

Enhanced WebAssign® Results in Higher Engagement and Improved Learning in Developmental Math

Efficacy Study — June 2013

ABOUT THE STUDY



About Enhanced WebAssign®

Enhanced WebAssign combines the exceptional Mathematics, Physics, and Astronomy content that you know and love with the most powerful online homework solution — WebAssign. Enhanced WebAssign engages classroom learners with immediate feedback, rich tutorial content, and interactive eBooks, helping students to develop a deeper conceptual understanding of their subject matter. Online assignments can be built by selecting from thousands of text-specific problems or supplemented with problems from any Cengage Learning textbook.

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Developmental Mathematics is a keystone of college success for a large percentage of the incoming population every year. It is a major area of concern and research due to the low success rates and high dropout rates these courses experience. The use of technology in these courses is considered critical to their improvement and redesign. Cengage Learning's Enhanced WebAssign (EWA) is one of the most popular products used to support learning in developmental math. The study presented below shows that using EWA in developmental math courses increases student learning and engagement when compared to similar classes not using EWA. In addition, students and instructors agree about the benefits of EWA to student performance and engagement and strongly recommend its use. This study was conducted during the spring academic term of 2013, approximately January through early June by Project Tomorrow, an independent research firm. Participating instructors were Cengage customers teaching developmental algebra (either elementary or intermediate) during the study period term. In total, 15 developmental math instructors and 516 students representing a mix of four-year institutions and two-year community colleges participated in this efficacy study. Eleven of the instructors in the study used a Cengage textbook in conjunction with EWA during their course; four of the instructors only used the textbook.

This study employed a mixed-methods approach in which we collected both qualitative and quantitative data that were analyzed to identify and explain patterns of outcomes. Quantitative data were derived primarily from instructor surveys and student surveys, which were completed at the beginning and end of the study period. Instructor questionnaires were designed to capture how instructors used EWA or other instructional technology in their teaching. These questionnaires also collected data on instructor attitudes about EWA and other instructional technology,

and measured how EWA might affect the way they teach their courses. Finally, where appropriate, the questionnaires also measured opinions about the helpfulness and importance of specific product features and capabilities.

Student questionnaires explored students' interest and engagement in the course, their study habits, and the value of instructional technology to their success in the course. Where appropriate, students were also asked about the helpfulness and importance of specific product features and capabilities.

Student focus groups and instructor interviews were the primary qualitative data collection tools. Qualitative data collection emphasized patterns of product usage (i.e., features used most often) and opinions about features (i.e., what is the most and least helpful to the instructor or student). Open ended questions in the student and instructor surveys captured additional qualitative data that were less rich in detail but provided many more responses and were useful to identify patterns of opinions.

The study participants included both college instructors and students. Amongst the student participants, 53 percent were first year students and 26 percent were in their second year of college. Three-quarters of the students considered their technology skills to be average compared to their peers. Within the classes that were using both the Cengage textbook and EWA, 66 percent of the students noted that this term's developmental math class was their first experience using EWA. For the most part the instructors in the study however had previous familiarity with using EWA. Seven of the 11 had used EWA in two or more previous courses. This familiarity was also evident in how they set up their course. Ten of the 11 instructors required their students to have access to both the print textbook and EWA as a course requirement. The instructors' familiarity with EWA also translated into high expectations for the impact of the product on student achievement.

Study Project Findings

The findings from this study explore both the instructor and student perspectives on the value of EWA as a preferred homework tool. Specifically we examined the efficacy of EWA in terms of the impact of EWA on student achievement, the productivity value of EWA to the instructor, student engagement in learning and course materials, and the likelihood that the study participant, student or instructor, would recommend EWA to a peer or colleague. The primary lens for the analysis is therefore these four value propositions: **impact**, **productivity**, **engagement**, and **recommendation-ability**. The analysis work included reviews of both the quantitative and qualitative data collected within this project.

