Evaluating Digital Learning for Adult Basic Literacy and Numeracy

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Executive Summary

The Need

The magnitude of the problem of unskilled labor for the U.S. workforce is known. More than 36 million adults in the United States do not have the basic literacy and math skills needed for many entry-level jobs and even less so for the types of jobs expected to dominate in the future. We also know that our federal- and state-funded adult basic education (ABE) programs, the main providers of skill development and training programs for this population, do not have the resources, facilities, or trained staff to serve all those adults in need of further education to improve their basic skills and job prospects. The purpose of this research was to understand the potential role of technology as a significant part of the solution to address the needs of ABE programs and these low-skilled adult learners. Specifically,

> *Can digital learning technologies increase the capacity of ABE programs by providing more efficient and effective learning opportunities to better serve the adult learning needs in their communities?*

The Research

In 2014, The Joyce Foundation asked SRI Education (sri.com/about/organization/education) to investigate the role and efficacy of digital learning technologies in (1) improving the basic reading, writing, and math outcomes for low-skilled adults in adult basic education programs (distinct from efforts to teach English as a second language or technology literacy) and (2) helping programs increase their capacity to serve a greater number of students. Through this research, we set out to understand how ABE programs might use these technologies to improve the instruction they offer, whether such technologies are effective with low-skilled adults (performing at fourth- to ninth-grade levels in reading and/or math) and which practices and product features might be associated with better outcomes for students and programs.

The primary research questions were the following:

1. How are the online technologies used to support instruction and program objectives in the courses ABE institutions offer?

2. What program factors and practices and product design features are associated with more intense use of the online technologies?

3. Can the use of well-designed, well-implemented online learning technologies result in gains in literacy, numeracy, and other foundational skills for low-skilled adults compared with instructional programs that did not use these technologies? Which types of participants tend to benefit most?

4. Which instructional design features of the online learning technologies are associated with better learning gains and student outcomes?

5. Which program conditions, program practices, and online learning technology uses are associated with better learning gains and student outcomes?

To address these research questions, we studied five products at 13 sites and in 14 different ABE programs (one site piloted a different product in two ABE progams) using various data collection methods and data sources. The research included visits to participating ABE sites for classroom observations and interviews with administrators, instructors, and adult learners to learn about their programs and how they were using the products and supporting their use. We also surveyed instructors and students about their experiences using the products. For an independent measure of product use, we accessed vendors' student-level use data captured by the products. To assess learning, we accessed scores on nationally normed standardized assessments administered by the ABE program sites. The sites also provided demographic information on the adult learners.

Quasi-experimental methods were used to estimate program impacts by comparing the scores on the learning assessment for students who used a product with scores on the same assessment for students who did not. A common statistical matching technique—propensity score matching—was used to improve the baseline equivalence of the groups that were compared. We also analyzed the relationship between the intensity of use of a product and students' performance on the site's standardized learning measure.

In general, we found that the majority of instructors and students had positive experiences in using the online products. According to self-reports from the interviews and surveys, use of the products provided significant value in how instructors supported students while allowing students to extend their learning time beyond the classroom.

Although these findings are promising, suggesting that digital technologies of the types studied can play an important role in ABE programs, we found that use varied widely across program sites. At some sites, use of a product was very limited. In those cases, use was affected by such factors as the program site’s commitment to using the product as a required core instructional activity, students’ intrinsic and extrinsic motivation to complete their program, students’ mobility, and students’ access to technology outside the classroom. Some of these factors are endemic to ABE programs and the lives of their students, but we believe others can be addressed by providing more time for programs to plan how best to integrate technology into their curriculum and enhance support for instructors and students.

In interpreting the findings presented here, consider that, except in two cases, the sites were using the products in their curriculum for the first time. Thus, the findings are for ABE program sites, instructors, and students in the early adoption stage; they may not reflect the outcomes of product use in more mature implementations, once program sites and instructors have had time to reflect and iterate on how they are using the products and supporting students.

The Products

After careful consideration, including input provided from the project's expert advisors,[1] five products were selected for the study.

- Reading Horizons Elevate (Reading Horizons)
- My Foundations Lab (MFL) (Pearson Education)
- Core Skills Mastery (CSM) (CSMLearn)
- ALEKS (McGraw-Hill Education)
- GED Academy (Essential Education)

The products represent a range of approaches to delivering web-based instruction intended to improve basic math and literacy skills. All the products can be used as a regular core activity within regular teacher-led instruction, and programs sites were selected with the expectation that the products would be used this way. All the products also can be accessed by students when they are away from the program site. Some of the products have content in both math and literacy, and others have content in a single subject area: math or literacy. All products have skill development instructional content for all or some portion of the targeted fourth- to ninth- grade-level range. Most of the products' instructional content is text based with occasional use of graphs and still images. The one exception is GED Academy, which delivers instruction through an animated instructor and students in a simulated classroom. MyFoundationsLab also includes some video presentations of content in some lessons. Most of the products provide direct instruction on concepts and skills as well as opportunities for practice. ALEKS is primarily a practice environment, although students have the option to use its "explain" feature to receive text-based solutions to problems. All the products assess students at various stages in a lesson. All are designed for native English-speaking students or students who have advanced out of formal English as a second language (ESL) programs with a minimum fourth-grade English proficiency.

The project participants. Thirteen ABE program sites were recruited to participate in the research. Candidate ABE program sites were identified through recommendations from the

[1] The seven advisors had expertise in a range of areas such as adult learning and basic education, learning science, curriculum design, math learning, adult literacy assessment, learning technologies, and technical assistance for the use of technology in adult basic education programs.

advisory board and from interviews with three ABE directors in states with a long history of support for the use of technology in ABE programming. We also asked the product vendors to recommend high-capacity ABE sites with known interest in piloting their products. We selected sites to represent a range of program types, governance, and goals for the adult learners: public and county school districts, community colleges, and community-based organizations. All the sites selected had a strong interest and willingness to participate in the research (including the required data collection), had an existing technology infrastructure, and served a large enough population of adult learners to provide reliable estimates of the utility and impacts of the products. All had multiple campuses where they offered ABE-related courses and programs. The majority of students in the research were 18–45 years old, had incoming math and/or reading skills at the fourth- to ninth-grade levels, and were not enrolled in an ESL program. One-hundred and five instructors and 1,579 adult learners participated in the study.

The Findings

Emergent Use Models

Several different use models were adopted by the programs sites. The choice of the use model adopted depended on several factors, such as the design of the product and the program sites' decisions on how best to use the products to enhance their instructional program and better support their students. Four different use models emerged: online, blended learning, hybrid learning, and supplemental.

- ***Online*** refers to use of a product as the primary mechanism of instructional content and delivery for the course. Students' use of the product was required; it took place in the program, school, or college computer labs monitored by instructors or on students' own time with individual support from instructors available on request. When instructors provided direct instruction, it was in response to student needs they identified while reviewing progress reports provided by the product or on student request.
- **Blended** use models require tight integration of the product into a broader curriculum and instructional program. When we characterized product use as "blended," instructors had planfully integrated product use with face-to-face instruction, so the whole program of study was partly online and partly face to face. Instructors attempted to link the content in their lectures to the content that students were assigned in the product, or they closely monitored student progress in the product and modified instruction in the

classroom accordingly and/or used students' performance in the product to identify those in need of individual attention.

- **Hybrid** models also combine the use of the product as a core instructional activity in combination with instructor-led instruction during regular class time. However, in this use model, the students' work in the product, although required, is not necessarily connected to instructor-led lessons and does not directly influence what instructors do in the classroom. To a casual observer, blended and hybrid models may appear alike. However, in hybrid use models, online activities are not coordinated with the face-to-face instruction. Instructors do not regularly review product dashboards, nor do they use their direct instruction time to cover topics that were revealed as potentially problematic for students based on their performance in the product. Instructors using a hybrid model often do so for several sound pedagogical reasons, namely (1) to provide students at different skill levels an instructional opportunity to fill in skill gaps at their own pace so they can better engage in the instructor-led lessons, (2) give more advanced students an opportunity to go beyond the current pace of the curriculum, and (3) to give all students an opportunity to become more comfortable learning with digital resources.
- **Supplemental** models are product uses that are scheduled outside regular class time (e.g., during lunch or before or after class). Students often perceive these add-on sessions as extracurricular, and instructors often do not require attendance since the activity is outside core instructional time. Typically, programs choose this use model because it does not interfere with the existing core curriculum and does not require instructors to plan for and adapt to potentially new ways of teaching.

Intensity of Use

Although many students logged significant hours on the products, overall the intensity of use was less than expected and varied greatly by site and product. Median total hours of use, including time students spent working with a product outside regularly scheduled time, ranged from a low of 3 hours to a high of 68 hours over program sessions that typically ran from 8 to 16 weeks. Seven of the 14 pilot sites had median use of less than 10 hours—less than half the time stipulated by the research team (20 hours) as a requirement for participation. Similar variation was evident in the number of days that products were used. The median number of log-in days across the sites ranged from 5 days to 26 days. The median student in 6 of the 14 sites used the products less than a total of 10 days, or about 1 day (or less) per week over the duration of an ABE program site's typical course offering.

The extent of use varied by product, reflecting differences in design features and intended uses. On average, Core Skills Mastery, MyFoundationsLab, and ALEKS had the highest student use levels, and GED Academy had the lowest. This cross-product variation is most likely due to the role the vendors intended the products to have in formal education settings and the individualized and self-paced nature of many ABE programs (including high school equivalency diploma prep programs).

Intensity of use varied by how programs decided to use and support the product. From the site visits and interviews with program staff and students, several factors emerged that appeared to be associated with consistent and greater use of the products by instructors and students, as well as product effectiveness. These factors are described below.

- **Programs were committed to use the product as a regular core instructional activity.** Greater use was likely when the ABE program and the instructors made a commitment to use the product as a regular instructional activity integrated into class time rather than as an add-on supplemental activity. When the product was supplemental, as at Site 7 and Site 12, use was significantly lower than for other models of use. At these two sites, use was scheduled outside regular class time, before the first regular class session in the morning, during lunch, or after the end of the regular day, and thus attendance was not required.
- **Use of the products must be mandatory whenever possible.** Products were also more likely to be used, both on and off site, when use was a mandatory part of the course rather than just encouraged. Mandating use of an online product or even class attendance is not always feasible in an ABE setting. However, before investing in technologies like the ones in this study, ABE sites should consider their willingness to make product use mandatory and consequential or whether their limited financial resources might be better invested in alternative supports for students.
- **The products must be aligned with the rest of curriculum.** Usage was higher when students and instructors viewed the products as instrumental in helping students achieve their goals. For example, when used in GED prep programs, products that are not tightly aligned with the GED exam may be perceived by instructors and students as providing less support for students. In addition, procedures, approaches, and explanations within a

product's content that were not aligned with classroom materials and instructor explanations often caused confusion among students. In either case, products that are not perceived as aligned with the goals of the curriculum or teacher-led instruction are less likely to be used or taken seriously by both instructors and students.

Intensity of use also varied by different student characteristics. Within a site, product use tended to be higher among female and older students, with some variation by product. Across most products, female students tended to use them 60% more on average than males. Older students (30 years old or older) tended to use the products about 80% more than younger students (18–29 years of age). Although we have no firm evidence for the reasons behind these differences, the females and older students in our sample appeared to be more motivated in their coursework than their peers and perhaps more likely to attend class regularly and persist within the digital learning technologies and their instructional programs. We also found evidence that the intensity of product use varied by students' incoming skills for three of the five products. Students with lower incoming prior test scores tended to use Reading Horizons Elevate and GED Academy more than their peers. In contrast, students with more advanced incoming math and reading skills tended to spend more time on Core Skills Mastery than their peers. Variation in the amount of use by incoming skill level is most likely a result of a combination of factors including the product design and reading-level demands of the instructional content.

Many students reported they used the products during off hours, but a lack of access to computers limited others. Part of the promise of instructional technology in ABE programs is that it can extend instructional hours by providing students with access to quality learning environments anytime and anywhere. Sixty-five percent of students surveyed reported using the product during off hours, ranging from 40% of students in ABE programs using Reading Horizons to 86% of students in programs using Core Skills Mastery. Many program sites encouraged students to use products outside regularly scheduled class time but did not mandate it. Almost half the instructors surveyed (46%) reported that the students' lack of access to the products at home limited their potential for improving student outcomes. About 25% of students reported that they did not use the products at home because they did not have access to a computer or compatible mobile device (only 5% cited a lack of Internet connectivity).

In general, students and instructors found value in using the products and believed they had some benefit to instruction, student confidence, and student learning. Instructors interviewed and surveyed found digital learning tools enabled them to better support students with a range of different skill levels, something that would not be possible without the individualized instruction provided by the products. A majority of instructors reported they would recommend the products to colleagues (83%) and would like to use the products in future courses (78%).

Many but not all of the students interviewed said they enjoyed the experience of learning independently with the products, appreciating that they could make mistakes and struggle in private and receive immediate feedback. They also liked the opportunity to learn at their own pace rather than at the pace of the class, which may have been moving slower or faster than they were comfortable with. Fifty-nine percent of students reported that the products gave them confidence they could learn new things on their own, while 50% reported that they had more confidence in their ability to read or do math. Eight in 10 students reported they would recommend the product they used to other students.

Instructors and students experienced several challenges that most likely impacted the use and effectiveness of products. The majority of instructors reported favorably on their experience using the products, but challenges were noted, such as some products' insufficient scaffolding to support struggling learners, content reading levels that may have been too difficult for some students, and some students' resistance to using the online learning technologies.

Impacts of Product Use on Learning

Estimating impacts of product use on student learning through a quasi-experimental matched control group design produced mixed results. We found positive impacts for some sites and outcome measures and negative impacts for others. Impacts for reading and math assessments were estimated for six unique program sites (five for reading and five for math) and all five products.[2] Of the 13 separate impacts estimated for reading and math, 6 were positive and 7 were negative, but only 2 of the effects estimated were statistically reliable (one positive and one negative). Overall, the effects estimated for math were slightly larger than for reading. Moderate to large statistically reliable positive impacts were found for one product in one program site: Core Skills Mastery (effect size for TABE Math = +0.48). A moderate to large

[2] Impacts were estimated for only 6 of the 14 product pilot sites because (1) an insufficient number of eligible students were available for analysis (five sites), (2) sites that provided grade equivalence scores for TABE failed to provide information on the level of test used for the pretest and posttest (two sites), or (3) the site did not have a viable comparison group available because the product was implemented in a new course (one site). Students in courses that used products were included in the impact analysis if they used the products for 10 or more hours based on usage computed from the products' back end data provided by the vendors. For a site to be included in the impact analysis, we needed to identify at least 25 eligible students in the both the user and nonuser groups. Five sites had too few eligible students because of (1) low initial enrollments and completions, (2) insufficient use of the product (less than 10 hours), or (3) missing scores on pretest and/or posttest achievement measures.

statistically significant negative effect was found for one product in a single site: Reading Horizons (effect size for STAR Reading [spring] = -0.49).

These impact findings should be interpreted with caution. Even though we made every attempt to implement the most rigorous designs available given the local research contexts by comparing the outcomes for students using the products with outcomes for a group of similar students who did not use them, these designs are unable to sufficiently isolate the effect of product use from other potential contributing factors. Other plausible explanations for the estimated impacts are differences between the groups in the quality of instruction experienced outside the use of the products as well as potential differences in the math and reading curricula the two groups of students were exposed to during the study period.

Implications of the Research Findings

An initial set of recommendations for ABE program administrators, instructors, and product developers drawn from our research findings are as follows.

For ABE program administrators and instructors

- To ensure that students spend sufficient time on the products and make adequate progress, commit to using the products as a regular part of core instruction (not as an add-on activity) and make use mandatory and consequential.
- To support product use outside scheduled class time, help students take advantage of federal, state, and local programs providing low-cost devices and Internet access and make sure all students know how and where they can obtain devices and connectivity on and off site (e.g., public libraries, workplaces, and community resource centers). In addition, provide incentives for off-hour use.
- To help ensure instructors' commit to using the products, provide adequate time for training, planning, and piloting to ensure better integration of the products into the curriculum and the instructors' own practices.
- Prepare to offer students who are struggling with the transition to online learning additional monitoring and support, including a more gradual ramp-up time on the products and alternative instructional activities during the transition. Plan for the likelihood that some students will not want to make a transition to digital instruction.

For developers and vendors of digital ABE products

- To ensure that all students can access the instructional content, particularly struggling readers, scaffold the text with audio and video presentations.
- To encourage and motivate student progress, provide immediate and meaningful feedback, hints, access to solution steps (particularly in math), recommendations for when to seek instructors' help, and encouragement for persistence to help prevent frustration among struggling learners.
- To support blended learning models and to keep instructors invested in students' work in the online environment, make the content modular so that programs and instructors can better integrate product use into the existing curriculum and with direct instruction.
- To help motivate instructors and students to use the product, make sure the content is aligned with all current ABE standards and competency exams.
- To ensure instructors leverage the information in the student progress dashboards, provide training specifically on their use as well as online resources and teaching models to demonstrate how the dashboards can be used to support students and inform the instructor's direct instruction.
- Provide sites with a variety of models of use to support a range of student types and program goals. Most students can learn online and independently with proper monitoring, coaching, and motivating factors.

Conclusion

The technology revolution in K–12 and postsecondary education has yet to reach adult basic education in a meaningful way. There is sparse research evidence and information to help ABE program administrators, instructors, and product developers understand which products, product features, models of use, and student supports are associated with effective learning technology implementations. The goal of this research project was to begin to generate some reliable independent evidence and information on the supports and practices needed to leverage the potential value of digital technologies for an ABE student population.

Overall, programs, instructors, and students found value in the digital learning technologies they used in the study. Instructors reported that product use enabled them to differentiate instruction to fill gaps in basic literacy and math skills across a wide range of students in ways that were not possible without the products. In addition, a majority of students, but not all, reported that they enjoyed using the products and that the products helped them improve their math and reading skills and gave them confidence they could use online resources to learn on their own without an instructor's direct involvement. A majority of students also reported that they used the products to continue to learn outside the regularly scheduled instruction time.

We found evidence that under the right set of conditions programs can effectively integrate use of these products into their curriculum, and students will use the products for significant amounts of time on and off site and enjoy the experience. We also found that it is possible to use digital learning technologies with low-skilled adults as the primary instructional content and delivery mode (i.e., online model), with instructors acting as facilitators and providing motivational and individualized support as needed. However, for the existing technology-based instructional products like those included in this study, it is likely that for many students, particularly those with the lowest skills, blended and hybrid models (with instructors delivering 50% or more of the instruction) will be the most prevalent and perhaps most effective use models for ABE programs.

