There is no shortage of scholarly literature examining various adaptive learning solutions, particularly in the area of Intelligent Tutoring Systems (ITS), also known as Cognitive Tutors. However, much of the research to date involves domain-specific prototype systems developed by the researchers with the goal advancing theory, design (pedagogical and technical), and efficacy of various adaptive learning/artificial intelligence approaches relative to desired teaching/learning outcomes. This information is valuable for educational researchers and those interested in developing a deeper understanding the ongoing development of adaptive learning technologies and approaches. For institutional decision makers who are actively considering the adoption of ITS or the more recent content-agnostic adaptive delivery platforms, the practical or applied value of the developmental research may be somewhat limited, given that many of the systems examined are neither publicly available (beyond research interests/projects) nor actively maintained/supported beyond the initial research project.

This annotated bibliography is targeted primarily to the practical information needs of higher education faculty, administrators, and staff from non-technical backgrounds who want to learn more about the availability, classifications, and reported results of various adaptive learning courseware and platforms, with an emphasis on off-the-shelf solutions. Aside from recent meta-analytic studies and state of the industry reports, the references provided in this document represent a mix of scholarly research articles, conference papers, and gray literature, including vendor white papers published within the past three to five years. The majority of the references refer to commercially or publicly available supported courseware and systems, many of which actually evolved from experimental research prototype systems developed by academia. A small number of references outside of these parameters are included for historical purposes. Endorsement of a particular product, platform, or solution is neither intended nor implied.

**RECENT STATE OF THE INDUSTRY/STATE OF THE RESEARCH REPORTS**


Written for higher education administrators and decision-makers, this Ithaka S&R report summarized 13 adaptive learning solutions based on the following differentiating factors:

- vendor information (founding date, origin, funding, business model);
- solution type and content model (ranging from adaptive platform providers with open content models to adaptive courseware providers with closed content models using publisher content);
- product descriptions, including level of LMS integration;
- use cases scenarios; and
- industry/ institutional partnerships.

The report neither rated the instructional efficacy of the solutions nor provided detailed technical information about their underlying adaptive mechanisms. CogBooks, RealizeIt, Smart Sparrow, Adapt Courseware,
McGraw-Hill Learn Smart Advantage, MyLab, Knewton, and Wiley Plus with Orion are among the solutions profiled. A key distinguishing factor among the solutions profiled is the extent to which they employ an open or closed content model, the latter of which relies on publisher content, learning objectives, and assessments, with limited to no modification flexibility.


This report from Education Growth Advisors (now Tyton Partners) described adaptive learning as the technology and data driven customization of an individual pathway through the content of a course and highlighted the potential of adaptive learning to increase retention, provide better measures of student learning, and improve pedagogy and learning outcomes. The report categorized suppliers/partners according to whether they provided adaptive platforms and authoring tools or technology-driven adaptive learning content. When choosing vendors/suppliers, university leaders were advised to determine whether their institutional goals were to “tweak” or “transform,” as the latter will likely require both platform and publisher solutions. A list of providers, organized according to business model (publisher or platform) and instructional model (supplemental or whole course) was provided. The report indicated that the most sophisticated offerings dynamically drew from multiple sources of student data to inform both adaptive delivery along one or more dimensions (i.e., content sequencing, modality, duration, frequency) and alignment with individual student knowledge, learning style, pace, ability, and motivation. The profiled offerings provided varying degrees of learner and instructor control over the “adaptive” delivery options afforded. The authors indicated that institutions can expect to make a reasonable investment of time analyzing possible solutions, given the current maturity level of the adaptive solutions marketplace. Also, those involved in instructional design, including subject matter experts, must be able to collaborate effectively with solution providers for the full potential of adaptive learning to be realized at scale. While additional rigorous experimentation was recommended, the report highlighted some preliminary results:

- An 18% increase in pass rates and 47% drop in withdrawals in mastery-based math courses attributed to Arizona State University’s partnership with Knewton;
- A 7% average increase in course pass rates among 700 university and community college students who used McGraw-Hill Education’s LearnSmart versus textbook test bank questions;
- 25% faster completion rate with comparable performance for students who participated in a randomized controlled study involving the use of Open Learning Initiative’s introductory statistics course (versus the face-to-face course).