"My goal is to have a higher percentage of my students complete the class, to have the class average raised, and to hear the students say they actually enjoyed using EWA to do their assignments, to have additional help (such as the videos), to communicate with me, and to have an accurate report of what their current grade is at any time."

Maureen DuPont

Math Instructor,
Palomar College

"The value of using EWA was like having a math tutor by my side all the time."

3rd-Year

Non-traditional Student

Wayne County Community College

“Students really like the instant feedback and the options to get help via Practice It and Watch It.”

Ann Kiefer

Math Instructor,
University of Wisconsin, Stevens Point

“I really loved the Watch It portion. When I couldn’t understand a problem I was working with, it would lay it out for me and show me how I could go about doing it. It made things a lot easier and it helped me understand what I did wrong in certain problems. It gave me a base to go off of. That was nice.”

3rd-Year Student

Chaffey College

“I liked that it allowed me to ask a question on a homework assignment as well as send private messages to the instructor.”

1st-Year Student

Palomar College

The key findings include:

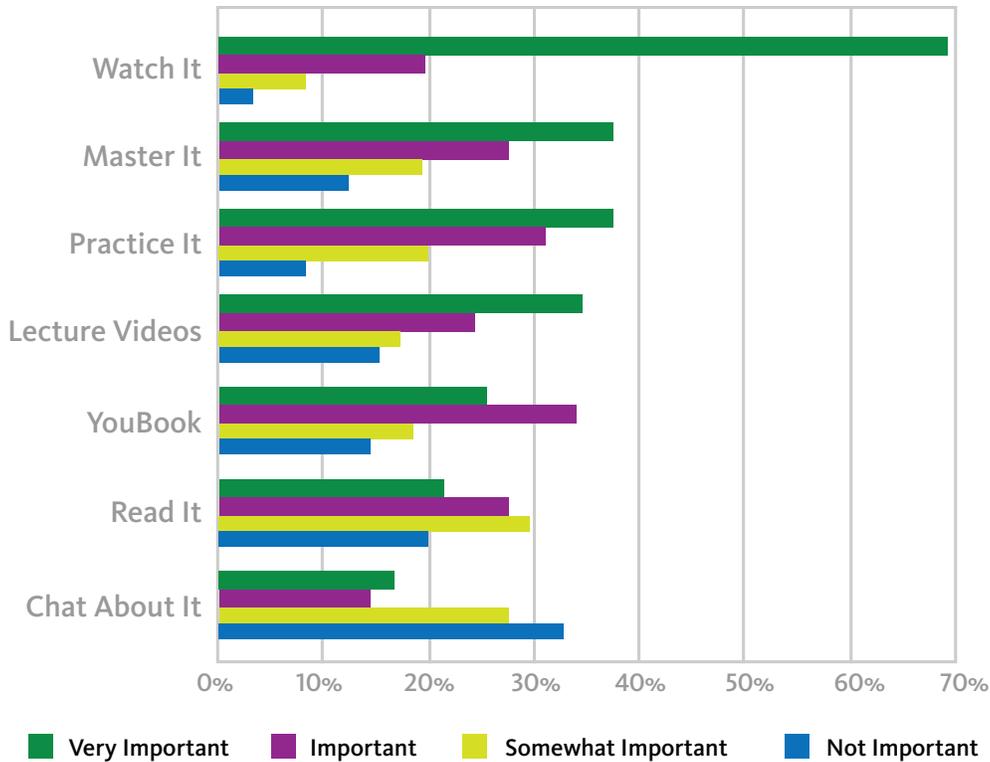
- Students using EWA received higher final course grades than students in similar courses without access to EWA.
- Course instructors say EWA is important to their professional productivity because it saves them time in course planning and grading assignments.
- EWA increases students’ engagement in learning and the course materials.
- Students highly valued the instant scoring of homework assignments, access to practice problems and step-by-step tutorials within EWA.
- Students using EWA were more likely to say that they had the resources they needed to be successful in their courses than students in similar courses without access to EWA.
- Both students and instructors would recommend EWA to a peer or colleague.