This research also revealed challenges in using learning technologies with low-skilled adults in ABE programs. Use of the products at several sites was well below what had been planned at the study outset. Instructors reported having insufficient time to plan how best to integrate the products into their curriculum and, in particular, to learn how to best use the feedback on student performance captured by the systems to inform their instruction and identify the students who were struggling the most. Across the board, the training the instructors received from vendors was relatively modest; although it was adequate to get them and their students started on the products, it was probably insufficient to enable the instructors to leverage the full potential of the products with their students. Vendors, state and federal agencies, and professional associations responsible for supporting ABE programs and instructors need to continue to develop and disseminate instructional online resources and webinar trainings that offer practical guidance and models of implementation that have been demonstrated to be effective across a variety of program and student populations.

Finally, the study produced no conclusive evidence that the use of the products was more effective in raising students' math or reading skills than the participating ABE program sites' current curricula and approaches. The impacts estimated varied by product and site. Given that most of the sites were in an early stage of adoption, use models evolved over time. In addition, the designs used to estimate product impacts were not optimal for isolating the effects of product use from other plausible factors. Clearly, more rigorous research is needed on specific products and use models to understand their potential benefits for improving math and literacy skills.

This research represents an initial step in exploring the product design features and program conditions under which digital learning may support the goals of ABE programs and their students. More rigorous research is needed to understand which product features and aspects of online, blended, and hybrid models are the most feasible to implement and the most effective for ABE programs with different capacities, instructors, and students. Digital learning technologies like those selected for this study, although not the solution for all ABE program needs, can be an important support for programs and instructors in expanding access to basic skills instruction and improving outcomes for low-skilled adults.

Introduction

The magnitude of the unskilled labor problem for the U.S. workforce is known. According to a recent Organisation for Economic Co-operation and Development (OECD) survey (OECD, 2013), more than 36 million adults in the United States do not have the basic reading, writing, and math skills needed for many of today's entry-level jobs and even less so for the types of jobs expected to dominate in the future. We also know that U.S. federal- and state-funded adult basic education (ABE) programs, the main providers of skill development and training programs for this population, do not have the resources, facilities, or trained staff to adequately help these adults improve their skills and job prospects. A recent report (Tyton Partners, 2015) highlighted the extent of the gap between demand and supply: Currently, ABE programs receiving federal or state funding can serve about 4 million adults, or just over 10% of those in need. It is likely that this gap will only widen in the future. While many factors contribute to this widening gap (e.g., inadequate state and federal funding and the changing labor economy), researchers in this study set out to understand the potential role of technology as a part of the solution. Specifically, they addressed the question of whether digital learning technologies can increase the capacity of ABE programs by providing more efficient and effective learning opportunities to better serve the adult learning needs in their communities.

Why Digital Learning Technologies?

Over the last decade, investments in digital learning for K–12 and higher education have skyrocketed, supported by systemic changes: improvements in schools' technology infrastructure, an influx of venture capital, pressure on districts to adopt technology, school and district motivation to innovate, and higher education institutions' wish to broaden their local and global reach. This suggests the possibility for such changes in ABE. The Office of Career, Technical, and Adult Education in the U.S. Department of Education, private foundations, and other organizations are interested in spurring similar innovation in ABE. These supporters see several potential advantages for technology-supported ABE:

- **Higher engagement:** Digital learning technologies (DLTs) can present material in multiple modalities and, increasingly, adapt content to maintain learners' interest and motivation.
- **Anytime, anywhere learning:** DLTs can bring learning to the adult learner wherever he/she has access, overcoming the limits of time and place (see Warschauer & Liaw, 2010).
- **Individualized lessons, practice time, and assessments:** DLTs can supplement limited staff and instructional resources to help meet the wide range of needs of the diverse learners typically served by ABE programs.
- **More productive practice time for learners and instructors:** DLTs can provide immediate feedback to learner responses, access to solution steps, and links to additional resources to support students in practicing newly learned skills and learning from their mistakes, while freeing instructors' time to work with individuals or small groups.
- **Monitoring of student progress:** DLTs can provide instructors with real-time class- and student-level progress reports, helping them monitor individual learners' progress and identify challenging concepts and areas where additional instructional support may be needed.
- **Development of independent learning skills:** DLTs can help struggling learners gain confidence that they can learn on their own with digital resources, potentially opening up a broader world of digital information and learning resources for them and better preparing them for today's job market.

Broadly defined, learning technologies are not new to ABE, as distance education for basic skills has been offered for many years (Fleischman, 1998; Petty, Johnston, & Shafer, 2004 in many states. What is new is learners' expanding access to devices with broadband Internet connectivity and capabilities associated with technological advances—including web-based delivery, adaptive technologies, and streaming video and audio—along with sophisticated dashboards and embedded motivation supports. These expanding capabilities are coupled with a better understanding of how people learn in digital environments (Means, Bakia, & Murphy, 2014; Means & Roschelle, 2010), although this research has been on children. Yet despite these advances, there is still a paucity of research on effective ways to use the new learning technologies with low-skilled adults (Litster et al., 2014).

The Research

In 2014, The Joyce Foundation's Employment Program and Innovation Fund asked SRI Education (sri.com/about/organization/education) to investigate the role and efficacy of online learning technology products in improving the basic reading and math outcomes of low-skilled adults in ABE programs (distinct from efforts to teach English as a second language or technology literacy) and in helping these programs serve more students. Through this research, the objective was to understand how ABE programs might use these technology products to improve their instruction, whether such technologies are effective with low-skilled adults (those performing at fourth- to ninth-grade levels in reading and/or math), and which practices and product features might be associated with better outcomes for students and ABE programs.

The primary questions motivating the research were the following:

1. How are the online technologies used to support instruction and program objectives in the courses ABE programs offer?

2. What program factors and practices and product design features are associated with more intense use of the online technologies?

3. Can the use of well-designed, well-implemented online learning technologies result in gains in literacy, numeracy, and other foundational skills for low-skilled adults compared with instructional programs that did not use these technologies? Which types of participants tend to benefit most?

4. Which instructional design features of the online learning technologies are associated with better learning gains and student outcomes?

5. Which program conditions, program practices, and online learning technology uses are associated with better learning gains and student outcomes?

Summary of Research Methodology

To address these research questions, we used a variety of data collection methods and data sources. The research included a visit to participating ABE program sites for observations of classroom instruction and interviews with administrators, instructors, and adult students to learn about the programs and how they were using the online technology products and supporting their use.[3] We also surveyed instructors and students about their experiences using the selected technology products. For an independent measure of the use of each of the products, we obtained from the vendors student-level use data captured by the technologies.

To assess learning, we obtained scores on nationally normed standardized assessments administered by the ABE program sites. The sites also provided demographic information (gender and age) on the adult learners. We then used quasi-experimental designs and methods to estimate the impacts of using each product in each participating institution by comparing the standardized assessment scores of students who used the product and students who did not.[4] When necessary, we used propensity score matching, a popular statistical matching technique, to improve the baseline equivalence of the treatment and comparison groups that were compared by controlling for students' baseline characteristics in our analytical models. Separately, we also used data on student use of the products captured by each product to analyze the relationship between the intensity of product use and students' performance on the standardized learning measure. Appendix A presents details on the analysis approaches.

General Limitations of the Research

Several limitations of the research have implications for our ability to generalize the findings to the broader ABE program population. First, sites volunteered to participate and were selected for having both the leadership capacity and the desire to implement learning technology products as well as the infrastructure in place to support their use. To increase our power to detect effects, we also selected program sites that planned to serve 100–200 students or more

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[3] Four sites were not visited because of their limited use of the products or the timing of their start in the research (Site 2, Site 4, Site 8, and Site 10). In such cases, researchers interviewed administrators and instructors by phone.

[4] The research team had planned to administer the Education & Skills Online (ESOL) assessment at all participating ABE sites (http://www.oecd.org/skills/ESonline-assessment/abouteducationskillsonline/). ESOL was developed by Educational Testing Service with funding from OECD. Administered online, ESOL is based on the Survey of Adult Skills administered by the Programme for the International Assessment of Adult Competencies (PIAAC). It was made available to SRI for use in the research in August 2015. We attempted to have all sites administer ESOL on participating students' enrollment and after the students had used a product for a minimum of 20 hours. However, for reasons that varied by ABE site, compliance with ESOL administration varied greatly across sites and response rates were extremely low. ESOL scores therefore were not used to estimate product impacts on student learning but were used in the case of one site to explore the correlational relationship between the intensity of product use and student learning.

during the study period, excluding the smaller ABE sites that make up the majority of the programs serving the low-skilled adult population. In addition, we targeted ABE sites and programs that did not primarily serve ESL populations as their mission, although some ESL students were enrolled in classes included in the study. We believe the ABE program sites we selected are typical of larger ABE programs serving low-skilled adults and that the English-speaking adult students who participated are typical of the different types of learners served by ABE programs. Nonetheless, the program sites were not randomly selected from the general ABE program population and so are not a truly representative sample. Thus, when considering whether the findings from this research might generalize to a particular program site outside the study sample, readers should determine whether the capacities of the site and the students served are similar to those of the site or sites participating in the research.

Another limitation of this research is the inability to make definitive claims about the effectiveness of the products in the study or the product features and practices associated with effects. The quasi-experimental designs used to estimate effects do not disentangle the effects of product use from other aspects of instruction, including direct instruction by the instructor. (Other limitations specific to the impact analyses are covered under “Impacts of Product Use on Learning” below.) Where we found a positive or negative effect for a product on student learning at an ABE program site, the strongest claim we can make is that the effect was associated with the program site’s curriculum, in which the product may have played a key role in the students’ instruction. The more major the role of the technology in the curriculum, the greater the likelihood that use of the product contributed to the effect. Because we did not attempt to systematically manipulate product features and program practices and test whether they contributed more or less to a product’s effect, we cannot definitively say that particular features or practices caused the effect. Instead, to identify features and practices that might warrant further investigation, we highlight the distinctive features and practices of the instructional setting that were associated with program sites where greater or small product effects were detected.

Finally, each product was piloted in up to three ABE program sites, and, except for two, the sites were implementing the products for the first time. Thus, the findings reported here are for ABE program sites, instructors, and students in the early adoption stage and may not reflect the outcomes of product use in more mature implementations, once program sites and instructors have time to reflect and iterate on how they are using the products and supporting students. Also, although we observed a number of use models and practices across the various sites and products, with the limited number of sites piloting each product we clearly did not observe every practice in each site and with each product. Consequently, the practices highlighted in particular sites that may appear promising cannot be separated from the characteristics of the ABE program and instructors in that site and the products used. Thus, we cannot make any definitive claims about how effective a practice might be in other ABE program sites or in interaction with other online technology products. As more research of this type is conducted with different combinations of practices, ABE program sites, and technology products, the field will begin to accumulate evidence and have more confidence making inferences about the importance of certain practices in the implementation of online technologies with low-skilled adults.

The Digital Learning Technologies Examined

Five digital learning technologies were selected for the study (Table 1). The products represented a range of approaches to delivering web-based instruction to improve basic math and literacy skills. Details about the products and selection process are presented here. All products can be used as a regular core activity within regular teacher-led instruction, and program sites were selected with the expectation that the products would be used this way. All products can also be accessed by students when they are away from the program site. Some of the products have content in both math and reading, and others concentrate on a single subject area, math or literacy. All products have skill development content for all or some portion of the targeted fourth- to ninth-grade-level range. Most of the instructional content in the products is text based with occasional use of graphs and still images. The one exception is GED Academy, which delivers instruction through an animated instructor and students in a simulated classroom. MyFoundationsLab also includes some video presentations of content in some lessons. Most of the products provide direct instruction on concepts and skills as well as opportunities for practice. ALEKS is the exception, being primarily a practice environment, but students have the option to use its “explain” feature to receive text-based solutions to problems. All the products assess students at various stages in a lesson. All are designed for native English-speaking students or students who have progressed out of formal English as a second language (ESL) programs with a minimum fourth-grade English proficiency. The criteria used to identify candidate products for study are listed in the sidebar.

Criteria for Selecting Candidate Products

- Offers an instructional environment and content formats appropriate for adult learners with a range of entering skill levels.
- Provides instruction over a range of levels with a minimum of a grade 4 equivalent literacy/numeracy up to a grade 9 equivalent.
- Delivers instruction purely online or in a blended model.
- If delivery is blended, more than 50% of the instruction is provided online.
- Provides 80 hours or more of instruction.
- Focuses on explicit instruction in basic numeracy, basic literacy, and skill development.
- Delivers instruction to the student. This is in contrast to a learning management system platform or resource-curation website that supports instruction through archiving third-party digital resources.
- Supported by evidence that it can be adopted at a moderate scale in a formal ABE or training program.

We engaged in a range of activities to identify candidate products, with a goal of selecting five for the study. Through web searches and recommendations from ABE experts, including the project's expert advisors, we identified a pool of potential products. Of those, 29 products met the selection criteria. Interviews with all 29 vendors gave us a deeper understanding of the products, how they were being used or could be used in ABE programs, and the vendor's willingness to participate in the research. We also saw demonstrations of the products. On the basis of these interviews and demonstrations, we selected 12 products as viable and qualified for inclusion in the study. To select the final five products, we created a decision matrix of the pros and cons of each product, trading off features to select a diversified set of products according to important characteristics such as adaptive content and unique features such as support for social-emotional factors in learning.

Table 1. Products Included in the Study

Product Name; Publisher	Key Characteristics
ALEKS (Assessment and Learning in Knowledge Spaces); McGraw Hill Education	• Adaptive math instruction with periodic reassessments. Diagnostic engine determines whether students have mastered content and gradually exposes them to new and more complex math when they are ready. Assessment environment continually spirals students through previously learned topics. • Students provided with immediate feedback on whether their problem answers were right or wrong and are given hints and step-by-step solutions for incorrect answers. • Designed for classroom-paced hybrid model (rather than an entirely self-paced model). • Although not designed for ABE, content is age agnostic. • Student learning supported through access to an as-needed “explain” feature that shows students problem solutions along with text explanations of how the problem is solved. • To monitor progress, students and instructors have access to students’ continually updated “knowledge map,” showing which topics they have mastered and which new topics they are ready to learn. • Instructors able to upload links to additional online resources. • Content is modular, enabling teachers to assign different modules or students to select from among modules available to them.
Core Skills Mastery; CSMLearn	• Focus on problem solving in math, reading in context, and mastery learning. • Closed adaptive learning environment designed to be used as an independent learning activity, separate from regular classroom instruction. Students must follow the prescribed learning path provided by the system. • Content adaptively determined based on a problem-by-problem formative assessment design. • Students have choice of different presentations of the material including reviewing concepts, engaging in problem solving, step-by-step solution path, and tips for solving problems. • Content designed for adults. • Built-in supports for online coaching, including flagging “stuck” students, and instructor/student messaging system. • Instructor reports contain a range of measures to track student progress across and within skills, time on system, rate of progress, types of errors made, “distraction” levels, etc. • Student reports include current topic student is working on, progress toward mastering different topics, time spent on system, and map of skills mastered and skills that need to be completed. • Encourages a “try-first” approach to solving problems and diagnoses common “thinking errors” for student feedback. • Promotes independent learning skills. Feedback to students includes messages of encouragement when students are struggling; emphasis on developing persistence, self-reliance, and attention to detail. • To prevent frustration, system messages students to move on to another topic if they spend too much time attempting to master a particular concept.

Table 1. Products Included in the Study (continued)

Product Name; Publisher	Key Characteristics
GED Academy; Essential Education	• Designed to prepare adult students for the GED exam. Provides both direct instruction and practice environment. • Designed to be used in blended or hybrid model. • Can be used as a core instruction or a self-directed practice activity to reinforce skills learned and fill in skill gaps. • Includes content in language arts, math, science, social studies, and computer/digital literacy skills. • Lessons take place in a simulated classroom environment with animated adult characters with different backgrounds that are designed to be relatable for adult learners. The simulated classroom is designed to model best instructional practices for instructors. Students can choose which lesson to work on within their learning plan and have full control over the video (e.g., rewind, skip forward). • Intake diagnostic assessment initially establishes a student's learning plan or a prescribed sequence of lessons. With over 600 lessons, the software adapts to the learner, so the total time spent working in the system depends on the students' needs. • Once established, the initial learning plan is automatically reset periodically based on the student's performance on a GED practice test. The system creates an accelerated plan if students are performing well, but it stays with the current learning plan if students are struggling and has them retake the current lesson. Students can choose to take the GED practice test at any time and receive an updated learning plan. • Teacher reports include time-on-task and scores for each student assignment and assessment. • Learners receive immediate feedback on their problem solution. If an answer is incorrect, the student is notified immediately and direct instruction is provided on the target concept, with emphasis on the major steps and subskills involved.
MyFoundationsLab; Pearson Education	• Can be used purely online or in a blended or hybrid model. • Math instruction is adaptive. • Scaffolds learning through use of worked examples of increasing cognitive complexity. • Practice environment provides immediate access, if needed, to step-by-step guidance to problem solutions and to related videos and animations. • Feedback on solutions to practice problems is immediate, reiterates why an answer is correct, and provides specific hints when the incorrect solution is selected. • Student is required to take regular skills check and assessments across different problem contexts to demonstrate mastery. • Students decide when to take skills-check assessments, allowing them to progress to the next unit when they feel they are ready. • Educators and students have access to reports on student performance, progress, and learning objectives mastered.

Table 1. Products Included in the Study (concluded)

Product Name; Publisher	Key Characteristics
Reading Horizons Elevate; **Reading Horizons**	• Specifically designed for struggling readers with a focus on development of foundational reading skills (e.g., decoding, vocabulary, and comprehension). • Online component is meant to be used as self-paced activity. • Print materials developed for blended or hybrid implementations available, including scripted lessons for instructors who may not have strong foundation reading skills training. • Instructors can initially place students in the software based on their own diagnostic assessment or students can be placed based on a diagnostic assessment given by the system. • Continuously assesses student skill level (i.e., Lexile level) and provides appropriate reading passages. Students can select fiction and nonfiction texts they are interested in from a library to test fluency. The newest version includes words relevant to occupations. • Built-in assessments enable program to adjust instruction and amount of practice or move the student to the next level. When a student shows signs of struggling, the software reviews instruction and offers more practice opportunities; when a student proves proficient, the software advances to the next skill. • Students have a choice of receiving a lesson on a skill or testing out by taking a pretest that requires the student to apply the skill in a real-life situation. Students are required to master skills in a predetermined order before progressing to the next lesson. • System provides capability for students to record themselves pronouncing a word and compare theirs with a narrator’s pronunciation. • Teacher reports include students' time spent on task, reading comprehension score, and lesson scores. Reports are available at the class or student level.

