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Improving Student Outcomes and Study Habits Using Technology to Promote Engaged Pre-Class Textbook Reading

Jeff Sarbaum (UNC Greensboro) & Thomas Hayward (Pearson Higher Education)





LEARNING AND TECHNOLOGY

SYMPOSIUM

April 13-14, 2023 | Charlotte, NC



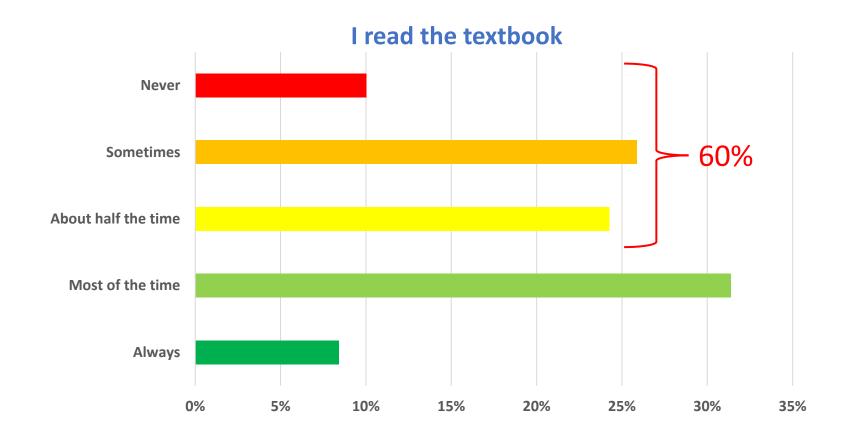
Goals of the Presentation

- What deficiencies / behaviors do your students exhibit that hinder their ability to succeed academically?
- Share some survey data on student behavior and the impact of a preclass reading intervention.
- Quickly explain how and why I got involved in a textbook project.
- Explore how Economics Interactive and other textbooks built on Pearson's new Revel Learning Platform promote engagement to improve student outcomes through continuous formative and summative assessment.

A Conversation with the Group

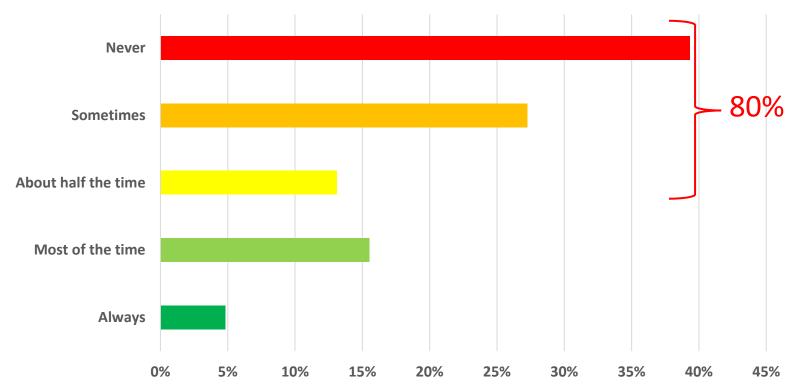
- What deficiencies / behaviors do your students exhibit that hinder their ability to succeed academically?
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Howard E and Sarbaum J (2022). Front. Educ. 7:770464. doi: 10.3389/feduc.2022.770464



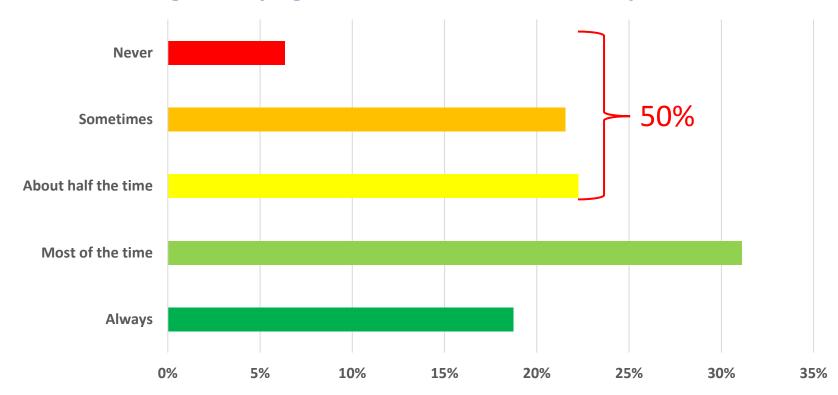
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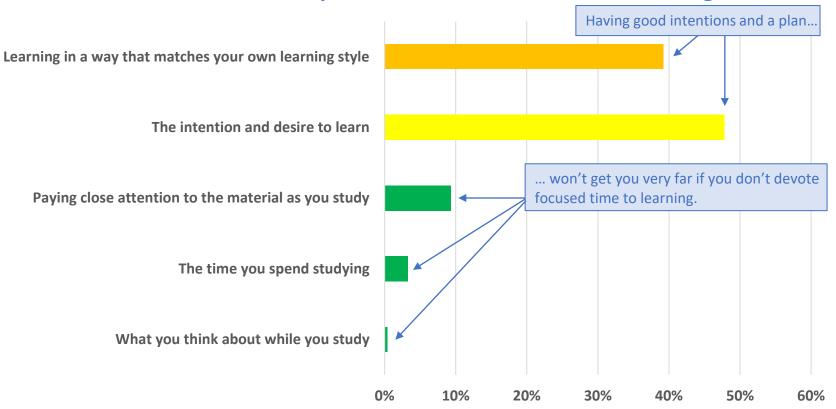
Howard E and Sarbaum J (2022). Front. Educ. 7:770464. doi: 10.3389/feduc.2022.770464

