

Summary of literature studies on the effectiveness of adaptive digital learning tools on student learning

Adaptive Digital Tool	Study	Impact on Student Grades	Students' and/or Instructors' Perceptions	Implications of the Findings
Cengage MindTap	<p>MarketingWorks and SEG Measurement (2015), two independent research firms conducted a study on 412 psychology students from 13 institutions of higher education. They wanted to examine the extent to which MindTap users improved their psychology knowledge more than a control group of students who used the same textbooks but not MindTap. High school GPA was used to place all students on the same baseline for comparison.</p> <p>Cengage (2015). A study of the impact of Cengage Learning's MindTap on student learning in post-secondary psychology courses. Retrieved online http://embed.widencdn.net/pdf/plus/cengage/mghoweh34r/wp_mindtap-post-secondary-psychology.pdf?u=gczqey.</p>	<ul style="list-style-type: none"> The treatment group (n=170) who used MindTap performed about 33% of a standard deviation higher than those in the control group (n=242) on the psychology post-test. 	<ul style="list-style-type: none"> Students agreed that MindTap met a variety of their learning needs, such as extended learning beyond the classroom, provided a new way to learn material, improved understanding of difficult and abstract concepts, helped them learnt content where they were struggling with and made the course more engaging. All instructors (n=14) agreed that MindTap: (1) enhanced students' critical thinking skills and keep them focused on areas where they needed the most help. Instructors also agreed that the scores and feedback students received from MindTap were accurate and of high quality. 	<ul style="list-style-type: none"> In order for MindTap content to work well, it should be aligned to the course lesson objectives.
McGraw-Hill LearnSmart	<p>Gurung (2015) compared and contrasted the effectiveness of three separate textbook technology supplements (LearnSmart, PsychPortal, and Aplia) across three semesters of an introductory psychology course (n = 600).</p> <p>Gurung, R. A. (2015). Three investigations of the utility of textbook technology supplements. <i>Psychology Learning & Teaching</i>, 14(1), 26-35.</p> <p>Griff and Matter (2013) assessed the effectiveness of LearnSmart for student learning and outcomes in undergraduate anatomy and physiology courses across six institutions (n = 587). They compared distributions of final grades between treatment and control sections, and instructor reported retention rates. The treatment sections used LearnSmart, whereas the control sections were given online questions from test bank in Connect from an anatomy and physiology textbook by MHE. Students in the control sections should have taken the same amount of time to complete as the LearnSmart assignments.</p> <p>Surveys were also conducted to collect perceptions from students and instructors.</p> <p>Griff, E. R., & Matter, S. F. (2013). Evaluation of an adaptive online learning system. <i>British Journal of Educational Technology</i>, 44(1), 170-176.</p> <p>Gearhart (2016) examined the effect of LearnSmart on student exam performance in an Interpersonal Communication course (n = 62). Students in two sections were enrolled in a control group (no LearnSmart usage) or a treatment group (with LearnSmart requisite assignments). Aggregated exam scores were compared using independent sample t tests. A student survey was conducted to collect student perceptions of their satisfaction (whether the tool met the needs of students), Utility (how students used the tool for understanding content, preparation before class and studying for exams), Usability (access and user-friendliness), and Perceived Value (worth the cost).</p>	<ul style="list-style-type: none"> For LearnSmart, students who scored higher for their pre-lecture quizzes and mastery-type assignments also performed better on their exams (differences were statistically significant). Positive correlations were reported between time spent and exam scores. LearnSmart had no significant effect on improvement (posttest scores minus pretest scores), student outcome (final grades), or retention rate. Two of the six schools showed consistently better results (statistically significant) in the treatment sections relative to the controls. No statistical difference between the exam scores of control and treatment groups The treatment group (n=29) performed better on textbook only content at the p= 0.08 level 	<ul style="list-style-type: none"> Students cited lack of time and motivation, and forgetting as reasons for limiting their use of the graded assignments. Students reported that they had to answer too many questions. <p>Students' perceptions:</p> <ul style="list-style-type: none"> Majority of students liked LearnSmart and found it useful. Some students reported that LearnSmart took more time than what they wanted to spend. Students reported that the LearnSmart quizzes focused on helping them prepare for the exams. Some students from the control sections reported that they found the online quizzes useful. <p>Instructors' perceptions:</p> <ul style="list-style-type: none"> Indicated that students in the LearnSmart sections were more engaged in class and asked questions that were more challenging. LearnSmart combined with online quiz questions selected by instructors would provide the optimum learning platform. <ul style="list-style-type: none"> A total of 20 students from the treatment group responded to the survey. Students agreed that they were very satisfied with LearnSmart, in particular its user-friendly feature. Students were more likely to use LearnSmart for exam review than preparing for class. Students disagreed that LearnSmart was worth the cost. 	<ul style="list-style-type: none"> Having students complete online exercises tied to textbooks may help students improve their awareness of what they know and what they do not know. Changing how adaptive digital tools are introduced and the incentives for their use can change how much students use the tools. The findings implied that LearnSmart may perform best when there is constructive alignment between the course learning objectives closely matched those of the textbook and LearnSmart. ☒ Student individual incentive which is not examined in the study may also impact student academic performance.

