difficult to anticipate all the ways in which university life would change in the upcoming months. Like many of our colleagues in the North Dakota State University (NDSU) Department of Agribusiness and Applied Economics, we quickly went from hoping for a minor interruption to coping with an extended period of distance (or remote) learning. By the end of the spring semester, we began to ponder how new policies and hybrid-flexible delivery methods would shape our teaching in the fall and beyond.

Despite the challenges of the spring and summer months, there were plentiful growth opportunities. For example, like many instructors, we received a crash course in distance learning strategies and technologies. Generally, the semester's unusual circumstances caused us to reflect on our course objectives, instructional methods, classroom environment, and the alignment among those components. The purpose of this commentary is to present our experiences and reflections during this time, which we have condensed into five key areas: building and maintaining the instructor-student connection; building and maintaining student relationships; providing relevant and timely feedback; creating an adaptable class schedule; and understanding students' nonacademic commitments.

We explore four classes we taught in spring 2020. These classes represent a variety of instructional settings and topics common to many departments of agribusiness and applied economics. The first is an elective agricultural lending class, which is generally taken by juniors and seniors. The second is a capstone course in agricultural management, which is generally taken by juniors and seniors. The third is a large introductory agricultural finance class, which is required for agribusiness and applied economics majors and taken by many others pursuing agricultural or business degrees. The fourth is an elective agricultural sales class, which is generally taken by juniors and seniors.

The move to distance learning was truly an experiential learning exercise for us. Although we still have plenty to learn, we hope that the some of the lessons learned through our experiences and conversations are useful to others as they plan or adjust instruction for the 2020–2021 academic year.

2 Building and Maintaining the Instructor-Student Connection

Instructor-student connections create a foundation for learning. Rapport between instructors and students may be developed through immediacy behaviors, which are verbal and nonverbal signals of availability and interest in student success (Anderson 1979). Although opportunities to display immediacy behaviors may be reduced if instruction is not face-to-face, students still value these behaviors from instructors (Russo and Benson 2005). In our experience, demonstrating concern and care for students is a valuable approach in distance learning settings. Making students feel appreciated can be reassuring amid uncertain circumstances like those likely to exist in the upcoming months.

Two of our classes were surveyed 4 weeks into distance learning during spring 2020. When asked about what had gone well in the transition to online learning, many students commented positively regarding instructors that were accessible and accommodating. Nearly half of surveyed students noted the importance of communication from their instructors, with several expressing that communication helped them feel a connection to the instructor and the class. However, there may be diminishing returns to instructor communication in online settings. One of our students noted that, "Our inboxes are constantly full, and it is almost impossible to keep up." According to another student, "The situation is constantly changing. By the time I read one email about how we will do things (going) forward, it has already changed."

Encouraging formative feedback from students may create greater student engagement (Aultman 2006). In spring 2020, we empowered students to provide feedback on distance learning instruction they had experienced and enjoyed in other classes. Although this approach has been used in the past, it was particularly well received during the initial stages of distance learning and created the additional benefit of rapidly expanding our list of distance learning ideas. The process not only explicitly recognized student feedback is valued, but increased student ownership in the class experience. For example, in the agricultural sales class, the move to distance learning threatened to nullify the capstone experience in which groups of four students meet with an industry sales professional and role-play a sales call. The instructor asked the students and participating sales professionals to envision how they could retain the capstone experience. Feedback clearly identified videoconferencing as an option, and the sales professionals were quick to communicate with their assigned student groups about this opportunity. By asking students to aid in identifying potential solutions, recognizing their feedback, and asking them to implement the solution, students assumed ownership of their role in the event. For the first time in two decades, student feedback on the capstone experience was unanimously positive.

Face-to-face instruction may be interrupted permanently or temporarily for some students, instructors, or institutions during the 2020–2021 academic year. Accordingly, it may be wise to prioritize the development of instructor-student rapport early in the semester when instruction is more likely to be face-to-face or when attendance may be higher. This approach is relevant in any semester, as Wilson and Wilson (2007) find that students who have a positive first day experience are more motivated and achieve higher grades at the end of the semester.

3 Building and Maintaining Student Relationships

Relationships among students are also important in developing a classroom culture. Students with a sense of belonging may exhibit increased motivation, engagement, and learning (Osterman 2000). During fall 2020, restrictions on student attendance or proximity, hybrid-flexible course designs, and planned or unplanned periods of distance learning may influence student interactions. Nevertheless, even in a distance learning format, there is evidence that students are more satisfied with their learning when they perceive the presence of their classmates (Russo and Benson 2005). Collaborative learning activities can help to build a sense of community in online classes (Chaterjee and Correia 2020). However, they must be well designed so students view online group projects as a learning experience that also builds a classroom community rather than just a requirement for earning a grade (Cameron et al. 2009).

Just as prioritizing the instructor-student relationship early in the semester is advisable, so too is providing opportunities for constructing student relationships. These relationships may enhance remote collaborative learning, which will occur if face-to-face interactions are not possible later in the semester. Thoughtfully planning student interactions at the beginning of the semester is a proactive strategy. The agricultural lending and management classes offer a case study on the importance of student relationships for collaborating in an online setting. Although these classes included many of the same students, group projects in the agricultural lending class generally went smoothly while there were more instances of free-riding, poor communication, and reduced project quality in the agricultural management class. This contrast may be explained by the agricultural lending class's smaller size, well-defined expectations, and the inclusion of industry professionals in project evaluation.

The introductory finance and agricultural sales classes presented challenges with creating student-to-student interaction because of large class sizes and reliance on impromptu groups for in-class activities prior to distance learning. The group forming process had not occurred when distance learning began, and therefore assigning students to groups remotely was less likely to be effective. To overcome this issue, rather than having students work in groups, the instructor employed student polls to create student connectiveness when class sessions were offered synchronously.

Many learning management platforms and commercial videoconferencing software products offer break-out rooms, which can be used for a particular activity or to hold a discussion based on a prior reading or content. In the hybrid-flexible model that will be employed at NDSU this fall, where some students will be in the classroom and others join the class remotely, in-person students can be formed into groups, and distance learners can be placed in groups with other distance learners using the videoconferencing platform.

4 Providing Relevant and Timely Feedback

Some traditional avenues for feedback such as informal classroom question and answer, in-class discussions, and office hours were altered, unavailable, or more time-consuming in the distance learning format. Quickly returning grades to students also became more challenging in spring 2020 because instructor time was consumed by other activities related to distance learning. Despite our best efforts to provide grades and other feedback, several students correctly noted that our feedback was different than in the typical face-to-face format. Student concern over feedback on assignments and assessments in online courses is not unusual (King 2014).

Grading rubrics are one method for providing feedback in the nontraditional settings that may be commonplace this fall. Although rubrics are widely used, they may be particularly useful for efficiently generating feedback in online settings (Zsohar and Smith 2008). Technology advances also facilitate meaningful feedback. For example, many grading platforms now allow for easy annotating, including smart learning of common feedback comments used by the instructor.

Student peer reviewing is another feedback tool that can be leveraged in hybrid-flexible or distance learning settings. If consistently used, giving and receiving peer feedback can develop a classroom's culture (Boud 2000). The agricultural management class regularly used formative peer review. These activities gave students rapid feedback on their major class project (a business plan), while also sparking reflection and learning by the reviewer. As a result, valuable revisions occur before the instructor has returned formal feedback to the entire class. The agricultural sales class has also employed peer review of papers for several years. The instructor found the process became more effective during distance learning because peer reviewing was done using the reviewing features (e.g., track changes and comment boxes) in Microsoft Word, and students were required to talk each other through the suggestions. Because it seemed to generate social interaction between students, the instructor will expand this practice in the future. Some of the same learning benefits of peer reviewing can be gained by selecting high quality peer examples for students to observe (Sadler 2002).

