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Revel educator study examines impact on student performance in Microeconomics at Penn State University

> **Key Findings**
> - Data indicate that 74% of students scoring above the median on Revel assignments earned an A, B, or C as their average exam grade.
> - Students who completed most Revel quizzes earned higher final course letter grades than students who skipped more than two Revel quizzes.
> - 70% of respondents on an end-of-semester survey agreed that the "read a little, do a little" interactive approach of Revel helped them learn and retain the material better than they would have with a traditional textbook.

Study Specifics

School name: Pennsylvania State University, University Park, PA
Course name: Introductory Microeconomic Analysis and Policy
Course format: Face to face
Course materials: Revel for *InMicro* by Hubbard and O'Brien

Timeframe: Spring 2018
Educator: Dr. Austin Boyle, Assistant Teaching Professor
Results reported by: Candace Cooney, Pearson Results Manager

Setting

- Locale: large, suburban, four-year, public, land-grant, doctoral university with 24 locations throughout Pennsylvania
- Enrollment: more than 46,000 students at University Park, approximately 98,000 students system-wide
- Full-time retention rate: 93%
- Six-year graduation rate: 85%
- Ethnicity: 65% Caucasian, 6% Hispanic, 6% Asian, 5% African American, 18% Other

About the Course

Austin Boyle has been teaching for 10 years and approximately five years at Penn State. Introductory Microeconomic Analysis and Policy is a one-semester, three-credit, entry-level course enrolling approximately 5,000 students per year, and is a general education course meeting requirements for many majors. Students will develop an understanding of and ability to use the economic way of thinking, use graphical supply-and-demand models to identify equilibrium and analyze markets, and relate concepts learned in class to events in the real world.

Challenges and Goals

Boyle believes students should be responsible for their own learning, which includes being prepared by reading the textbook prior to lecture. Giving up class time for weekly reading assessment quizzes was not an option. Because Revel™ offered an opportunity to attach points to reading the textbook, he engaged in an early class test of the program while it was still in development, using content from several chapters in Spring 2016. Boyle chose to adopt Revel for his Fall 2017 classes to hold students accountable for reading and understanding basic

course concepts, so his lecture could focus on more in-depth explanation and real-world application of the content.

As a fully digital program, Revel presents an affordable option to print textbooks, although students always have the option to purchase a print book as a companion for the online learning experience in Revel. Most students, however, choose to only purchase access to Revel. On an end-of-semester survey of Boyle's students (75% response rate), 77% (69 of 90 students) chose not to purchase a print textbook to accompany Revel. Students who used only Revel in digital format indicated the following:

- Initially, 70% (43 of 69 students) were apprehensive at the beginning of the semester using only Revel for reading assignments.
- However, 65% of those students (28 of 43 students) agreed that they became comfortable using Revel for their reading assignments as the semester progressed.

Ultimately, 76% (68 out of 90 students) were comfortable using Revel exclusively for reading assignments either before the semester began or as the semester progressed.

Implementation

Students use Revel for understanding content and quizzing. On the student survey, 43% of respondents said they spent 1–2 hours per week working in Revel, while 52% spent more than two hours each week working in Revel. Boyle views the Revel assignments as formative, an opportunity for students to experiment and learn, with reading taking place prior to lecture and chapter quizzes completed after lecture.

Revel integrates dynamic media like videos, animations, and interactive graphing throughout pre-built readings. Not only does the media offer an alternative way of learning, it also encourages students to take an active role in their reading. Although these interactives are intended to be completed quickly, most students unfortunately do not take advantage of the dynamic media options: just 28% of respondents on the survey indicated that they usually or always viewed the media options as they were reading, although an additional 33% responded that they sometimes viewed the embedded media.

The unique Revel approach of reading chapter content followed by immediate assessment, however, was widely seen as beneficial by survey respondents:

- 70% agreed that the "read a little, do a little" interactive approach of Revel helped them learn and retain the material better than they would have with a traditional textbook.
- 68% said they preferred the interactivity of Revel to a traditional, print textbook.

Revel offers a mobile app so students can read, practice, and study anytime and anywhere, allowing them to access course materials, including the full text, on their tablet or mobile phone, offline and online. While most students used a laptop for Revel, 20% of respondents on the survey did use their mobile phone or tablet to access Revel throughout the semester.