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	<p>Gearhart, C. (2016). Does LearnSmart Connect Students to Textbook Content in an Interpersonal Communication Course?: Assessing the Effectiveness of and Satisfaction with LearnSmart. <i>International Journal of Teaching and Learning in Higher Education</i>, 28(1), 9-17. Retrieved from: https://files.eric.ed.gov/fulltext/EJ1106331.pdf.</p> <p>Sun et. al. (2017) focused on adaptive digital tool LearnSmart (McGraw-Hill, New York, NY), and examine its impact on student learning effectiveness by testing the direct and indirect relationships among perceived competence (mastery of concepts), perceived challenge (workload and extent of difficulty of the class and assignment), instructors, perceived value (overall evaluation of the utility of the tool), and satisfaction with LearnSmart (n=197). The findings were from four undergraduate marketing and management courses.</p> <p>Sun, Q., Abdourazakou, Y., & Norman, T. J. (2017). LearnSmart, adaptive teaching, and student learning effectiveness: An empirical investigation. <i>Journal of Education for Business</i>, 92(1), 36-43.</p>	<ul style="list-style-type: none"> Objective measures were not included in the study 	<ul style="list-style-type: none"> Regression analysis results showed that the use of LearnSmart improved students' perceived competency, thus increasing their perceived value of using LearnSmart, as well as their satisfaction with LearnSmart. Perceived challenge impacted student's perceived value of using LearnSmart, but it did not influence satisfaction with LearnSmart. 	<ul style="list-style-type: none"> Experienced instructors (those who were not using LearnSmart for the first time) help students to improve their perceived value of LearnSmart by adapting their teaching to student learning style.
Pearson MyMathLab	<p>Hegeman (2015) examined if student performance in an online College Algebra course could be improved by replacing resources by Pearson MyMathLab with instructor-generated video lectures (n = 156).</p> <p>Hegeman, J. S. (2015). Using Instructor-Generated Video Lectures in Online Mathematics Courses Improves Student Learning. <i>Online Learning</i>, 19(3), 70-87.</p>	<ul style="list-style-type: none"> Students scored significantly higher scores on online quizzes and exams, and handwritten midterm and final exams in the online course with instruction-generated video lectures than the one with MyMathLab resources. The course pass rate was statistically significantly higher for the online course with instruction-generated video lectures than the one with MyMathLab resources. 	<ul style="list-style-type: none"> No subjective evaluation was included in the study. 	<ul style="list-style-type: none"> As with any course (face-to-face or blended), instructors should incorporate course design techniques and instructional activities that encourage student engagement and learning.
Pearson MyStatLab and MyMathLab	<p>Tempelaar, Rienties and Giesbers (2015) investigated the predictive power of two e-tutorials: MyStatLab and MyMathLab by the publisher Pearson in modeling student performance. Participants were 922 first-year students enrolled in a blended learning module on mathematics and statistics at the Business and Economics School at Maastricht University.</p> <p>Tempelaar, D. T., Rienties, B., & Giesbers, B. (2015). In search for the most informative data for feedback generation: Learning Analytics in a data-rich context. <i>Computers in Human Behavior</i>, 47, 157-167.</p>	<p>Data generated by the practicing mode of MyLabs were substantial predictors for final exam performance:</p> <ul style="list-style-type: none"> Mastery level and time spent on tasks for the whole module ($r = .490$) Mastery level and the average number of attempts per task ($r = .630$) Time spent on tasks for the whole module and the average number of attempts per task ($r = .470$) 	<ul style="list-style-type: none"> No subjective evaluation was included in the study. 	<ul style="list-style-type: none"> Practicing longer in the two e-tutorials by Pearson increases expected performance as students who practice more achieve higher mastery levels.
WileyPlus with ORION	<p>Broadway Analytics, Inc (2014) conducted an independent review to measure the impact of WileyPlus ORION on student outcomes in three subject areas: Accounting, Business and Anatomy and Physiology. Thirteen instructors and 804 students participated in the study.</p> <p>A student survey was conducted to assess their perceptions of and attitudes towards ORION. Interviews were conducted with the instructors to collect their feedback.</p>	<ul style="list-style-type: none"> Students who attempted 100% of the chapters have, on average, over a half-point higher grade than those who have not attempted any chapters. Students who spend an extra 3 hours using ORION have, on average, nearly a half-point higher course grade. Students who score an extra ten points on their average proficiency in ORION have, on average over a quarter-point higher course grade. 	<p>Students strongly agreed about the benefits of ORION:</p> <ul style="list-style-type: none"> Helped them developed a better understanding of the concepts (72%) Helped them to better retain the material (70%) Made them felt more confident in their ability to learn the material for the course (70%) Helped them used their study time more efficiently by showing them what they needed to focus on most (73%) Helped them feel more motivated to practice and/or study for the course (64%) 	<ul style="list-style-type: none"> By assigning ORION as part of the course grade or extra credit, successfully incentivised students to spend more time and to tackle more chapters in ORION.