Distance learning created two opportunities for additional feedback in the agricultural sales class. First, in the capstone experience, the sales professionals were asked to provide both oral and written feedback to students when in the past this was limited to oral feedback. The additional feedback reinforced important lessons from industry. Second, students were asked to practice self-reflection on their work after it was graded. In the future, regardless of the class's delivery method, self-reflection statements will be included in each major exercise. Furthermore, given instructor time constraints, students will be encouraged to improve and resubmit their work, providing another opportunity for thoughtful reflection and additional exposure to concepts and their application.

It is imperative we keep in mind that students often require positive feedback as much as critical feedback. In spring 2020, the desire to provide positive feedback became more prominent because it was clear some students were struggling with course content and lack of social interaction.

5 Creating an Adaptable Class Schedule

Many instructors thoughtfully construct class schedules based on learning objectives and past instructional experiences. However, in the 2020–2021 academic year, it may be unrealistic to assume that what worked in the past will work today. With hybrid-flexible instruction encouraged at many institutions and contingency plans for fully remote instruction on the minds of instructors, it is worth considering the opportunity cost of time devoted to following a schedule at a distance for both instructors (e.g., sending reminders to students, grading, and revising the schedule) and students (e.g., seeking clarifications from the instructor and coordinating deadlines between multiple classes).

Schedule adaptability is important. For example, after distance learning began in spring 2020, the instructor of the agricultural management class attempted to maintain many low stakes formative assessments and made those assessments due at dates aligned with normal class meeting days. After students struggled to juggle these varied deadlines without the typical in-person prompting from the instructor, the class schedule was quickly revised to make most assignments due on a single deadline each week. Indeed, Zsohar and Smith (2008) recommend that online classes use consistent deadlines (i.e., the same day and time each week) to encourage assignment completion and to simplify schedules for students taking multiple online classes. Looking to fall 2020, the instructor is making all assignments due on the same day and at the same time each week. The idea is to create a clear understanding of the class's rhythm and expectations from the outset of the class, thereby reducing confusion and revisions if some or all students are required to learn remotely later in the semester.

In contrast, the other instructor did not change the due dates for assignments, regardless of whether class was offered synchronously or asynchronously on that day. The rationale was to reduce the number of schedule changes in the class, ensure students were prepared for each synchronous class period, and facilitate the potential resumption of face-to-face class meetings. The instructor experienced the same issues noted by the first instructor. It is not clear whether maintaining the planned schedule or adopting a simpler schedule for assignment deadlines would have resulted in less complexity in the already turbulent situation. However, clear scheduling is important, and this must be adaptable to the uncertainties surrounding future classes.

6 Understanding Students' Nonacademic Commitments

Hybrid-flexible or distance instruction allows students to alter their nonacademic lives. Specifically, places of residence, family responsibilities, and work hours may all change for students not required to attend class in person. In spring 2020, some of our students responded to the cancellation of in-person classes by working more hours. Many students with agricultural backgrounds were burdened by nonacademic workloads when they returned home to help with farm activities. When asked about the most challenging parts of the move to online learning, one student stated that, "I live on a farm and when I am home, I work outside." Another student added that, "I'm not much of a computer person, so it's really hard to get myself to do the homework and even harder to make time to study, and it's only going to get worse when we get in the field."

Many of our students indicated that asynchronous instruction was preferred to synchronous instruction in spring semester 2020 because of the flexibility it provided for nonacademic responsibilities. In fact, students that elect to take online classes often do so because of that flexibility (Jayaratne and Moore 2017). However, asynchronous instruction has drawbacks, including reduced development of classroom connections (Moallem 2015). Furthermore, students' expectations and preferences for distance education may have changed after their experience in spring 2020. The advantages of synchronous learning do not preclude students participating asynchronously when necessary. Carefully considering the trade-offs between asynchronous and synchronous online instruction is recommended.

Just like students' nonacademic responsibilities can create challenges, they can also provide instructional opportunities. If students react to hybrid-flexible instructional methods at NDSU by spending more time working in fall 2020, those students may contribute to agribusiness or agricultural economics classes by sharing real-world applications of class concepts. These students could also expand and personalize their knowledge through experiential learning. Finally, students may also have opportunities to benefit from others' perspectives if they are living away from campus. For example, in spring 2020, the instructor of the agricultural finance class was able to engage many students and their families in a discussion about farm succession planning because many students had moved home at the end of the semester (Wachenheim 2020). Having family members participate in the discussion moved the lesson from defining succession planning to facilitating its implementation.

7 Final Thoughts

The topics discussed above are some of the ways in which we can plan for success in the 2020–2021 academic year. Although the lessons learned from the past few months will vary by institution, course, and instructor, reflections on this time period will likely be beneficial. Perhaps our most important realization is just how much we appreciate interacting with our students in the classroom. Many students echoed this sentiment. Sharing our enthusiasm with students and harnessing their back-to-school excitement may be the top priorities as instruction resumes.

Accommodations for individual students and learning environments can improve learning for many students. Recently, the focus on accommodating students with disabilities has evolved toward the Universal Design for Learning. This approach suggests changes for a student with a specific disability also improve accessibility for other students. For example, adding video captioning to accommodate deaf students may fit the learning preferences of other students. The same concept applies to designing accommodations for both students learning remotely and those in the classroom. Over the next academic year, our classes will likely require more flexibility to accommodate a multitude of circumstances. Even if we return to full-time face-to-face instruction, there will be some students who require continued distance learning. We have a great opportunity to redesign for flexibility and to rethink how our courses can best serve the multitude of student characteristics and personal circumstances present in a classroom.

About the Authors: Erik Hanson is an Assistant Professor in the Department of Agribusiness and Applied Economics at North Dakota State University (Corresponding Author: erik.drevlow.hanson@ndsu.edu). Cheryl Wachenheim is a Professor in the Department of Agribusiness and Applied Economics at North Dakota State University.

References

Anderson, J. 1979. "Teacher Immediacy as a Predictor of Teaching Effectiveness." *Annals of the International Communication Association* 3(1):543–559.

Aultman, L.P. 2006. "An Unexpected Benefit of Formative Student Evaluations." *College Teaching* 54(3):251–285.

Boud, D. 2000. "Sustainable Assessment: Rethinking Assessment for the Learning Society." *Studies in Continuing Education* 22(2):151–167.

Cameron, B.A., K. Morgan, K.C. Williams, and K.L. Kostelecky. 2009. "Group Projects: Student Perceptions of the Relationship Between Social Tasks and a Sense of Community in Online Group Work." *The American Journal of Distance Education* 23(1):20–33.

Chatterjee, R., and A. Correia. 2020. "Online Students' Attitudes Toward Collaborative Learning and Sense of Community." *American Journal of Distance Education* 34(1):53–68.

Jayaratne, K.S.U., and G. Moore. 2017. "Perceptions of College Students Toward Online Classes: Implications for Teaching Online 1." *NACTA Journal* 61(4):304–309.

King, S.B. 2014. "Graduate Student Perceptions of the Use of Online Course Tools to Support Engagement." *International Journal for the Scholarship of Teaching & Learning* 8(1):1–18.

Moallem, M. 2015. "The Impact of Synchronous and Asynchronous Communication Tools on Learner Self-Regulation, Social Presence, Immediacy, Intimacy and Satisfaction in Collaborative Online Learning." *The Online Journal of Distance Education and e-Learning* 3(3):55–77.