The ABE Program Sites

Thirteen sites were recruited to participate in the research (Table 2). ALEKS was piloted in two institutions (one of which operated across three distinct locations), and one site piloted two different products in two different adult basic education programs (Site 4 and Site 6). The other products were piloted in three institutions each. Candidate ABE program sites were identified through recommendations from the advisory board and from interviews with a selection of state ABE directors. We also asked vendors to recommend high-capacity ABE sites with known interest in piloting their learning technology products. Sites were selected to represent a range of program types, governance, and goals for adult learners: public and county school districts, community colleges, and community-based organizations. All the sites had a strong interest and willingness to participate in the research (including the required data collection), had an existing technology infrastructure that could support robust use of the products, and served a large enough population of adult learners to provide reliable estimates of the utility and impacts of the products. Sites were provided with a $20,000 stipend for their participation.

The majority of students in the research were 18–45 years old, had incoming math and/or reading skills at the fourth- to ninth-grade level, and were not enrolled in an ESL program. A total of 105 instructors and 1,579 adult learners participated in the study. We obtained permission to conduct the research from each organization's research review board and/or administration, as appropriate, and negotiated data use agreements with each site to facilitate the sharing of student data with the research team.

A profile for each site is included in Appendix B.

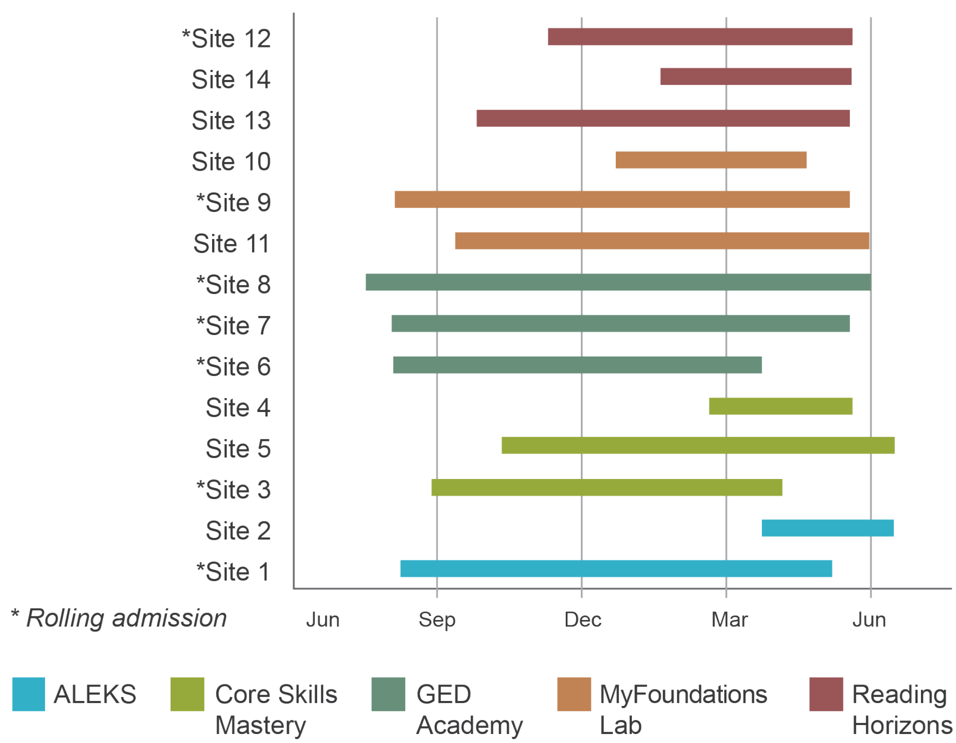
Table 2. Participating Sites

Product Piloted	Site (State)	Organization Type	Number of Teachers	Number of Students
ALEKS	Site 1 (CO)	K–12 school district adult and family education program	4	96
	Site 2, Program A (CA); Program B (CA); Program C (MA)	Nonprofit organization	3	56
Core Skills Mastery	Site 3 (IL)	Nonprofit adult education center	6	85
	Site 4, Adult Diploma Program (OH)	Community college	2	94
	Site 5 (CO)	Nonprofit organization	8	125
GED Academy	Site 6, adult basic and literacy education (OH)	Community college	6	150
	Site 7 (KS)	Nonprofit adult education center	4	78
	Site 8 (KY)	Nonprofit adult education center	7	57
MyFoundationsLab	Site 9 (AZ)	Community college	9	219
	Site 10 (IN)	Community college	26	220
	Site 11 (RI)	Nonprofit adult education center	13	189
Reading Horizons Elevate	Site 12 (IL)	K–12 charter alternative high school	9	72
	Site 13 (UT)	K–12 district specialty school for adult learners	2	58
	Site 14 (KY)	K–12 district adult education	6	80

Duration of Site and Student Participation in the Study

The start and end time of each site's participation in the study during the 2015–16 academic year varied (Figure 1). The variation was due to three factors: (1) when the sites were identified, recruited, and approved for participation in the study by their administration; (2) the scheduling of staff training; and (3) the sites' schedule for offering the targeted courses. All sites were recruited with the expectation that students participating in the study would have an opportunity to enroll for a minimum of 10 weeks of instruction and 20 hours of exposure to the digital learning product selected. The duration of an individual student's participation in the study may have been shorter than the duration of the site's participation depending on whether the site had a rolling admissions or open-entry/open-exit policy (see Figure 1) and when the student may have completed and exited the program. In sites with rolling admissions, students were included in the research if (1) they were administered a pretest assessment at enrollment as a policy of the site and (2) they completed their site's posttest assessment (typically after 40 hours or more of instruction, although this varied by site). Students with pretest assessment scores who left their programs before taking a posttest were excluded from the samples used in the estimation of product impacts on achievement measures and course outcomes.

Figure 1: Program Site Start Time and Duration



Training and Support for Implementation

Two outside sources supported sites in product implementation, the product vendor and Mockingbird Education. Each vendor was responsible for scheduling a training session with each organization. Training was delivered mainly online, although Reading Horizons Elevate and Pearson provided it in person. Vendor trainings ranged from a single session as short as 1 hour up to a full day (Reading Horizons and Pearson delivered in-person full-day trainings) covering start-up, student onboarding, and introductions to the product features. As indicated in the site visit interviews, whether or not instructors were trained in product use varied depending on whether the sites requested training, scheduling constraints, and staff turnover. During the site visits we learned that often more experienced instructors supported less experienced staff in use of the products. Each vendor was also encouraged to offer follow-up support as needed, and several instructors reported using a vendor's customer support service.

In addition to vendor-provided training, free technical assistance funded by the research project was offered by Mockingbird Education (www.mockingbirdeducation.net). The primary technical assistance provided was a full-day workshop (6 hours) for educators on blended learning in the adult classroom with a focus on needs specific to vulnerable learning populations. Six of the sites took advantage of this workshop, although sometimes the geographic spread of instructors made arranging attendance difficult. Mockingbird also developed a technical assistance website for the ABE sites that had resources for supporting and implementing their digital technology as well as weekly project updates.

Overall, 75% of the instructors surveyed said they participated in some form of training. However, only 52% said they were "well prepared" or "very well prepared" to use the product, ranging from a high of 100% (ALEKS) to a low of 11% (GED Academy).

The sections that follow present the major findings from the research. We begin with a description of the types of use models that emerged at the program sites—that is, the ways the products were used to support teaching and learning. Then follows a description of the findings from the analysis of the system use data and student and instructor surveys. The report ends with an examination of the possible impacts of product use on student achievement and the features of ABE programs, use models, and products that may have been associated with these impacts.

Major Cross-Site Research Findings

Emergent Use Models

In selecting products for this study, we spent time with the vendors to understand the intended use of each product. Some of the products were designed for self-study as the primary learning approach, with instructors as “guides on the side.” Others were intended to be used as a self-paced remedial instruction, filling in gaps in students’ foundational skills so they could take better advantage of their instructors’ direct instruction. Still others were designed to be used in conjunction with direct instruction as a practice environment, helping students retain new skills they had just learned in the classroom.

In observing the products in action in classrooms and interviewing program administrators and instructors, we noticed different types of use models across sites. Some of these were consistent with the vendors’ intentions for the product and some were not. For purposes of this report, we use the term *use model* to indicate how the product was actually used, as opposed to its intended use. In general, although vendors may have presented preferred ways to implement the products, ultimately it was the decision of each ABE program site and its instructors to implement a model that they believed was best for their students.

Four use models emerged based on how the program sites used the products to support their instructional program. Many influences shaped actual product use, from product design features to the mission and goals of a particular ABE program center to instructors’ beliefs about how to teach, how adults learn, and how best to motivate students. In addition, a site’s vision for the potential role of the technology product in its curriculum and the ability to implement that vision also most likely influenced the use models. The four use models observed across the sites were *online*, *blended*, *hybrid*, and *supplemental*. These are defined as follows.

- **Online** refers to use of a product as the primary mechanism of instructional content and delivery for the course. Students’ use of the product was required. It took place in the program, school, or college computer labs monitored by instructors or on students' own time with individual support from instructors available on request. When instructors provided direct instruction, it was in response to student needs they identified while reviewing progress reports provided by the product or on student request.

Adult Diploma Program (ADP) at Site 4

The Adult Diploma Program (ADP) at Site 4 is a state-legislated competency-based high school diploma program for adults age 22 and older focused on sector-specific careers. Core Skills Mastery (CSM) was used in a noncredit course, Adult Learner Pathways to Career and College Readiness Credentials, which provides students with the literacy, numeracy, and computer proficiency skills necessary to succeed in later courses. This pathway-readiness course was entirely online, using CSM as the curriculum. Academic coaches (not instructors) supported students, encouraging them to complete CSM using the CSM messaging features, phone calls, and meetings at the Site 4 computer labs, where students were offered facilities to work on CSM. For ADP, completion of CSM was as much about persistence and a mastery orientation as about literacy and numeracy improvement. The program coordinator believed that a CSM certificate showed that students were prepared to learn and could do problem solving in technology-rich environments. Students could take as long as they needed to complete CSM, some working for many hours over many months. There were strong extrinsic motivations to complete CSM and thereby gain entry to the pathways courses: Scholarships were available to students once they completed CSM if they earned a high enough score on the WorkKeys skills assessment test. Overall, these learners could expect better jobs once they completed the pathways career training. The pathways-readiness approach with CSM differed from the typical GED preparation courses. As one coach described,

> *We have had people that came into this program from the GED program. And the difference between these two [GED and ADP]...the GED is your basic school setting...math, reading, science....[In contrast] CSM is preparing you for the workforce...solving simple math problems....It also builds your confidence and your motivation, allowing you to be a better employee.*

- **Blended** use models require tight integration of the product into a broader curriculum and instructional program. When we characterized product use as "blended," instructors had planfully integrated product use with face-to-face instruction, so the whole program of study was partly online and partly face to face. Instructors attempted to link the content in their lectures to the content that students were assigned in the product, or they closely monitored student progress in the product and modified instruction in the classroom accordingly and/or used students' performance in the product to identify those in need of individual attention.

Site 1 Colorado School District

Site 1 provides ABE courses as part of its Adult and Family Education program. Enrollment is offered monthly, and adult learners enter the ABE program with a wide range of skills in math and reading. Students are placed into one of three classes based on TABE scores and meet twice a week for a total of 6 hours. ALEKS was used a minimum of 1.5 hours per week and up to 4 hours when students used it during off hours. Instructors used various strategies to blend ALEKS into their instruction. They assigned ALEKS as homework but also worked with students one on one during class on the ALEKS' assignments to help them improve their grades. When instructors offered whole-class direct instruction on a topic, they often used ALEKS during class to have all students practice solving problems requiring the skills covered in the lesson. Overall, instructors and students enjoyed their experience using ALEKS. One instructor reported, "ALEKS is a very powerful program when it's used with a teacher. Now I have the time to give individualized teaching." One student interviewed talked about both the challenge and value of learning independently with a digital resource like ALEKS:

> *In the beginning, it was really helpful to have [the instructor] because I was relearning multiplication and algebra. Once I got that from her, I kind of went on ALEKS on my own. Class was on equations, and I was able to go past and beyond that at home. If it [learning] was just in class, then I would have been bored because I already learned and grasped and wouldn't have been able to move on.*

- **Hybrid** models also combine the use of the product as a core instructional activity in combination with instructor-led instruction during regular class time. However, in this use model, the students' work in the product, although required, is not necessarily connected to instructor-led lessons and does not directly influence what instructors do in the classroom. To a casual observer, blended and hybrid models may appear alike. However, in hybrid use models, online activities are not coordinated with the face-to-face instruction. Instructors do not regularly review product dashboards, nor do they use their direct instruction time to cover topics that were revealed as potentially problematic for students based on their performance in the product. Instructors using a hybrid model often do so for several sound pedagogical reasons, namely (1) to provide students at different skill levels an opportunity to fill in skill gaps at their own pace so that they can better engage in the instructor-led lessons, (2) to give more advanced students an opportunity to go beyond the current pace of the curriculum, and (3) to give all students an opportunity to become more comfortable learning with digital resources.

Site 13, Rural School District, Northern Utah

This Site 13 school is one of six specialty schools in Site 13 located in northern Utah. The school offers programs specifically designed to meet the needs of adult learners, most of whom pursue one of the following programs: a high school diploma, a GED certificate, ESL skill development, basic literacy or numeracy instruction (starting at or below a high school graduate level), or a transition to a community college. The program serves about 200 students each day. Classes meet twice per week for 2 hours over a 5-week session. Reading Horizons Elevate was used as part of the Reading Improvement course. The instructors used Reading Horizons during the last 30 minutes of each class, using desktop and laptop computers in the classroom. Students were also expected to spend as much as 2 more hours on Reading Horizons outside class during the 5-week session, at home or in the school's computer lab. While students worked on Reading Horizons, the instructor circulated among them, checking in and working with individual students. Because of the adaptive design of Reading Horizons, each student worked at his or her own pace through the program. Both teachers and students interviewed commented on the value of students' being able to work on basic literacy skills at their own pace within a classroom of students with a wide range of literacy skills.

One student commented:

> *It's more private than in the class. It's just you and the computer. You don't want others to know you can't say a word. With [Reading Horizons], others don't know what you can't say.*

- **Supplemental** models are product uses that are scheduled outside regular class time (e.g., during lunch or before or after class). Students often perceive these add-on sessions as extracurricular, and instructors often do not require attendance since the activity is outside core instructional time. Typically, programs choose this use model because it does not interfere with the existing core curriculum and does not require instructors to plan for and adapt to potentially new ways of teaching.

Site 12 Urban Adult Charter School

Site 12 provides alternative education programs for dropouts and at-risk youth, ages 16–20, in northeast Illinois, through a multicampus system. The goal of Site 12's use of Reading Horizons Elevate is to provide basic literacy skills education to struggling readers to help them succeed in their other classes and eventually graduate and receive a high school diploma. Reading Horizons, familiar to Site 12 through use in its special education program, is used by students in a literacy lab as a pullout program taught by reading coaches or specialists. Each campus has its own way of implementing the literacy lab. The intervention has been delivered as part of an English language arts course, an extra instructional session during lunchtime or study hall held in a computer lab or library, a pullout from another class, or an elective credit. The literacy lab is rarely held before or after school, however, because students would be unlikely to attend at those times.

How Reading Horizons Elevate was used varied depending on the campus. For campuses with shorter literacy lab periods, instructors monitored students' self-paced work in a computer lab or library and answered questions as needed. In other cases, instructors felt that working on the computer for an entire class period was too much for the students, so they combined Reading Horizons with off-computer activities. One teacher let each student have one day to read a book of their choosing during class. Another mixed in direct instruction or reading Lexile-leveled articles related to the social justice theme of the school using a different technology product. Progress on Reading Horizons was not tied to grades, and coupled with the fact that the literacy intervention was treated as an extra period of instruction, campuses found it challenging to motivate students to attend the labs.

Table 3 shows the use models implemented for each product by each site. Some sites left the choice of use model up to the educators, so some sites implemented more than one use model. Details on the use models at each site are in Appendix B.

Table 3. Use Models by Product and ABE Program Site

Product Piloted	Site Name (State)	Use Models			
		Online	Blended	Hybrid	Supplemental
ALEKS	Site 1 (CO)		✓		
	Site 2 – Program A (CA)			✓	
	Site 2 – Program B (CA)		✓		
	Site 2 – Program C (MA)			✓	
Core Skills Mastery	Site 3 (IL)	✓		✓	
	Site 4 Adult Diploma Program (OH)	✓			
	Site 5 (CO)				✓
GED Academy	Site 6 Adult Basic and Literacy Education (OH)		✓		
	Site 7 (KS)				✓
	Site 8 (KY)	✓			
MyFoundationsLab	Site 9 (AZ)		✓	✓	
	Site 10 (IN)	✓		✓	
	Site 11 (RI)			✓	
Reading Horizons Elevate	Site 12 (IL)				✓
	Site 13 (UT)			✓	
	Site 14 (KY)			✓	

Intensity of Use

Two key questions driving this research were (1) whether ABE program sites would be able to integrate the digital learning technologies into their curriculum in a meaningful way and (2) whether the average low-skilled ABE learner would actually use the products over a sustained time (10 weeks or more). To address these questions, we analyzed the data captured by the products each time students logged in, completed a unit or activity, and attempted assignments and assessments. We also surveyed the instructors about how often they used the products in their courses.

During recruitment of the ABE program sites, the research team communicated its expectations about use of the products during the study period. First, the products were to be used as a regular, required core instructional activity and not as a supplemental activity used at the discretion of individual instructors or students. Second, over the period of the targeted course or program session (typically 10–12 weeks), instructors were to dedicate a minimum of 20 hours of instructional time to use of the product by students. This was to include both time students spent working on the products on campus under an instructor’s or instructor aid’s supervision and the time students spent working with the products independently on and off site. Ultimately, the use models and actual intensity of use at each site varied depending on (1) discussions between the vendors and the program sites about what type of use might be appropriate for each site and (2) individual decisions made by site administrators and instructors based on program and student needs.

To indicate use overall and across products and program sites, we report the results for two variables that were available for all products: (1) the number of hours students used the products—on and off site—for reading and math instruction[5] and (2) the number of days students logged on to the products. We were unable to obtain a richer set of common variables because of differences among the products in what student use data were archived and how the data were formatted and stored.

Table 4 shows the actual level of software use for each product and ABE program site. The use statistics shown are for all the students who enrolled in a course in one of the program sites during the study, including those who may have joined and left the program during the study.

[5] Students used MyFoundationsLab and GED Academy to receive instruction in other subject areas in addition to reading and math. Because this research concerned the potential benefit of online instruction to help low-skilled adult improve their reading and math skills, we analyzed and report results for use of the products for reading and math instruction only.

