The Impact of WileyPLUS and ORION Adaptive Practice on Student Engagement, Performance, and Proficiency
Faculty and students alike are constantly challenged to make choices about which teaching and learning tools to engage with. They ask themselves which ones will most effectively achieve the outcomes they seek, provide a satisfying user experience and help them make the best use of limited time. Wiley works with faculty and students to continuously improve its programs and services to answer these questions. New research results show:

• Instructors and students perceive greater engagement and performance as chief benefits of WileyPLUS.

• Students who earned a higher percent of the available WileyPLUS points earned a better grade in the course. For example, those who earned 100% of the available WileyPLUS points earned a course grade that was about 1.5 grades higher than those who did not earn any WileyPLUS points.

• The use of ORION adaptive practice in addition to WileyPLUS resulted in better grades than using WileyPLUS alone. That is, the use of ORION adaptive practice in conjunction with WileyPLUS resulted in students earning nearly one-third of a grade higher than when WileyPLUS was used without ORION adaptive practice.

• ORION is especially effective when used as a study tool before major tests or exams.

• Instructors who share a concern that their students are not engaged enough in their course see the greatest benefit.

• ORION adaptive practice helps good students do even better and encourages all students to engage more in the material. Instructors using WileyPLUS with ORION can move from the typical bi-modal classroom of high and low engagement student groups to a more differentiated classroom with greater insight into student study and practice activity.
About WileyPLUS

Instructors often describe the challenges they face with students who are unprepared for their course of study (not having taken pre-requisite courses or needing remediation) or for their current classes (not having spent sufficient time on their assignments). At the same time, the demands on instructors’ time have risen along with the expectation that they should use technology tools to reach and engage students. WileyPLUS courses deliver a teaching and learning experience that help instructors and students achieve educational success in today’s blended and online learning environment. The pedagogical framework of each WileyPLUS course is built on the benefits of blended learning—that is, learning from a combination of face-to-face and online tools and resources such as an interactive eTextbook, automatically graded practice with constructive feedback and links to content, and instructor-selected assignments enhanced by adaptive practice and collaborative learning tools. Research has shown consistent benefits, including enhanced learning outcomes, when blended learning is well implemented.  

“WileyPLUS is a great online learning tool that offers a variety of ways to learn material. The ability to store and retrieve material/assignments is great. The varied methods of learning are very valuable.”

—Andrew Wright, Student, Coastline Community College, Accounting

ORION Adaptive Practice

The majority of WileyPLUS courses include an adaptive practice component called ORION. Based on cognitive theory, cognitive task analysis, and cognitive modeling, ORION is a personalized, adaptive practice experience that helps students build their proficiency on topics through practice questions while using their study time in a way that is most effective for the individual student.

Adaptive learning systems are based on many years of research, conceptualization, and practice, and they have been shown to lead to substantial improvement in student learning of diverse subjects and even across subjects. Because students enter class with diverse academic backgrounds, expecting students to learn by presenting all of the students with the same material is not only unrealistic, but also unproductive. There is clear evidence that students lose their motivation if they are not given instructional material and guidance that is commensurate with their goals and level of understanding, challenges them, and provides the specific help they need in order to reach a more independent state of understanding. For a more detailed discussion of adaptive learning research and practice, see the white paper “Adaptive Online Learning” available at https://www.wileyplus.com/WileyCDA/about/whitepaper.html.

ORION adaptive practice guides students to what they need to study most, while giving instructors a deeper understanding of what’s going on in their class and with individual students. ORION provides an adaptive, formative assessment that is personalized to the needs of individual students, providing students and instructors with feedback and analytics on questions, learning objectives, and chapters. Students learn where their individual
strengths and weaknesses lie while instructors can identify learning trends early, facilitate engagement based on student needs, and monitor progress as well as make improvements in the course over time.

Personal Learning Paths and Proficiency

When students start at different levels of understanding and work in a personalized, adaptive learning experience, gauging and comparing students’ understanding requires a different metric. ORION tracks both performance (number of correct and incorrect answers) and proficiency (a dynamic, predictive metric based on students’ adaptive practice). The proficiency metric estimates a student’s knowledge of a learning objective or chapter.

Proficiency is a composite metric based on several factors: the student’s performance on individual questions, the difficulty level of the question, the difficulty level of the learning objective, and the student’s indicated level of confidence in his/her answer. With these learning analytics, students can easily see what they already know and what they need to study more.

“ORION really helped me to conceptualize the information. After learning and studying, I would do some ORION assessments and things just began to come together and make sense.”
—Rebecca Kelly, Student, Delaware Technical and Community College, Biology case study

“I liked the ability to see what portions of a chapter I needed to work on the most. ORION definitely helped prepare me for the quizzes, homework, and exams.”
—Andrew Wright, Student, Coastline Community College, Accounting

Study Background

Wiley commissioned Broadview Analytics, Inc., a third-party evaluator, to gather data, conduct analysis, and report the results of a study of the relationship between student achievement and student engagement with WileyPLUS and ORION adaptive practice. The hypothesis to be tested is that the use of ORION results in better student outcomes, controlling for the use of WileyPLUS. Additionally, the study explored the levels of student engagement with WileyPLUS and/or ORION to determine if greater engagement is associated with greater student achievement. Student engagement is defined as the amount of assignments attempted or completed, and student achievement is defined as the final grade in the course.

