



Research Brief with ACHIEVE Read & Practice, 2018-01

RESEARCH BRIEF

How ACHIEVE Read & Practice supports student success in psychology courses at a range of institutions

Introduction and Background

In order to provide instructors and other faculty the most valuable and actionable evidence of how a digital tool will work for their students in their educational environments, evaluation of product effectiveness needs to begin in development and continue throughout the lifetime of the product. By beginning testing early in a product's life cycle, instructors have valuable insights they can use when making adoption and implementation decisions. This research brief presents the results from beta tests of ACHIEVE Read & Practice for psychology and provides a discussion about how we have used early evaluation to further refine the product, to inform subsequent impact testing, and to provide early evidence of effectiveness to support instructors when they make adoption and usage decisions.

ACHIEVE Read & Practice

ACHIEVE Read & Practice is a product designed based on learning and cognitive science. The learning tool includes an eBook with embedded and adaptive quizzes. The eBook displays text in manageable sections with various tools to support online reading, such as highlighting and note-taking. To encourage students to read the eBook and then practice what they have learned, students are periodically directed to adaptive quizzes with the goal of “filling in the bar” on a progress meter—combining formative assessment and retrieval practice. Quiz questions change depending on the topic and difficulty level, giving a student more practice in areas where they most need it. If a student needs extra support on the quiz, they can access hints or request to be taken back to the eBook section where the answer can be found. Accessing a hint reduces the amount of points that a question is worth, requiring the student to answer additional questions in order to fill in the bar. However, other types of support (e.g. reviewing eBook sections) do not trigger a point deduction since this is a study habit the learning tool intentionally reinforces. Once students have filled in the bar, the learning tool provides them with a study plan to review the eBook section(s) that they need the most support with, and the students have the option of retaking the quiz to improve their knowledge of those sections. Throughout the experience, students can access visual metrics to guide them on where to focus their learning, and instructors can access visual metrics to help them tailor their lectures or provide extra support.

Learning Science Design and Development

Early development of Read & Practice has leveraged specific learning research, a series of codesign workshops and iterations with students and instructors, and insights from data mining of historical student and instructor behaviors and preferences:

Learning research. Learning researchers conducted a thorough literature review to identify the product capabilities that would support retention and understanding. The research has indicated that retrieval practice improves learning and information retention (Agarwal, Bain, & Chamberlain, 2012; Butler, 2010). And, formative assessment with immediate feedback supports student engagement and learning by helping them self-assess their knowledge and respond to that feedback with additional practice (Nicol & Macfarlane-Dick, 2006). Self-regulation research has suggested that tools like the progress meter support student retention by allowing them to monitor the execution of their learning activities (Carneiro, Lefrere, Steffens, & Underwood, 2012), while the ability to access hints supports student motivation (Ferlazzo, 2015). The learning tool displays eBook content in brief sections based on segmentation and chunking literature which has indicated that spacing supports organization of material for comprehension and retention (Miller, 1956).

Codesign and iterative improvement. Following a full literature review and the development of initial wireframes, learning researchers have codesigned ACHIEVE Read & Practice with instructors and students using research-based learning design principles. Early in development, we interviewed 15 students and 14 instructors to support the design of the quiz features, feedback, and analytic insights. Based on their feedback, the product design underwent five complete iterations.

Data insights. Historical item-level data from 160,000 students distributed across 4,582 courses using LearningCurve were analyzed to understand student and instructor behaviors and preferences, including how they selected content. These analyses have helped refine how content is selected for inclusion in the adaptive quiz component of Read & Practice. Content selection has informed instructors where to place emphasis in their classes, and content usage by students has informed how that content may be supporting their learning process. For example, items that took an unusually long time for students triggered a review process for whether we should include that item in Read & Practice or whether it could be improved. As more instructors and students use Read & Practice, it will undergo ongoing analyses for continual review and revision of the content and overall product experience.