Table 4. Intensity of Product Use, by ABE Program Site

	Use Statistics				
	No. of Students with Log-in ID	No. of Log-in Days (median)	Total Hours (median)	Use Levels (% users at each level)	
				0–10 hours	10+ hours
ALEKS					
Site 1	96	14	28	8%	82%
Site 2 (Program A /Program B/Program C)	56	17/24/1[a]	9/20/1	57%	43%
Core Skills Mastery					
Site 3	85	26	68	8%	92%
Site 4	94	23	28	31%	69%
Site 5	125	9	9	66%	34%
GED Academy					
Site 6	150	23	15	42%	58%
Site 8	57	9	4.4	89%	11%
Site 7	78	7	2.5	82%	18%
MyFoundationsLab					
Site 9	219	5	5.8	62%	38%
Site 10	220	13	18	27%	63%
Site 11	189	13	12.3	44%	56%
Reading Horizons Elevate					
Site 14	80	17	7.8	66%	34%
Site 13	58	9	7.2	64%	36%
Site 12	72	7	3	86%	14%

[a] *Number of log-in days and total hours shown separately for the three local program sites (Program A, Program B, Program C) for Site 2.*

Seventy-five percent of all students who enrolled in a course or instructional program in one of the sites participating in the study used one of the products. Not all students who enrolled in a site's ABE program during the study period used the product that a site had selected. Such students had left the ABE program before the site's initial use of the product or decided not to use the product either on their own or at the encouragement of instructors who might have believed it was not a suitable learning environment for them. The percentage of students who enrolled in an ABE program during the study who also created a legitimate product log-in identifier ranged from a low of 44% at one site (Site 7, GED Academy) to a high of 92% at another (Site 4, Core Skills Mastery).

Specific findings related to the use of the products during the study were as follows.

Although many students logged significant hours on the products, overall the intensity of use by students was less than expected and varied greatly by site and by product. Median total hours of use, including time students spent working with a product outside regularly scheduled time, ranged from a low of 2.5 hours (GED Academy at Site 7 and Reading Horizons Elevate at Site 12) to a high of 68 hours (Core Skills Mastery at Site 3). Seven of the 14 sites had median use of less than 10 hours (including all three sites using Reading Horizons Elevate), or less than half the time originally expected by the research team (20 hours). Similar variation was evident in the number of days that products were used. The median number of log-in days ranged from 5 days (MyFoundationsLab at Site 9) to 26 days (Core Skills Mastery at Site 3). The median student in 6 of the 14 sites used the product less than a total of 10 days, or 1 day or less per week over the duration of an ABE program site's typical course offering.

The extent of use varied by product, reflecting differences in design features and intended uses. On average, Core Skills Mastery, MyFoundationsLab, and ALEKS had the highest levels of student use, and GED Academy had the lowest. This cross-product variation is most likely due to the role the vendors intended the products to have in formal education settings and the individualized and self-paced nature of many ABE programs (including high school equivalency diploma prep programs).

The products' intended role in the curriculum most likely had a large effect on how often students used them. Core Skills Mastery (CSM) is designed to be a stand-alone program of instruction; students are to work independently through the 30-plus units of content with the goal of completing them all and receiving the CSM certificate of completion. Students progress to the next unit only after they demonstrate mastery. They are expected to work for 30 minutes to 2 hours in a single session, and the typical student works through the content in 10–60 hours, on and off site, depending on the requirements of the ABE program site. In contrast, Reading Horizons Elevate is meant to be used as discrete activity in a blended or hybrid learning model within a broader program of instruction; it was not designed to be a comprehensive literacy curriculum or an online reading course. The product is designed to help students fill in gaps in foundational literacy skills such as decoding and phonetics so they can more fully engage in and benefit from teacher-led instruction. Individual sessions on Reading Horizons Elevate typically last 10–20 minutes, and product use is typically limited to on site. Thus, in comparing the intensity of use of these two products, we would expect, by design, for students to spend significantly more time on Core Skills Mastery than Reading Horizons Elevate.

We also found that products used in high school equivalency (HSE) diploma prep programs, such as GED Academy, had the lowest intensity of use overall compared with products used in other types of programs. Students enrolled in general HSE diploma prep programs enter with widely varying motivation and skill levels. Each student is on his or her own timetable for being prepared to take the HSE diploma exam, depending on incoming skills, family and work responsibilities, and intrinsic and extrinsic motivating factors. Some students may need 6–8 weeks of instruction before being prepared to take the exam and leave the ABE program, whereas others may require a year or more. It is also typical for students to rotate in and out of these programs on the path to completing their diploma. Staff at these program sites are sensitive to the needs of their students and go out of their way to accommodate their schedules. They are less likely to require attendance or minimum levels of progress for students to maintain their program eligibility. As a result, research sites using the products in HSE diploma prep programs tended to show significantly lower overall use during the study. This was certainly the case for Site 14 (Reading Horizons Elevate) and Site 7 (GED Academy).

Intensity of use varied by how programs decided to use and support the product. From the site visits and interviews with program staff and students, several factors emerged that appeared to be associated with consistent and greater use of the products by instructors and students, as well as product effectiveness. These factors are described below.

- **Programs were committed to use the product as a regular core instructional activity.** Greater use was likely when the ABE program and the instructors made a commitment to use the product as a regular instructional activity integrated into class time rather than as an add-on supplemental activity. When the product was supplemental, as at Site 7 and Site 12, use was significantly lower than for other models of use. At these two sites, use was scheduled outside regular class time, before the first regular class session in the morning, during lunch, or after the end of the regular day, and thus attendance was not required.
- **Use of the products must be mandatory whenever possible.** Products were also more likely to be used, both on and off site, when use was a mandatory part of the

course rather than just encouraged. Mandating use of an online product or even class attendance is not always feasible in an ABE setting. However, before investing in technologies like the ones in this study, ABE sites should consider their willingness to make product use mandatory and consequential or whether their limited financial resources might be better invested in alternative supports for students.

- **The products must be aligned with the rest of curriculum.** Students and instructors must view the products as instrumental in helping students achieve their goals. For example, when used in GED prep programs, products that are not tightly aligned with the GED exam may be perceived by instructors and students as providing less support for students. In addition, procedures, approaches, and explanations within a product's content that were not aligned with classroom materials and instructor explanations often caused confusion among students. In either case, products that are not perceived as aligned with the goals of the curriculum or teacher-led instruction are less likely to be used or taken seriously by both instructors and students.

Finally, we also noted that product use was higher when products were integrated into courses that were required for advancement in a program or pathway. In several cases, products were used in courses or instructional programs that, if completed successfully, gave students the opportunity to advance to a higher level course or program or to receive a high school, diploma, certification, or job. For example, Site 4 used completion of CSM as a prerequisite for entrance to a new adult diploma program. Similarly, use of CSM at Site 3 was a requirement for participation in a select career pathway program. At Site 10, MyFoundationsLab was the primary source of instruction for most students in a noncredit developmental skills course designed to help prepare them to enter a credit-bearing math-related career pathway. At all three sites, the intensity of product use was among the highest across the participating sites. This higher intensity may have been related to some program factors that motivated use, including the fact that use was compulsory and was part of a program that helped students achieve an important tangible goal. In addition to these external motivating factors, the characteristics of the students enrolled in these programs may have also contributed to higher levels of product use, including higher average levels of persistence and attendance relative to students enrolled in the other ABE programs in the study.

Student Factors Predicting Use

In this section, we explore how student characteristics predicted use of the products. We investigated the extent to which student age, gender, and incoming skill level predicted intensity of use (total number of hours of use) for each of the products (Tables 5–8). For details on the analytical models and results see Appendix A, Section A.3.

In general, product use tended to be higher among female and older students, with some variation by product (Table 5). On average, female students used the products for 60% more time than males, ranging from no difference to little difference for MyFoundationsLab and Reading Horizons Elevate to two times as much for ALEKS, Core Skills Mastery, and GED Academy. Except for Core Skills Mastery, older students (30 years old or older) also tended to use the products more than younger students (18–29 years of age), ranging from 50% more for MyFoundationsLab to four times more for GED Academy (Table 6). Although we have no firm evidence for the reasons behind these differences, the females and older students in our sample appeared to be more motivated in their coursework than their peers and perhaps were more likely to attend class regularly and persist within the digital learning technologies and their instructional programs.

Table 5. Intensity of Product Use (hours), by Gender

	Female						Male					
	N	Med.	Mean	*SD*	Min	Max	*N*	Med.	Mean	*SD*	Min	Max
ALEKS Sites Included: Site 1, Site 2	75	25.6	36	35.7	0	205	69	18.3	19.1	16.0	0	60.7
Core Skills Mastery Sites Included: Site 3,Site 4, Site 5	205	26.4	47.4	55.6	0	467	98	12.0	19.0	26.8	0	178.9
GED Academy Sites Included: Site 6, Site 7, Site 8	166	6.3	16.5	23.6	0	134.1	112	2.7	9.8	17.0	0	85.6
MyFoundationsLab Sites Included: Site 9, Site 10, Site 11	256	10.2	24.9	44.3	0.1	340	368	10.9	19.9	35.7	0	547.2
Reading Horizons Sites Included: Site12, Site 13, Site 14	112	6.5	8.1	7.4	0	23.9	86	2.9	5.8	7.0	0	23.6

Table 6. Intensity of Product Use (hours), by Age Group

	Age 18–29						Age 30 or Older					
	N	Med.	Mean	*SD*	Min	Max	*N*	Med.	Mean	*SD*	Min	Max
ALEKS Sites Included: Site 1, Site 2	110	18.3	21.9	23.1	0	153.3	34	34.1	47.0	37.7	4.3	205
Core Skills Mastery Sites Included: Site 3,Site 4, Site 5	77	7.9	13.9	23.0	0	122.8	48	7.4	17.6	27.1	0	132.4
GED Academy Sites Included: Site 6, Site 7, Site 8	166	2.7	9.7	16.8	0	85.9	113	12.0	19.7	25.7	0	134.1
MyFoundationsLab Sites Included: Site 9, Site 10, Site 11	405	9.49	17.3	26.9	0	340	223	14.1	31.6	55.1	0	547.2
Reading Horizons Sites Included: Site 12, Site 13, Site 14	124	3.4	6.2	6.7	0	23.9	73	7.6	9.2	8.1	0	23.7

We also found evidence that the intensity of product use varied by students' incoming skills (Tables 7 and 8). In particular, students with lower incoming achievement scores (below the median score) tended to spend more time working on the products for ABE programs using Reading Horizons Elevate (based on prior reading scores) and GED Academy (based on prior reading and math scores) than students in the same programs who scored at or above the median on a prior achievement test. Thus, for these products it appears that students with the greatest needs spent more time working on the products. Interviews with instructors and vendors indicate that the variation in use by incoming skill level might be a result of the design of these particular products and how they were used by the program sites. For example, instructors using Reading Horizons Elevate reported that some of their advanced students were able to complete the available units before the end of the term and were assigned other activities while their peers continued working in the product. In the case of GED Academy, performance on an intake diagnostic assessment determines the sequence of content that students work through and need to master within the product. Students with lower scores on the intake assessment will receive a learning plan that requires them to complete more units and master more topics than their more advanced peers before being prepared to take the GED exam. In contrast, students with higher prior reading and math scores tended to use Core Skills Mastery more than students with lower prior achievement scores (based on both prior math and reading scores). The reason for this relationship is not clear, but we do know that Core Skills Mastery content is text-rich and places greater demands on a student's reading ability than the other products in the study.

Table 7. Intensity of Product Use (hours), by Score on Math Pretest

	Below Median Prior Math Score						At or Above Median Prior Math Score					
	N	Med.	Mean	*SD*	Min	Max	*N*	Med.	Mean	*SD*	Min	Max
ALEKS Sites Included: Site 1, Site 2	70	21.8	26.4	24.8	0	153.3	74	20.2	29.3	32.9	0.03	205
Core Skills Mastery Sites Included: Site 3,Site 4, Site 5	100	9.0	26.4	38.8	0	188.1	100	29.45	50.48	49.0	0	272.8
GED Academy Sites Included: Site 6, Site 7, Site 8	135	5.7	13.2	19.0	0	106.7	116	4.3	15.8	24.1	0	134.1
MyFoundationsLab Sites Included: Site 9, Site 10, Site 11	295	13.6	25.8	44.2	0.1	547.2	235	10.0	21.3	38.3	0	340

Note: Because Reading Horizons is a literacy product, it was not included in these analyses.

Table 8. Intensity of Product Use (hours), by Score on Reading Pretest

	Below Median Prior Reading Score						At or Above Median Prior Reading Score					
	N	Med.	Mean	*SD*	Min	Max	*N*	Med.	Mean	*SD*	Min	Max
Core Skills Mastery Sites Included: Site 3,Site 4,Site 5	89	14.7	32.3	41.5	0	162.4	88	32.0	52.0	50.6	0	272.8
GED Academy Sites Included: Site 6, Site 7, Site 8	109	7.4	19.5	26.1	0	134.1	103	2.8	11.1	18.0	0	87.0
MyFoundationsLab Sites Included: Site 9, Site 10, Site 11	222	13.3	23.9	44.4	0.1	547.2	240	9.3	20.6	37.49	0	340
Reading Horizons Sites Included: Site 12, Site 13, Site 14	101	6.6	8.7	8.3	0	23.9	98	3.0	5.4	5.9	0	23.7

Note: ALEKS, a math product, was not included in these analyses because a score for prior reading ability was missing for a majority of the students.

Off-Hours Use of the Products

We also investigated the extent to which students used the products outside regular class hours. Part of the promise of instructional technology in ABE programs is that it can extend instructional hours by providing students with access to quality learning opportunities anytime and anywhere (assuming students have access to devices and broadband Internet).

At the start of the study, an open question for us, and for many of the ABE program staff we interviewed, was whether students would use the products on their own outside regular class time. Most students enrolled in ABE programs have many demands on their time besides their coursework, including family and, for many, one or more full- or part-time jobs. In addition, several ABE administrators were concerned that students would not be able to access the software because of a lack of home access to working computers or inadequate Internet connectivity. In fact, almost half the instructors surveyed (46%) reported that the students' lack of access to the products at home limited their potential for improving student outcomes. About 25% of students surveyed reported that they did not use the products at home because they did not have access to a computer or compatible mobile device (only 5% cited lack of Internet connectivity). As a result, although many program sites strongly encouraged students to use the products outside regularly scheduled class time, they did not mandate it.

However, evidence from the student survey and an analysis of system use data from two of the products revealed that students' off-hour use was fairly significant, albeit varying by product and site. On the survey, 65% of students reported using the product outside regular class time, ranging from 40% of students in ABE programs using Reading Horizons Elevate to 86% of students in programs using Core Skills Mastery (Table 9).

Table 9. Product Use Outside Regular Class Time, as Reported in Student Survey

Product	% Students Reporting Off-Hour Use
Reading Horizons Elevate	40
MyFoundationsLab	65
ALEKS	64
GED Academy	69
Core Skills Mastery	86

Only the vendors of Core Skills Mastery and Reading Horizons Elevate were able to provide student-level time-of-day data that we could use to independently compute students' off-hour use. Of the students who used Core Skills Mastery, 91% used it outside regular class time ranging from 78% at Site 5 to 99% at Site 3 (Table 10). For Reading Horizons, 54%% of students used the product outside the regularly scheduled class time, varying from 50% at Site 12 to 60% at Site 13.

Table 10. Product Use Outside Regular Class Time, as Calculated from Product System Data

Product	ABE Program Site	% Using Outside Scheduled Time	Total Hours (median)
Reading Horizons Elevate	Site 12	50%	0
	Site 14	51%	0.5
	Site 13	60%	0.4
Core Skills Mastery	Site 5	78%	3
	Site 4	97%	19
	Site 3	99%	56

The differences in the time students used Core Skills Mastery and Reading Horizons Elevate outside class was probably associated with the intended role of the product, how it was used at a site, and whether the ABE instructors expected students to use it outside class hours. For example, the highest median off-hour use across the sites using Core Skills Mastery, a complete program of math instruction, was where use outside regular class time was expected, supported, and rewarded: a median of 19 and 56 hours for Site 3 and Site 4, respectively. In contrast, the off-hour use of Reading Horizons was relatively modest for the median student, ranging from 0 hours to 0.5 hour. This low off-hour use was probably related to the intended role of Reading Horizons in the curriculum and the expectations that program sites had for students' external use of it. Reading Horizons was designed for use in a blended or hybrid model, with instructors using it as a discrete instructional activity for building foundational literacy skills within a broader reading curriculum. It is not a comprehensive literacy curriculum or online reading course and was not meant to be. While Reading Horizons can be used at home and instructors encouraged this, the ABE sites in this study did not require that students use it outside class time and did not have strong expectations that they would.

Self-Reported Benefits and Challenges of Product Use

During the study, instructors and students were administered surveys on their experience with the online instruction products; the potential benefits to instruction, learning, and student attitudes; for students, the use of the product during off hours; and, for instructors, the challenges they faced in implementing the technologies at their ABE program sites. We obtained survey responses from 74 instructors and 486 students, response rates of 70% and 31%, respectively. (Response rates by product are reported in Appendix A, Table A2.1.) In addition, during the site visits we interviewed a sample of instructors and students about their experiences using the products. The findings are reported here.

In general, instructors and students found value in using the products and believed they had some benefit to instruction, student confidence, and student learning. Instructors were relatively positive about their experiences using the digital learning tools with their students. Many reported they felt they were better able to support students with a range of skill levels because of the individualized instruction the products provided. On the survey, a majority of instructors reported they would recommend the products to colleagues (83%) and would like to use the product in future courses (78%).

A clear majority of the instructors surveyed reported that the products helped them improve the instruction they offered. Almost 90% agreed the products helped them identify struggling students (88%), provided immediate feedback to students (88%), and allowed students to progress at their own pace (91%). Slightly fewer instructors, but still a significant majority, reported that the online products helped them differentiate the content they provided students based on individual student needs (79%).

An instructor using Reading Horizons Elevate in Site 13 and another using MyFoundationsLab in Site 10 provided the following comments:

Reading Horizons Elevate. "I use it as a practice opportunity. In the first hour and a half of class we read stories, use vocabulary, speak in English, and write sentences. Then I use Reading Horizons Elevate as individualized practice. They are always on their own level and can work at their own speed, fast or slow. It's not a repetition of the other class content, but hopefully it builds basic skills. I have to teach to the middle. Using Reading Horizons Elevate is a way for them to have success at their level and improve but also feel part of the class."

MyFoundationsLab. "Most students liked being able to get [work] done. Especially in a remedial situation, students feel like they've been in remediation before, feel like they're not going to get through it, not going to get done. In this case, they felt like they could complete the tasks, see the bar filling up, felt like actually getting something done. I like it for these students in particular because these students hate 'book classes.' [The use of the product] gives them authority over their own education.... They have autonomy and authority, can choose to finish faster."