The Impact Value

The analysis of the impact value of EWA on student achievement focuses on four strands. First, we examine the particular features of EWA and their relative importance to the students using data from both the student questionnaires. Second, we review the functionality provided by those features, both from the perspective of the student and the instructor. The third analysis strand looks at students’ perceptions on their own potential success in the course, and how their use of EWA translates into higher self-efficacy around math accomplishments. Finally, we analyze the impact of EWA on students’ grades with a comparative analysis of final grades for students in both the treatment and control groups.

Overwhelmingly the most important feature within EWA for students is the **Watch It** component that provides a video-based tutorial to help students learn how to solve math problems. Almost every student in the treatment study identified **Watch It** as an important component of EWA at various levels. Over two-thirds of the students (69 percent) ranked **Watch It** as very important to their success in the math course. The students also highly ranked in importance the product components of **Master It**, **Practice It** and the **Lecture Videos**, though to a far lesser degree than **Watch It** as noted in Figure 1.

Figure 1
Students' Ranking of Importance of EWA Features



Instructors also placed a high premium on the impact value of **Watch It**. They saw the feature as being especially effective for struggling students (64 percent or 7 of the 11 EWA instructors) and helping students master difficult concepts (60 percent or 6 of the 11). In general, the EWA instructors strongly agreed with the benefits of EWA for all students' learning. All 11 of the EWA instructors agreed that EWA provided more opportunities for students to practice skills, to learn course materials and to facilitate content retention.

Students zeroed in on particular functionality elements inherent within the EWA features to explain the personal value of the homework solution. The instant scoring on the homework assignments was identified as the number one most helpful functionality within EWA. The access to the practice problems and other learning resources as well as the step by step assistance in math problem solving activities also ranked highly with the students. Three-quarters of the students in the treatment group (75 percent) noted the ability of EWA to extend learning beyond the classroom and enable students to self-direct their own personalized learning path. This attitudinal viewpoint was supported by the fact that 71 percent of the students told us that they completed EWA practice problems on their own even if they were not assigned or graded. EWA therefore not only supported teacher directed homework assignments but also empowered students to go beyond classroom assignments and do self-remediation as needed to be successful in their course.

"EWA is very organized and helps me stay on top of my assignments. I also like that I can see my grades immediately, because then I know exactly what I need to work on and can start fixing the problem right away."

5th-Year Student
 University of Wisconsin,
 Stevens Point

"EWA helped me to understand the material. It gave me confidence that I could work the problems. The man with the cheerful voice helped me a lot and made me feel more upbeat about doing complicated problems. Plus I liked his sense of humor!"

2nd-Year Non-traditional Student
 New Mexico State University,
 Albuquerque

“The value of using EWA was it gave me the ability to understand everything. It was like a review for me and it helped me learn the material better.”

1st-Year Student
Northeast Mississippi Community College

“EWA enabled me to spend time planning more effective ways of teaching my students.”

Delia Samuel
Math Instructor,
Century College

“EWA ensures that students get instant feedback on whether they are solving problems correctly or not. It gives them the practice they need to be successful while saving the instructor the burden of hours of unnecessary grading work.”