I begin studying for an exam at least three days before



Howard E and Sarbaum J (2022). Front. Educ. 7:770464. doi: 10.3389/feduc.2022.770464

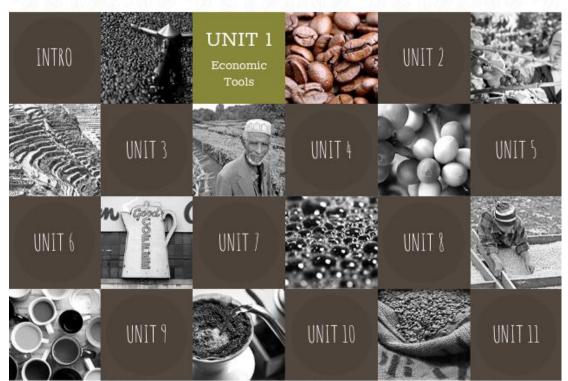
What is the most important factor in successful learning?



How Did I End Up Working on a Textbook?











Unit Unit 2 Unit 3 Unit 4 Unit 5 Unit 6 Unit 7 Unit 8 Unit 9 10 11 Search ...

Unit 1: Economic Tools Section 1 Section 2 Section 3 Section 4 Section 5 Section 6

Page 1 Page 2 Page 3 Page 4

4. What is Ceteris Paribus?

Whenever we try to explain the world with a model, we must hold some things constant so that we can focus on the cause-and-effect we are interested in. Ceteris paribus simply means we are doing that—holding some things constant so that we can measure and better understand the relationship between other things. For example, if we want to know a how a change in the price of coffee impacts sales, we need to assume people's income and the price of tea are unchanged. Why? Well, if income and the price of tea are changing too, it'd be impossible to single out the impact of a change in price on coffee sales. Economic models rely heavily of the use of ceteris paribus in order to better understand how economics variables interact.



The ceteris paribus assumption is important because it:

- holds everything constant.
- allows variables of interest to be isolated.
- lets us study the impact of everything all at once.
- is an economic model that shows the relationship between price and quantity.

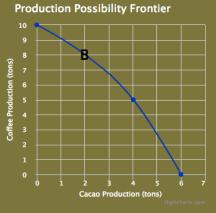
Question 1 of 2

Next >



Connect Your Graph with Your Land

YOUR DATA Possibility Cacao (tons) Coffee (tons) A 0 10 B 2 8 C 4 5 D 6 0





Possibility A | Possibility B | Possibility C | Possibility D

- DECREASE DEMAND

INCREASE DEMAND +

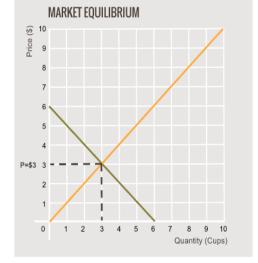
DECREASE SUPPLY

INCREASE SUPPLY +

	QUANTITY		
PRICE	Demand	Supply	
\$8.00		8	
\$7.00		7	
\$6.00	0	6	
\$5.00	1	5	
\$4.00	2	4	
\$3.00	3	3	
\$2.00	4	2	
\$1.00	5	1	
\$0.00	6	0	

EQUATIONS Demand Q = 6 - 1P

Supply Q = 1P



Requiring versus Recommending Preparation Before Class: Does It Matter?

Sarbaum, Gicheva, Andersen, Southern Economic Journal, 2018, 85(2), 616–631

• Divide 15 sections into before class and after class unit Learning Area due dates.