Of the numerous challenges instructors of ABE classes face in trying to deliver effective instruction, perhaps the most significant is adjusting to the wide variation in their students' skills. Some programs used placement tests to assign students to classes based on their incoming skill levels to reduce the range of skills in a given classroom. While this "leveling" by classes helped to some degree, it did not solve the problem, with instructors still finding it difficult to support all students. The value of using digital learning products reported by many instructors was the products' ability to provide instruction that was differentiated and targeted to an individual student's current skill or understanding.

Many, but not all, of the students interviewed reported that they enjoyed the experience of learning independently with the products, appreciating that they could make mistakes and struggle in private and receive immediate feedback. They also liked the opportunity to learn at their own pace rather than at the pace of the class, which may have been slower or faster than they were comfortable with. Fifty-nine percent of students reported that the products gave them the confidence they could learn new things on their own, while 50% reported that they had more confidence in their ability to read or do math. Eight in 10 students reported they would recommend the product they used to other students.

During site visits, we heard these types of benefits from students:

Reading Horizons Elevate, Site 13. "With the computer, you can keep repeating the word as much as you want. It's like you have your own teacher."

ALEKS, Site 1. "I think ALEKS program helped me learn about math. I like the program because if I answer wrong, they explain to me how I can do it. Then the second question I can do better."

The majority of instructors reported favorably on their experience using the products, but challenges were noted, such as some products' insufficient scaffolding to support struggling learners, content reading levels that may have been too difficult for some students, and some students' resistance to using online learning technologies in place of instruction delivered by their teacher in a classroom of their peers. We believe these challenges are probably relevant to many product developers and ABE program sites considering adopting online technologies to support the learning of low-skilled adults.

To support students' independent use of the products, particularly in math instruction, adequate scaffolding must be incorporated to support learning, persistence, and help-seeking behaviors. To make progress, low-skilled adults, particularly those with the lowest skills, need adequate support from the products including clear explanations of concepts and solution steps, multiple representations of difficult concepts and skills, and guidance for seeking help when progress is stalled. One of the challenges several instructors and students expressed was the inability to make progress within a product, even after multiple attempts, which caused frustration. According to students and instructors, this is often due to explanations that are unclear or confusing with no alternative explanations or approaches presented. This also points to the need for instructors to closely monitor students' progress in the products either in real time, by being present in the classroom or lab during product use, or by regularly reviewing progress reports provided by the products. Product developers should also consider ways for the products to identify students who are struggling and provide instructors regular updates so they can support their students.

The literacy demands of the text in the products may hinder some students' learning of the focal concepts and skills. ABE students enter their programs with a range of skill levels, particularly in reading and math. Students with low literacy may be held back from making progress in range of academic areas, including math. Designers of products that offer primarily text-based instruction and require students to learn by reading need to consider the student's reading level and perhaps provide online dictionaries of key terms and alternative representations of the content such as video presentations and audio translations. Product developers may also consider assessing students' literacy skills during their initial use of the product and identifying for instructors students who may need extra support and monitoring as they work with the product.

Some students may experience anxiety and be resistant to using the product during the transition to independent online learning environments. Although in interviews and surveys many students expressed satisfaction with the products they used and felt they benefited from their use, about 20% of students reported they did not. For these students, the transition to independent online learning may take longer and require more support from instructors; some students might never make the transition. An instructor from Site 10 described his own class's transition to using MyFoundationsLab as the primary mode of instruction:

> *Overall a lot of them are very overwhelmed at first. It's a lot to do in a little bit of time…. Once we kind of get going, and they see that I'm there to help, that they get one-on-one attention, by the end of class those that stay [enrolled] tell me how helpful it is.*

However, the same instructor reported that some of her older students showed the greatest resistance: "Older students seemed to feel like they had been shoved into a computer class and they were not there to have a computer class…[they] felt like it was the college's way of blowing them off."

Impacts of Product Use on Learning

We had planned to estimate the impact of product use on student learning outcomes for each site and product, but limitations in the data sets reduced estimation to 6 program sites.[6] Two analytical approaches were used. The first compared performance on standardized learning measures between students who used the products and those who did not. In this approach, we included only those students who used the products 10 or more hours during the study. In the comparison group were students who did not use the products and either (1) were enrolled in the same program but in different classes or campuses (concurrent cohort design) or (2) were enrolled in the program in a prior year before the adoption of the technology (prior cohort design). In both cases, we used matching techniques to improve the quality of the matches at baseline.

In the second approach, we analyzed the relationship between the intensity of use and students' performance on a standardized posttest measure for those students who used the product. The question examined with this analysis was: Did students who used the products more frequently show greater gains in learning outcomes and skill development than students who used the products less often?

We attempted to isolate the effect of the products on learning outcomes from other factors by controlling for factors in our models that may have been associated with better test scores and that were external to the use of the products, such as students' age, gender, and incoming skill levels. A detailed explanation of the analytical models and tables with results are provided in Appendix A.

[6] Impacts were estimated for only 6 of the 14 pilot sites because (1) an insufficient number of eligible students were available for analysis (5 sites), (2) sites that provided grade equivalence scores for TABE failed to provide information about the level of test used for the pretest and posttest (2 sites), or (3) the site did not have a viable comparison group available because the product was implemented in a new course (1 site). Students in courses that used products were included in the impact analysis if they used the products for 10 or more hours based on usage computed from the products' back end data provided by the vendors. For a site to be included in the impact analysis, we needed to identify at least 25 eligible students in the both the user and nonuser groups. Five sites had too few eligible students due to (1) low initial enrollments and completions, (2) insufficient use of the product (less than 10 hours), or (3) missing scores on pretest and/or posttest achievement measures.

Assessments of Student Learning

We used two sources of data to measure gains in student literacy and math skills. The primary and most complete data set on learning was from the ABE programs' own student records. Except for Site 10, all institutions had a policy of testing students when they entered the program (pretest) and when they exited the program or after a period of instructional hours as required by federal reporting guidelines (e.g., after 40 hours of instruction). The most prevalent assessment ABE programs used for state and federal accountability purposes was the Test of Adult Basic Education (TABE; http://www.datarecognitioncorp.com/Assessment-Solutions/Pages/TABE.aspx). Pretest and posttest TABE scores were available for 8 of the 10 sites included in the analyses. Scores on the STAR assessment were available and analyzed for Site 12, and scores on the Comprehensive Adult Student Assessment Systems (CASAS; https://www.casas.org/home) were available for students enrolled at Site 11 campuses.[7]

Student Samples Included in Impact Analyses

Impact analyses were conducted on a subgroup of students who enrolled in the participating ABE programs during the study. Students were included in the impact analyses if they had both a pretest and a posttest score available. Student mobility is high at some of the sites, with many students leaving a program before the administration of a posttest, so many students were excluded from the analyses because of the lack of a posttest score. In addition, in estimating the impacts of product use on students' cognitive skills by comparing scores for students who used a product and students in the same ABE program who did not, we restricted the user or "treatment" sample to students who used a product for 10 or more hours to understand the potential impact for students who used a product for a relatively meaningful amount of time. Further, some students were excluded from the analyses when we used propensity score matching to help improve the equivalence of the groups that were compared. In some instances, students were dropped from the analyses because we could not identify a similar student in the control group. Finally, in the case of GED Academy and MyFoundationsLab, two products that provided instruction in both reading and math, impacts were estimated separately for students who used the product in a particular subject area (some students used the product in one subject area but not the other).

[7] Scale scores were analyzed whenever available from sites. However, for 4 of the 10 sites only grade-equivalent scores were provided and analyzed (Site 2, Site 3, Site 5, and Site 14).

Limitations of Impact Analyses

Effects based on comparative impact designs. Even though the designs applied were the most rigorous available, they could not completely isolate the impacts of the digital learning technologies from other aspects of the use models and learning environments that might also affect learning, such as differences in instructor quality. The comparative quasi-experimental designs we used to collect evidence on product impacts are described in Appendix A (Section A4). For each impact estimated, although the comparison group (nontechnology users) may have been similar in many ways to the group of students using the product, important differences between the two group may have still existed (e.g., differences in curriculum, instructor capacity, and unobserved differences in the characteristics of the students). These existing differences may explain differences between the groups on the posttest above and beyond any effect due to the use of the product. Thus, because we cannot completely isolate the effect of the introduction of a product in a curriculum from other key differences between the product user and nonuser groups, we cannot be sure the estimated impact was caused by the use of the product alone.

Finally, the impacts estimated are based on measures of academic cognitive skills only, assessed through the administration of comprehensive standardized tests. Use of the products may have impacted other skills and attitudes of importance to students, ABE sites, employers, and the product vendors (such as students' digital literacy skills and confidence they can acquire academic skills and can use digital resources to learn independently), but these were not measured reliably or consistently across students and were not the primary focus of this research.

Examining the relationship between use and student outcomes. In these analyses, examined the degree to which time spent using a product was related to student performance on standardized measures of achievement (see Appendix A, Section A5, for details). Although these models can help indicate whether a relationship between use and learning outcomes exists, they cannot be used to establish, with any level of confidence, whether product use *caused* better student leaning outcomes. There are multiple plausible explanations for any of the reported associations. The findings should be treated as exploratory and positive associations as promising but not definitive evidence of a causal connection between greater product use and improved learning and skill development.

Findings from Comparative Impact Analysis

To estimate the impacts of product use on student learning, we compared the scores on a learning assessment for students who used a product and students who did not. Propensity score matching was used, a technique for improving the baseline equivalence of the groups that were compared (see details about the models in Appendix A). Only in Site 14 were we unable to adequately adjust for initial baseline nonequivalence well enough to meet standards for impact estimation. As a result, that site was dropped from this analysis. In Site 7 and Site 8, the sample sizes were too small to estimate an impact because of a combination of low enrollments, missing test scores, and low use of the products (less than 10 hours of use). For Site 10 (MyFoundationsLab), the impacts estimated were based on comparing matriculation and pass rates for an entry-level credit-bearing English course that followed the noncredit developmental education course the products were used in (following program policy, no posttest was administered in the developmental education course). Because few students in our sample matriculated to the credit-bearing course, the sample available for estimating impacts was not sufficient, so impact results for Site 10 also are unavailable. Finally, we requested scale scores for each test administered from all program sites, but a few sites using the TABE could provide only grade-equivalent scores. However, because grade-equivalent scores are not comparable across different test levels (TABE uses separate forms to assess students at different skills levels), two sites, Site 2 and Site 5, were eventually excluded from the analyses because they could not provide information on the test form used for the pretest and posttest.

To aid in interpreting the differences in test scores across sites, tests, grade levels, and subject areas, we report the difference in adjusted mean scores as a standardized effect size. An effect size expresses the difference between two mean scores in terms of how spread out the scores are. (Technically, the effect size is expressed in terms of standard deviations of outcome scores.)[8] An effect size of 0.3, for example, means that one group on average scored 0.3 standard deviation higher than the other group. This would apply whether the scale of the test score were 0 to 100, 150 to 600, or any other measure. That is, an effect size of 0.3 would essentially represent the same magnitude of difference regardless of the underlying point

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[8] An effect size is commonly computed by taking the mean difference in test scores between the treatment and comparison groups and dividing it by the pooled standard deviation for the total sample (treatment and comparison students combined).

system used by the outcome measure. Because of this property, researchers commonly use effect sizes to compare the impacts of interventions across analyses using different tests.

In addition to reporting an effect size for each site and outcome measure analyzed, we provide the 95% confidence interval to give a sense of the precision and the uncertainty of an estimate. The confidence interval describes the probability (95%) that the true impact lies somewhere within the interval if we were to rerun the study with a different sample of schools, instructors, and students within these sites. Confidence intervals rather than point estimates alone are often preferred by researchers because they include information about the uncertainty of the point estimate. Every value in the confidence interval is a plausible value for the effect. If zero is in the interval, the null hypotheses, a zero effect cannot be rejected. In general, the larger the sample size, the greater the precision of the point estimate and the narrower the confidence interval.

Table 11 shows the results of the impact analyses for learning outcomes. It presents the adjusted differences in the gains between groups as well as estimated effect sizes (Hedges' g) and confidence intervals. Statistically significant results are in boldface. Figures 2 and 3 indicate how the distribution of the effects vary across products and program sites, in descending order from positive to negative, for reading and language and math. The width of the bars represents the minimum and maximum of the 95% confidence interval. When the interval includes an effect size of zero, the actual effect may include a no-effect result and the estimated impact is considered not statistically significant.

Table 11. Impact Results for Comparative Analyses

Product and Site	Test	Condition	*N*	Pre-test	Post-test	Adjusted Mean Differences	Effect Size	Effect Size 95% CI	
				Mean (*SD*)	Mean (*SD*)		Hedge's *g*	Min	Max
ALEKS									
Site 1	TABE Math	Control	54	493.6 (30.4)	523.9 (40.7)	11.6	0.28	-0.09	0.65
		Treatment	53	499.3 (41.8)	539.7 (41.4)				
Core Skills Mastery									
Site 3	**TABE Math (Grade Equivalent)**	**Control**	**33**	**9.3 (2.7)**	**9.3 (2.9)**	**1.28**	**0.48**	**0.05**	**0.91**
		Treatment	**67**	**9.2 (2.6)**	**10.3 (2.5)**				
	TABE Read (Grade Equivalent)	Control	42	8.9 (2.4)	9.2 (2.6)		0.24	-0.17	0.64
		Treatment	52	9.0 (2.6)	9.3 (2.7)				
GED Academy									
Site 6	TABE Math	Control	46	488.7 (62.0)	527.7 (45.5)	-5.24	-0.11	-0.54	0.32
		Treatment	40	491.6 (52.4)	525.9 (47.3)				
	TABE Reading	Control	41	528.3 (58.5)	532.5 (47.6)	7.67	0.16	-0.29	0.61
		Treatment	33	541.5 (55.7)	548.1 (44.3)				
	TABE Language	Control	45	489.1 (68.8)	512.8 (51.4)	8.9	0.16	-0.29	0.61
		Treatment	35	498.2 (64.7)	524.2 (58.7)				

Table 11. Impact Results for Comparative Analyses (concluded)

Product and Site	Test	Condition	*N*	Pre-test	Post-test	Adjusted Mean Differences	Effect Size	Effect Size 95% CI	
				Mean (*SD*)	Mean (*SD*)		Hedges' *g*	Min	Max
MyFoundationsLab									
Site 9	TABE Math	Control	90	490.6 (60.7)	522.5 (63.8)	-5.37	-0.08	-0.39	0.23
		Treatment	73	494.2 (56.19)	519.8 (61.7)				
	TABE Reading	Control	89	549.9 (71.7)	555.1 (61.1)	-18.21	-0.3	-0.61	0.01
		Treatment	70	546.8 (72.0)	536.5 (60.2)				
	TABE Language	Control	91	537.3 (51.7)	551.8 (60.3)	-8.04	-0.13	-0.44	0.18
		Treatment	75	531.9 (74.2)	540.4 (67.5)				
Site 11	CASAS Math	Control	176	218.7 (9.8)	225.8 (10.6)	-0.72	-0.07	-0.34	0.2
		Treatment	76	220.6 (10.0)	226.4 (9.3)				
	CASAS Reading	Control	161	231.4 (10.0)	238 (10.2)	-0.26	-0.03	-0.38	0.32
		Treatment	36	231.6 (9.8)	237.9 (8.96)				
Reading Horizons Elevate									
Site 12	STAR Winter	Control	38	523.7 (110.9)	552.5 (143.9)	29.51	0.19	-0.24	0.62
		Treatment	43	516.3 (129.0)	557.0 (165.5)				
	STAR Spring	Control	60	540.4 (97.3)	711.5 (230.2)	-96.82	-0.49	-0.9	-0.08
		Treatment	40	528.9 (114.1)	596.7 (156.5)				

Figure 2. Effect Sizes for Reading and Language, by Product and Program Site

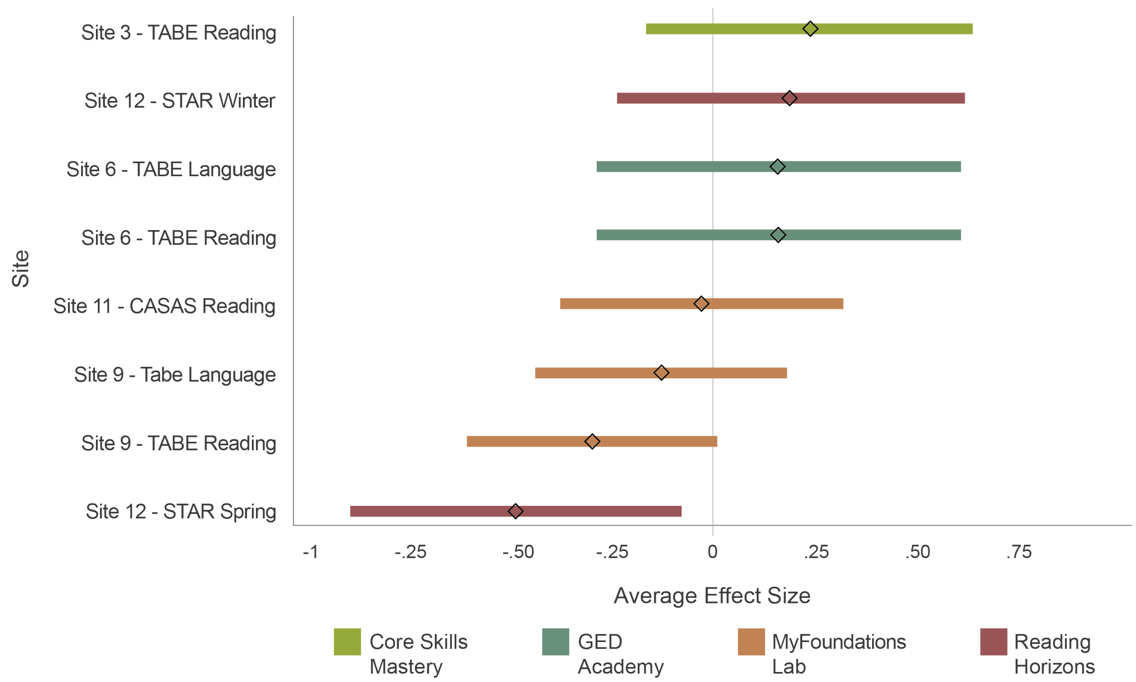
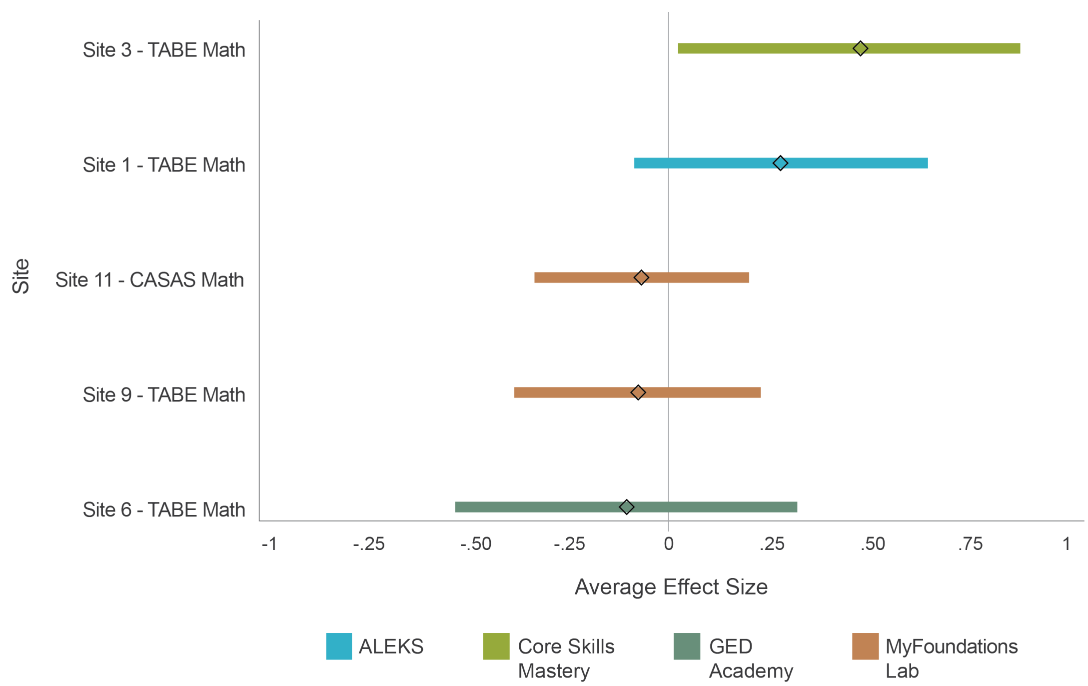


Figure 3. Effect Sizes for Math, by Product and Program Site



Estimating impacts of product use on student learning through a quasi-experimental matched control group design produced mixed results. We found positive impacts for some sites and outcome measures but negative impacts for others. Impacts for reading and math assessments were estimated for six unique program sites (five for reading and five for math) and all five products.[9] Of the 13 separate impacts estimated for reading and math, 6 were positive and 7 were negative, but only 2 of the effects estimated were statistically reliable (one positive and one negative). Overall, the effects estimated for math were slightly larger than for reading. Moderate to large statistically reliable positive impacts were found for one product in one program site: Core Skills Mastery (effect size for TABE Math = +0.48). A moderate to large statistically significant negative effect was found for one product in a single site: Reading Horizons (effect size for STAR Reading [spring] = -0.49).