Revel assignments
Concept Checks: These questions are embedded in the narrative of the chapter so students can confirm their understanding of the content before moving on to a new section or topic. These required assessments are comprised of multiple-choice and draw-graph exercises, and students have access to learning aids and feedback so they can validate their comprehension. These quizzes are recorded in the gradebook and account for 50% of the Revel score.

Practice quizzes: These six-question, pre-built quizzes are located after each section students read. Boyle makes these quizzes available for students to review concepts and quiz themselves, but they are not required or graded.

- 73% of respondents on the student survey agreed that Practice Checks at the end of each section allowed them to check their understanding of what they just read before moving on to the next section of the eText.
- *"The practice questions throughout the lessons were helpful in reinforcing the information being learned."* *(student quote)*

End-of-chapter quizzes:These 10-question, multiple-choice quizzes give students an opportunity to test their comprehension of the chapter as a whole and count for 50% of the overall Revel score.

Other course assessments
Boyle employs a collaborative discussion board called Piazza as a way to make his large lecture class more interactive. Students post course questions or comments on real-world articles applicable to course concepts. The discussion board is not graded, yet activity is often enthusiastic. Boyle also employs a personal response system (clickers) to promote engagement in lecture. 110 questions are asked throughout the semester, approximately 2–3 per day, and students may discuss the questions with others around them. Students earn full credit if they answer a minimum of 80% of the in-class clicker questions regardless of accuracy, or they earn a percentage of the points based on the number of questions they complete. In-class paper-and-pencil assignments require students to think about a problem, work in pairs with other students for a solution, and finally share their response for a recorded grade.

Weekly quizzes are given through the campus LMS, Canvas, and students also complete two midterms and a final exam. Midterms are comprised of 30 multiple-choice and five short-response, multi-part questions, and students have 75 minutes for completion. The final exam includes 60 multiple-choice questions, and students have two hours for completion.

Assessments

- 40%   Midterm exams (2)
- 30%   Final exam
- 10%   Canvas quizzes
- 5%   Revel concept checks
- 5%   Revel quizzes
- 5%   Clicker questions
- 5%   Think/Pair/Share in-class assignments

Results and Data

Students were placed in two groups based on their total Revel score being above or below the median score of 87%. Data indicate the following (figure 1):

- 74% of students of students scoring above the Revel median earned an A, B, or C as their average exam grade.
- No students (0%) who scored below the median earned an A as their average exam grade, while 67% of students scoring below the median earned a D or F as their average exam grade.

Six students who did not take any exams were excluded from this analysis.

For students, the formative Revel assignments are intended to help them identify where they may be in terms of successfully completing summative course exams. Data suggest that if students are not completing Revel assignments successfully, they may lack the requisite content knowledge necessary to effectively complete the course exams. The average exam score was 69%.

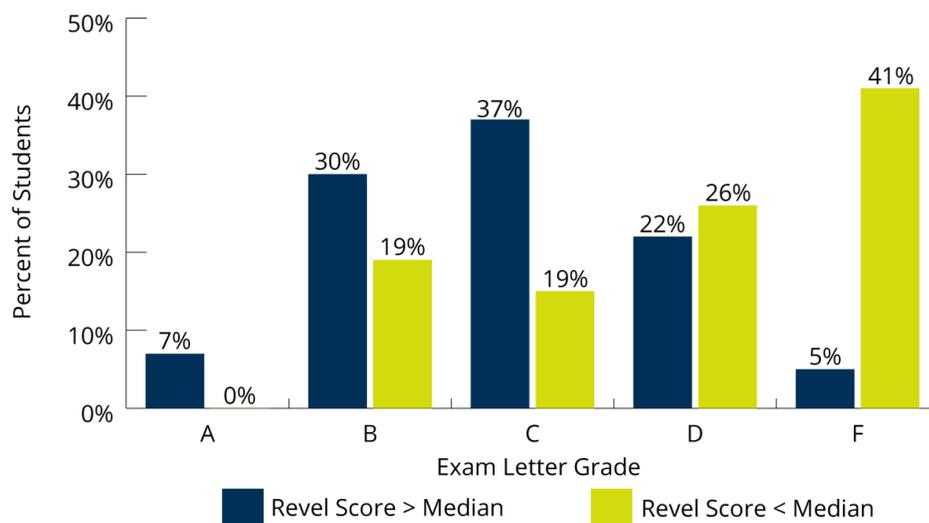**Average exam grades based on Revel score**

Figure 1. Relationship between Revel Scores Above and Below the Median and Average Exam Letter Grades, Spring 2018 (n=114)

Revel quiz completion is measured by identifying the number of quizzes a student did not complete out of the 16 chapter quizzes assigned (figure 2). A quiz score of 0 was used to indicate a quiz that was skipped and not completed.