Expanding on their March 2013 report, “Learning to Adapt: A Case for Accelerating Adaptive Learning in Higher Education,” Education Growth Advisors (now Tyton Partners) suggested in this report that higher education administrators begin looking now at the increased number of supplier offerings in the emerging market for adaptive learning systems. To assist university decision makers, the authors profiled eight suppliers of a range of adaptive learning solutions. Rather than attempt to rate or rank-order these suppliers, the report instead examined the providers from the perspective of how their offerings utilized adaptivity for personalized learning, product attributes relative to instructional considerations, and most importantly in terms of scalability, the maturity level of the solutions offered.


In support of the Army’s learning plan for 2015 and beyond, which calls for methods aimed at increasing the effectiveness and efficiency of Army training and development, the authors surveyed the literature to identify the state-of-the-art in adaptive learning technologies. Based on the current maturity level of adaptive learning systems, they concluded that production of adaptive learning environments at scale was not possible absent the involvement of expert human designers. The authors indicated that they were not able to conclude with confidence which adaptive approach was best suited to a particular learning context based on study designs and empirical evidence provided in the 20 papers that met their inclusion criteria. They also suggested that adaptive methods based solely on pretest data rather than real-time performance data were insufficient. Based on their review of the empirical evidence, the authors concluded that adaptive learning could be beneficial. They suggested that the greatest learning returns likely to occur under adaptive conditions involved “(1) Error-sensitive feedback, (2) Mastery Learning, (3) Adaptive spacing and repetition for drill-and-practice items, (4) Fading of worked examples for problem solving situations, or fading of demonstrations for behavioral tasks (such as in scenario-based simulations), (5) Metacognitive prompting, both domain relevant and domain independent” (p. 8). The authors advised that any design and procurement specifications for technology-based training and education include these techniques.

**STUDIES EVALUATING THE EFFECTIVENESS OF VARIOUS ADAPTIVE LEARNING APPROACHES**

**Meta-Analyses of Intelligent Tutoring System Evaluations**


The authors performed a meta-analysis of 50 previous controlled evaluation studies on the use of Intelligent Tutoring Systems (ITS) in elementary, secondary, and post-secondary settings for a variety of subjects including mathematics, writing, programming, research methods, and physics. They found moderately strong effects on
test performance across settings, with ITS students generally outperforming control groups who received traditional classroom instruction, other types of computer assisted tutoring, and even human tutoring. The authors compared and contrasted the inclusion criteria for their analysis with that used by others researchers on earlier meta-analytic reviews, arguing that the inclusion of evaluations of systems not defined as ITS (answer-based versus step-based) and studies with inadequate controls influenced the findings (smaller effects overall) of the previous reviews. From their secondary analysis, the authors identified a number of factors associated with smaller effects, the most prominent of which was the use of standardized versus local post-tests that were more closely aligned to the actual curriculum. Weaknesses in control treatments and the quality of ITS integration and implementation (technical and instructional) also influenced effect. A table summarizing the subject, setting, system, numbers of students, duration, and method of assessments for each the 50 studies is included.


In their meta-analysis of 107 research studies involving 14,321 learners, the authors found that learning outcomes were greater with the use of Intelligent Tutoring Systems (ITS) than compared to computer-based instruction without ITS, large group instruction, and textbooks. They also found significant positive effect sizes across a range of subject domains and at all levels of education, regardless whether the ITS was used for primary or supplemental instruction. The authors used a research-based definition of ITS to evaluate which studies were included in their analysis. Effect sizes under random-effects and fixed-effects models for multiple moderator variables pertaining to ITS types, students, settings, and methods of the original studies are provided and discussed at length in the body of the report. Descriptive characteristics and effect sizes for the studies included in the meta-analysis are provided in the supplemental information available at: http://dx.doi.org/10.1037/a0037123.supp.