Table 7 List of Course Sections

Table /	List of Course Sections			
Section	Type	Instructor ID	Taught by Ph.D. Student	Start Time
1	Doforo			
1	Before	1	No	15:30
2	Before	1	No	15:30
3	End	1	No	9:30
4	End	1	No	9:30
5	Before	2	No	11:00
6	End	2	No	12:30
7	Before	3	Yes	14:00
8	Before	3	Yes	14:00
9	End	3	Yes	17:00
10	Before	4	Yes	14:00
11	End	4	Yes	11:00
12	End	4	Yes	15:30
13	Before	5	Yes	12:30
14	Before	5	Yes	15:30
15	End	5	Yes	14:00

Impact of Before Class on Exam Performance - ITT

• ITT = Effect of being in the due before class group regardless of completing the assignment before class.

$$Score_{ijt} = X_i'\beta + \sum_{k=1}^{4} a_k Pretest_k_i + \sum_{k=1}^{4} \gamma_k (Before_i \times Pretest_k_i)$$
 (1)

$$+\theta_t + \varepsilon_{ijt}$$
,

- Pretest (ability) = indicator for student i being in group/quartile k
- Before = indicator for student i being in a due before section
- X_i = vector of student level control age, race, gender, etc.
- Θt = either a random or fixed instructor effect

Table 4 Intent-to-Treat Estimation Results

Model:	(1) Instructor RE	(2) Instructor RE	(3) Instructor FE	(4) Final exam only and instructor RE	
"Before" section	0.137***				
	(0.046)				
"Before" section x Pre-test group 1		-0.031	-0.053	0.015	
		(0.092)	(0.092)	(0.157)	
"Before" section x Pre-test group 2		0.286***	0.247***	0.319**	
		(0.091)	(0.091)	(0.156)	
"Before" section x Pre-test group 3		0.259***	0.162*	0.303*	
		(0.095)	(0.096)	(0.161)	
"Before" section x Pre-test group 4		0.026	-0.008	-0.00001	
		(0.096)	(0.096)	(0.164)	
Pre-test group 1 (<25 th percentile)		-0.294*	-0.312*	-0.496*	
		(0.165)	(0.164)	(0.280)	
Pre-test group 2 (25th to 50th percentile)		-0.053	-0.061	-0.260	
		(0.131)	(0.130)	(0.223)	
Pre-test group 3 (50th to 75th percentile)		-0.126	-0.177	-0.161	
		(0.111)	(0.111)	(0.189)	
Number classes attended	0.104***	0.100***	0.129***	0.135***	
	(0.020)	(0.020)	(0.020)	(0.033)	
Number missed HW	-0.047***	-0.049***	-0.043***	-0.049**	
	(0.011)	(0.011)	(0.011)	(0.019)	
Section taught by Ph.D. student	-0.182***	-0.188***		-0.167*	
	(0.050)	(0.050)		(0.086)	
Standardized pre-test score	0.400***	0.315***	0.308***	0.278***	
	(0.027)	(0.057)	(0.057)	(0.097)	
N	1347	1347	1347	449	

^{*} p<0.1, ** p<0.05, *** p<0.01. All models include age and indicators for gender, Hispanic ethnicity, race, in-state residency, whether the student lives on campus, citizenship status, major field of study, and imputed pre-test score.

Impact of Before Class on Exam Performance - LATE

 LATE = Effect of doing the assignment before class as a result of being assigned to the due before class group.

	Due After Class	Due Before Class
D = 0		
(Student Completed After Class)	77%	11%
D = 1		
(Student Completed Before Class)	23%	89%
*Treatment moved behavior of 66%	6 of students	

$$Score_{ijt} = X_i'\alpha + \sum_{k=1}^{4} b_k Pretest_k_i + \sum_{k=1}^{4} \delta_k (PctComplete_{ij} \times Pretest_k_i)$$
 (2)

$$+\rho_t + \epsilon_{ijt}$$
,

- PctComplete_{ij} = fraction of assignments competed before exam_i for student_i
- δ_k = average treatment effect for group k completing assignment before class vs later