Osterman, K.F. 2000. "Students' Need for Belonging in the School Community." *Review of Educational Research* 70(3):323–367.

Russo, T., and S. Benson. 2005. "Learning with Invisible Others: Perceptions of Online Presence and Their Relationship to Cognitive and Affective Learning." *Journal of Educational Technology & Society* 8(1):54–62.

Sadler, R. 2002. "Ah! … So That's Quality." In P. Schwartz and G. Webb, eds. *Assessment: Case Studies, Experience and Practice from Higher Education*. London: Kogan Page.

Wachenheim, C. 2020. "Remote Learning Environment Provides Unexpected Benefits." *Farm and Ranch Guide,* June 5, 2020.

Wilson, J.H., and S.B. Wilson. 2007. "The First Day of Class Affects Student Motivation: An Experimental Study." *Teaching of Psychology* 34(4):226–230.

Zsohar, H., and J.A. Smith. 2008. "Transition from the Classroom to the Web: Successful Strategies for Teaching Online." *Nursing Education Perspectives* 29(1):23–28.

2(5) doi: 10.22004/ag.econ.308058

Teaching and Educational Commentary

Reflections in Adjusting to a Global Pandemic from a Regional Agribusiness Program

J. Ross Pruitt, Rachna Tewari, and Joseph E. Mehlhorn
University of Tennessee at Martin

JEL Codes: A22, Q10, Q13
Keywords: Agribusiness, COVID-19, online teaching, pandemic

Abstract
Being able to draw upon a long history of distance-enabled education aided the University of Tennessee at Martin's agribusiness program in adapting to a fully online teaching environment during a pandemic. Experiences of agribusiness programs in adjusting to unforeseen challenges are included in the discussion as potential solutions. Feedback was sought from students primarily taking on-campus courses regarding the difficulties experienced and the adjustments made when the campus suspended its normal operations to ensure the health and safety of the university community. Specifically, the feedback focused on adjustment factors for online transition, technological issues and familiarity with the online learning platform, quality of instruction, and students' perceptions of the university's overall response to the pandemic. It was noted that student success in courses during the transition was impacted by their time management skills and efficiency, which are traits desired by employers. While significant differences will continue to exist between on-campus and online teaching, student learning could be improved via innovative strategies to enhance teaching effectiveness in online courses. This commentary shares both student and faculty perspectives during the transition to online and also provides suggestions on ways to adapt to an increased need for distance-enabled learning.

1 Introduction

Even with a relatively long history of distance-enabled learning at the University of Tennessee at Martin (UTM), the recent COVID-19 pandemic created a set of unanticipated challenges. The agribusiness program at UTM provides students the opportunity to learn in either a face-to-face or online classroom setting. This allows students to self-select a learning environment that is most conducive to their situation and educational preferences. However, a global pandemic does not recognize the differences between learning environments and creates challenges even for well-established online agribusiness programs, let alone on-campus agribusiness programs. This paper seeks to highlight the issues agribusiness faculty and students faced in adjusting to educational efforts during a global pandemic. We will emphasize the solutions that made the transition for on-campus students to a distance-enabled learning environment smooth. Firsthand feedback from students in the sudden and unexpected shift to online learning is also provided. The combination of these two contributions will aid in course delivery and student engagement, should continued distance-enabled learning environments be necessary.

2 Historical and Regional Perspectives

The agribusiness program at UTM began offering courses through a distance-enabled learning environment approximately twenty years ago. Initial offerings were in a Master of Science in Agricultural and Natural Resource program. Over the past decade, undergraduate options in agribusiness, farm and ranch management, and veterinary technician management have been added. Delivery of these programs evolved from correspondence courses to compact and digital video discs to the current online learning management system (LMS). In addition to these delivery mechanisms, UTM agribusiness faculty regularly deliver lectures to the regional UTM campuses via closed circuit television.

These efforts in distance-enabled learning were the result of significant resources being invested by the university with agribusiness being one of a limited number of academic programs taking advantage of the investment. The effort from developing these distance-enabled programs provided agribusiness faculty significant opportunities to experiment and fully develop an online teaching philosophy and pedagogy. This expertise aided in a relatively smooth transition for on-campus students once the COVID-19 pandemic resulted in face-to-face classes being suspended. Agribusiness faculty typically teach in both learning environments, which allowed for easy transition of recorded lectures via the university's LMS.

3 Challenges and Solutions for a Distance-Enabled Education Environment

The abruptness of many universities sending students home in the spring left faculty scrambling to transition material from expected face-to-face class meetings to distance-enabled education. Many of the tried and true tactics to be successful in a face-to-face course meeting were no longer available for faculty to connect with students, while students were upended from their educational routines, which had been ingrained over years of traditional educational methods. This section highlights some common problems faced across universities and provides solutions based on our years of distance-enabled education experiences.

3.1 Availability and Reliability of Broadband

One of the reasons that UTM agribusiness faculty were advised to lecture asynchronously is a reflection of the reliability of broadband internet and its availability for many UTM students. While a significant number of students do come from the Nashville and Memphis metropolitan areas, others do come from more rural areas. Based on statistics from the Federal Communications Commission (FCC), all of Tennessee has at least two providers of broadband internet,[1] with approximately 93 percent of the state's population having at least three providers (Federal Communications Commission 2019). These estimates are somewhat overstated as capacity is an issue in the state[2] and the reliance on satellite internet to reach stated percentage coverage levels. Approximately one-third of Tennessee's population relies on satellite internet connectivity to have at least two providers in their area. There are stark differences between the urban and rural population in Tennessee when looking at asymmetric DSL (ASDL), cable, fiber, or fixed wireless options in the state (see Table 1). Urban populations are approximately double the rural areas in terms of having at least two broadband internet service providers. For the 7th and 8th U.S. Congressional districts where a significant number of UTM agribusiness students come from, the difference between urban and rural is even starker. Both congressional districts have approximately one-quarter of their population served by at least two nonsatellite broadband internet providers (Federal Communications Commission 2019).

A significant number of students did return home, but there were several who stayed in or near the Martin campus, either in residential halls or off-campus residences. This may have been a reflection of better internet accessibility in their residences close to the UTM campus. We must also note that some students faced additional internet challenges once businesses closed combined with subsequent "stay-at-home" orders issued by municipal and state governments, thereby limiting potential solutions for their limited internet availability.

[1] The FCC uses a download speed of 25 megabits per second (Mbps) to define broadband with an upload speed of 3 Mbps.
[2] One of the authors was unable to obtain a DSL connection because of a lack of capacity in the area.