Unlike other previous meta-analyses focused exclusively on k-12, the authors limited their review to studies that examined the effectiveness of Intelligent Tutoring Systems (ITS) relevant to subject domain, level of integration, and other types of instructional interventions in higher education settings. A total of 35 reports (containing 39 studies) published between 1990 and 2012 were examined. Sample sizes of the studies were between 20 and 1,066. Of the 22 ITS covered, the authors indicated that the most frequently studied were AutoTutor, ALEKS, XTex-Sys, and WISE. The authors concluded that ITS produced a moderate positive effect on learning, with average effect sizes ranging from .32 to .37. Differences between ITS, subject matter, or level of integration in teaching/learning were not statistically significant. However, the authors found that ITS on the whole outperformed other traditional classroom and computer-assisted instruction methods, except
for human tutoring. In their discussion of findings relative to previous meta-analyses, the authors concluded that ITS effect is more pronounced among college students compared to K-12 and that ITS can effectively serve as a primary (stand-alone) instructional tool, supplemental resource, or be integrated as a regular part of classroom instruction. Note: A supplemental document summarizing the studies, ITS used, intervention and comparison conditions, subject domains, and research designs can be downloaded from http://dx.doi.org/10.1037/a0034752.supp.


VanLehn found that effect size of human tutoring (d =0.79) was much closer to that (d=.76) of Intelligent Tutoring Systems (step and substep based systems). While falling shy of meeting all the requirements for a meta-analysis, this review examined the results of 44 experiments published between 1975 and 2010, which compared at least two types of different tutoring – human, no tutoring (classroom teaching), and computer tutoring using answer-based, step-based and sub-step based approaches. Only those with random assignment to conditions or classes were included. Human tutoring was defined as synchronous interaction between an adult subject matter expert and a single student. Studies comparing only answer-based tutoring to no-tutoring were excluded. The analysis was further limited to studies involving STEM topics and in which the experiments controlled for variables such as content and duration, while manipulating interaction granularity. In all of the studies, tutoring was used in lieu of a single activity such as homework, but did not replace actual classroom teaching. Based on his review of the literature that examined the effectiveness of human tutoring compared to computerized approaches, VanLehn argued that only rapid feedback at the step level and scaffolding were plausible explanations for the effect of human tutoring. He argued that those same characteristics also help explain the efficacy of intelligent tutoring systems compared to answer-based systems. He also pointed out that previous studies showing larger effect sizes for human tutoring involved mastery learning, the threshold for which was higher – 90% versus 80% with tutors compared to classroom teachers.

**Subject Domain Studies at the Course Level Using Specific Adaptive Learning Courseware and Platforms**

**Anatomy – McGraw Hill Education’s LearnSmart**


The authors examined the impact of an adaptive learning system on learning outcomes of undergraduate students in anatomy and physiology courses at six community colleges and universities. Of the 587 students, 264 used McGraw Hill Education’s adaptive learning system LearnSmart and 323 used the standard textbook and completed questions online from the publisher’s test bank. Overall, the authors found no statistically significant improvements for the experimental group using LearnSmart based on their comparative analysis of
pre- and post-test scores, grade distributions, and retention. However, the experimental groups at two community colleges in the study achieved better outcomes than the control groups. While the data was inconclusive, variances in the alignment between course goals, texts, and the specific use of LearnSmart across the schools may have accounted for these differences, according to the authors. Anecdotal evidence collected via instructor and student surveys suggested that students using LearnSmart experienced and demonstrated higher levels of engagement with the class.