Table 6 Local Average Treatment Effects

	(1) GLS	(2) GLS	(3) IV	(4) IV	(5) IV	(6) IV
% completed check-ins	0.177***	GLS	0.202***			
•	(0.052)		(0.068)			
Completed check-ins x Pre-test group 1	` ,	-0.168*	` ,	-0.049	-0.079	0.020
		(0.102)		(0.136)	(0.136)	(0.231)
Completed check-ins x Pre-test group 2		0.217**		0.398***	0.347***	0.437**
		(0.099)		(0.129)	(0.129)	(0.216)
Completed check-ins x Pre-test group 3		0.544***		0.361***	0.228*	0.419*
		(0.105)		(0.133)	(0.135)	(0.223)
Completed check-ins x Pre-test group 4		0.084		0.037	-0.021	-0.009
		(0.110)		(0.170)	(0.169)	(0.295)
Pre-test group 1 (<25 th percentile)		-0.118		-0.216	-0.255	-0.526
		(0.174)		(0.199)	(0.198)	(0.341)
Pre-test group 2 (25th to 50th percentile)		-0.251*		-0.384**	-0.393**	-0.672**
		(0.138)		(0.164)	(0.163)	(0.282)
Pre-test group 3 (50th to 75th percentile)		-0.501***		-0.418***	-0.396**	-0.550**
		(0.125)		(0.156)	(0.155)	(0.268)
Number classes attended	0.101***	0.095***	0.100***	0.097***	0.127***	0.131***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.021)	(0.033)
Number missed HW	-0.042***	-0.044***	-0.041***	-0.045***	-0.041***	-0.044**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.020)
Section taught by grad. student	-0.165***	-0.172***	-0.164***	-0.173***		-0.150*
	(0.050)	(0.050)	(0.050)	(0.050)		(0.085)
Standardized pre-test score	0.401***	0.312***	0.402***	0.316***	0.309***	0.277***
	(0.027)	(0.057)	(0.027)	(0.057)	(0.057)	(0.097)
N	1347	1347	1347	1347	1347	449

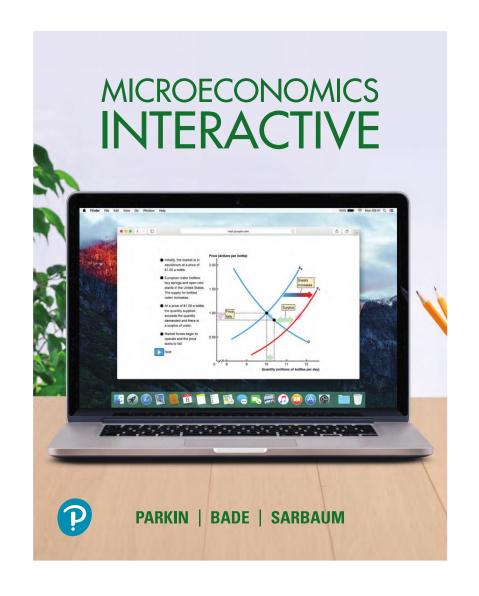
^{*} p<0.1, ** p<0.05, *** p<0.01. The IV models use section type as an instrument for the fraction of completed check-in assignments. All models include age and indicators for gender, Hispanic ethnicity, race, in-state residency, whether the student lives on campus, citizenship status, major field of study, and imputed pre-test score. The specifications include instructor random effects, with the exception of the one in column 5, which includes instructor-level fixed effects. The estimation in column 6 is limited to final exam scores.

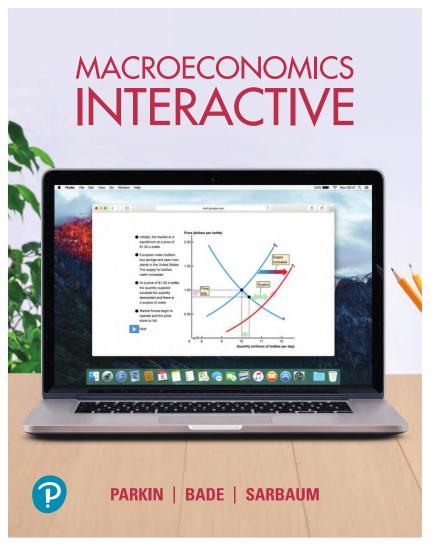
Requiring versus Recommending Preparation Before Class: Does It Matter?

Sarbaum, Gicheva, Andersen, Southern Economic Journal, 2018, 85(2), 616–631

- Reading quizzes had a "due" date or matching "recommended be done by" date posted in the class LMS.
 - ~ 90% of "due before" students completed on time before class.
 - ~ 25% of "recommended be done by" students completed prior to class, with most eventually completing, sometimes AFTER they'd taken the final exam.
- 25th to 75th ability quartiles in the treatment group showed a test score improvement of 3-4% points relative to the control group.
 - Assigning material before class improves performance (ITT).
 - Students who review prior to class do better relative to students of similar ability who review after class (LATE).

