macmillan learning

Educator Study with Achieve for Calculus Fall 2021

COURSE:	Calculus, delivered face-to-face
PRODUCT USED:	Achieve for Calculus Book: Calculus Early Transcendentals, 4th ed. by Rogawski, Adams, and Franzosa
STUDY DESIGN:	Implementation study with descriptive and correlational analyses

How Achieve for Calculus supports student academic performance in an average-sized Calculus classroom at a four-year university

Institutional and Course Context

Oregon State University is a public four-year college offering bachelor's, master's and Doctorate degrees. The institution serves over 26,000 undergraduate students. The instructor who partnered with us on this study taught 39 students in a face-to-face formatted instruction.

Instructor Implementation

The instructor used Achieve throughout the Fall 2021 semester. During this study the instructor assigned homework assignments and post-lecture summative assessments.

"I love the flexibility of the system. I can very easily update questions, change scenarios slightly, add hints to questions, and create my own. I also was happy that I could change the assignments after they were assigned and even after students began working on them." —Professor Clark

Study Design

This study examined whether use of Achieve was related to student outcomes. In addition, information about instructor and student perceptions of Achieve was gathered. Achieve usage was documented through analysis of platform data. Student learning data were collected at the end of the semester via course records shared by the instructor. End-of-semester surveys were used to gather data on instructor and student perceptions of the product, along with student engagement. Data were matched across sources, and descriptive and correlational analyses were conducted.

Results

Achieve is engaging. The instructor reported that students were engaged in their class. Students also reported they found Achieve engaging. They added that Achieve helped them prepare for class.

- 100% reported being engaged in the course this semester.
- 79% reported being actively engaged in classroom discussions.
- 84% reported the pre-lecture activities within Achieve as engaging.
- 74% reported the homework within Achieve as engaging.

Achieve encourages active learning. The instructor reported observing a typical amount of active learning in their course.

Students reported active learning.

- 95% reported engaging in active learning in the course this semester.
- 79% reported that Achieve helped support their learning.
- 84% reported pre-lecture activities in Achieve helped them stay on track during class discussions.
- 89% reported pre-lecture activities in Achieve helped them actively learn in the classroom.

Achieve is easy to use. The instructor reported that Achieve was easy to use and they were comfortable using Achieve in virtual classroom environments.

Students reported Achieve was easy to use and to navigate.

- 84% reported they were comfortable using Achieve.
- 79% reported that Achieve was easy to use.
- 74% reported feeling very confident using Achieve.
- 89% reported they would recommend taking a course using Achieve to a friend.

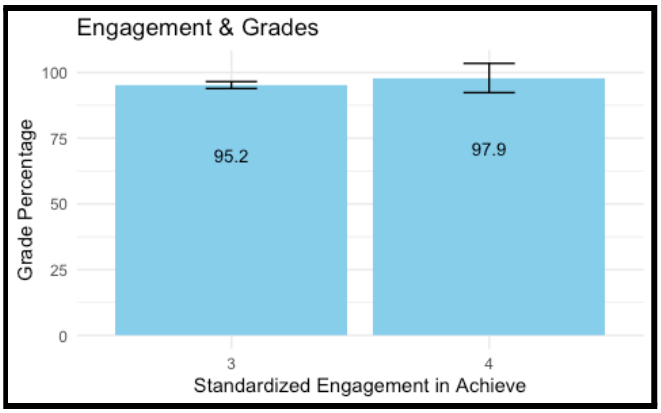
Achieve supports student comprehension of classroom material. The instructor reported that the tools within Achieve helped them understand where their students had gaps in their knowledge and also enhanced their pedagogical framework.

Students reported comprehension of material.

- 79% reported that Achieve was effective in supporting their learning over the semester.
- 63% reported that using Achieve helped them gain a better mastery of the course content than courses without Achieve.
- 89% reported that homework within Achieve helped fill gaps in their knowledge.
- 79% reported that homework within Achieve fostered deeper insights into the class content.
- 89% reported the pre-lecture activities also helped fill gaps in their knowledge.
- 95% reported they often comprehended the material.

"The best part was the chance to answer questions multiple times if you got them wrong with the extra chances feature. It encouraged me to reexamine how I answered a question, and look further into the process of how I solved it to seek out mistakes." —Student

Student engagement in Achieve appears to be related to student academic achievement. Activity completion in Achieve is shown below. Here students are grouped by completion of the overall class median (mid-point). The median was equal to 20 assignments across one class section. Although the relationship between how many activities students finished within Achieve (as a percentage of how many were assigned in the course) and their final grade in the course was not statistically significant, we can see that those students who are completing more Achieve activities do have higher grades on average. This graph indicates that the more activities students completed, the better they performed in the class overall (again, this was not statistically significant).



Note. The standardized engagement levels are defined as follows:
0 = no activities completed,
1 = less than 50% of the overall median completed,
2 = 50%-75% of the overall median completed,
3 = 75%-100% of the overall median completed,
4 = greater than the median.

Insights for Optimization

The instructor and students provided insightful feedback on features of Achieve. The instructor suggested they would like to be able to see when their students last logged into Achieve. They also mentioned that streamlining the assignments for students, making them less complicated and making instructions and readings easier, would be helpful.

Students suggested including more help and hint options within homework assignments. They also mentioned that more targeted feedback would be helpful. Some students mentioned that accepting multiple forms, as well as making it more clear what form an answer should be in, would be beneficial. Finally, students mentioned that video explanations would be helpful for their understanding.

Overall, the results of this study have generated valuable recommendations for the Achieve product team. The positive

Note: These results are part of a larger Achieve study across multiple institutions. To access the full report and results, please visit http://www.macmillanlearning.com/catalog/page/learningscience.

results support that Achieve has positive outcomes on students' achievement and warrant a larger quasi-experimental study to determine the magnitude of the effects.

Insights for Instructors

One of the most important insights is how students and the instructor reported that homework, and specifically the feedback provided in homework assignments, reinforced learning. Students also reported that Achieve was easy to use and helped them better understand class material. Therefore, instructors in similar educational contexts might consider implementing pre-class materials and homework in Achieve to increase overall student performance.

Study Limitations

Although the data are rich and the findings important for product optimization and insights for instructors, they are specific to this course and cannot be generalized to all instructors who use Achieve. The results are also descriptive and correlational and should not be used to infer causation.

Ethics and Data Privacy

Prior to data collection, this study and the associated consent forms and instruments were reviewed and approved (found exempt) by the Human Resources Research Organization (HumRRO). HumRRO is an accredited (00009492) third-party Institutional Review Board organization with no affiliation with Macmillan Learning. Macmillan Learning seeks third-party review to eliminate any bias in the decision of the exemption. The data in this study, which are provided by the instructor and consenting students, are initially identifiable. However, once a random identifier is generated identifiable data are destroyed. Data are provided in secure storage locations, and access is permitted only to the primary investigator in the study. For full details of our data handling and storage privacy procedures, contact marcy.baughman@macmillan.com.

Acknowledgments

At Macmillan Learning we are committed to developing learning solutions that help instructors and their students to achieve their full potential. We go about this by co-designing with students, collaborating with leading educators and learning scientists, and partnering with colleges and instructors to research effectiveness and efficacy and share insights for success.

Our goal is to help advance teaching and learning by enabling evidence-based decision making and to contribute to research into educational technology. To these ends, we take a comprehensive approach to measuring the effectiveness and efficacy of the digital learning tools that we produce. This report represents one study that makes up the larger body of efficacy research into Achieve. We thank the incredible instructor and their students who partnered with us on this research: Sara Clark - Oregon State University.

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