**Digital Literacy – McGraw Hill Education’s LearnSmart**


This study compared objective test performance of 218 students enrolled in a digital literacy course covering information technology topics, including hardware, software, telecommunications, programming logic, database technology, information literacy, and Web page development. An experimental group (n=105) used McGraw Hill Education’s LearnSmart adaptive learning solution for interactive exercises, while the control group (n=113) used quizzes from the publisher’s test bank. Both types of activities used a similar multiple choice, true-false, and matching format. Both groups of students were instructed to complete the adaptive exercises or test bank quizzes after the assigned readings from the electronic textbook used by both groups. The authors’ analysis found no significant difference on the mid-term and final objective test scores between the two groups.

**Mathematics (Accounting, Algebra, Statistics) – Various Systems**


The authors examined the efficacy of ALEKS, an online intelligent tutoring and assessment solution in an undergraduate accounting course covering fundamental functional competencies outlined by the American Institute of Certified Public Accountants (AICPA). They provided a useful description of the underlying theory and mechanics of ALEKS and briefly discussed the results of previous studies on ALEKS (acquired by McGraw Hill Education in 2013) in other subject domains. Performance of students in the experimental group (n= 30) who used ALEKS in lieu of quizzes was compared to that of students in two previous semester sections (n=34 and n=35) of the same course who did not use ALEKS. To ensure alignment with the course goals and objectives, the instructor abridged the pre-existing content in ALEKS using the system’s content editor. Scores

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1 References to additional evaluation studies on Intelligent Tutoring Systems (ITS) for mathematics are cited within the meta-analyses of Kulik & Fletcher (2015), Steenbergen-Hu & Cooper (2014), and VanLehn (2011).
on the first midterm and the final exam (identical questions for all sections) were used as the primary performance measures. According to the author’s analysis of findings, students who used ALEKS performed significantly better on the first midterm and marginally better on the final. The authors also found positive correlations between exam scores and percentage of problem types and key learning objectives mastered in ALEKS. Anecdotal evidence supplied by the instructor suggested that students using ALEKS consumed less instructor time outside of class (i.e., during scheduled office hours) for tutoring on the basic accounting concepts.


This report described the results of a randomized study involving 605 traditional-age college students that examined learning outcomes achieved via a traditional classroom model for teaching introductory statistics compared to a hybrid model that combined weekly classroom instruction and assistance with use of an adaptive learning system (developed by Carnegie Mellon University). University of Maryland Baltimore County and Towson University were among the six public four-year universities involved in the study. A slight, but not statistically significant, performance gain among the hybrid students was found in course pass rates, final exam scores, and scores on a standardized statistical literacy test. The results were nearly identical with and without controlling for variables such as student demographics, full-time/part-time status, primary language, and number of courses previously completed. The hybrid students spent about 25% less time on the course than the traditional students. In terms of satisfaction, students rated the hybrid format less favorably, indicating that the course was more difficult and that they felt they learned less. The authors provided a cost simulation that suggested the prototype course model could result in cost savings, primarily in the area of instructional inputs.


ALEKS (acquired by McGraw Hill Education in 2013) replaced traditional textbook assignments in eight college algebra courses during a single semester in 2003. Students were randomly assigned to the treatment (final n=132) or control group (final n=119). With the exception of an evening class comprised primarily of non-traditional students, students using ALEKS outperformed those using the traditional textbook assignments, based on the comparison of pre-test and final exam scores. The authors noted that the pre-test and final exam questions were primarily aligned to the textbook and syllabus rather than ALEKS assignments. The section of students who did not outperform the textbook-based section taught by the same instructor reported difficulty finding the computer time needed to complete the ALEKS assignments several weeks into the study and were allowed to choose either the textbook-based or the ALEKS-based curriculum. The authors found that ALEKS
was the only statistically significant factor associated with student growth, based on their analysis of traditional versus non-traditional student status, ALEKS usage, and information provided by the students regarding their mathematical ability. A regression analysis examining ACT math scores for a subset of freshmen students and the use of ALEKS showed an 11% growth for the ALEKS students. The authors also analyzed ACT mathematics scores and subsequent ACT Collegiate Assessment of Academic Proficiency exam scores for a subset of 28 students who were in the treatment (n=15) or control group (n=13). They found that students who were part of the ALEKS group retained their learning gains 14 months after the course.