Transitioning from a Website to a Textbook



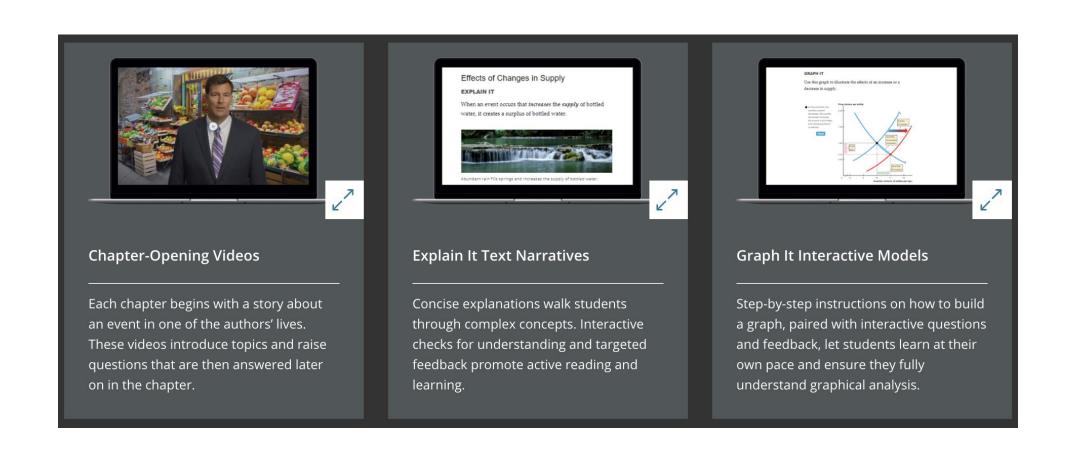


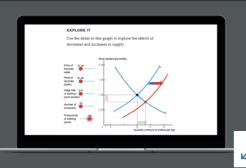
What is Economics Interactive?

- A digital first fully integrated learning experience that allows you to assign and give points for reading and comprehension...
- ...based on the three pillars of learning science:
 - 1. Reduce extraneous cognitive load
 - Segmented content, simple formatting, teaching images
 - 2. Interactive constructive engagement
 - Buildable graphs and tables, video with embedded assessment
 - 3. Providing immediate feedback
 - Embedded assignable assessment with teaching feedback
- Built on Revel, Pearson's new learning science driven platform



Economics Interactive: The "It" Factor





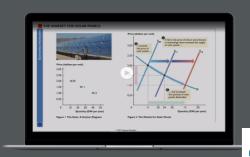
Explore It Interactive Models

Interactive graphs enable students to change variables with sliders and observe the predicted outcomes.



Check that I've got it

End-of-section practice exercises act as short quizzes and provide students with detailed feedback for incorrect answers.



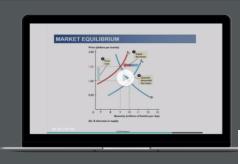
Apply It videos

Video assignments help students see how a concept they have recently learned about explains an interesting real-world event.



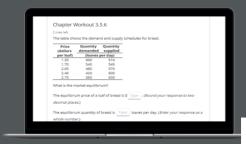
Chapter-closing videos

End-of-chapter videos revisit the chapteropening story and ask students to apply what they've just learned using videoembedded interactive question and answering.



Review It Videos

Summary videos provide students with an audio-visual recap of information presented on each learning objective, prior to working the end-of-section practice exercises.



Chapter workouts

Comprehensive chapter quizzes use multiple-choice, free-response, and student-draw-graph exercises. They can be assigned as tests for credit or as homework with feedback to reinforce learning.







Home





















Modules

Syllabus

Discussions

Grades

Pearson

Course Materials

People

Ø Files

Ø Outcomes

Rubrics Ø

Ø Quizzes

Ø Assignments

Dance



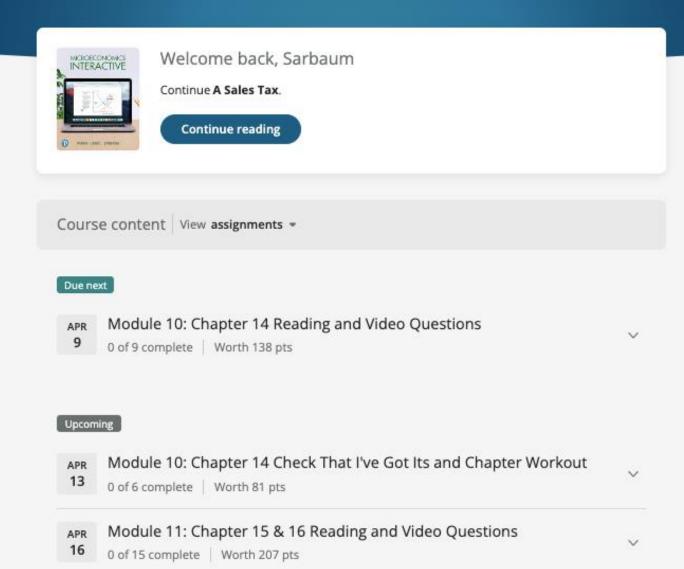
Select Open Pearson to see your content.