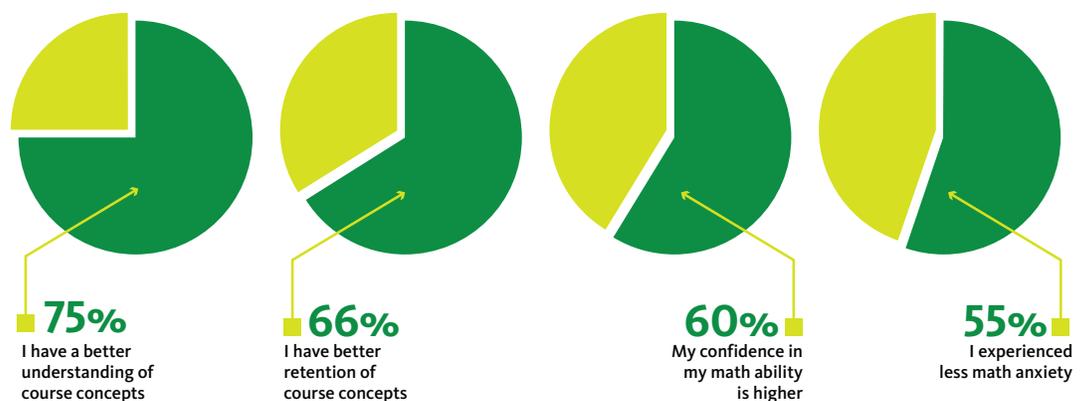
Sam Davis
Math Instructor,
Cal State East Bay

For the students in the treatment group who had access to EWA in their spring courses, the homework system not only engaged them in the course but it also increased their self-efficacy for academic success. Students in the treatment group had stronger feelings about their success and ability to track their progress in their math course than comparable students in the control group who did not have access to EWA.

While nine out of ten EWA students (90 percent) believe that they had the resources to be successful in their developmental math course, only 73 percent of the students in the control group held that same belief. In a similar way, 83 percent of the EWA students said they had the ability to track their own progress within the math course while only 62 percent of the non-EWA students agreed. EWA therefore provided a mechanism for students in developmental math courses to have a greater likelihood of achieving success, both from a resource standpoint and an ability to track personal progress and knowledge attainment, than other students who did not have access to EWA.

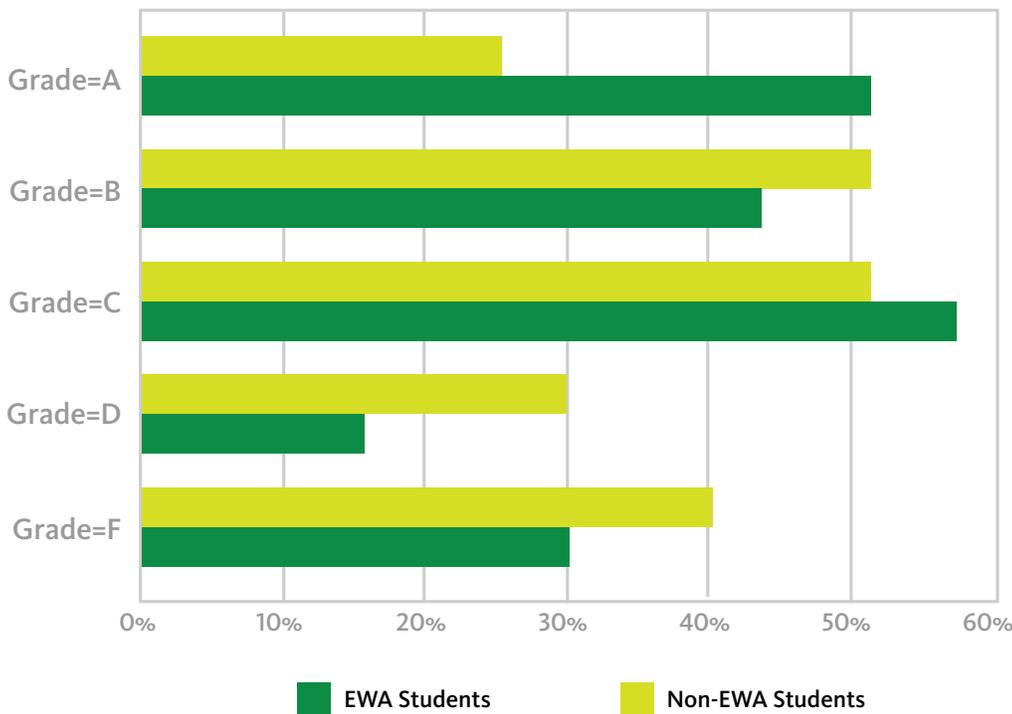
The self-affirming aspect of EWA and the confidence that it gives students that academic success is possible for them is also evidenced by the students’ post-assessment of their math self-efficacy and knowledge attainment. Students credit EWA with decreasing their math anxiety (55 percent) and increasing their self-confidence in their abilities to be successful in math (60 percent). This new level of math confidence carries over into greater understanding and retention of course concepts as well. The data shared in Figure 2 was collected through the student post surveys at the end of their semester or term.