Table 1. Comparison of UTM College of Agricultural and Applied Science Students and Broadband Access by Congressional District

Congressional District	Percent of UTM CAAS Students	Percent of UTM Agribusiness Students	At Least 2 Nonsatellite Internet Providers		At Least 3 Nonsatellite Internet Providers	
			Urban	Rural	Urban	Rural
District 1	1.6%	N/A[1]	73.26%	46.04%	29.71%	13.66%
District 2	1.7%	2.9%	86.08%	42.53%	32.76%	12.62%
District 3	1.3%	N/A	86.08%	42.53%	44.69%	9.60%
District 4	7.5%	6.2%	91.13%	50.88%	29.62%	13.50%
District 5	4.1%	2.9%	89.71%	50.79%	6.25%	0.19%
District 6	7.2%	7.6%	76.21%	37.92%	5.66%	3.63%
District 7	21.2%	19.3%	84.62%	26.86%	14.61%	4.38%
District 8	41.9%	40.0%	76.79%	25.24%	11.03%	1.37%
District 9	1.7%	N/A	73.39%	29.16%	1.98%	1.62%
Out of State	11.9%		77.68%	36.00%	28.92%	9.18%

[1] UTM's Office of Institutional Research was unable to provide data if less than five students majored in agribusiness in a given Congressional district. This accounted for 58 of 275 agricultural business students (21.1%) as of the Fall 2019 semester. Several agricultural business students are still listed as agricultural students as the agricultural business major started in Fall 2019.
Source: FCC Fixed Broadband Deployment (2019)

Use of asynchronous delivery methods can be used to provide flexibility to the student so they are not competing against family members during peak times of the day for broadband internet speed in more rural areas. Readers should take into account the information provided in Table 1 does not account for reliability of the connection and whether the internet plan has data caps, which could result in additional charges to the student and/or family if the limit is exceeded. Shorter duration lecture videos also can ease some concerns about straining broadband capacity of the student's residence.

Given the use of asynchronous lecture delivery methods, our university's Instructional Technology Center (ITC) indicate students tend to not watch recorded lectures. Data is not currently available from the university's LMS to provide information on the percentage who watch a lecture in its entirety. UTM faculty has been encouraged by ITC to keep lecture videos to approximately twenty minutes to facilitate easy downloads as well as to maintain student attention.

3.2 Creation and Grading of Assignments

Agribusiness faculty's prior experience with teaching online provided expertise in being able to quickly re-design assignments for on-campus students who were now completing the semester online. While a significant number of assignments will always be grading intensive and/or primarily writing based, a LMS can reduce instructor's effort devoted to grading with foresight. Little can be done for classes that are writing intensive, but math-based problems can easily be graded by a LMS. Depending on the LMS, it may offer features such as formula-based questions or numerical answer questions. With the former, the instructor can create a question that randomly generates a problem based on parameters set by the instructor according to a specific mathematical formula, while the latter creates a standardized question where the student types in a numerical answer. Use of formula questions is exceptionally useful in agricultural finance (time value of money problems), agricultural price analysis, and introductory agricultural economics courses (cost calculations and/or elasticities). This can minimize concerns about answers being shared by students in the same course as a specific problem for each student may be generated. Coding of numerical questions in a LMS ignores numerical formatting with the ability of the instructor to set a tolerance range that accounts for rounding differences. These tools help the instructor focus on awarding partial credit (as necessary) on incorrect answers instead of looking at all submitted answers.

A key consideration when using machine gradable tools is that it requires more work initially on the faculty member. Many LMS systems can be "clunky" when it comes to creating assessments. It does take more time to thoughtfully set up questions in advance that can be self-graded, but the reward pays off when it comes time to grade. This is especially important in large course sections. The ability of students to upload handwritten work or Excel-based answers also aids in providing feedback and partial credit. Use of AI-assisted discussion tools could be a solution as it reduces the time spent grading by faculty (Kiesel et al. 2020), as well as the existing discussion board feature on many LMS.

Students were able to complete assignments on their own schedule, mirroring their ability to watch lecture content in an asynchronous format. The ability of students to enter and exit an assignment over multiple settings (but still just one attempt) until they are ready to submit it for grading reduces their stress. This ability reflects the fact the instructor has set up the assignment to automatically grade it once submitted. In classes where students are encouraged to collaborate on homework assignments, this allows students who are on different schedules time to work together to build teamwork skills.

3.3 Group Work

With employers seeing a university education as a way to improve and develop soft skills needed for their labor force (Andrews and Higson 2008; Stewart, Wall, and Marciniec 2016; Ritter et al. 2018), group work is an effective way to help achieve this objective. However, online learning presents a significant challenge to group projects because of the lack of in-person meetings and differing schedules. The COVID-19 pandemic may result in in-person meetings occurring less frequently, while the ability to work in a team stays relatively constant as an in-demand skill. Our experience, at least in courses initially designated as online, is students are hesitant to engage in group online projects. This can be from prior negative experiences where at least one group member did not fulfill their obligations, resulting in lowered grades for the entire group (even when peer evaluations are incorporated). Given primarily online agribusiness students at UTM account for approximately one-third of total enrollment in the major and are spread across the United States and at different stages in life, their hesitation is at least partially justified. On-campus students have similar concerns even when they are allowed to pick their teammates. Moral hazard concerns among students seem to provide a greater incentive to avoid group work than employers demand for employees who can collaborate and effectively work in teams.

Some concerns regarding group work may be addressed through instructors informing students of available group tools that are often available in a LMS. This helps minimize the need to share cell phone numbers in order to use the popular networking app, GroupMe. LMSs that provide group space within the course often allows students to share files and discussion boards that only group members can see similar to Google Docs. Use of scheduling websites such as Calendly and Doodle can also assist students in setting team meeting times. Instructors may also provide a group contract that includes information to student groups to decide upon meeting times by the members and how long will members have to complete assigned portions of the project similar to the project manager/private contractor approach (Brown et al. 2019). The goal of the contract is not to replace a peer evaluation but to help the team set clear expectations. Students could also be given the opportunity to provide a summary of how they contributed to the project that other teammates are unable to see in an effort to not only engage with their peers in a group project but also provide honest feedback.

3.4 Examinations

Exams pose a different and significant challenge compared with assignments because of the need to assess students' retention of material and minimizing concerns of academic dishonesty. This is easier in a face-to-face course as instructors can choose to not return exams and visually observe students during an exam. Use of questions from test banks can achieve exam security as students are not guaranteed to see the same questions as classmates. An effective LMS will provide the instructor with the ability to specify a certain number of questions from multiple test banks in one exam with each bank a different style of question (e.g., multiple choice, true/false, short-answer). Incorporation of formula-based questions also minimizes concerns about math problems being shared among students. There are no easy solutions for classes that heavily incorporate the use of Microsoft Excel. Students can easily share files without the instructor's knowledge as long as the student saves it on either their computer or logs in with their username on a shared computer prior to submission. Awareness of the time when the student submitted the exam and how long it took to complete the exam can aid in Excel-based courses although this is not foolproof.

While assignments are typically available for students to complete on their own schedule, this is not the case for exams. Agribusiness faculty typically allowed students to be able to complete the exam over a few days in one (timed) setting. This compares to allowing students the ability to enter and exit homework assignments as much as necessary before the assignment's deadline. This often reflected that faculty had set up the homework assignment so that the LMS would autograde most of the assignment. This provided students flexibility to complete exams on their schedule and at times when others in their residence are not using shared internet bandwidth. As with much of what has already been said, the key to the success of the aforementioned strategies and techniques is clear communication with the students. To facilitate a successful transition from a face-to-face setting to online for students, clear communication on revised course policies and alerting students in advance of deadlines is necessary.

Our experience with the use of web browser add-ins that prevent use of multiple browser tabs is mixed. These can be used to minimize concerns of academic dishonesty, but can crash the student's browser during an exam resulting in additional stress to the student. Even when the browser add-in works as desired, this does not prevent a student from using a second device to find the answers. There are services that can monitor via recording or having a proctor watch the student during an exam. These are costly to the student because of significant out-of-pocket expenses, and are typically not included in tuition or fees associated with the course. If the instructor makes the students take an exam during a specified time when the latter has to be logged into Zoom or similar software, the instructor should be sensitive to distractions caused by themselves or other students asking questions.