Open Pearson

ECO 201-02: Principles of Micro (SP23)



SCORES DASHBOARD NOTEBOOK STUDY



Contents

Notebook

View all chapters ▼

Chapter 7: Taxes FEB 26

Reading

Chapter 7 Opening Video FEB 26

Reading Worth 3 pts

7.1 Sales Taxes and Excise Taxes FEB 26

Reading | Worth 45 pts

☆ Check that I've got it: Section 7.1 MAR 2

Practice | Worth 12 pts

7.2 Income Taxes and Social Security Taxes FEB 26

Reading Worth 36 pts

☆ Check that I've got it: Section 7.2 MAR 2

Practice | Worth 12 pts

7.3 Tax Revenue and Efficiency FEB 26

Reading | Worth 30 pts

☆ Check that I've got it: Section 7.3 MAR 2

Practice | Worth 9 pts

7.1 Sales Taxes and Excise Taxes

Almost every time you buy something—a late-night order of pasta, a plane ticket, a tank of gasoline—you pay a tax.

On some items, you pay a sales tax that is added to the advertised price.



A sales tax is added to the advertised price.

On other items, you pay an excise tax—like tax on gasoline—that is included in the advertised price.



Contents

Notebook

View all chapters ▼

7.1 Sales Taxes and Excise Taxes FEB 26

Reading | Worth 45 pts

Check that I've got it: Section 7.1 MAR 2

Practice | Worth 12 pts

7.2 Income Taxes and Social Security Taxes FEB 26

Reading | Worth 36 pts

Check that I've got it: Section 7.2 MAR 2

Practice | Worth 12 pts

7.3 Tax Revenue and Efficiency FEB 26

Reading Worth 30 pts

Check that I've got it: Section 7.3 MAR 2

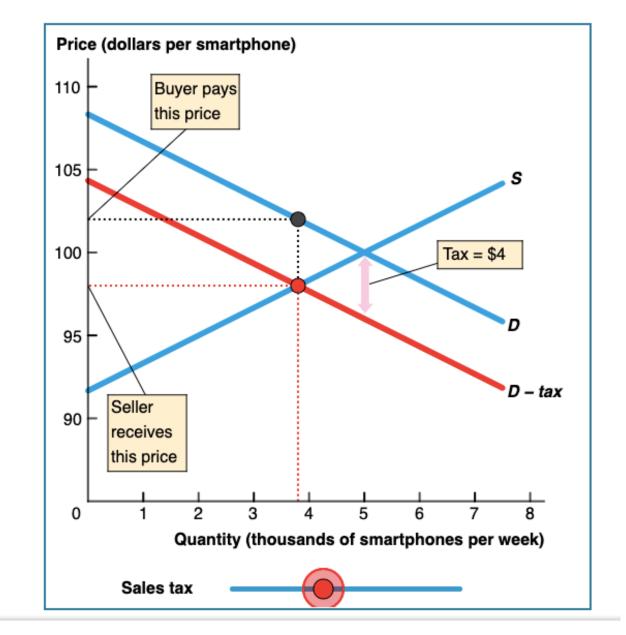
Practice Worth 9 pts

7.4 Fairness and the Big Tradeoff FEB 26

Reading Worth 21 pts

Check that I've got it: Section 7.4 MAR 2

Practice | Worth 9 pts







Practice | Worth 9 pts

Notebook Contents View all chapters ▼ 7.1 Sales Taxes and Excise Taxes FEB 26 Reading Worth 45 pts ☆ Check that I've got it: Section 7.1 MAR 2 Practice Worth 12 pts 7.2 Income Taxes and Social Security Taxes FEB 26 Reading Worth 36 pts ☆ Check that I've got it: Section 7.2 MAR 2 Practice Worth 12 pts 7.3 Tax Revenue and Efficiency FEB 26 Reading Worth 30 pts ☆ Check that I've got it: Section 7.3 MAR 2 Practice | Worth 9 pts 7.4 Fairness and the Big Tradeoff FEB 26 Reading Worth 21 pts ☆ Check that I've got it: Section 7.4 MAR 2

	po	nts
Expl	ore	e It 7.1.1
3 tries	left	
What	hap	pens when the government increases the sales tax on smartphones?
-		paid by buyers, the price received by sellers, and the gap the prices
\bigcirc	A.	rises; rises: narrows
\bigcirc	В.	falls; rises; widens
\bigcirc	C.	falls; falls; narrows
$\overline{}$	D.	rises; falls; widens
0		