Findings from Correlation of Use with Achievement Outcomes

In these analyses, we examined the relationship between the average total time per day students used a product and their scores on a standardized assessment ABE program sites administered as a posttest. To attempt to control for the possibility that students' background characteristics and prior skill level may have influenced how often they used a product and, independently, how well they scored on the posttest, in the models we controlled for background characteristics (e.g., age, gender) and pretest scores on the same assessment. We also controlled for the number of days between the pretest and posttest because this varied by ABE program site and sometimes within program sites. Additional details about the analytical models and a complete table of results are in Appendix A.

The results of the analyses are shown in Table 12 including the direction of the relationship between the intensity of product use and students' posttest scores. Overall, the results were inconclusive but tended to be more positive than negative: Greater use of the products was associated with better gains in student test scores. Most of the relationships were not statistically significant except in two cases. Of the 19 estimated relationships, linking use levels to learning outcomes, 12 of the relationships were positive and 7 were negative. Only two of

[9] Impacts were estimated for only 6 of the 14 sites because (1) an insufficient number of eligible students were available for analysis (5 sites), (2) sites that provided grade equivalence scores for TABE failed to provide information about the level of test used for the pretest and posttest (2 sites), or (3) the site did not have a viable comparison group available because the product was implemented in a new course (1 site). Students in courses that used products were included in the impact analysis if they used the products for 10 or more hours based on usage computed from the products' back end data provided by the vendors. For a site to be included in the impact analysis, we needed to identify at least 25 eligible students in the both the user and nonuser groups. Five sites had too few eligible students due to (1) low initial enrollments and completions, (2) insufficient use of the product (less than 10 hours), or (3) missing scores on pretest and/or posttest achievement measures.

these estimates were statistically significant ($p < .05$), one positive (TABE Reading for Reading Horizons in Site 14) and one negative (TABE Reading for Core Skills Mastery in Site 3). The direction of the relationships was often mixed within products, varying in some cases by site and outcome measure. However, the relationships between use levels and outcomes were consistently positive for ALEKS across two sites and for GED Academy within Site 6 across all three content areas (math, reading, and language).

Table 12. Relationship Between Duration of Use per Day and Scores on Learning Assessment

Product	Site	Posttest Measure	*N*	Direction of Relationship
ALEKS	Site 1	TABE Math	56	Positive
ALEKS	Site 2	TABE Math	38	Positive
ALEKS	Site 3	TABE Math	73	Negative
ALEKS	Site 3	TABE Reading	66	Negative**
ALEKS	Site 4	ESOL Math	33	Positive
ALEKS	Site 4	ESOL Read	33	Negative
ALEKS	Site 5	TABE Math	35	Negative
ALEKS	Site 5	TABE Reading	27	Positive
GED Academy	Site 6	TABE Math	55	Positive
GED Academy	Site 6	TABE Reading	49	Positive
GED Academy	Site 6	TABE Language	48	Positive
MyFoundationsLab	Site 9	TABE Math	134	Negative
MyFoundationsLab	Site 9	TABE Reading	134	Positive
MyFoundationsLab	Site 9	TABE Language	151	Negative
MyFoundationsLab	Site 11	CASAS Math	115	Positive
MyFoundationsLab	Site 11	CASAS Reading	50	Positive
Reading Horizons Elevate	Site 12	Winter STAR	51	Negative
Reading Horizons Elevate	Site 12	Spring STAR	47	Negative
Reading Horizons Elevate	Site 14	TABE Reading	23	Positive**

** $p < .01$

Conclusions and Implications of the Research Findings

The education technology revolution in K–12 and postsecondary education has yet to reach adult basic education in a meaningful way. New efforts to raise awareness of offerings such as EdSurge's *Edtech Index for ABE* show a splintered product space of a few products with limited coverage. The supply appears to be inadequate to support the full range of students who are relying on ABE programs to build the skills that will enable them to find better job opportunities (www.edsurge.com/product-reviews/college-resources/adult-education). There is even less research evidence and information to help ABE program administrators and instructors as well as product developers understand which products, product features, models of use, and student supports are associated with effective learning technology implementations. The goal of this research project was to begin to generate some reliable independent evidence and information on the supports and practices needed to leverage the potential value of digital technologies for an ABE student population.

Overall, programs, instructors, and students found value in the digital learning technologies they used in the study. Instructors reported that the use of the products enabled them to differentiate instruction to fill gaps in basic literacy and math skills across a wide range of students in ways that were not possible without the products. In addition, a majority of students, but not all, reported that they enjoyed using the products and that the products helped them improve their math and reading skills and gave them confidence they could use online resources to learn on their own without an instructor's direct involvement. A majority of students also reported that they used the products to continue learning outside the regularly scheduled class time.

The significance of these findings should not be underestimated. Many of the students enrolled in ABE program have had little prior success developing their basic skills in formal education environments. This was probably the first time that many of them had used learning technologies in a meaningful way. Given the size of the population in need of the kinds of services ABE programs provide, these findings indicate that learning technologies like those in this study can be part of the solution, helping ABE programs and instructors do what they do better and providing many adults with the confidence that they can use online resources on their own time and at their own pace, inside and outside a formal ABE program.

However, this research did uncover challenges in using learning technologies with low-skilled adults in ABE programs. Use of the products at several sites was well below what had been planned at the study outset. Instructors reported having insufficient time to plan how best to integrate the products into their curriculum and, in particular, to learn how to use the feedback on student performance captured by the systems to inform their instruction and identify the students who were struggling the most. Across the board, the training the instructors received from vendors was relatively modest; although it was adequate to get them and their students started on the products, it was probably insufficient to enable the instructors to leverage the full potential of the products with their students. Vendors, state and federal agencies, and professional associations responsible for supporting ABE programs and instructors need to continue to develop and disseminate instructional online resources and webinar trainings that offer practical guidance and models of implementation that have been demonstrated to be effective across a variety of programs and student populations.

The primary challenge facing ABE programs, instructors and product developers is how to engage and support all students in online learning environments. While a majority of students reported they enjoyed using the products, would recommend them to their peers, and thought they benefited from using the products in important ways, 1 in 5 students did not. In general, these students reported that they preferred working directly with instructors over learning online and with technology. This finding will not be a surprise to anyone who has spent time with these students. A majority of them, all over age 18 and struggling to read and do math at the fourth- to ninth-grade level, have had difficulty learning throughout their lives. Several instructors interviewed said they thought the reading level of several of the products was too difficult for many of their students at the low end of the reading spectrum. Further, depending on the learning scaffolds embedded in the products, the immediacy of instructors' support, and students' ability to seek help when needed, some students may become stuck in a digital learning environment and experience frustration. Product developers and ABE programs and instructors must be aware that without the proper design features, supports, and monitoring in place, a certain percentage of the most vulnerable students will struggle in any learning environment. Products and the ABE programs that implement them must be designed to identify these students before they enter the digital learning environment and provide appropriate support once they start using the product.

This research does suggest that under the right conditions, ABE programs can effectively integrate learning technology products into their curriculum and that most students will use them for a significant amount of time on and off site and will have a positive experience. Greater use occurred when ABE program sites and instructors were committed to using the products as a core and required instructional activity with time explicitly scheduled for use. Another success factor was close monitoring and support of students' use of the product. We also found that it is possible to use digital learning technologies with low-skilled adults as the primary instructional content and delivery mode (i.e., online use model), with instructors acting as facilitators and providing motivational and individualized support as needed. However, for technology-based instructional products like those in this study, for many students, particularly those with the lowest skills, blended and hybrid models with instructors delivering 50% or more of the instruction will probably be the most prevalent and perhaps the most effective for most ABE programs.

An initial set of recommendations for ABE program administrators, instructors, and product developers, based on these research findings, follows.

For ABE program administrators and instructors

- To ensure that students spend sufficient time on the products and make adequate progress, commit to using the products as a regular part of core instruction (not as an add-on activity) and make use mandatory and consequential.
- To support product use outside scheduled class time, help students take advantage of federal, state, and local programs providing low-cost devices and Internet access and make sure all students know how and where they can obtain devices and connectivity on and off site (e.g., public libraries, workplaces, and community resource centers). In addition, provide incentives for off-hour use.
- To help ensure instructors' commit to using the products, provide adequate time for training, planning, and piloting to ensure better integration of the products into the curriculum and the instructors' own practices.
- Prepare to offer students who are struggling with the transition to online learning additional monitoring and support, including a more gradual ramp-up time on the products and alternative instructional activities during the transition. Plan for the likelihood that some students will not want to make a transition to digital instruction.

For developers and vendors of ABE products:

- To ensure that all students can access the instructional content, particularly struggling readers, scaffold the text with audio and video presentations.

- To encourage and motivate student progress, provide immediate and meaningful feedback, hints, access to solution steps (particularly in math), recommendations for seeking instructors' help when necessary, and encouragement for persistence to help prevent frustration among struggling learners.
- To support blended learning models and to keep instructors invested in students' work in the online environment, make the content modular so that programs and instructors can better integrate product use into the existing curriculum and with direct instruction. Teachers like the fact that the products' instruction is individualized and allows students to work at their own pace on the skills they need. Yet many teachers wishing to implement blended instruction feel disconnected from what students are working on when the product's instructional content is not the same as what is being covered in the classroom. These teachers are less likely to be invested in the use of the technology and are more likely to resort to potentially less effective hybrid and supplemental models of use.
- To help motivate instructors and students to use a product, make sure the content is aligned with all current ABE standards and competency exams.
- To ensure instructors leverage the information in the student progress dashboards, provide training specifically on their use as well as online resources and models to demonstrate how the dashboards can be used to support students and inform the instructor's direct instruction.
- Provide sites with a variety of models of use to support a range of student types and program goals. Most students can learn online and independently with proper monitoring, coaching, and motivating factors.

This research represents an initial step in exploring how digital learning products might support the goals of ABE programs and their students. Given the wide variety of skills of the adult learners and the different ABE goals and resources, more rigorous research is needed to understand which product features and aspects of online, blended, and hybrid use models are the most feasible and the most effective for ABE programs. Digital learning technologies like those selected for this study, although not the solution for all ABE program needs, can be an important support for programs and instructors in expanding access to basic skills instruction and improving outcomes for low-skilled adults.

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Appendix A. Technical Appendix

Described here are the data collection methods, survey response rates, the modeling of student predictors of product use, the modeling of impacts of product use on academic achievement, and the modeling of the relationship between product use and achievement data from the 14 pilot sites.

A.1 Data Collection and Preparation Procedures

Student demographics and achievement data were accessed directly from the sites. Additional participant background data and product implementation data were collected through participant surveys (student and instructor) and from product vendors (individual students' use of the products). Participant surveys were administered online and on paper. Online surveys were collected through SRI secure online survey system, and the paper surveys were administered by program site administrators and instructors and mailed back to SRI International for processing. All product use and student achievement data were accessed according to the approved data collection plan and, where applicable, the respective program sites' Institutional Review Board policies and SRI's Institutional Review Board policies. The sites provided data only after site leaders and SRI signed a data use agreement that outlined how the data would be used and secured and how student confidentiality would be protected.

To maintain instructor and student data confidentiality, the data were archived in a secure file server at SRI to which only a limited number of approved SRI analysts had access. An SRI staff member not otherwise involved in the project anonymized the data files before releasing them to the analysis team by substituting the site-specific ID or personally identifiable information with a consistently formatted SRI-generated ID number.

A.2 Instructor and Student Survey Response Rates

Table A-1 shows response rates and the number of respondents by product and site for the instructor and student surveys. The overall response rates were 31% (*N* = 486) for the student survey and 70% (*N* = 74) for the instructor survey. The sample included students who completed the course or remained in it until the end of the term as well as students who withdrew or dropped during the period of the study. Students who withdrew or dropped out of a course may have done so before the administration of the survey. The denominator for computing the student survey response rate was the number of student product users. Students were considered a "product user" if they were associated with a unique product log-in identifier in the system use data file provided by each vendor.

Table A-1. Survey Response Rates for Students and Instructors

Product and Site (State)	Student Survey		Instructor Survey	
	N	Percent	*N*	Percent
ALEKS	84	55%	6	86%
Site 1(CO)	52	54%	3	75%
Site 2 (Program A, CA; Program B, CA; Program C, MA)	32	57%	3	100%
Core Skills Mastery	92	30%	10	63%
Site 3 (IL)	29	47%	1	17%
Site 4 Adult Diploma Program (OH)	44	34%	2	100%
Site 5 (CO)	19	15%	7	88%
GED Academy	90	32%	14	82%
Site 6 Adult Basic and Literacy Education (OH)	67	45%	5	83%
Site 7 (KS)	22	28%	3	75%
Site 8 (KY)	1	2%	6	86%

Table A-1. Survey Response Rates for Students and Instructors (concluded)

Product and Site (State)	Student Survey		Instructor Survey	
	N	Percent	*N*	Percent
MyFoundationsLab	137	22%	32	67%
Site 9 (AZ)	57	26%	8	89%
Site 10 (IN)	4	2%	13	50%
Site 11 (RI)	76	40%	11	85%
Reading Horizons Elevate	83	40%	12	71%
Site 12 (IL)	26	36%	6	67%
Site 13 (UT)	20	35%	1	50%
Site 14 (KY)	37	46%	5	83%
Overall	486	31%	74	70%

A.3 Student-Level Predictors of Product Use

Analytical Model and Results

We ran separate models for the five products in the study. The total time students were logged in to the product, measured in hours, was the dependent variable. For two products, MFL and ALEKS, outliers were recoded so they did not exceed a maximum of 5 hours (300 minutes) per day. Given the distribution of the dependent variable, we determined that a multiple linear regression was not suitable. A Poisson regression model was considered. However, given evidence of overdispersion in the dependent variable, we ultimately selected a negative binomial regression to model the dependent variable. When provided by the program site, we controlled for age, gender, and prior achievement. We also specified robust standard errors. For purposes of interpretation, age was centered around the median and prior achievement was centered around the mean. The output was reported in incidence rate ratios. Both univariate and multivariate models were run, univariate models to determine whether there was a statistical difference in product use with respect to a single variable and multivariate models to determine which variables were most significant.

Table A-2 shows the percentage of student product users included in the final univariate models. Again, students were considered a product user if they were associated with a unique product log-in identifier in the system use data file provided by each vendor. The sample included students who completed the course or remained in it until the end of the term as well as students who withdrew or dropped out during the period of the study.

Table A-2. Student Product Users Included in the Univariate Analyses as a Percentage of All Users

Product	Model 1 – Gender (N)	Model 2 – Age (N)	Model 3 - Math Prior Achievement (N)	Model 4 - Reading Prior Achievement (N)
ALEKS	95% (144)	95% (144)	95% (144)	NA
Core Skills Mastery	99% (303)	41% (125)	66% (200)	58% (177)
GED Academy	98% (278)	98% (279)	88% (251)	74% (212)
MyFoundationsLab	95% (596)	100% (628)	84% (530)	74% (462)
Reading Horizons Elevate	94% (198)	94% (197)	NA	100% (210)

Tables A-3 to A-7 show the results for the negative binomial regression models by product.