Figure 2
Students’ Evaluation of the Impact of EWA on Their Academic Self-Efficacy



The final analysis strand on the impact value of EWA extends the subjective or qualitative benefits articulated by the students and their instructors into the realm of tangible outcomes. Reviewing the final grades awarded to both the students in the treatment group and the students in the control group the impact of the access by the students in the treatment group to EWA is apparent. As illustrated in Figure 3, students who were using EWA within their developmental math class received twice as many “A” grades as those in the control group without access to EWA. Additionally, the overall grade point average (GPA) for the EWA students in total is approximately .39 points higher than the equivalent for the non-EWA students.

Figure 3
Analysis of Final Course Grades for EWA and Non-EWA Students



In summary, the impact value of EWA for students begins with their self-identification of the features and functionality that best meet their needs as developmental math students. Their abilities to customize their learning process using the EWA tools results in higher self-efficacy for academic success. Correspondingly, the students with access to EWA had higher grades in their course than their peers who did not have the opportunity to use EWA within their coursework. From both the perspective of the student and the instructor, EWA creates a learning environment where students can be successful.

“EWA saves me time, gives students another source to get their questions answered and helps motivate students to get the work done.”

Mary Lou Beckman
 Math Instructor,
 Northeast Mississippi Community College

“I am grateful for the extra learning opportunities that students have through the online resources available to them with EWA.”

Jennifer Bluth
 Math Instructor,
 Anoka-Ramsey Community College

“I strongly benefited from using EWA during this course because I could easily keep track of my progress in the class and also EWA kept me more organized for class.”

3rd-Year Student
 University of Wisconsin, Stevens Point

“EWA has been the best tool to have with a class like this. Sometimes when the materials taught in class are not clear, seeing the videos and examples within EWA has made it a lot easier to understand and solve the problems.”

5th-Year Student

5th year student, Anoka-Ramsey Community College

“Learning at your own pace, instant grades online, tutorials, videos and practice problems — EWA has everything I need.”