*Programming/Computer Sciences – Various Systems*


This paper reported on a doctoral study that examined whether the addition of metacognitive and motivational prompts in a well-established Intelligent Tutoring System, SQL-Tutor, improved overall learning, effort, and problem-solving persistence of first-year undergraduates in a database course at a university in the United Kingdom. The control group (n=20) used an existing version of SQL-Tutor that provided the same domain feedback without the additional motivational and metacognitive feedback provided to the study group (n=16). The additional feedback was based on student performance within the system and responses to prompts asking the students to rate their confidence level with the material. Learning gains were measured using a pre-test and exam delivered within the university’s instance of the Blackboard LMS. While both the study group and the control group outperformed students who did not use the SQL-Tutor, there was no statistically significant gain in learning for the study group compared to the control group. Effort, measured as the ratio of total solving attempts to number of problems attempted, was similar for both groups, while the control group demonstrated greater persistence as measured by the number of attempts before giving up on a problem. As part of the enhanced feedback strategy, the system prompted the study group students with links to similar problems they already solved in the system. However, students often ignored this form of help.


The authors compared two models for scaffolding learning in introductory computer programming courses at Shaw University. One model involved the use of program planning worksheets (CAL) outside of class (for homework preparation) by some students. The other utilized both the worksheets and an Intelligent Tutoring System (CAL-CT) that provided students with step-based assistance and feedback. Three semesters of test

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2 References to additional evaluation studies on Intelligent Tutoring Systems (ITS) for programming are cited within the meta-analyses of Kulik & Fletcher (2015), Steenbergen-Hu & Cooper (2014), and VanLehn (2011).
scores were analyzed for students using each of these methods. The results were also compared to those of students who used neither method. The study focused on three concepts, Variables and Basic Statements, Ifs, and Loops. While both the CAL and CAL-CT conditions resulted in improved test scores, the combined CAL-CT approach yielded the largest learning gains, as measured by test scores. The most significant gains involved Loops, followed by the If construct. It was not clear how students were assigned to one of the three conditions. The information provided on the results of the Variables and Basic Statements construct suggested that between-group controls on the use of programming tutors were not enforced.


The author found that previous positive results from in-vivo studies of a metacognitive strategy designed to engage learners in self-explanation of worked examples in Intelligent Tutoring Systems (ITS) could not be duplicated when applied in-natura. Kumar based his findings on three semesters of data collected from multiple institutions whose students used a web-based intelligent tutor (available for Java, C++, and C#) for help with construction of if/if-else statements. Students from the participating institutions were randomly assigned to the treatment or control group. For the control group, students received a step-by-step explanation of the correct solution and were not required to engage in either passive or active self-reflection before moving on to the next problem. For the treatment group, students were prompted to select the correct steps from a menu following submission of an incorrect answer. While the treatment condition resulted in more time spent on each practice problem, scores per practice problem were not significantly different between the treatment and control group. Per problem post-test scores were lower for the treatment group and students in that group also solved fewer problems. The author’s comparative analysis of pre-test/post-test scores for practiced concepts revealed no significant overall learning gain differences between groups.