3.5 Reading the Virtual Classroom

Instructors can often take for granted the ability to read students' body language and answer questions in a face-to-face course until its gone. Being able to read the room and quickly clarify difficult content is a skill that is not easily replicated in an online, asynchronous learning environment. Instructors must manage providing the right amount of material they have generated and supplementary internet resources provided by institutions of higher education. This aids the student in having alternative ways to comprehend difficult material in an asynchronous format.

The lack of synergy of being on campus and answering questions in front of the entire course is a difficult hurdle to overcome. With many LMSs providing discussion boards, encouraging students to use the boards as a way to replicate asking questions in front of other students in an on-campus course can be a successful strategy. Students may be hesitant to use this approach, but one tactic that instructors can use is to post questions from relevant student emails and answer them publicly. Even in courses designated as strictly online, students will sometimes take the initiative and answer the questions for the instructor. This helps students feel that they have mastered course content and helps create a connection between students who may not be able to physically interact with each other.

There were difficulties faced in the transition with the loss of in-class activities that cannot be replicated in a virtual learning environment. Loss of these in-class activities can result in increased need of faculty-student interaction on difficult material. Many of the planned in-class activities reflected the ability to have students present in a central location allowing for direct student interaction with their peers and instructor. Such activities reinforce learning objectives and student engagement, which was not feasible in a virtual learning environment.

3.6 Loss of Camaraderie and Routine

While some of the distance-enabled transitions described were relatively easy for UTM agribusiness faculty to navigate, the loss of camaraderie among the agribusiness faculty and students was noticeable. Students in the Fall 2020 semester routinely comment upon the loss of the camaraderie that occurred once transitioned to distance-enabled learning beginning March 12, 2020. This is not to minimize the challenges that many of the agribusiness program's 350 students faced, but it reflects a conscious decision by faculty to develop a certain type of atmosphere over time and has become a core recruiting strategy for the program. We have already documented some of the challenges with respect to internet connectivity. While many on-campus students had to adjust to a new learning environment with on-demand lectures, a significant number had previously taken an online course while at UTM. Increased use of dual enrollment courses within Tennessee provide students the opportunity to complete general education course requirements while in high school. These individuals can then graduate early given UTM's existing online agribusiness program.

Approximately one-third of agribusiness majors are solely online students and spread throughout the country. The online student population is a different market segment than on-campus students. Not only are there significant differences in this market segment due to age and work status, but also reflecting they are located throughout the United States, not just Tennessee. For online students, they may be more prepared for online learning with better internet connectivity available at their primary workplace or residence. The improved internet connectivity (if not impacted by "stay-at-home" orders) does not offset the stresses of caring for loved ones, working while teaching children, obtaining and providing the necessities of life, and managing businesses during a pandemic, which UTM online agribusiness students faced. Some of these stresses may not have directly been faced by on-campus students, but the upheaval did result in a loss of routine that resulted in many needing to stay disciplined.

Regardless of whether the student is classified as online or on-campus, they did not ask to be in the situation of living through a pandemic. Their emotions ran the gamut of "what does this mean for my upcoming graduation ceremony?" to "how am I going to complete the course with no internet connectivity?" to a lack of discipline that on-campus courses foster by regularly meeting. The latter is one detrimental aspect to providing lecture material asynchronously, even though students seemingly preferred asynchronous lectures as it allowed them to complete courses while employed. As stated previously, we do not know the level of internet connectivity with individual students. Even with students preferring asynchronous video lectures, many did not watch the lecture in its entirety.

An additional strategy to help on-campus students replace at least some of the camaraderie they are missing in an online learning environment is the use of scheduled virtual office hours. These can take many forms, such as a specific time where the instructor makes themselves available for questions to a dedicated question and answer session about an assignment. Anecdotal evidence suggests the virtual office hours are less effective in getting students to attend. This may reflect a similar reticence to use office hours in many on-campus settings or that students feel an email can result in just as effective a solution as attending the virtual office hours. We have had better success with a scheduled virtual meeting to discuss certain assignments. These were recorded for students to watch who had conflicts and later posted in the course's LMS. Many students who participated were reluctant to turn on their cameras due to not wanting to be recorded, as well as potential bandwidth concerns. We did notice that after all assignment-related questions had been addressed, students would engage more with the instructor once the recording had been stopped. This facilitated additional opportunities to relate current events to economic theory. Instructors were also able to gauge how the students' adjustment to online learning was occurring and if additional adjustments to instructional efforts were needed. The stronger the relationship is with students, the easier it is for them to provide information to adjust teaching methods in the middle of chaos. These conversations also allowed the instructor to put students at ease and clarify the information overload they faced from various university sources.

4 Student Evaluation and Feedback

To better understand student response and reaction to online transition to teaching mid-semester, an online feedback and evaluation form was developed and assigned to students in traditional on-campus agribusiness classes that were being taught online because of the pandemic. A total of 72 completed responses were received. Student response was anonymous, and questions were structured to derive open-ended qualitative responses. Primarily, the evaluation focused on the elements of initial student response to online transition; adjustment factors; technological issues and familiarity with the online learning platform; quality of instruction within a fully online learning environment; and student perception of higher education institutions' handling of situations such as a global pandemic. Student response to each of these elements is summarized below.

4.1 Initial Student Response to Online Transition

The question specifically asked, "What was your initial thought/response when the announcement for moving the Spring 2020 semester to online was made? Discuss your response with respect to the logistics for moving online and concern for your overall performance (grade) in the course."

Most students agreed that their initial responses were primarily driven by surprise in a dynamic situation around the pandemic that was evolving rapidly, and they were overwhelmed with a feeling of uncertainty about what would follow next. Some students initially felt that they would do better in an on-campus environment, the transition to online would be difficult, and would eventually negatively impact their grades. A few students suggested that they were skeptical about moving online because of nervousness about missing important elements of the course that could potentially not be taught well online. From a logistical standpoint, some students expressed being uncomfortable with submitting online assignments; however, in reality it was not as difficult as they had expected.

It was noted that since all students submitting the feedback were agribusiness majors, most of them were familiar with the existing online class environment and had prior experience with at least one online class. Some students expressed concern about internet connectivity at home based on their location. On the contrary, a few commuter students or those that did not relocate back to their hometowns after the transition did not face the internet connectivity issue and were also able to keep their jobs, especially if they worked in a farming environment.

Students perceived the instructor's willingness to help and communicate a key factor that affected their performance in the course during the transition. They also felt that the transition forced them to set aside time to complete their course deliverables and to develop a systematic plan to balance their work-study routine. This was especially true of students who worked a significant number of hours a week as they pursued their degree. A few students who planned on switching to the fully online program in the near future felt that the transition was a beneficial learning experience for them. These students were able to complete the course assignments at their own pace and the transition gave them a "trial" run of how a fully online program works. They also felt that it allowed them to get more work done in one setting, take detailed notes, and study better overall. Some students also indicated that they were able to better realize their potential to use online learning to their advantage, were able to overcome multiple challenges, and perform better than they had originally expected.

Many students felt that it was an exciting transition at first, but became difficult over the next few weeks especially in regard to completing group-based projects. They were concerned about the quality of group projects; coordination and communication among the group members; peer evaluation; and whether they would be able to complete the project as planned. While some responses suggested that their group projects fared well overall, and they were proud of how they handled it, others struggled with group projects during the transition. The latter also mentioned that they had little to no communication within their group, and as they approached the submission deadline, there was a lot of chaos and confusion eventually leading to a poor quality submission.