3.6	Average # of Revel quizzes skipped by all students
2.1	Average # of Revel quizzes skipped by students earning a final course grade of A, B, or C
6.5	Average # of Revel quizzes skipped by students earning a final course grade of D or F
72%	Average final course score

Data show:

- Students who completed most quizzes earned higher final course grades — students earning an A or B skipped two or fewer Revel quizzes on average.
- Students who completed fewer quizzes earned lower final course grades — students earning an F skipped an average of nine quizzes.
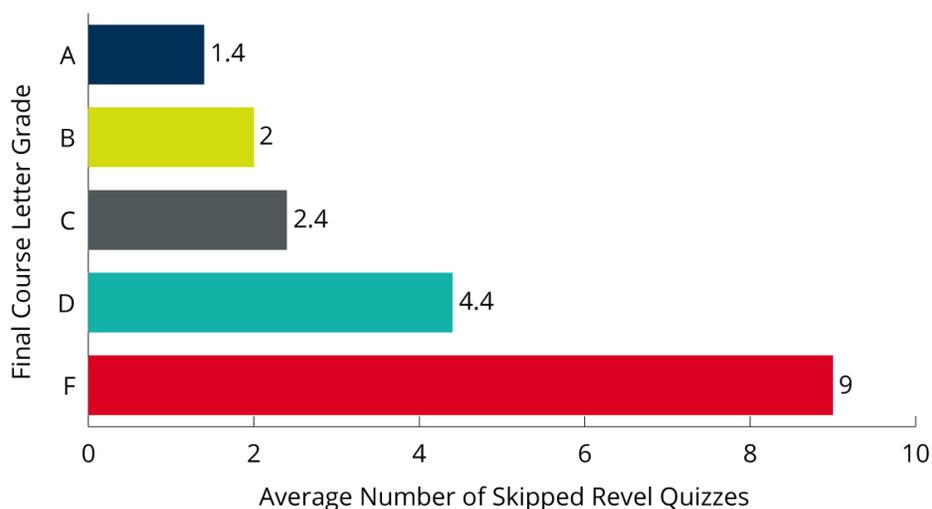
Revel quiz completion and final course grades

Figure 2. Relationship between Final Course Grades and Revel Quiz Completion, Spring 2018 (*n*=114)

The Student Experience

> "The interactive style of Revel really helped me. You had to read something, then go and apply it."
> —Student, Penn State University

Responses from the Spring 2018 end-of-semester survey of Boyle's students indicate that the majority of responding students recognize the value of Revel.

- 70% of respondents agreed that the "read a little, do a little" interactive approach of Revel helped them learn and retain the material better than they would have with a traditional textbook.
- 79% of respondents agreed that Revel practice questions at the end of each section allowed them to check their understanding of what they just read before moving on to the next section of the eText.
- 68% of respondents said they prefer the interactivity of Revel to a regular print textbook.
- 67% of respondents said the resources provided in Revel made the program a good value for the course.

Student responses to the question, "What were the benefits of Revel?" include:

- *"The in-text questions were very helpful. It allowed me to stop and think about what I just learned and making them worth points forces you to understand the important concepts rather than just gloss over them while reading."*
- *"It broke down complex issues into smaller steps to learn how to connect all elements."*
- *"Convenient, easy to access method, with helpful interactions like 1-tap definition pop-ups for certain words, and linked keywords for easy access to related things in the book."*
- *"It forced me to really understand the material to move on and get the questions correct. Although I did not really enjoy doing it at the time, I can see how beneficial it was. One example was learning the midpoint formula, I don't know why but I just really struggled understanding it until I worked through it on Revel."*
- *"Revel made me familiar with some topics before coming to class which helped me obtain more from the lectures."*

Conclusion

Boyle initially engaged in a Revel class test hoping to achieve his goal of holding students accountable for their own learning, which included being prepared by reading the textbook prior to lecture. The pilot was successful, leading to adoption of the program the following semester. On the student survey, students revealed an appreciation for the change in course format, indicating a preference for the interactivity of Revel when compared to a traditional print textbook. As one student shared, *"Revel is a very helpful tool for me to show up ready for class, for many times the Revel homework was due before we actually learned the subject in class, and having that "pre-workout" with Revel really helps."*