Research Methods - RMT and Pearson’s OperationARA


Based on previous findings showing learning gains for traditional students who used the Research Methods Tutor (RMT), the authors examined the effectiveness of RMT when used by non-traditional aged students who lived off-campus, and were typically employed full-time and/or primary caregivers or parents. Modeled after Auto-Tutor, RTM was designed as an online dialog-based Intelligent Tutoring System (ITS) intended to

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3 For additional information on Kumar’s work on the development of C/C++/Java/C# tutors, covering specific programing concepts, see www.problets.org and http://www.problets.org/about/publications.html.
supplement rather than replace course materials and instruction on the basic concepts of ethics, variables, reliability, validity, and experimental design. With the exception of the RTM modules completed (for course credit) after the same topics were covered in class, instructional conditions (i.e., textbook, syllabus, instructor) were the same for both the control group (n=31) and the test group (n=56). Students in both groups also completed identical pre- and post-tests for course credit along with another post-test designed to assess transfer learning and critical thinking on the same topics covered in class and via RMT. Total RMT usage was estimated at 3-5 hours per the 16-week semester during the two semesters in which data was collected. Students in the test group significantly outperformed the control group on both the post-test and the transfer learning test. When pre-test scores for the non-traditional students were compared to those of the traditional students in the previous study, the authors found that the net learning gain for the non-traditional students was double that of the traditional-aged students. Unlike the traditional students, a large number of the non-traditional students gave lower ratings to the RMT’s appearance and the optional downloadable animated tutor agent.


The authors identified and tested predictive models of deep and shallow learning (i.e., learning gains) for college students with high and low existing knowledge in a research methodology course utilizing Operation ARA (Acquiring Research Acumen), a game-based intelligent tutoring system, embedded in the curriculum. A total of 192 students in 11 course sections were involved. The authors’ representations of time on task, discrimination, and generation significantly predicted shallow learning for students with high and low existing knowledge and deep learning for students with low existing knowledge. They were not able to identify a model for deep learning in students with high existing knowledge. Note: OperationARA (previously OperationARIES!), was developed by a team of psychology faculty from Northern Illinois University, University of Memphis, and Claremont McKenna College. It is available from Pearson as a stand-alone web-based offering or in combination with Research Methods texts and MySearchLab.

Effective Writing Support – Various Systems


During a three month period, the authors examined usage patterns and results for OpenEssayist among a small group of adult students enrolled in a graduate module at the Open University. The system’s graphical representation of the frequency of keywords and sentence and essay structure was intended to encourage
student reflection of essay quality between draft and final submission. A total of 41 students accessed the system. The authors noted significant variance in usage frequency, duration (per session), and the number of features used, with most students accessing the system for multiple sessions concentrated around assignment due dates. The authors found a statistically significant correlation between grades and number of drafts submitted to the system. The mean course grade for students who used the system was significantly higher than students from the previous cohort who did not use OpenEssayist.


The authors traced the ongoing development (summarized with citations) of The Writing Pal (W-Pal) through multiple iterative prototyping phases and field testing. Their discussion of Automated Writing Assessment (AWE) tools illuminated several key differences between systems designed primarily to provide summative feedback in the form of a score versus those designed to serve as Intelligent Tutor Systems (ITS). W-Pal was classified as the latter category, as its emphasis is on formative rather than summative feedback. In addition to automated writing assessment, W-Pal also provides instructional content on writing strategies (including the use of mnemonics), game-based practice exercises, and writing practice. While W-Pal is oriented primarily to high-school students, with emphasis on SAT essay writing proficiency, the authors suggested that it may also be helpful for underprepared college students. Gains in writing proficiency were found in high-school students involving W-Pal. However, the authors caution against generalizing from those results, given that the majority of testing to date has been developmental in nature, focusing on feasibility and efficacy of the natural language processing tools, assessment algorithms, and the usability of specific front-facing design elements.