Beta Test

Following codesign and iteration with students and instructors, we invited instructors from a variety of colleges and contexts to use the product for a complete semester. During these beta tests, we documented implementation and collected systematic data on the user experience and student and instructor outcomes. We

have learned what product effects can be observed in small settings with deeply understood contexts and have evaluated whether use of specific product features is related to outcomes. The following is an overview of the study design, methodology, and a brief discussion of the findings and implications.

Methodology. We used implementation studies in seven educational contexts to understand how instructors choose to use Read & Practice and what student and instructor outcomes are related to those use cases. A mixed methods design was used to analyze data.

Institution and instructor sample. We recruited seven instructors from six public two-year institutions to participate. The majority of instructors in the sample (57%) have been teaching more than 15 years. Twenty-nine percent have been teaching between six and 15 years, and one has been teaching under five years. There was quite a bit of variation in how comfortable instructors felt using technology, which was related to whether they had used a digital learning tool in the past.

Student sample. Of the 191 students who used Read & Practice in the fall of 2017, 127 (66%) consented to participate in the beta study (all students received Read & Practice free of charge during the study but were not required to participate in the study in exchange). A slight majority of the students in the sample were female (54%). Most had no prior experience in psychology (59%) and were not psychology majors (79%). Eighty-one percent had used a digital technology tool in a course in the past but many (49%) were unsure whether the use of digital learning tools enhances their learning in a college-level course. Students reported being moderately motivated, with 57% indicating that they would spend more than six hours a week outside of class time studying for this course and 78% reporting that they planned to come to every class with no exception. There was variability in self-reported prior academic performance with 44% reporting they had a high school grade point average between 3.01–3.5 at graduation, 39% reporting it was between 2.6–3.0, 11% reporting it was between 2.1–2.5, and 6% reporting it was either above a 3.5 or below a 2.1.

Data collected. Comprehensive data were collected for a mixed methods analysis. Survey scales that had been pilot tested for psychometric soundness were collected from instructors and students at the start and end of the course. Instructors kept weekly logs of implementation and perceptions. An active learning classroom observation protocol adapted from Lane & Harris (2005) was used when researchers conducted site visits. A formal instructor interview protocol and student focus group protocol were implemented. Product usage data, self-reported prior academic performance data, and records of current academic performance data were collected. Data were matched across sources, and descriptive and correlational analyses were conducted.

Findings. Findings from the beta test study suggested that both instructors and students find ACHIEVE Read & Practice easy and enjoyable to use, effective in helping students stay on track with reading and preparing for class, and accessible. Data show that instructors use Read & Practice to identify students who are falling behind and intervene as necessary. Results also suggested that use of the tool is related to overall academic performance in the course.

All instructors implemented Read & Practice in their fall 2017 psychology course in slightly different ways. Instructors were able to choose how they implemented the product.

All instructors made use of Read & Practice a requirement, but the frequency and duration of use varied by instructor and chosen eBook. Three instructors used Read & Practice with the eBook *Developing Person Through the Lifespan* 10th Edition by Kathleen Berger. Three instructors used the eBook *Scientific American: Psychology* 2nd edition by Deborah Licht, Misty Hull, and Coco Ballantyne, and one instructor used the eBook *Psychology in Everyday Life* 4th Edition by David Myers and Nathan DeWall. The way the instructors used each title varied. There was great variability in the number of Read & Practice activities (i.e. quizzes) that instructors assigned. The instructor that assigned the most activities (53) was teaching an online-only course, and students were permitted to complete the activities at their own pace. About 10% of the students completed all of the activities before the associated lectures. The instructor who assigned the fewest activities (13) taught a face-to-face course, assigned the activities weekly, and noted at the end of the semester that they would be assigning more activities per week the next time they implement the product. The table below provides an overview of how Read & Practice was used in each course in the study, the eBook it was used with, and the proportion of a student’s final course grade that Read & Practice activities contributed to.