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	<p>Broadway Analytics, Inc (2014). White Paper: WileyPlus with ORION Efficacy. An Independent Review. Retrieved from: https://www.wiley.com/college/sc/orionpromo/pdf/ORION_Efficacy_Report.pdf.</p>	<ul style="list-style-type: none"> Students who scored 50% in WileyPlus have, on average, a whole grade higher than those who score 0%. Students who actively engaged with both WileyPlus assignments and ORION proficiency tests earned a whole letter grade higher than those with lower engagement. <p><i>Note: all the findings reported were statistically significant at a p-value of less than 0.0005.</i></p>	<p>Instructors reported that they would:</p> <ul style="list-style-type: none"> Continue to use ORION in future terms (100%) Recommend ORION to a colleague (100%) 	
	<p>Basitere and Ivala (2017) evaluated the effectiveness of WileyPlus ORION by comparing the proficiency test scores with paper-based test scores in a first-year introductory engineering physics course (n = 44). Three focus group interviews were conducted with high, middle and low performing students to gain insights into their experiences with WileyPlus ORION.</p> <p>Basitere, M., & Ivala, E. N. (2017). An evaluation of the effectiveness of the use of multimedia and Wiley plus web-based homework system in enhancing learning in the chemical engineering extended curriculum program physics course.</p>	<ul style="list-style-type: none"> Students' proficiency test scores were positively correlated with their midterm physics test scores ($r = .210$) 	<ul style="list-style-type: none"> Students reported that the timeous feedback given on how they responded to a question helped them in building confidence to carry on with other questions. Students reported two reasons that affected the time spent on WileyPlus ORION: i. Unreliable Wi-Fi for those residing on campus, and ii. Lack of computer/smartphone. 	<p>☒ Students who spent more time on the platform tend to perform better in their course than those who used it for a shorter time.</p>

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