**Adaptive Learning Vendor Sponsored Case Studies, Conference Papers, and Whitepapers**


This conference paper by researchers employed by RealizeIt Systems reads as part sales literature, part help manual in that it presents a high level overview and screen shots of course performance metrics available to academic administrators using aggregated data compiled from 14,832 learners enrolled over 13 sessions of an English Composition Course. The specific metrics, trends, and correlations described are not contextualized to relevant learning theories or empirical findings presented in the scholarly literature. Rather, the authors describe the various ways RealizeIt compares input factors, outcomes, and learning process behaviors, including interactions and engagement, to identify trends and relationships – actionable information administrators can use to inform best practices and determine where improvements to some aspect of learning design and delivery are needed.
http://dx.doi.org/10.1109/ICWOAL.2014.7009203

In this conference presentation paper, the RealizeIt system is presented as an adaptive, content agnostic curriculum delivery platform. The authors describe how content is defined within the system, the interplay between the content profiles and learner profiles, and the role of the system’s artificial intelligence engine in managing what is presented to the learner. These descriptions are oriented to the information needs of faculty and instructional designers seeking a high-level conceptual overview of the system. Additional information about RealizeIt’s functionality and features is provided in Howlin, C. P. (2013). The RealizeIt system. Retrieved from http://realizeitlearning.com/innovation/research/


The authors reported on performance findings, based on two years of field testing, for the Determine Knowledge (DK) algorithm used by RealizeIt to assess students’ latent knowledge relative to the curriculum. They compared and contrasted the efficiency and effectiveness of this algorithm to another adaptive learning algorithm based on Knowledge Space Theory (KST). While the DK algorithm could not match the overall accuracy of the Knowledge Space algorithm, the authors found that DK algorithm determined knowledge states more efficiently, with fewer pre-test questions and less computation time, particularly for high and low knowledge states. The authors indicated that based on their findings, additional improvements have been made to the system, including the incorporation of probabilistic measures of ability and the application of Item Response Theory to all questions.


This case study reports the results of the University of Montana and Montana Digital Academy math remediation pilot using EdReady. Students who did not meet a math prerequisite and those who narrowly missed or barely met the ALEKS placement cutoff score were invited to participate in a six-week free self-paced summer program available online. Of the 72 students who accepted the invitation, 63 completed a sufficient amount of work to be included in the analysis. Students self-selected the EdReady pathway mapped to the initial math courses for their majors. Of the 41 students who reached the target score in EdReady, 35 (85%) also raised their ALEKS score by one or more points (on a five-point scale). Of those who did not reach the target score in EdReady, two who had logged more than 10 hours practice were able to substantially increase their ALEKS scores. An examination of the learner analytics showed that students who reached the target score logged more frequently and spent substantially more time with the EdReady resources compared to the other students. The pilot findings suggested that students who were diligent in utilizing
EdReady for self-study could achieve sufficient levels of math readiness (for their targeted course) faster than with a traditional developmental math course.


Using non-technical language and broad brush strokes, the authors described adaptive learning systems, their value proposition, and the core components that should be present for a system to be considered “adaptive” -- namely a content model, a learner model, and an instructional model. They trace development and use of adaptive learning in K-12, higher education, and corporate settings, noting prominent efficacy studies and other factors that have contributed to or hindered adoption at scale in these settings. The authors summarized the current state of interest in adaptive learning in higher education settings and various use case scenarios. They also listed numerous acquisitions and partnerships that have occurred in recent years, including McGraw-Hill Education’s acquisition of ALEKS, Desire2Learn’s acquisition of Knowillage Systems, Knewton’s partnership with Pearson, and Career Education Corporation’s (American InterContinental University, Colorado Technical University, etc.) partnership with CCKF on development of adaptive courses using CCKF’s RealizeIt platform (branded as Intellipath by Career Education Corporation).


This purpose of this whitepaper published by Cogbooks is to provide a non-technical introduction to adaptive learning systems. It is essentially a product positioning paper regarding the design approach and underlying technology of Cogbook’s solution compared to other adaptive solutions. No references are provided in support of the assertions. Notwithstanding this caveat, non-technical faculty and administrators will find the authors’ descriptions helpful when reading the more technical experimental research literature covering various attributes of adaptive learning systems.