Table A-3. ALEKS. Results of Student-Level Predictors of Product Use (Total Hours)

Variable	(1) Univariate Model with Gender	(2) Univariate Model with Age	(3) Univariate Model with Pre-math Score	(4) Multivariate Model with Pre-math Score
Female	1.884***			1.492***
	(0.286)[a]			(0.219)
Age (median split)		1.052***		1.045***
		(0.00964)		(0.00890)
Pre-math score (median split)			1.009	0.959
			(0.0543)	(0.0417)
Constant	19.08***	21.63***	27.86***	17.62***
	(1.914)	(1.795)	(2.414)	(1.862)
Alpha	0.915	0.845	1.006	0.807
	(0.125)	(0.124)	(0.141)	(0.118)
Observations	144	144	144	144
Pseudo R^2	0.0257	0.0257	0.0257	0.0257
Sites included in analysis	Site 1 Site 2	Site 1 Site 2	Site 1 Site 2	Site 1 Site 2

Dependent Variable: *Total time (hours).* ***Model:*** *Negative binomial regression (coefficients reported as rate ratios).*
[a]*Robust standard errors for rate ratios in parentheses.*
****p < .01, **p < .05, *p < .1*

Table A-4. Core Skills Mastery. Results of Student-Level Predictors of Product Use (Total Hours)

Variable	(1) Univariate Model with Gender	(2) Univariate Model with Age	(3) Univariate Model with Pre-math Score	(4) Univariate Model with Pre- reading Score	(5) Multivariate Model with Pre-math Score	(6) Multivariate Model with Pre- reading Score
Female	2.499*** (0.409)[a]				1.724** (0.431)	1.995*** (0.524)
Age (median split)		1.017 (0.0135)			1.009 (0.0132)	1.019 (0.0152)
Pre-math score (median split)			1.127*** (0.0335)		0.863** (0.0625)	
Pre-read score (median split)				1.066** (0.0319)		0.932 (0.0411)
Constant	18.99*** (2.696)	14.45*** (2.178)	33.61*** (3.272)	40.55*** (3.544)	9.412*** (1.584)	9.857*** (1.686)
Alpha	1.623*** (0.135)	1.705*** (0.233)	1.556*** (0.142)	1.501*** (0.135)	1.588*** (0.214)	1.602*** (0.215)
Observations **Pseudo R^2**	303 0.0118	125 0.0118	200 0.0118	177 0.0118	116 0.0118	94 0.0118
Sites included in analysis	Site 3 Site 5 Site 4	Site 5	Site 3 Site 5	Site 3 Site 5	Site 5	Site 5

Dependent Variable: *Total time (hours).* ***Model:*** *Negative binomial regression (coefficients reported as rate ratios).*
[a]*Robust standard errors for rate ratios in parentheses.*
****p < .01, **p< .05, *p < .1*

Table A-5. GED Academy. Results of Student-Level Predictors of Product Use (Total Hours)

Variable	(1) Univariate Model with Gender	(2) Univariate Model with Age	(3) Univariate Model with Pre-math Score	(4) Univariate Model with Pre-reading Score	(5) Multivariate Model with Pre-math Score	(6) Multivariate Model with Pre-reading Score
Female	1.692*** (0.335)[a]				1.464* (0.296)	1.633** (0.389)
Age (median split)		1.052*** (0.00909)			1.046*** (0.00947)	1.053*** (0.00968)
Pre-math score[b] (median split)			1.152 (0.109)		0.999 (0.0938)	
Pre-read score[b] (median split)				0.812** (0.0841)		0.835* (0.0824)
Constant	9.772*** (1.603)	10.87*** (1.074)	14.25*** (1.314)	15.12*** (1.529)	8.781*** (1.497)	8.178*** (1.689)
Alpha	3.144*** (0.290)	2.961*** (0.278)	3.208*** (0.328)	3.044*** (0.324)	2.880*** (0.302)	2.609*** (0.297)
Observations	278	279	251	212	250	212
Pseudo R^2	0.0030	0.0118	0.0210	0.0210	0.0210	0.0210
Sites included in analysis	Site 6 Site 7 Site 8	Site 6 Site 7 Site 8	Site 6 Site 7 Site 8	Site 6 Site 7 Site 8	Site 6 Site 7 Site 8	Site 6 Site 7 Site 8

Dependent Variable: *Total time (hours).* ***Model:*** *Negative binomial regression (coefficients reported as rate ratios).*
[a]Robust standard errors for rate ratios in parentheses.
[b]Scores standardized across program sites. Program sites used different pretest assessments.
****p < .01, **p < .05, *p < .1*

Table A-6. MyFoundationsLab. Results of Student-Level Predictors of Product Use (Total Hours)

Variable	(1) Univariate Model with Gender	(2) Univariate Model with Age	(3) Univariate Model with Pre-math Score	(4) Univariate Model with Pre-reading Score	(5) Multivariate Model with Pre-math Score	(6) Multivariate Model with Pre-reading Score
Female	1.248 (0.181)[a]				1.103 (0.158)	1.051 (0.183)
Age (centered)		1.032*** (0.00604)			1.025*** (0.00659)	1.033*** (0.00873)
Pre-math score[b] (median split)			0.933 (0.0884)		0.937 (0.0759)	
Pre-read score[b] (median split)				1.014 (0.0905)		0.934 (0.0789)
Constant	19.91*** (1.859)	19.63*** (1.286)	23.67*** (1.801)	22.22*** (1.901)	19.74*** (1.688)	18.52*** (1.663)
Alpha	1.319*** (0.0884)	1.262*** (0.0808)	1.233*** (0.0894)	1.298*** (0.106)	1.166** (0.0857)	1.203** (0.0987)
Observations	624	628	530	462	526	458
Pseudo R^2	0.00954	0.00954	0.00954	0.00954	0.00954	0.00954
Sites included in analysis	Site 9 Site 10 Site 11	Site 9 Site 10 Site 11	Site 9 Site 10 Site 11	Site 9 Site 10 Site 11	Site 9 Site 10 Site 11	Site 9 Site 10 Site 11

Dependent Variable: *Total time (hours).* ***Model:*** *Negative binomial regression (coefficients reported as rate ratios).*
[a]*Robust standard errors for rate ratios in parentheses.*
[b]*Scores standardized across program sites. Program sites used different pretest assessments.*
****p < .01, **p < .05, *p < .1*

Table A-7. Reading Horizons Elevate. Results of Student-Level Predictors of Product Use (Total Hours)

Variable	(1) Univariate Model with Gender	(2) Univariate Model with Age	(3) Univariate Model with Pre-math Score	(4) Univariate Model with Pre-reading Score	(5) Multivariate Model with Pre-math Score	(6) Multivariate Model with Pre-reading Score
Female	1.392** (0.214)[a]				1.127 (0.314)	1.233 (0.193)
Age (median split)		1.013** (0.00516)			1.019** (0.00881)	1.013** (0.00524)
Pre-math score (median split)			1.048 (0.112)		1.056 (0.111)	
Pre-read score (median split)				0.768*** (0.0543)		0.792*** (0.0580)
Constant	5.845*** (0.747)	6.475*** (0.554)	8.815*** (1.055)	6.846*** (0.484)	6.888*** (1.851)	5.526*** (0.721)
Alpha	1.209* (0.128)	1.184 (0.131)	0.703* (0.146)	1.191 (0.131)	0.633** (0.146)	1.119 (0.135)
Observations	198	197	52	199	51	188
Pseudo R^2	0.0032	0.0044	0.0005	0.0126	0.0122	0.0136
Sites included in analysis	Site 12 Site 13 Site 14	Site 12 Site 13 Site 14	Site 13	Site 12 Site 13 Site 14	Site 13	Site 12 Site 13 Site 14

Dependent Variable: *Total time (hours).* ***Model:*** *Negative binomial regression (coefficients reported as rate ratios).*
[a]*Robust standard errors for rate ratios in parentheses.*
****p < .01, **p < .05, *p < .1*

A.4 Estimating Product Impacts on Student Achievement

This section describes the preparation and modeling of academic achievement data from the study sites.

Students Included in the Study Sample

1. We limited the sample to students who used the product for 10 or more hours during the period of the study. The rationale was to ensure that we were estimating the impacts of product use on learning for students who used the product for a relatively significant period of time—at least half the total time specified by the research team (20 hours).

2. Students with complete demographic information (i.e., gender and age) and academic achievement information (e.g., TABE scores before product use and post-TABE scores) were included in the analysis. This enabled us to find a matched and balanced comparison group to estimate impacts on student academic achievement.

3. We further limited the sample to students who took the pretest within 14 days of using the product the first time. When information was available, a maximum period of 14 days between the pretest and the student's program or product start date (whichever was available) was included as an exclusionary criterion in the analysis. By adding this constraint, we attempted to standardize the timing of the administration of the prior achievement measure (e.g., TABE scores before the start of the program) and the amount of instructional time between the pretest and posttest so that it was comparable across students and across the treatment and comparison groups.

Dependent and Independent Variables

The variables included in the statistical models were as follows.

1. **Academic achievement variables:** Scores on an academic achievement test administered by the program sites at or near enrollment (i.e., pretest scores) and at the end of the targeted course or after a predetermined period of instruction, typically 40 hours (i.e., posttest scores). Posttest scores were used as the dependent variable. The pretest scores associated with achievement at or near enrollment and before use of the products were used as a covariate in the model. Sites used a range of tests including TABE Math, TABE Reading, TABE Language, STAR, CASAS Math, and CASAS

Reading. Most sites administered both math and reading achievement tests. We requested scale scores for each test administered from all program sites. A few sites could provide only grade-equivalent scores for the TABE. However, because grade-equivalent scores are not comparable across test levels, two sites, Site 2 and Site 5, were eventually excluded from the analyses because they could not provide information on the test level used for the pretest and posttest.

2. **Demographic variables:** Age and gender.
3. **Instructional time:** Elapsed time (days) between pretest and posttest.

Equivalence of Site Location, Instructors, Curriculum, and Instructional Time

Table A-8 indicates the extent to which the program site location, instructors, curriculum, and instructional time were the same or different for treatment and control students. When data were available, the number of campuses and instructors for each group are shown.

Table A-8. Similarities Between Treatment and Control Groups in Site Location, Instructors, Curriculum, and Instructional Time

Product	Site	Campus	Instructors	Course or Curriculum	Instructional Time
ALEKS	Site 1	Same	Same/different (4 treatment; 4 comparison; 2 instructors the same)	Same	Same
Core Skills Mastery	Site 3	Same	Different (7 treatment; 3 comparison)	Different	Different
GED Academy	Site 6	Same/different (6 treatment; 16 comparison; 2 campuses the same)	Different (6 treatment; 25 comparison)	Same	Same
MyFoundations Lab	Site 9	Same	Different (6 treatment; unknown multiple comparison)	Different	Same
	Site 11	Same	Different (unknown multiple treatment; unknown multiple comparison)	Different	Different
Reading Horizons	Site 12	Same	Different	Different	Different

Sample Matching

To assess whether students in the treatment and comparison groups were similar, we took students with complete achievement data and background information and examined the equivalence of their pretest scores, elapsed time (days) between pretest and posttest, age, and gender. We used the *What Works Clearinghouse Procedures and Standards Handbook* (version 3) to guide the analysis.[10] When a difference between treatment and comparison students for any baseline measure had an effect size greater than 0.25, propensity score matching was used to improve the equivalence between the groups. We used R *MatchIt* to implement propensity score matching.[11] Specifically, we used nearest neighbor matching and matching with replacement to select the best comparison matches for each student in the treatment group. Logistic regression models were used to estimate the propensity score, defined as the probability of receiving treatment, conditional on the student characteristics. After matching with replacement, the R package generated the weights to account for the frequency with which each control student was used as a match to students in the treatment group.

Analytical Model and Results

General linear modeling (linear regression) was used for analysis, with weights generated by *MatchIt*. The regression coefficient, *p*-value, effect size, and confidence interval of each effect size were reported.[12] The results of the model are shown in Table A-9.

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[10] For details, see page 15 in the *What Works Clearinghouse Procedures and Standards Handbook* version 3.0 (https://ies.ed.gov/ncee/wwc/Docs/referenceresources/wwc_procedures_v3_0_standards_handbook.pdf)

[11] D. Ho, K. Imai, G. King, & E. Stuart. (2007). Matching as Nonparametric Preprocessing for Reducing Model Dependence in Parametric Causal Inference. *Political Analysis*, *15*, 199–236.

[12] An unbiased effect size estimate corrected for small sample bias was calculated by multiplying the Hedges' g by a factor of $\omega = [1 - 3/(4N - 9)]$, as suggested by the What Works Clearinghouse standards.

Table A-9. Impact Results for Comparative Analyses

Product Site	Test	Condition	*N*	Pre-test	Post-test	Adjusted Mean Differences	Effect Size	Effect Size 95% CI	
				Mean (SD)	Mean (SD)		Hedges' *g*	Min	Max
ALEKS									
Site 1	TABE Math	Comparison (prior cohort)	54	493.6 (30.4)	523.9 (40.7)	11.6	0.28	-0.09	0.65
		Treatment	53	499.3 (41.8)	539.7 (41.4)				
Core Skills Mastery									
Site 3	TABE Math (grade equivalent)	Comparison (prior cohort)	33	9.3 (2.7)	9.3 (2.9)	1.28	0.48	0.05	0.91
		Treatment	67	9.2 (2.6)	10.3 (2.5)				
	TABE Read (grade equivalent)	Comparison (prior cohort)	42	8.9 (2.4)	9.2 (2.6)	0.24	-0.17	0.64	0.24
		Treatment	52	9.0 (2.6)	9.3 (2.7)				
GED Academy									
Site 6	TABE Math	Comparison (concurrent)	46	488.7 (62.0)	527.7 (45.5)	-5.24	-0.11	-0.54	0.32
		Treatment	40	491.6 (52.4)	525.9 (47.3)				
	TABE Reading	Comparison (concurrent)	41	528.3 (58.5)	532.5 (47.6)	7.67	0.16	-0.29	0.61
		Treatment	33	541.5 (55.7)	548.1 (44.3)				
	TABE Language	Comparison (concurrent)	45	489.1 (68.8)	512.8 (51.4)	8.9	0.16	-0.29	0.61
		Treatment	35	498.2 (64.7)	524.2 (58.7)				

Table A-9. Impact Results for Comparative Analyses (concluded)

Product Site	Test	Condition	*N*	Pre-test	Post-test	Adjusted Mean Differences	Effect Size	Effect Size 95% CI	
		(Prior or Concurrent Comparison)		Mean (SD)	Mean (SD)		Hedges' *g*	Min	Max
MyFoundationsLab									
Site 9	TABE Math	Comparison (prior cohort)	90	490.6 (60.7)	522.5 (63.8)	-5.37	-0.08	-0.39	0.23
		Treatment	73	494.2 (56.19)	519.8 (61.7)				
	TABE Reading	Comparison (prior cohort)	89	549.9 (71.7)	555.1 (61.1)	-18.21	-0.3	-0.61	0.01
		Treatment	70	546.8 (72.0)	536.5 (60.2)				
	TABE Language	Comparison (prior cohort)	91	537.3 (51.7)	551.8 (60.3)	-8.04	-0.13	-0.44	0.18
		Treatment	75	531.9 (74.2)	540.4 (67.5)				
Site 11	CASAS Math	Comparison (prior cohort)	176	218.7 (9.8)	225.8 (10.6)	-0.72	-0.07	-0.34	0.2
		Treatment	76	220.6 (10.0)	226.4 (9.3)				
	CASAS Reading	Comparison (prior cohort)	161	231.4 (10.0)	238 (10.2)	-0.26	-0.03	-0.38	0.32
		Treatment	36	231.6 (9.8)	237.9 (8.96)				
Reading Horizons Elevate									
Site 12	STAR Winter	Comparison (concurrent)	38	523.7 (110.9)	552.5 (143.9)	29.51	0.19	-0.24	0.62
		Treatment	43	516.3 (129.0)	557.0 (165.5)				
	STAR Spring	Comparison (concurrent)	60	540.4 (97.3)	711.5 (230.2)	-96.82	-0.49	-0.9	-0.08
		Treatment	40	528.9 (114.1)	596.7 (156.5)				

A.5. Examining the Relationship Between Use and Basic Skill Outcomes

This section describes the modeling of system use data from each of the product vendors to examine the relationship between product use and academic outcomes. Any student who used the product and for whom vendors provided system use data was included in the statistical analysis. A general linear model (linear regression) was used with academic achievement as the dependent variable.

Product Use

To create a measure of product use, we first examined three variables: time spent on the product (hours), number of days with at least one log-in, and a combination of the two variables (average hours spent on the product per day). There was high correlation among the three variables. In examining the relationships between the three variables and the posttest scores, we found that average hours spent on the product per day had the highest correlation with the test scores across the study sites. To avoid collinearity issues in the linear regression model, we decided to use the average hours spent on the product per day as the measure for the product use for these analyses.

Analytical Model and Results

We controlled for pretest scores, age, gender, and elapsed time between pre- and post-test in the linear regression model when these variables were available for a particular program site. Table A-10 shows the results of the linear regression models.

Table A-10. Results of Analysis of Relationship Between Product Use and Learning Outcomes

Product Site	Test	Covariates	*N*	Beta	*p*-Value	Total R^2
ALEKS						
Site 1	TABE Math	Pre-TABE Math, gender, age, days between pre- and post- tests	56	+0.06	0.28	0.60
Core Skills Mastery						
Site 3	TABE Math (Grade Equivalent)	Pre-TABE Math, gender, days between pre- and post- tests	66	-0.00	.30	0.62
	TABE Read (Grade Equivalent)	Pre-TABE Read, gender, days between pre- and post- tests	58	-0.01	.05	0.60
Site 4	Education Skills Online Math	Pre-ESO Math, gender	33	+0.10	.46	0.3
	Education Skills Online Reading	Pre-ESO Read, gender	33	-0.10	.31	0.25

Beta represents the change in the outcome score for a one-unit change in the amount of product use (average hours spent on the product per day), given that we control for other independent variables in the model, including a student's pre-test score, gender, age, and days between pre- and post-tests. For example, for site 1, for every unit increase in the average hours students spent working on ALEKS per day, on average, we observed a 0.06 increase in the post TABE Math score. Note that since the scales for different tests are not the same, the size of the Betas associated with different tests cannot be compared.

Table A-10. Results of Analysis of Relationship Between Product Use and Learning Outcomes (concluded)

Product Site	Test	Covariates	*N*	Beta	*p*-Value	Total R^2
GED Academy						
Site 6	TABE Math	Pre-TABE Math, age, gender, days between pre- and post- tests	55	0.16	0.45	0.48
	TABE Read	Pre-TABE Read, age, gender, days between pre- and post-tests	49	0.38	0.08	0.57
	TABE Language	Pre-TABE Lang, age, gender, days between pre- and post- tests	48	0.37	0.16	0.51
MyFoundationsLab						
Site 9	TABE Math	Pre-TABE Math, age, gender, days between pre- and post- tests	134	-0.04	0.35	0.61
	Education Skills Online Math	Pre-ESO Math, age, gender	20	+0.01	0.97	0.71
	TABE Read	Pre-TABE Read, age, gender, days between pre- and post-tests	134	+0.10	0.09	0.48
	Education Skills Online Reading	Pre-ESO Read, age, gender	20	+0.27	0.44	0.67
	TABE Language	Pre-TABE Lang, age, gender, days between pre- and post- tests	151	-0.03	0.55	0.50
Site 11	CASAS Math	Pre-CASAS Math, age, gender, days between pre- and post-tests	115	+0.01	0.26	0.53
	Education Skills Online Math	Pre-ESO Math, age, gender	87	+0.01	0.56	0.72
	CASAS Reading	Pre-CASAS Read, age, gender, days between pre- and post-tests	50	+0.00	0.84	0.37
	Education Skills Online Reading	Pre-ESO Read, age, gender	40	+0.00	0.90	0.48
Reading Horizons Elevate						
Site 14	TABE Reading	Pre-TABE Read, age, gender, days between pre- and post-tests	23	+0.03	<0.01	0.51
Site 12	STAR Winter	Fall STAR, age, gender	51	-2.4	0.13	0.45
	STAR Spring	Fall STAR, age, gender	47	-2.32	0.20	0.25

Appendix B. Site Profiles

The following site profiles are organized by product.