ECO 201-02: Principles of Micro (SP23)







DASHBOARD GR

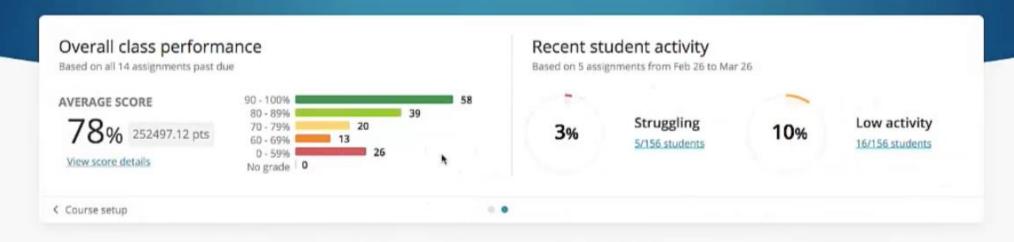
GRADES

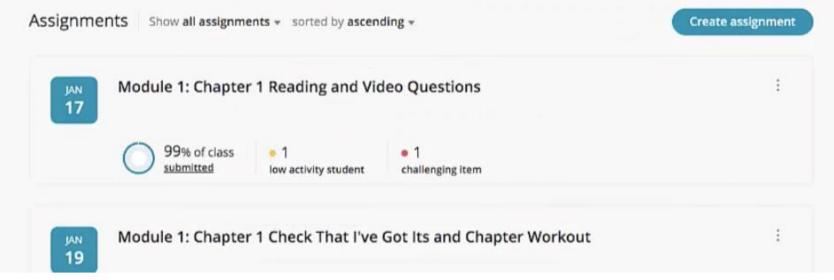
RESOURCES

SETTINGS

Welcome back, Sarbaum

You have 8 assignments due March 26 through April 20. Check progress on the Grades page.







ECO 201-02: Principles of Micro (SP23)







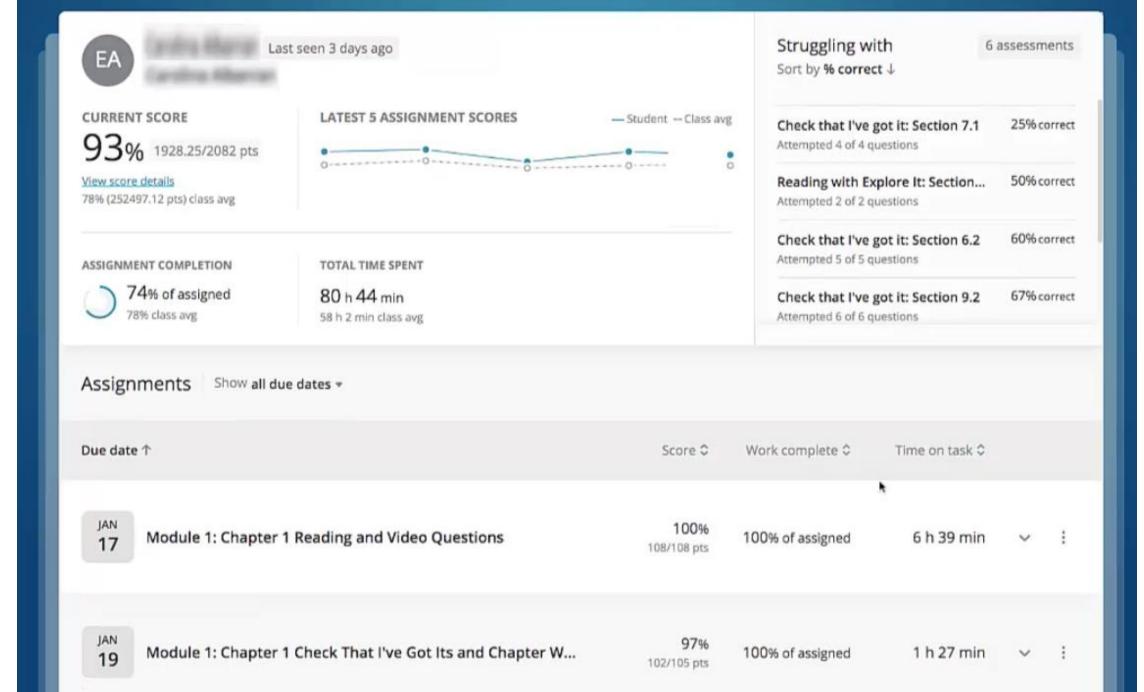
DASHBOARD

GRADES

RESOURCES

SETTINGS

Students Assignments Show all students +	Q Filter studen	nts Export
Name ↑	Score C Work comple	ete 🗘 Time on task 🗘
DA Last active 9 hours ago	62% 1290.5/2082 pts 54% of ass	igned 42 h 22 min :
CA Last active 3 days ago	79% 1645.25/2082 pts 66% of ass	igned 45 h 45 min :
EA Last active 3 days ago	93% 74% of ass	igned 80 h 44 min :
ZA Last active 4 days ago	83% 74% of ass	igned 25 h 36 min :