3rd-Year Student

Anoka-Ramsey Community College

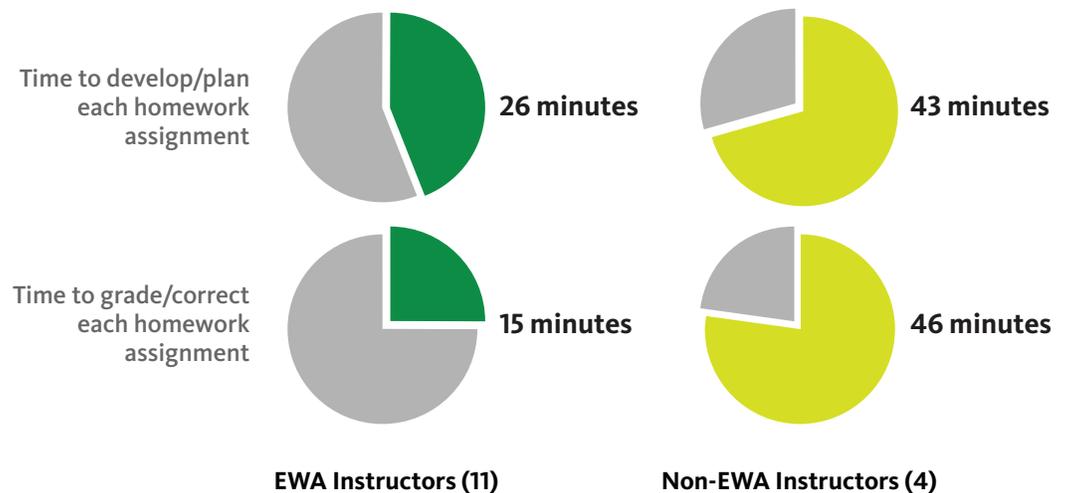
The Productivity Value

The positive impact of EWA however is not limited to just the students. Instructors realized significant productivity benefits from EWA as well. We examined directly the impact of EWA on the instructors primarily from the perspective of time savings. Amongst all 11 of the EWA instructors (100% of the study participants), EWA generated the highest value as a time saving tool in regards to grading assignments and course planning. To underscore the significant value of these two benefits, 82 percent of the instructors ranked time savings for grading assignments as *very important*, and 64 percent ranked course-planning time savings as *very important*. Six of the instructors also noted that EWA saved them time through reduced office hours. According to our interviewed instructors, students were less likely to come to office hours to get homework help since EWA provided remedial support through the **Watch It** and **Practice It** features.

These findings around the time savings capabilities of EWA are further substantiated through an analysis of the time spent on homework assignments by both the EWA and the non-EWA instructors. As suggested in Figure 4, EWA instructors spent less time developing homework assignments and grading/correcting those homework assignments than their peers in the control group that were not using EWA.

Figure 4

Average Time Spent on Homework Preparation and Grading



The Engagement Value

Instructors define student engagement in many different ways. To frame the analysis of the impact of EWA on student engagement in learning and the course materials, it was imperative that we first gained an appreciation for how the instructors in the study measured student engagement at the beginning of the semester. The number one way that the EWA or treatment instructors identified student engagement in their course was by the percentage of homework assignments completed. All 11 of the EWA instructors considered that a valid measure. Ten of the eleven also identified quality of student work and attendance in class as important. Eight and seven of the instructors respectively valued class participation and timeliness of completed assignments.

We also asked the instructors to estimate the importance of EWA in their efforts to engage student learning. Ten of the eleven instructors shared their belief that student access to EWA in their course would increase student engagement in the learning materials. In their post survey assessment, these same ten instructors continued to assert this linkage between EWA and increased student engagement. Specifically, they noted that EWA helped to facilitate better class discussions (46 percent) and keep students on track with their homework assignments (55 percent). Three of the EWA instructors made special reference to the **Watch It** feature within EWA as an important engagement driver.

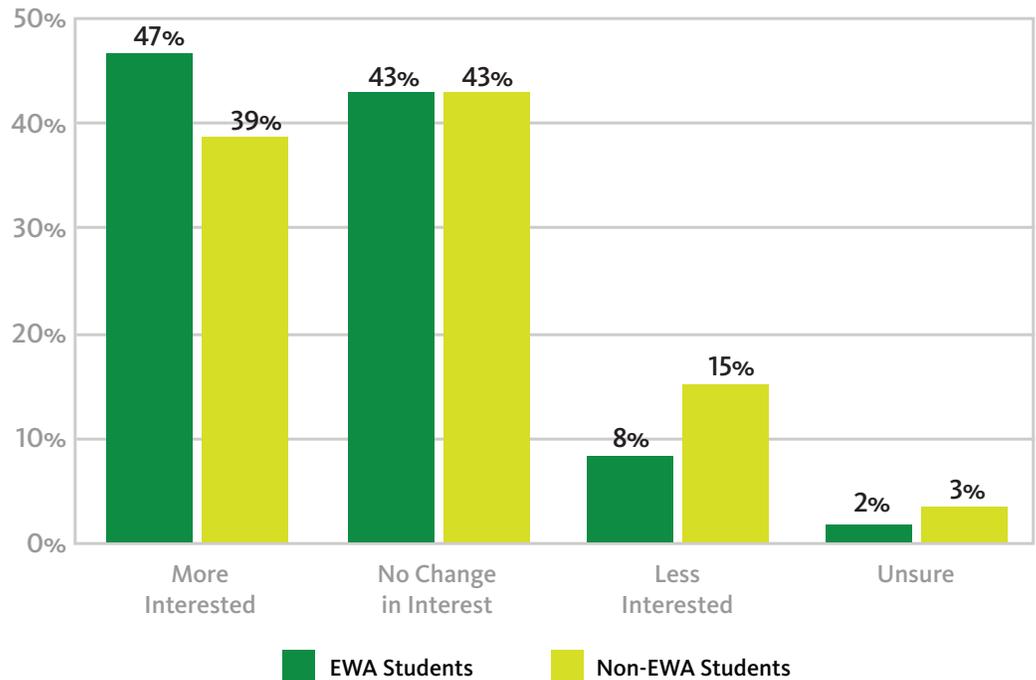
From the student perspective, two-thirds of the EWA or treatment students (67 percent) said that because of using EWA they were more engaged in their course materials. The students also noted other behavioral impacts such as the following:

- More likely to complete every homework assignment (72%)
- More motivated to learn (69%)
- Greater interest in course materials (57%)
- More likely to attend class (49%)

Additionally, just over 50 percent of the treatment students felt that class time was more interesting and class discussions were better as a result of EWA. The students' benefit statements in many ways directly relate to the instructors' rubric for evaluating student engagement.

It is also noteworthy that students' self-assessed level of interest in the course changed from the beginning of the semester to the end, and that the depth of that change was greater for the students in the EWA course. This is illustrated in Figure 5.

Figure 5
How Has Your Level of Interest in Your Math Course Changed Since the Beginning of the Term?



While 47 percent of the EWA students said that their level of interest in their beginning or intermediate algebra class increased over the term, only 39 percent of the students in the non-EWA course felt the same way. Additionally, the non-EWA students were twice as likely as the EWA students to say that their interest level had dropped. Validating the benefit statements expressed by the students, the positive changes in student interest appear to be related to their use of EWA. Amongst the students who said that their interest in the course materials increased, 82 percent attribute that growth in interest to their course access to EWA.

The Recommendation Value

The recommendation value is a good summative assessment on the overall value of a product for both instructors and students. In general, college instructors are typically reluctant to recommend products, and especially technology-based products, to colleagues unless they have benefited directly and significantly from their own personal use of the product. It is therefore especially noteworthy that all eleven of the instructors or 100% of the treatment group participants said it was likely or very likely that they would recommend EWA to another mathematics instructor. Of this group, eight of the 11 (73 percent) noted that it was *very likely* that they would make that recommendation.

The EWA students were asked their response if a friend or fellow student asked them about taking a course that included EWA. More than eight of ten students (82 percent) said they would recommend that their friend or fellow student take the EWA course. Of that group, slightly more than one-third of the students (37 percent) said they would *strongly recommend* that the friend take the EWA course. For the vast majority of the students, the value of having access to EWA within their developmental math course was a significant and meaningful asset that resulted in higher achievement and impact.

Conclusion

Students using Enhanced WebAssign received higher final course grades than their peers not using it. In addition, EWA students felt more engaged and better equipped because of EWA. EWA video resources and instant feedback were identified as effective learning tools by both students and instructors. Instructors reported large productivity and effectiveness gains using EWA. Both students and instructors strongly recommended EWA for their peers. EWA provides clear benefits to learners and instructors and can play a key role on any course redesign or improvement initiative in developmental mathematics.



About Project Tomorrow

Project Tomorrow®, the national education nonprofit organization dedicated to empowering student voices in education discussions, prepared this program evaluation for Cengage Learning. Project Tomorrow has 16 years of experience in the K-12 and higher education sector and regularly provides consulting and research support to school districts, government agencies, business and higher education institutions about key trends and research in science, math and technology education.



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