Textbook	Implementation model	% Final grade
Licht; SciAm 2e	Face-to-face course; assigned fewer activities as compared to other instructors; graded on pass/fail but will change that moving forward to promote retakes.	35%
Myers; PEL 4e	Face-to-face course; assigned an average of two activities a week. Used for instruction and review; the reading was assigned before the lecture. Students would tell instructor about what they had read and then they discussed their experience with the quizzes with their classmates.	20%
Licht; SciAm 2e	Face-to-face course; assigned an average of two activities a week. About 60% “running start” students. Used for reinforcement and assessment preparation.	20%
Berger; LS 10e	Completely online course; set up all assignments at start of course. Students were expected to complete about six per module, self-paced (10% completed all of them early).	15%
Berger; LS 10e	Face-to-face course; assigned many activities early—some students completed them early; instructor doesn’t believe this impacted performance. Used for review.	12%
Berger; LS 10e	Face-to-face course; assigned an average of two activities a week; didn’t want students completing activities early since they were used for reinforcement.	10%
Licht; SciAm 2e	Face-to-face course; higher than average number of activities assigned. Used strictly as review and rarely reerred to the quizzes during class time.	10%

ACHIEVE Read & Practice was easy to use and beneficial for instructors and students.

Students in the study often noted the ease of use, and instructors reported that the simplicity of the tool saved them time when compared to other publisher-provided tools they had used.

Instructors and students reported that Read & Practice was easy to use. On the presurvey, 87% of students indicated that they valued ease of use in a digital learning tool. On the postsurvey, we asked students to rate how much they agreed that Read & Practice was easy to use, and 97% of students either agreed or strongly agreed. When data were disaggregated by how comfortable students felt using technology in the classroom, even those students who indicated that they were

only “somewhat comfortable” had an average ease of use rating of 3.5 (on a scale of 1 = “strongly disagree” to 4 = “strongly agree”).

Instructor findings followed a similar trend. That is, instructors noted in their presurvey that they often found publisher-provided tools to be challenging to set up and use. On the Read & Practice postsurvey, instructors were asked to rate on a scale of 1 = “strongly disagree” to 4 = “strongly agree” whether they agreed that Read & Practice was easy to set up and use. On average, both ratings were high (3.62 and 3.37, respectively).

Students noted the benefits of using Read & Practice at a much higher rate than they reported challenges. Ninety-seven percent of students reported that Read & Practice had some benefit, while only 3% reported that they did not realize any benefit from using the product. The most frequently reported benefit was that the product helped students prepare for their course assessments. For example, one student reported, *“a lot of the questions that were asked on the quizzes helped me to answer my course exams since I had seen them previously and got . . . to [learn] why that was the answer.”* Another student reported, *“to have access to practice quizzes reinforced concepts and vocabulary that allowed me to recognize similar questions based off of those concepts and vocabulary when taking our exams.”*

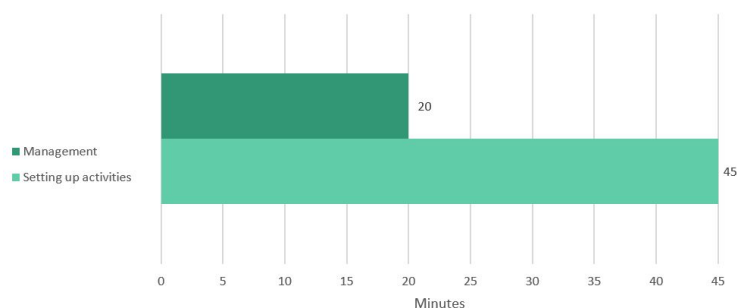
The next most frequently reported benefits were ease of use and directing a student’s study. For example, one student reported, *“my favorite part of Quiz Plus was the simple and organized way to read the text.”* Another student reported, *“[the greatest benefit is] . . . the efficiency of it and its aid in showing which areas to focus more attention to.”*