Revel Microeconomics Interactive, 1e

By Michael Parkin, Robin Bade, Jeff Sarbaum

Open the book

Instructor Resources

Resources	File Type

PowerPoint

The PowerPoints include lecture notes and images that can be used for your class.

Accessible Lecture PowerPoints (Chapters 1-18) Zip

Animated Lecture PowerPoints (Chapters 1-18) Zip

Test Bank

The test bank contains over a thousand multiple-choice, true/false, and short-answer questions to help build tests and quizzes for your class.

Test Bank - Word (Chapters 1-18) Zip

Test Bank - PDF (Chapters 1-18) Zip

Scoring

Set the points, tries, and penalties for each assessment type in your course. Students receive one try fewer than the number of answer options. Your changes apply to assestudents haven't started.

Assessment type	Possible points	Tries	Pe	enalty per try	
Chapter workout	3 per q	uestion 3	·	Partial credit	
Chapter closing video	15 total				
Check that ive got it	3 per q	uestion 3	·	Partial credit	
Shared media	100 total				
Concept check	3 per q	uestion 3	·	Partial credit	
Writing assignment	100 total				

Save

Student Comments from Macro El

- Hi Professor Howard! Before getting into it, I just want to say that this textbook tool is very convenient to use and has been one of the best methods of getting me to read textbook content to date!
- Hey Jeff, I had a student in ECO 202-01 tell me that the EI text has been, hands down, his best textbook experience out of any he has had so far. Totally unsolicited, he just said it out of the blue.

Student Comments from Micro El

(based on a survey asking for feedback)

- All in all, great book Dr. Sarbaum. It feels truly more immersive than a simple reading experience with on-time questions to test your grasp on concepts. The embedded questions help keep me focused, especially with the videos because my attention can lack sometimes, but I always pay attention knowing I might have to answer a question about one specific thing I heard in the video.
- I feel like you have put together an amazing book it is very easy to read and allows you to test your comprehension instead of endless paragraphs of never-ending text. The interactive graphs and videos are an amazing feature that allows me to see what I'm reading so I really enjoy what you have created, and I hope many professors will catch on and find books like yours.

Student Comments from Micro El

- I liked the book a lot compared to other ebooks I've had to use. It was a little annoying at first having questions embedded in the reading, but I've realized that it caused me to retain more information as opposed to a passive reading assignment. I also liked how simple it was to see due dates and points scored for assignments. Other ebook systems are far too complicated, but this one was very straightforward.
- I really like all of it! I feel like the interactive aspects are most helpful. The graphs that allow you to use sliders are really cool. I feel like I'm learning but not having to do tedious work in order to do so.

Student Comments from Micro El

- It's an amazing experience!!! Much BETTER than an average textbook to use!
- I really like this and I feel like I am more inclined to pay attention than if you were to give us a regular textbook.
- The book is great. It forces you to read every single detail because of the questions you have to answer. Overall, I think this should be done for almost every course. It is really helpful.

See me after the session if you'd like to review all the survey feedback responses (a.k.a. to confirm I'm not cherry picking too much \mathfrak{G})

How Do I Use Revel and Economics Interactive?

- I assign the chapter "reading and video questions" to be due the night before the first lecture of the week.
 - 3 points, 3 attempts, -1 point for each missed attempt, 50% penalty if completed late.
 - Students are generally able to get high scores if they pay attention to the content and do the work.
- I assign the chapter "check that I've got its" and "chapter workout" to be due at the end of the week after class.
 - 3 points, 3 attempts, -1 point for each missed attempt, 50% penalty if completed late.
 - These questions can be a bit more difficult and are used to ensure students globally understand the chapter content before moving on.

My Experience Working with Pearson: Two Takeaways

- Their primary focus / mission is to develop tools / products that will improving learning, knowing that if they do this well the rest will follow.
- They are committed the DEI across their organization and products.
 - Currently reviewing all titles for biased content
 - In our title we changed the longstanding term "black market" to "illicit market"
 - In our title we changed a video clip of a white officer interacting with a black individual to one that did not have the potential to trigger racial sensitivities.

Questions?