The study followed a quasi-experimental design. Each instructor taught two sections of a course using WileyPLUS—one section where the instructor required auto-graded questions and ORION adaptive practice assignments (treatment class) and one section just using auto-graded assignments (control class). With a coin flip, instructors randomly chose which of their two classes used ORION, and students enrolled in the classes without knowing if it was
a treatment or a control class. There were 198 students in the treatment classes and 207 in the control classes. The treatment and control classes used the same Wiley text.

• Eight instructors from two-year and four-year institutions participated in the quasi-experimental portion of the study. Five of the instructors taught Accounting courses with 223 students, two instructors taught Business courses with 88 students, and one instructor taught Chemistry courses with 94 students.

• Note: Several additional instructors in a variety of courses and their students provided survey feedback on their experience with WileyPLUS and/or ORION but could not participate in the quasi-experimental design. Their feedback is included in the separate Instructor and Student Perspective sections of this paper and in some quotations (noted as case studies).

The Quasi-Experimental Design for Testing the Impact of ORION Adaptive Practice

Students enroll in course

ORION is randomly assigned to a class section

Class A

ORION

Class B

Semester Elapses

Test Group Results

Control Group Results

Seven of the instructors taught their classes in a traditional, in-person setting, and one instructor taught completely online classes. Eighty-seven percent of the students were in traditional format classes and 13% were in online classes. The instructors taught their treatment and control classes in the same format.

Reflecting real-world practice, the instructors varied in their application and assignment of WileyPLUS and/or ORION. In the treatment classes, four of the instructors used ORION adaptive practice as a post-class homework assignment, three used ORION adaptive practice as a practice tool for major exams, and one used ORION adaptive practice as a pre-class assignment.

In both the treatment and control classes across subjects, over half of the course grade was based on exams. In the control classes, homework (largely WileyPLUS assignments) accounted for 18% of the grade, while in the treatment classes homework accounted for 12% of the grade and ORION adaptive practice accounted for 11% of the grade.

Six of the instructors also used WileyPLUS for homework assignments in both the treatment and control classes. Three of these instructors had over 30 WileyPLUS homework assignments in their classes, while the other three instructors had roughly half that many. Two instructors assigned over 1,000 points using WileyPLUS and four assigned 400 points or fewer.
Instructors participated in two surveys about their experience using ORION adaptive practice and/or WileyPLUS. The start-of-term survey captured intent and expectations, while the end-of-term survey captured experience and satisfaction. Students were also invited to participate in an end-of-term survey about their experience. Instructors submitted detailed student grade data at the end of the term, including the performance of each student on WileyPLUS and ORION assignments. Instructors de-identified the data so that it did not include students’ personally identifiable information.

### Overall Student Performance

The students’ grades were converted to a numerical score using the GPA system (e.g., A=4, A-=3.7, etc.). The average treatment course grade was 2.5 (B- to C+) and the average control course grade was 2.45 (B- to C+).

However, after controlling for student use of WileyPLUS across treatment and control groups, there is a significant improvement in final course grades from 2.320 in the control classes to 2.626 in the treatment classes.

The ANCOVA equation is:

\[
\text{course grade} = 1.750 + 1.589 \times \text{percent of WileyPLUS points earned} + 0.306 \times \text{treatment}
\]

That is, the use of ORION adaptive practice in conjunction with WileyPLUS resulted in students earning nearly one-third of a grade higher than when WileyPLUS was used without ORION adaptive practice. The significance level of the treatment variable has a p-value of 0.011.

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![Course Performance, Controlled for WileyPLUS](image)
Student Performance: Impact of WileyPLUS

Students in both the treatment and control classes who earned a higher percent of the available WileyPLUS points earned a better grade in the course. The regression equation is:

\[
course\ grade = 1.678 + 1.430 \times \text{percent of points earned}
\]

That is, those who earned 100% of the available WileyPLUS points earned a course grade that was about 1.5 grades higher than those who did not earn any of the available WileyPLUS points. The significance level of the model has a p-value of less than 0.0005.

Course Performance by WileyPLUS Percent Obtained

“I like that the questions in ORION are changed slightly and recycled so that I learn rather than memorize.”

—Rebecca Howell, Student, University of New Orleans, Organic Chemistry
**Student Performance: Impact of ORION Adaptive Practice**

Students in the treatment course who earned a higher percent of the available ORION adaptive practice points earned a better grade in the course. The regression equation is:

\[
\text{course grade} = 1.581 + 1.624 \times \text{percent of points earned}
\]

That is, **those who earned 100% of the available ORION adaptive practice points earned a course grade that was about 1.5 grades higher than those who did not earn any ORION adaptive practice points.** The significance level of the model has a p-value of less than 0.0005.