Students were also asked to report if they experienced any challenges while using Read & Practice and, if so, what the greatest challenge they experienced was. This feedback is critical for continual product improvement. The most frequently reported challenge was slower than expected loading time. One student reported, *“sometimes the eBook didn’t load. But that may have been due to my service and laptop,”* while another student reported, *“sometimes the ‘read book’ portion when taking the quiz would not load, and I constantly had to refresh the page for it to work.”*

Read & Practice saves instructors time when compared to previously used publisher-provided digital learning tools. At the beginning of the semester, instructors were asked to report how much time they spent preparing for their course outside of class time and specifically on publisher-provided digital learning tools. More than half of instructors (57%) reported that they spent “a significant amount of time” preparing for their course using previously provided publisher tools. These instructors spent, on average, one to three minutes preparing ACHIEVE Read & Practice for the course during the beta test.

Instructors were asked to report in their weekly logs how much time they spent setting up activities in ACHIEVE Read & Practice. The average time

Instructor time spent on ACHIEVE Read & Practice this semester



spent throughout the semester setting up activities was 45 minutes, which the majority of instructors (86%) regularly reported was “not burdensome at all.” They reported that 20 minutes overall was spent managing the product, which was again reported to be “not burdensome at all.”

Instructors were also asked to report how much time was spent each week viewing analytics within ACHIEVE Read & Practice. While the average amount of time spent on analytics trended higher (15 minutes average per week) than on assigning activities, this finding should be considered within the context of instructors using analytics to tailor their lesson plans to their students’ needs. Spending more time on analytics would be expected if insights were being gleaned and action items were being developed.

Students remained on track with reading and came to class prepared to participate.

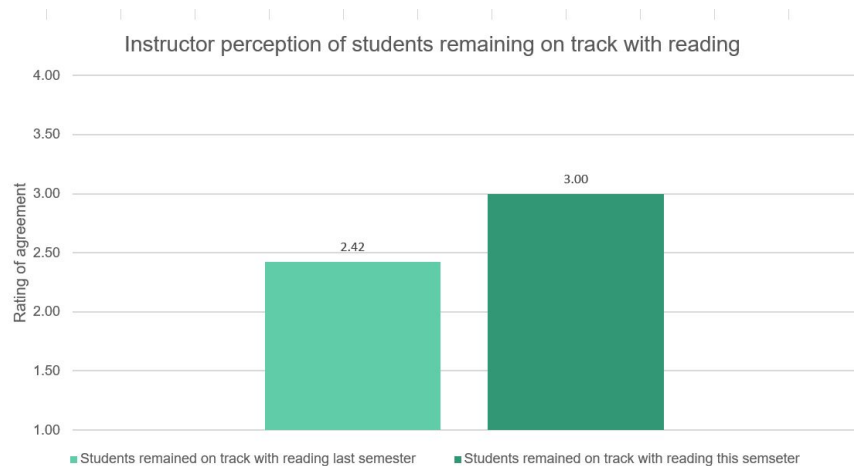
Students reported that Read & Practice was engaging and that the combined ease of use, accessibility, and tools available to them helped them remain on track with reading. Instructors agreed that they observed students remaining on track with reading.

Read & Practice supported student engagement with activities and helped students remain on track with reading. On the presurvey, instructors tended to disagree that students they had taught in previous semesters remained on track with reading (the average rating was 2.42 on a scale of 1 = “strongly disagree” to 4 = “strongly agree”), and they reported that it had been very challenging to motivate their students to stay on track with reading (the average rating was 1.7 on a scale of 1 = “very challenging” to 4 = “not challenging at all”).

In Read & Practice, activities are not “unlocked” until students have accessed the related eBook section. Therefore, activity completion rates revealed that the majority of students using Read & Practice remained on track with reading. The highest average completion rate was observed in

the course that used the Myers and DeWall eBook (86%). However, overall, the majority of classes realized moderately high average activity completion rates with the exception of the students in one course who, on average, only completed 55% of assigned activities. When considering that subset of students, however, the students reported being less academically prepared as compared to the overall sample, which may account for the deviation in completion rate.