Evaluation results also indicated that most students were primarily concerned about their overall performance as impacted by early exam grades. However, as the course continued and they started familiarizing themselves with a fully online learning interface, their performance in the course improved, which was evident from their improved final grades in the course. They were also worried because of the presumption that success in college comes from showing up and paying attention in class. Being fully online may negatively impact their grade point average and thereby the successful completion of the program in the long run. UTM did not provide a pass/fail option because of concerns about financial aid implications and students who were applying to professional schools. Interestingly, some students also looked at the transition as an opportunity to boost their grade rather than to hurt it. When Spring 2020 grades were compared with Spring 2019 grades at UTM, students did a letter grade better.

4.2 Adjustment Factors for Online Transition

The question specifically asked, "How much time (days/weeks) did it take for you to adjust and get accustomed to the fully online learning environment? What was the easiest and hardest part of this transition? Discuss both."

Responses indicated that for most students, it took anywhere from a few days to up to two weeks to adjust to the transition. The transition to distance-enabled education occurred in the ninth week of a sixteen-week semester at UTM. Flexibility within an online class, as allowed by the instructor, prior experience with online classes, not having to commute to campus every day, and the obvious need for staying safe amid a global pandemic were considered positive factors as the students adjusted to the online transition. Factors that were concerning to the students were keeping track of submission deadlines, inability to meet and discuss content with peers, lack of motivation to learn, and time management. Study habits heavily impacted overall student performance during the semester, depending on the type of learner (visual, auditory, reading/writing, and kinesthetic) they were. Several students indicated that the hardest part of learning in an online setting was to feel as confident in grasp of material following a lecture video as compared with a traditional face-to-face lecture. It was tempting to just skip through the lecture notes or audio-visual explanation provided by the instructor and directly attempt a quiz or assessment. It almost seemed like a false assurance that the student would perceive that they learned a concept, when in reality they may have not fully understood it or may have missed critical information.

The first few weeks seemed more challenging to most students as the instructors themselves adapted to the transition and attempted to adapt to the evolving situation. Some responses also indicated that the time of day a particular assignment was due was also important, especially if they were working. Also, professors had different requirements for online assignments and submissions, and sometimes the format or upload requirements could cause confusion. Most students agreed that being accountable to oneself, using a scheduling calendar, trying not to procrastinate, and keeping ahead of the submission deadlines were helpful during the transition. Some students felt that the assigned time for completing an online exam or quiz was also a concern, as some professors assigned relatively shorter time limits in comparison to on-campus classes.

4.3 Technological Issues and Familiarity with the Online Learning Platform

The question specifically enquired, "Would you consider yourself more technologically equipped with the learning management system (Canvas) now than when you were taking classes on campus? In other words, did the move to fully online enhance your technological skills for online learning? Anything fascinating or interesting that was a 'light bulb' moment?"

Several students that completed the evaluation agreed to being better equipped with Canvas as a result of the mandatory online transition. They felt more confident using the different tools and features within Canvas, and were more comfortable navigating the system for submission of assignments, quizzes, and other deliverables. A few responses also indicated that they were able to use certain features such as the calendar to their advantage, which helped them keep track of submission deadlines and also being more organized. Some students also suggested that the online transition compelled them to enhance their technological skills, something they would not have to be too concerned about in a typical on-campus learning situation. Further, a few responses highlighted the importance of time zones in online learning. For students located in time zones that were different from that of the instructor, submission deadlines and virtual meetings were hard to keep track of, especially if the instructor did not specify the details in their communication. It was also noted that students felt more comfortable using options such as Zoom, Google Docs, and Canvas groups for team-based projects during the online transition, and this improved their computer skills overall.

While many students had a positive and enhanced learning experience during the transition in regard to the use of computer technology and LMS, about half of the students felt no difference. Additionally, a few students indicated facing technological challenges that may have negatively affected their performance in the online course in comparison to if the course was offered on-campus.

4.4 Quality of Instruction Within a Fully Online Learning Environment

The students were asked, "How would you rate the quality of instruction within a fully online learning environment in comparison to when the same course was being delivered on-campus? Discuss your thoughts on lecture/content delivery, clarity of instructions for completion of assignments/quizzes/exams, engagement, and generation of interest in the topics covered."

Student response in regard to quality of instruction as affected by the online transition was mixed. Some thought that the instructions for most classes were very clear, and there was no confusion on when an assignment or exam was due, while some courses did not have adequate clarity on instructions regarding quizzes, exams, assignments, or other deliverables. Per students' responses, the quality of instruction varied with the professor's teaching style and if the class had a hands-on component incorporated, such as a lab. Classroom distractions were minimal due to the online environment; however, they missed interacting with their peers and the instructors. Virtual office hours or Zoom-based class meetings were helpful; however, sometimes meeting times posed a constraint based on where the student was located, internet connectivity, and the student's work schedule.

A few students also pointed out that they felt that some instructors may have faced difficulties while adjusting and reevaluating their syllabus during the transition, which also affected the quality of teaching. It was also noted that the students perceived the instructor's prior experience with teaching online an important factor affecting the quality of instruction. Students also preferred flexible virtual learning with the use of PowerPoints, audiovisual explanations, and interactive assignments, over live class sessions using Zoom or similar programs. Virtual learning also assisted students with accommodation needs in comparison with live learning sessions.

4.5 Student Perception of Higher Education Institutions' Handling of Situations such as a Global Pandemic

The question asked, "From a college student's perspective, in unforeseen situations such as the current COVID-19 pandemic, what are some steps that higher education institutes can take to better prepare for a smoother transition to ensure minimal impact on student learning, program completion, and the overall college experience."

Students agreed that overall the university handled the situation adeptly, given the circumstances and the urgency around the pandemic with limited response time at hand. They felt that it was imperative for instructors to incorporate some online learning components in their regular face-to-face courses for contingency planning, should an emergent situation arise again. Basic online navigation training or instructional videos focused on the LMS for students entering the program was also essential for a smooth transition for students. Students also expressed that proration or reduction in tuition and other fees should be considered for such situations. Continued communication with student success counselors and the Office of Academic Records was also deemed important, especially during course registration for the upcoming semester. Results also indicated that emphasizing the use of the LMS and providing assistance with navigating the university portal as part of the freshmen level general education classes across the university would also help prepare students for such unforeseen events.

5 Conclusion

A prior investment in online agribusiness education eased the transition as a result of the 2020 COVID-19 pandemic for students at the University of Tennessee at Martin, but there were still significant challenges present. The closure of campus in March 2020 led faculty to adjust on-campus courses to a distance-enabled environment for a student population that was not fully prepared for the transition. Findings from this commentary centered around three key areas and concerns that impacted the learning process:

- Internet access and connectivity issues
- Student engagement/camaraderie, and
- Time management and work life balance.

The issue of internet access and connectivity was a primary concern. Faculty utilized asynchronous delivery methods to help students in rural areas with limited broadband internet access. While students without internet access were unable to participate in courses, the use of asynchronous delivery was found to be the best alternative for non-broadband users. For students who lacked experience with online courses, anecdotal and feedback-based information indicated that challenges were faced as a result of not having developed the skills to be initially successful (e.g., time management and discipline to be engaged).

Camaraderie was stated as one of the experiences students missed once the on-campus class meetings were suspended. Despite efforts to overcome the lack of classroom interaction through virtual question and answer sessions and the use of discussion boards, this is an area that could be improved upon. The use of group assignments to promote student engagement was also affected by the online experience and impacted student camaraderie. A plausible solution to enhance the in-person group experience was to encourage students to utilize digital apps to connect and share information among the student groups within the LMS.