**Course Performance by Percent of ORION Points Attained**

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<th>21-30%</th>
<th>31-40%</th>
<th>41-50%</th>
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**“Students who faithfully used ORION performed better on graded assignments and exams.”**

—David Hollomon, Instructor, Victor Valley College, Business

The study indicates that the way students use ORION impacts its effectiveness. That is, those in classes where it was assigned primarily as a study tool before major tests or exams showed the largest performance gain.
Help with Student Engagement

In classes where instructors were challenged with students not fully engaging in the classroom, student use of ORION resulted in better outcomes. Instructors who cited student engagement as a challenge saw the average course grade increase from 2.48 to 2.81 with the use of ORION.

Student Performance by When Student Engagement Is an Instructor Challenge

The integration of adaptive practice allows the top performing students to do even better and provides early cues for students who may struggle in upcoming higher-stakes assessments. Overall course performance changes from typical bi-modal classroom of high and low engagement student groups to a more differentiated classroom.

Course Performance by Student Segment
**Conclusion**

Students earned higher course grades when they engaged with adaptive practice in conjunction with auto-graded assignments. Greater engagement with either assignments or adaptive practice is associated with better course performance.

ORION adaptive practice provides students with an additional tool to engage in the course and provides greater insight for students and instructors into course performance, especially in classes where engagement is considered a challenge. ORION adaptive practice has particular strength when used as a study tool before major tests or exams.

“**WileyPLUS and ORION helped my students feel more confident about the material, which resulted in more participation during class.**”

—Cynthia Baertich, Instructor, University of Southern Mississippi, Spanish case study
Student Perspective

Students were asked to participate in an end-of-term survey to gather feedback on their experience using ORION adaptive practice and/or WileyPLUS.

Positive Impact of WileyPLUS

Students gave very positive feedback on the impact of WileyPLUS on their class experience, learning, and grades. Students agreed or strongly agreed that WileyPLUS helped them:

- With homework and practice: 73%
- Develop a better understanding of course concepts: 69%
- Prepare for quizzes and exams: 69%
- Come to class better prepared: 65%
- Understand how they were meeting course objectives and where they needed to spend more time studying: 64%
- Engage more fully in the course: 64%

When asked about the functionality of WileyPLUS, students replied that it was clear and easy to use (69%) and the resources they needed were easy to find (71%).

Positive Impact of ORION Adaptive Practice

Students also gave positive feedback on the impact of ORION adaptive practice. Students found ORION adaptive practice helpful or very helpful with:

- Understanding how they were meeting course objectives and where they needed to spend more time studying: 70%
- Evaluating their progress in learning the material: 63%
- Preparing for quizzes and exams: 60%
- When asked about the functionality of ORION adaptive practice, students replied that it was clear and easy to use: 60%
- Practicing the material on a regular basis: 58%
- Developing a better understanding of course concepts: 57%
The instructors were asked to participate in a start-of-term survey about their primary objectives, expectations, and course challenges, as well as an end-of-term survey about their experience with ORION and/or WileyPLUS. All of the instructors participated in the start-of-term survey, and seven of the eight instructors participated in the end-of-term survey. All of the instructors identified their top objective to be that students gain a basic understanding of the core concepts of the course. The top challenges they identified were (1) students not fully engaging with the course material, and (2) students not completing their work ahead of class.

**Positive Impact of WileyPLUS**

All of the instructors reported being satisfied or very satisfied with their experience using WileyPLUS. Four of the instructors stated that WileyPLUS performed as they had expected and three stated that it had exceeded their expectations. The instructors who stated that WileyPLUS exceeded their expectations reported being pleasantly surprised that students actually did the WileyPLUS homework and came to class prepared. Overall, the instructors saw WileyPLUS as having a positive impact on student engagement and performance.

**Positive Impact of ORION Adaptive Practice**

Five of the seven instructors reported that ORION adaptive practice met or exceeded their expectations. The instructors who stated that ORION adaptive practice exceeded their expectations saw improved student performance. They stated that students who completed their ORION adaptive practice assignments did better overall than students who did not, and students in the treatment class (WileyPLUS with ORION adaptive practice) were more thoroughly prepared for class than control class students (only WileyPLUS).

The instructors reported that the chief benefit of using ORION adaptive practice was that students were more prepared for class and improved their performance. They believed that:

- Assigning work in ORION adaptive practice requires the students to look at the material before lecture and makes them more prepared for class discussions.
- ORION adaptive practice provides extra practice for struggling students and expanded coverage of content.
- Students who use ORION adaptive practice seriously will usually perform better on tests and assignments.

The instructors found the ORION adaptive practice Productivity Reports, Performance Reports, Student Activity Dashboard, and Proficiency Metric to be very helpful. As one instructor put it:

“I was able to check their performance, the time they spent with ORION adaptive practice, where they were in comparison to the class, and what they were struggling with.”

—Shainaz Landge, Instructor, Georgia Southern University, Organic Chemistry

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