Additionally, instructor ratings of whether students remained on track with reading increased .58 from the presurvey (2.42) to the postsurvey (3.00), and student ratings increased .20. When students were asked specifically to “rate how much you agree that Read & Practice helped you stay on track with the assigned reading” on a scale of 1 = “strongly disagree” to 4 = “strongly agree,” the average



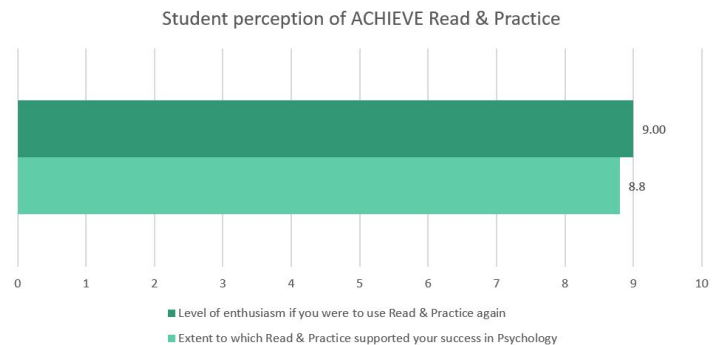
rating was 3.35. One student reported, “it helped me stay on task with my reading and keep up with what was going on in class.”

Instructors used analytics to support student success. Instructors reported that they regularly viewed the analytics provided in the Read & Practice dashboard which helped them identify students who were not remaining on track with reading so they could intervene.

Instructors noted that one of the most beneficial components of Read & Practice was the availability of analytics that present individual student performance and overall class performance. Eighty-six percent of instructors reported viewing the analytics each week. Of the instructors who viewed the analytics, 71% noted that they were able to identify students who were falling behind in the reading, and 67% reported that they modified their lecture and/or lesson plans based on the insights they gleaned from the analytics. One instructor reported, “the biggest benefit for the instructor is the analytics. I have never had such insight into how individual students were progressing. Two students in particular I know I caught and helped before it was too late.”

Read & Practice is related to student academic success and classroom behaviors. Both students and instructors perceived Read & Practice to be beneficial to student success in the course. Also, results suggested that the features available within Read & Practice, including retaking quizzes, influenced academic performance.

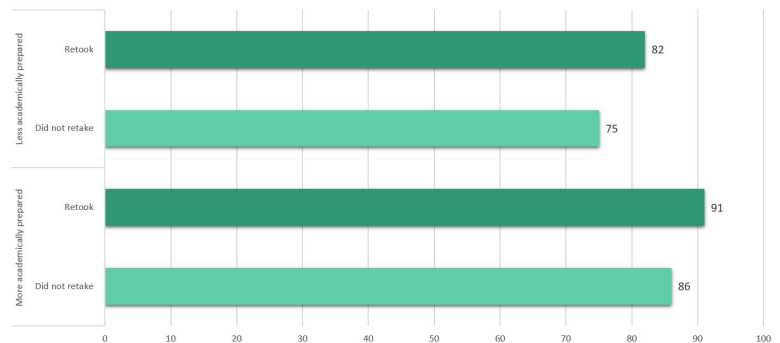
Students believed ACHIEVE Read & Practice helped them academically, and they would be excited if the tool was used in another course that they enrolled in. When asked to rate the extent to which they thought use of Read & Practice supported their performance in their psychology course this year, the average rating was 8.13 (on a scale of 0–10). Interestingly, students who were psychology majors had a lower than average rating of support (7.30), while students who were not and did not plan to become majors had a higher than average rating of support (8.26). It is possible that students who were majors did not require additional support, while non-majors did because, in fact, non-majors were twice as likely to retake quizzes for practice than were majors.