Faculty and students had trouble transitioning to a completely online environment. The faculty had to adjust to a different teaching environment while dealing with personal issues and fears associated with the pandemic. While the daily schedules ceased, faculty realized that the added workload of developing online materials and dealing with increased student communication was heavier than expected. Students still faced the tradeoff between increased mastery of one course's content, which takes time away from other courses, while potentially balancing job and/or familial responsibilities. If distance-enabled learning environments are going to be the norm in at least the 2020–2021 academic year, faculty must accept that students have a myriad of responsibilities that exist outside of a specific course requirement. It would therefore not be productive to increase course assignments under the assumption that students will have more time on their hands from being online. Students cited that some instructors had difficulty adjusting to teaching online, and this impacted student perceptions of the overall online experience. This issue highlights the need for more faculty training in online teaching pedagogy. Faculty will need to continually improve their teaching portfolios to better accommodate and reach students as online instruction will likely increase in the future.

There are always going to be significant differences between the traditional and distance-enabled learning environments that cannot be easily overcome as discussed in this commentary. However, the COVID-19 pandemic has taught us that there are significant possibilities in online education, and developing new and innovative teaching tools and strategies can be instrumental in improving the overall teaching-learning experience.

About the Authors: J. Ross Pruitt is an Associate Professor in the Department of Agriculture, Geosciences, and Natural Resources at University of Tennessee at Martin (Corresponding Author: rpruit10@utm.edu). Rachna Tewari is an Associate Professor in the Department of Agriculture, Geosciences, and Natural Resources at University of Tennessee at Martin. Joseph E. Mehlhorn is the Gilbert Parker Chair of Excellence and Interim Graduate Dean at University of Tennessee at Martin.
Acknowledgements: This research was reviewed and approved by the University of Tennessee, Martin, Office of Research, Outreach and Economic Development (#2020-815-E05-4005).

References

Andrews, J., and H. Higson. 2008. “Graduate Employability, ‘Soft Skills’ Versus ‘Hard’ Business Knowledge: A European Study.” *Higher Education in Europe* 33(4):411–422.

Brown, R., N. Zuo, J. Shockley, and S. Buck. 2019. “An Authentic Learning Approach to Group Assignments: An Analysis of Student Attitudes.” *Applied Economics Teaching Resources* 1(2):1–13.

Federal Communications Commission. 2019. Fixed Broadband Deployment. https://broadbandmap.fcc.gov/#/area-comparison?version=jun2019&tech=acfsw&speed=25_3&searchtype=cd&geoid=47&searched=y.

Kiesel, K., N. Zuo, Z.T. Plakias, L.M. Pena-Levano, A. Barkley, K. Lacy, E. Hanson, and J. Treme. 2020. “Enhancing Student Engagement in a Changing Academic Environment-Tested Innovations for Traditional Classes and Online Teaching.” *Applied Economics Teaching Resources* 2(3).

Ritter, B.A., E.E. Small, J.W. Mortimer, and J.L. Doll. 2018. “Designing Management Curriculum for Workplace Readiness: Developing Students’ Soft Skills.” *Journal of Management Education* 42(1):80–103.

Stewart, C., A. Wall, and S. Marciniec. 2016. “Mixed Signals: Do College Graduates Have the Soft Skills that Employers Want?” *Competition Forum* 14(2):276–281.

2(5) doi: 10.22004/ag.econ.308059

Teaching and Educational Commentary

Considerations for Economic Instruction in the Era of COVID-19

Thomas P. Zacharias[a] and Keith J. Collins[b]
National Crop Insurance Services[a], U.S. Department of Agriculture[b]

JEL Codes: **A1, A2, D6, H4**
Keywords: **COVID-19, externality, free rider, information, market failure, public good**

Abstract
Educational concerns during the COVID-19 pandemic center on how to effectively assemble, communicate, and assess material to be taught and learned. We believe that in advancing "the how" of remote, online, and related learning, we do not overlook "the what" that is to be learned, as well as other concerns. U.S. performance in combating the pandemic provides an exceptional opportunity to teach students data presentation, interpretation, and basic economic principles to better understand individual behavior, hopefully to improve future societal responses to pandemics. We believe an important factor in the persistence and rebound of the virus as it spreads from urban to rural areas is the presence of negative externalities associated with the failure to wear masks and socially distance. Additionally, the public good nature of virus-free air and public health may not be well understood. U.S. performance has been affected by a complex interaction of economic, social, and political behavior. Dissecting these influences would challenge students at all levels to learn about and discuss the economic considerations surrounding the pandemic.

1 Introduction

In preparing a paper for this COVID-19 Special Issue, it occurred to us that although the primary focus of the submission request was on the "how-to" of teaching economics under conditions of the pandemic, we should not lose sight of the importance of the larger context of economic instruction in relation to the situation during the pandemic. In expanding on the "how-to" theme, we thought it useful to submit a commentary that reflects on the why, what, when, and who of economic instruction in relation to the COVID-19 pandemic, speaking to the broader societal concerns of the crisis.

2 The Why (Motivation)

Why the need for a special issue? As the novel coronavirus (SARS-Cov-2) increasingly caused sickness and death, demand for many goods and services significantly decreased, forcing business shutdowns and over 20 million U.S. job losses. Responses during the pandemic have included government and private financial assistance; intensive efforts to find vaccines and therapeutic medicines; and advice from experts on steps to be taken by governments, businesses, and individuals to carry on and be protected from the virus. It is premature to definitively judge the degree of success in preventing and suppressing the pandemic, but at this point in time, some impacts are known. The United States leads the world in the number of cases and deaths at this stage. Yet, the death-per-case ratio in the United States is much lower than many other highly affected countries (Johns Hopkins University, "Mortality Analyses"), suggesting some success in treatment and protection of the most vulnerable. The United States has also led development of therapeutics and vaccines, as well as generally avoiding stringent and prolonged lockdowns, which, while likely adding to the case count, limited the economic and related harm that otherwise could have occurred. While the nation is recovering, we consider whether the response could have been better.

As the virus rebounded after its initial decline and we saw people attending large gatherings, not distancing and wearing masks, the authors' reaction was, "How well are externalities understood?" We fear the connection between private and public benefits and costs may not be well understood. We believe that now is a critical time in our society for economics education as a guidepost for improved decision making, both individually and collectively.

3 The What to Teach

We believe that economics has a great deal to say about both the individual and public response to the pandemic. Had certain relatively straightforward economic analytical constructs been widely understood and adopted, perhaps better public health outcomes could have been achieved domestically and internationally. The following list is not all inclusive, but illustrative of what economic thinking brings to the table in our current crisis. The list goes something like this: the concept of a negative externality, public health as a public good, and an informed statistical and analytical understanding of the crisis.

3.1 Negative Externalities

Most economic students are introduced to the concept of an externality in their first principles and/or intermediate microeconomics class. Traditional examples are firms polluting either air or water. For those not fortunate enough to have participated in the study of markets and market failures, such as externalities, when are students (and citizens) exposed to the simple notion that one's pursuit of personal well-being may impose a cost, risk, or benefit on others in society? Now is a good time. Health experts have determined that wearing a mask, social distancing, and avoiding large crowds help slow virus transmission (U.S. Department of Health and Human Services 2020). These protocols benefit the individual by providing some protection from infection from others and benefit others, a positive externality, by protecting them should the individual be infected and be transmitting the virus (perhaps even unknowingly if they are asymptomatic). Not wearing a mask or social distancing exposes the individual to infection, and if infected and transmissible, exposes others to infection, a negative externality. Homo economicus may ignore externalities in deciding how to behave, but most "real" people are likely to be cognizant of third-party effects. However, in the pandemic, there is another economic agent, the government, which is generating externalities as well. To reduce the negative externalities caused by infected individuals, governments have closed businesses, schools, and other entities. These government actions created negative externalities for individuals, including loss of jobs, income, stress, in-class instruction, freedom of movement, and so on. These externalities may have long-run costs, but may even have long-run benefits, if the restrictions lead to new technologies, more cost-effective ways of doing business, and expanding access to education.