When asked to indicate how excited they would be if Quiz Plus was used in another course that the student enrolled in, the average rating (on a scale of 0–10) was 8.10. Students who indicated that they were not currently psychology majors but intended to declare psychology as their major rated their level of excitement higher than average.

When data were disaggregated by how strongly students agreed that digital technology could support their performance in the classroom, there was little variability in the average ratings. That is, students who at the beginning of the semester did not agree that digital learning tools could support their performance in psychology tended to agree that Read & Practice did support their performance throughout the semester.

Retaking quizzes in ACHIEVE Read & Practice supported student engagement and academic success in the course. All students, but particularly those who were less academically prepared, retook quizzes for practice. Students who retook quizzes for practice reported increased performance from midterm to end of semester more often, on average, than those who didn't. Also, students who retook quizzes had higher completion rates of their activities within Read & Practice than students who didn't. While it is not surprising that more engaged students would retake quizzes and complete more assignments, the trend interestingly persisted when compared to students who reported being more and less academically prepared.



Instructors observed more positive classroom behaviors when students were using ACHIEVE Read & Practice. Instructors were asked on the presurvey to rate the extent to which they agreed that they had observed these classroom behaviors from students in a course they previously taught that was either the same, or similar to, the course that they were teaching during the beta test. They were asked to respond to the same behaviors at the end of the beta testing semester.

Instructors reported that when using Read & Practice students were more likely to use the quizzes to reinforce their lectures (mean = 3.00) than in previous courses (mean = 2.25). Students were also more likely to have good study habits (mean = 2.47) than before using Read & Practice (mean = 2.30). These differences were not as large as those seen in student self-reporting, but the trend persisted within students and instructors.

Implications. Instructors who have challenges with keeping students on track with reading and coming to class prepared to participate may benefit from using Read & Practice in their classroom. Students find it easy to use and engaging, making it more likely that they will complete the associated activities. Even instructors who have not used digital learning tools in their course in the past will likely find the tool to be intuitive and straightforward. Additionally, instructors who have struggled with spending a great deal of time setting up other publisher-provided learning tools may find that they save time on course preparation by using Read & Practice.

Limitations. As a beta study, the sample was limited to seven instructors and 127 consenting students in introductory psychology courses. Though the results are important to inform adoption and usage decisions and to contribute to ongoing refinements of Read & Practice, because of the small sample size and exploratory

nature of the study, the results cannot be generalized to the universe of expected users. Additionally, all analyses are descriptive or correlational and therefore are not meant to infer causation.

Future research. The findings from this study have contributed to the ongoing improvement of Read & Practice for psychology. To measure incremental effects of improvements, a replication beta study will be conducted in spring 2018. A beta test of Read & Practice for history will also be conducted capturing the same data so that trends or variability between disciplines can be measured. When the product is in full use, a quasi-experimental study will be conducted to continue to evaluate and measure the efficacy of Read & Practice in a variety of disciplines.

Works Cited

Agarwal, P. K., Bain, P. M., & Chamberlain, R. W. (2012). The value of applied research: Retrieval practice improves classroom learning and recommendations from a teacher, a principal, and a scientist. *Educational Psychology Review*, 24, 437–448.

Butler, A. C. (2010). Repeated testing produces superior transfer of learning relative to repeated studying. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 36, 1118–1133.

Carneiro, Lefrere, Steffens, & Underwood (2012). Self-regulated learning in technology enhanced learning environments. Springer Science and Business Media.

Ferlazzo, L (2015). Building a Community of self-motivated learners: strategies to help students thrive in school and beyond. Routledge; Taylor & Francis.

Lane & Harris (2015). A new tool for measuring student behavioral engagement in large university classes. *Journal of College Science Teaching*, 44 (6): 83-91.

Miller, G (1956). The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information. *Psychological Review*, 63 (2): 81–97.

Nicol, D.J & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: a model and seven principles of good feedback practice. *Studies in Higher Education*, 31.