3.2. Public Health as a Public Good

The notion of public health as a public good could be fundamental to achieving better societal outcomes. Public good examples such as national defense or the lighthouse in the case of public good inputs are commonly taught in more upper level undergraduate courses in detail. At what level are students and, again, the general citizenry exposed to the concept of "public-ness" in terms of the benefits to all in the context of non-rivalrous consumption? A related concept, the "tragedy of the commons," is essential for a better understanding of the risks and costs borne by the collective in the presence of free-rider or hoarding behavior. This principle concludes that when people seek to maximize their use of finite resources, the resources can be depleted, making the behavior self-defeating and reducing social welfare. Hoarding of masks and sanitizers led to shortages of these items that then reduced the ability of some people to protect themselves and others. To what extent, do individual and collective decisions add to or diminish the "stock" of public health that benefits our society? Characterizing public health as a public good would seem to be a conceptual framework that would better frame the political discourse (Anomaly 2011).

3.3. Statistical and Analytical Understanding

A case could be made that statistical and analytical training is a public good unto itself (a topic for another day). To reiterate though, as important as how economics is taught in the COVID-19 environment, what is taught is far more important. Without an understanding of basic statistics and quantitative analysis, our society will be hard pressed to evaluate the serious public health alternatives and economic choices we now face each day in addition to planning for a highly uncertain future.

Data and analytics are commonly being presented to assess the pandemic and define the health goal to "bend the curve." The term is being used to induce people to act in ways that change the trajectory of COVID-19 cases, hospitalizations, and deaths. Students and citizens in general should be able to examine various charts and national, state, and regional data sets to identify the problem of spread and what constitutes bending the curve (see Johns Hopkins University and Medicine 2020, for various charts and data). In addition to arresting spread and death, a key goal is to ensure the number of people needing medical care will be below the resources of the medical system, which relies on plots of hospital admissions, ICU beds occupied, tests, ventilators used, deaths, and so on. These variables may also be graphed by region, age, race, and so on. It is critical that students understand the definitions of the variables used and the composition of the populations being sampled when making comparisons of metrics over time and space. The need and importance of a sound analytical understanding of the data and metrics used in COVID-19 discussions can simply not be overstated.

4 When and Who to Teach

It is not uncommon to hear "virtual meeting" conversations these days begin with statements to the effect, "What day is this?" Or, in working from home, "I have lost track of time…" Assuming that the pandemic world is with us for some time, these feelings will no doubt linger. With online technology and a fluid work/study environment, economics instruction can be 24/7. Extending beyond the daily time scheduling dimension, a more compelling question is when should students and the public have greater exposure to economic instruction? How early can young people begin to acquire a basic understanding of the importance of economics as a behavioral science? Having a basic idea of capitalism, socialism, competitive markets, and market failure would help young people better understand what they see and hear in the news and the world around them. Because the last pandemic occurred over a century ago, there is a lack of institutional memory about the lockdowns and mask ordinances that were implemented then. It would be ideal if every high school student received a dose of economics training, American history, and how our political and economic systems function. The challenge of course is opportunity cost, as more economics means less of something else. There also is the challenge of imparting economic concepts in a nonquantitative way to students with little analytical training, and in finding those capable of doing so.

In pursuit of a greater public understanding of externalities and public goods, the profession should seek to broaden its outreach beyond the traditional college classroom, which is easier said than done. With more people using the internet, the pandemic represents an excellent opportunity to do so. Webinar-based instruction, podcasts, and the like are excellent means to reach a broader clientele. Virtual communications technologies appear to be stable, relatively low cost, and easy to use, as observed by the very quick widespread adoption of these tools for both professional and personal use. These technologies will no doubt continue to improve and gain even wider spread adoption and allow the profession to speak to a wider audience. As one is never too old to learn, accessing the more mature segment of the population is an added aspiration to aid public appreciation of market failures, although we are unclear on how to incentivize that segment to want to learn economics. Admittedly though, would it not be beneficial if many more thought like an economist?

It needs to be pointed out that while many students are capable of functioning well with remote learning, many are not, making their less effective education a negative externality because of lockdowns and social distancing. Students may lack proper equipment and internet access, not have a place conducive for learning, lack personal discipline outside the classroom setting, have insufficient family support, and other limitations. There is the added burden on parents when all are employed. Advances in remote and hybrid learning are needed to address these and many other issues, such as widely accessible, flexible, and low-cost delivery platforms for hard-to-reach populations; prevention of abusive behavior; cybersecurity; appropriate assessment of learning; enhanced social and academic interaction among students; and teacher training and health. These considerations, and the belief that in-person education is the gold standard, underlie the resistance to shutting schools during the pandemic and the push to reopen in-class education as soon as possible.

5 Final Thoughts: Economics and Beyond

It is naïve and disingenuous to suggest that if society and governments had a better understanding of economic thinking that public health outcomes would have vastly improved. Even so, as economists, we work on the margins. Had physical restrictions or use of masks been adopted earlier, how many lives would have been saved, and how much sooner would case counts have dropped? Moreover, how much sooner might most economic activity have recovered? With the benefit of perfect hindsight, one would like to think both public health outcomes and economic activity could have been improved with better economic decision making.

Going forward, the global community still faces enormous challenges in terms of public health and reopening of economies and educational institutions. A major impediment we see to addressing COVID-19 spread is individuals choosing not to wear masks and social distance. Why are these choices being made? The answer is complicated and involves more than economics, as factors like morality and political persuasion also come into play. Difficult tradeoffs between protecting oneself, protecting others, and the need to return to economic and social normalcy are factors as well. Perhaps we worry too much how expansive the drive for more STEM-emphasized education might become, but we believe that a well-founded knowledge of history and economics are fundamental for a nation's citizens to understand and collectively deal with COVID-19 and other challenges of today's world. Increasing social divisiveness to the point of discounting harm to others can have roots in misperceptions of how society and its institutions function and in a lack of knowledge of basic facts about the causes and effects of the forces that have shaped our society and economy over time. We think the current pandemic provides an opportune time to challenge students at all levels to learn about and discuss the causes of market failures and social welfare.

About the Authors: Thomas P. Zacharias is employed through the National Crop Insurance Services. Corresponding Author (tom-z@ag-risk.org). Keith J. Collins is retired and formerly employed by the U.S. Department of Agriculture.

References

Anomaly, J. 2011. "Public Health and Public Goods." *Public Health Ethics* 4(3):251–25.

Johns Hopkins University and Medicine 2020. "Coronavirus Resource Center." Retrieved from https://coronavirus.jhu.edu.

Johns Hopkins University and Medicine 2020. "Coronavirus Resource Center, Mortality Analyses." Retrieved from https://coronavirus.jhu.edu/data/mortality.

U.S. Department of Health and Human Services, Centers for Disease Control and Promotion 2020. "CDC Activities and Initiatives Supporting the COVID-19 Response and the President's Plan for Opening America Up Again." Washington, DC, May. Retrieved from https://www.cdc.gov/coronavirus/2019-ncov/downloads/php/CDC-Activities-Initiatives-for-COVID-19-Response.pdf.

2(5) doi: 10.22004/ag.econ.308060