Product: ALEKS

Colorado School District (Site 1)

Product used	ALEKS
Organization type	K–12 school district adult and family education
Location	Central Colorado
Program goal	GED preparation
Targeted Course	Math class within ABE/ASE program
Use Model Type	Blended
Planned frequency (weekly)	Twice a week, 45 minutes per session plus 2 hours outside class time

Site Portrait

The overall mission of Site 1 in Central Colorado is "to provide quality educational experiences that equip all students for success as parents, citizens, and workers." The district's adult and family education program offers classes in several areas including Adult Basic Education (ABE), Adult Secondary Education (ASE), and English as a Second Language (ESL) for students over age 17. The district's adult education also includes a Family Literacy Program that has four components: parent time, parent and child time, adult education, and an age-appropriate children's literacy program. Parents taking adult education classes in either the ABE/ASE or ESL tracks can participate in the Family Literacy Program.

Site 1 serves a population of mostly Latino students, but this is evolving as people of other nationalities and refugee populations enroll. Learners typically range in age from 17 to 40, with a median age of late 20s. Most students are underemployed or unemployed and have had 3 to 12-plus years of formal education, not necessarily in a U.S. school system. Most ESL students in the ABE/ASE program enter with both low literacy and low numeracy.

During the study year, classes using ALEKS were offered at one school campus in Central Colorado.

Site 1 operates from August through June, with rolling enrollment offered each month. The ABE/ASE classes are designed to help students improve their language arts and mathematics skills sufficiently to obtain their High School Equivalency (HSE) diploma or to improve their scores on ACCUPLACER exams, which can be used to improve job opportunities or make students eligible for certain college, trade school, or certificate programs.

The program uses scores on the TABE administered at enrollment to assign students to classes at the appropriate skill level (0.0–3.9 range = low-level class; 4.0–8.9 range = medium-level class; 9.0–12.9 range = high-level class). Only students in the medium-level classes participated in the study, and they were taught by three instructors. The medium-level classes were further split to create two sublevels, 4.0–5.9 range and 6.0–8.9 range, and students were assigned courses based on these sublevels.

Use Model

The instructors used ALEKS to support their math classes using either a blended or hybrid model. Classes met twice a week for a 3-hour period, totaling 6 hours per week. During each class, students used ALEKS for 45 minutes to an hour. In the classes observed as taught by three instructors, two instructors used ALEKS in the last hour of the class and another used it in the first hour of the class. All students were expected to work on ALEKS for 1.5 to 2 hours during class and up to 2 hours outside class, for approximately 3–4 hours per week.

The two instructors who taught the 4.0–5.9 range classes covered the same content sequence and pacing, and developed a common set of assessments for their classes. These instructors also aligned the content of their direct instruction and the textbook (*Achieving TABE Success* Level M) with the topics students were working on in ALEKS.

The instructors varied in how they integrated ALEKS into their direct instruction. For example, the instructor teaching the 6.0–8.9 skill-level students assigned homework in ALEKS, to be completed inside and outside class time. This instructor set a goal of 80% correct for each student on the homework and reviewed the most difficult topics with the whole class to help students toward that goal. One of the instructors teaching the 4.0–6.9 skill-level students also assigned homework in ALEKS but did not set any specific performance requirements. While most students worked on ALEKS independently, some also worked together in pairs or small groups to solve problems. After the in-class ALEKS use, the instructor reviewed some selected ALEKS problems with the whole class.

Key Implementation Supports and Lessons Learned

Students were expected to use ALEKS outside class, but the time they spent varied substantially depending on their access to technology. Because technology and Internet access were an issue for many students outside class, the program began to offer drop-in access to the computer lab. Some students who were intrinsically motivated to use ALEKS outside class time did find ways to access ALEKS on other devices or accommodate use in their busy schedules.

To increase variety in the types of instruction students experienced and to lessen the chance of fatigue setting in during extended periods working within ALEKS, one instructor began to incorporate breaks after every 15 minutes of ALEKS use (a practice recommended by the study's technical assistance provider, Mockingbird Education). During each break, students were encouraged by the instructor to present to their peers a solution to an ALEKS problem they recently solved.

Self-Reported Benefits and Challenges

Overall, the adult education program director's, instructors', and students' feedback on their experience using ALEKS was positive. According to the program director, instructors found the reports and dashboards showing data on student progress provided by ALEKS to be useful as well as how the product differentiated instruction for students of different skill levels. The director felt that the blended learning model worked for their program, especially for the students in the low-level class who needed more review, practice, and instructor support. The students interviewed also said they enjoyed their experience using ALEKS but they thought they would prefer a blended or hybrid learning model, combining both online and direct instruction, to online-only learning.

As mentioned, one challenge instructors and administrators faced was getting students to use ALEKS outside class. Allowing drop-in access to the computer lab was one change made during the study year to boost the use of ALEKS outside regular class time in order to address many students' lack of off-campus access to technology and the Internet.

Product: ALEKS

National Nonprofit (Site 2)

Product used	ALEKS
Organization type	National nonprofit organization with a large network of program sites
Location	Southwest Los Angeles, CA; South Los Angeles, CA; and Northern, MA
Targeted Course	Construction, basic skills, pre-algebra and algebra (South Los Angeles); pre-algebra and algebra (Southwest Los Angeles); HiSET academic preparedness (Northern MA)
Program goal	High school diploma
Use model type	Program A (Hybrid); Program B (Blended); Program C (Hybrid)
Planned frequency (weekly)	Varies by site, 3–4 days per week, 1–5 hours per day

Site Portraits

Site 2 is a nonprofit organization serving high-risk youth ages 16–24 with a network of 260 urban and rural programs in 46 states. While the individual services local program sites provide vary, overall the local programs provide a range of comprehensive services including empowerment, educational, and vocational training; career development; social support; community service opportunities; access to postsecondary education; and job placement.

Three local program sites in two states—California and Massachusetts—participated in the study.

Two Site 2-affiliated programs in California. A local nonprofit operates two Site 2-affiliated programs in the Los Angeles area, Program A and Program B. Both have an education partnership with a charter school sponsored by Site 2, which has a waiver to issue credits and a high school diploma to those over 18 who participate in Programs A and B. These programs serve high-risk youth in economically distressed areas through a small-group cohort structure (approximately 34 students per cohort) that combines occupational/vocational (e.g., construction, hospitality, and culinary arts) and educational opportunities including a credit-based high school diploma program. Students also participate in community advocacy, leadership development, career pathways, and counseling. Program A serves a student population that is primarily 17- to 19-year-old unemployed Latino males living within a 5-mile radius of the site. Program B serves primarily Latino and African American male and female students from the surrounding areas.

At each local site, the TABE is administered at the beginning and end of the program but is not typically used for program placement; instead, school transcripts, sometimes in conjunction with TABE scores, are used. The average student enrolling in the programs is typically at a sixth-grade reading level and a fourth-grade math level.

One Site 2-affiliated program in northern Massachusetts. The Site 2 program in northern Massachusetts, Program C, is operated by a foundation and financed primarily by the U.S. Department of Labor. In contrast to the credit-based diploma programs in California, Program C prepares high-risk students (e.g., low income, out of school, in the criminal justice system, and/or unemployed) to pass the Massachusetts High School Equivalency Test (HiSET). In addition to the high school equivalency preparation program, Program C provides empowerment and vocational training, career development, social support services, community service opportunities, access to postsecondary education, and job placement. At Program C, students are tracked into three skill levels based on their incoming TABE scores.

Only students 18 years old and older were included in the research.

Program Organization

At Program C, each quarter is dedicated to a different social justice or social-emotional topic: health and wellness, rights and responsibilities, summertime volunteering and community engagement, and independent study. Although Program C has a set schedule and rotation that it is expected to follow, there is flexibility. The schedule may change depending on off-site opportunities that arise in any given week. Over a 3-day period, three groups of about 11–12 students rotate through the vocational component of the course and academic courses. The program meets from 8:30 a.m.–3:00 p.m. Monday through Thursday and 8:30 a.m.–12:30 p.m. on Friday. Students are in the program for up to 30 hours each week, with half that time spent in academic subjects; the time spent on math instruction is approximately 3 hours per week.

In Program A, approximately 60 students are on campus and another 15 are off campus as part of an independent studies track. The program has five full-time instructors and one part-time science instructor in addition to counselors and office staff. The program typically starts in September and follows a 12- to 14-week-long trimester schedule. A full-time student could take up to 30 credits per trimester; on average, students take five or six courses each trimester depending on their schedule and academic workload. Within the program, some students may be enrolled in more than one math class in the same trimester; for example, a student could be taking two courses, such as a pre-algebra and an algebra class. Within each course, students spend 4.5 hours on math per week.

Approximately 80–100 students are in Program B during a year. The program academic calendar is divided into three semesters roughly 10–12 weeks in duration. Each class has a maximum of 25 students. The three classes in the study were algebra, pre-algebra, and multi-core craft curriculum (MC3). In the MC3 course, students are trained in the construction and building trade and in math skills. As part of their math curriculum, students are required to raise their numeracy skills with the goal to move up a grade level in math. All three classes in the study met Monday through Thursday for 55 minutes each day, and in all three classes instructors required students to cover at least 15 topics per week and spend at least 3 hours per week on ALEKS. The class schedule was slightly different for the MC3 course because these students came early, at 7 a.m., to receive training in construction skills until noon. Math instruction started at noon when this class joined the pre-algebra and algebra class.

While the number of full-time and part-time instructors at the Site2-affiliated programs vary, each participating program had one full-time instructor for math. For example, at Program C, there is typically an additional person (e.g., aide, assistant, tutor) who works one on one with students. At Program B, there are four full-time teachers each in social studies, science/math, English, and construction and one part-time culinary teacher.

Use Model

Because Site 2 was not approached about participating in the research until January 2017 and the study's data collection activities ended in July, Program C students used ALEKS during the second quarter and part of the beginning of the third quarter, and Program A and Program B students used ALEKS during the last trimester.

Because use models varied with each program, we describe each program's model separately.

Program A (Los Angeles, CA). The instructor originally planned for students to spend a majority of their weekly math instruction time on ALEKS, but scheduling changes resulted in less use than planned. Math instruction was provided for a total 4.5 hours per week. Students who attended regularly spent approximately 1–1.5 hours on ALEKS each week.

A typical math class usually started with the instructor going over a common set of learning objectives for the class period. The instructor then checked in with individual students and led a group discussion on a particular math topic. After the discussion, students were given time to work independently on ALEKS at their own pace. They sought help from the instructor as needed, especially when they experienced difficulties entering their answers to problems. Students were encouraged but not required to use ALEKS outside class. The instructor was not aware of any students doing so.

The instructor reported that she did not regularly use the ALEKS reports on student progress to monitor use or provide feedback to students because of limits on her time. However, the instructor said she planned to go over the reports with individual students during their evaluations at the end of the quarter.

Program B (Los Angeles, CA). ALEKS was implemented during the last trimester only during the pre-algebra, algebra, and construction courses. About 90% of class time was spent on ALEKS, and students primarily worked independently on topics assigned by ALEKS based on their scores on an initial assessment administered within ALEKS. During students' ALEKS use, the instructor remained in the classroom to provide guidance and support when needed. According to the instructor, two different groups of students emerged: one that was able to work on ALEKS independently and another that needed more teacher support to make progress.

The use model for ALEKS was modified over time because of a number of factors including the amount of time needed for all students to get logged in to ALEKS on their laptops. Originally, the instructor had planned to do a 15-minute mini lesson at the beginning of the class and then have students work on ALEKS for the remainder of the period. Instead, to maximize the amount of time students spent working in ALEKS, the instructor decided to provide mini lessons only on an as-needed basis when many students were struggling with a common topic. Typically, these mini lessons took place no more than once a week and required advance planning by the instructor.

While students worked at their own pace, the instructor set a weekly time goal (3 hours per week) and topic coverage requirement (mastery of at least 15 ALEKS topics). The trimester goal was a total of 20 hours on ALEKS and mastery of 90 topics. Spending time on ALEKS outside class was not a requirement, but students were still expected to achieve the 3-hour weekly goal if they did not attend class. The instructor used ALEKS to create student progress reports, which she used to provide feedback (the number of topics a student attempted and mastered) during weekly meetings with students.

Some students who were on track to graduate at the end of the program year were not required to attend class in person and used ALEKS off campus. Those students were required to meet with the instructor after school on their own time. The instructor noted that among these remote users of ALEKS, students unable to schedule regular check-ins with the instructor tended to spend little time on ALEKS.

Program C (Northern MA). Instructors had planned to spend 3 hours per week on math instruction. The initial plan for each class period was to dedicate half the time to direct instruction and half to ALEKS. However, the actual time allotment varied widely from class to class, with more time spent on ALEKS than direct instruction, at least partially to accommodate the technology setup for working on ALEKS. Some students used ALEKS outside class as well.

There was no coordination between the topics that students covered on ALEKS and what the instructor covered during direct instruction. According to the instructor, since she planned the direct instruction lessons 2–3 weeks in advance and students worked in ALEKS at their own pace, it was not possible to align the direct instruction content with the ALEKS topics.

While students worked on ALEKS, the instructor ensured they remained on task and monitored their progress. In addition, the instructor helped clarify anything students found confusing, including the explanations provided by ALEKS.

Key Implementation Supports and Lessons Learned

Program B (Los Angeles, CA). To ensure students would make significant progress while on ALEKS, Program B planned to enforce both a weekly time requirement (3 hours per week) and a topic mastery requirement (15 topics). Noting that some students needed to spend more time mastering a topic than others, however, the instructor adapted the topic coverage requirement for each student.

The adoption of ALEKS resulted in a significant change in how math was taught. In prior years, the instructor had usually taught a series of lessons covering a range of topics during a 3-week block. This was followed by a week dedicated to a project that helped students apply and demonstrate what they had learned during the previous 3 weeks. According to the instructor, some students reported that they felt the project-based learning activity was not an effective way to showcase their learning and took time away from learning content. Once Program B incorporated ALEKS into the course, the student project requirement was removed and the majority of this time was devoted to working through the ALEKS content. According to the instructor, many students may have preferred this change in that the use of ALEKS provided them an opportunity to learn more content based on their individual needs.

To encourage use of ALEKS outside regularly scheduled class time, the instructor attempted to have students use ALEKS on their smartphones, but this was not effective because many students found the text on the mobile version too small to read. So to provide students with an opportunity to use the product outside class time, Program B gave students access to desktop computers on site. Many students do not have a computer or Internet access at home. (Any Internet access is usually through a mobile device.)

Program A (Los Angeles, CA). In hindsight, the instructor believes that his use of ALEKS would have been more effective if he had integrated and aligned the content students worked on in ALEKS with his lectures and discussion. The instructor initially adopted a hybrid model for using ALEKS to support his instruction: instructor-led lecture and whole-class discussion followed by self-paced use of ALEKS along individualized pathways determined by the product. Since ALEKS covers a breadth of topics, students might be working on topics that the instructor is not covering in class; the instructor thus felt that students' work in ALEKS was not necessarily reinforcing what they learned in recent lectures. As a result, in the future the instructor plans to assign ALEKS as a supplemental activity outside regular class time as part of mandatory homework assignments.

Program C (Northern MA). The Program C instructor felt that overall implementation would have benefited if he had started using ALEKS at the beginning of the 10-month program. This would have provided him with more time to establish classroom norms and expectations about how the product would be used, fostering greater student buy-in and more consistent use. Additionally, starting the use of ALEKS earlier could have provided the instructor an opportunity to work out how to best to incorporate it into the program in a way that showcased how mastering topics in ALEKS ultimately prepares students for the HiSET, which was not apparent to most of the students. One student observed, “I don’t always have time on top of studying for the HiSET and things like that.” While ALEKS use outside class was encouraged, the instructor did not mandate it or assign it as homework because, in his experience, students would not complete it.

In every academic class period, time is allotted for independent practice. The instructor noted that integrating ALEKS use during this portion of the class worked well. It provided an opportunity for students to work at their own pace and to work on topics that may not have aligned with the overall shared objectives for the class.

The instructor participated in the initial ALEKS webinar, felt adequately prepared, and was comfortable with computer use. He found ALEKS easy to use, particularly after spending some time on it and becoming familiar with its teacher-facing features. According to the instructor, “Some of the reports that I was…generating took a little bit longer to figure out. I didn’t think it was the program itself, it was just I needed to give myself enough time to play with it.”

Self-Reported Benefits and Challenges

In general, instructors reported that the individualized and adaptive nature of ALEKS were beneficial to students. Several instructors felt that while some students used ALEKS to review and practice the material and topics being taught in the class, others used it to get exposure to advanced topics once they mastered the topic being covered in class. From the instructors’ perspective, ALEKS provided an ability to cover more content than was possible during direct instruction and to use class time to cover specific topics in more depth. While both breadth and depth are preferable, limited class time made it challenging to include both without the use of ALEKS. For example, using ALEKS at Program B significantly changed how instruction was structured and the amount of math content students were exposed to and mastered.

Given the disparity in students’ academic preparation, especially in math, within any Site 2 cohort, instructors found ALEKS useful in meeting each student’s individual needs. The initial ALEKS assessment, along with the instructor dashboard, provided instructors with useful information, giving them an understanding of the skills of each student so they could appropriately target the needs of different students and groups of students in their direct instruction. Some instructors reported that ALEKS and its dashboards also saved them considerable time by automatically assessing students and organizing the information for them to review.

Overall, the students' reactions to ALEKS were positive, although some found it more useful and helpful than others. Students who had unfavorable opinions about the courseware often expressed frustration with ALEK's "knowledge checks," which serve as formative assessments that help the instructor understand what students fully or partially understand and can inform lesson planning. Some students became frustrated when they felt they were being tested on a concept they had not seen before or when a concept from a prior lesson reappeared. Some students found the knowledge checks too frequent (every 3 hours), wanting more time to progress through the topics before completing a knowledge check. To try to minimize frustration that might build in students who are struggling with a particular concept, ALEKS transitions students to new topics after a certain threshold of unsuccessful attempts at solving a problem, a practice that frustrated some students who wanted to persist and master a topic. Although some students interviewed found these practices frustrating, in general instructors found them sound pedagogically and supportive of student mastery. One instructor reported she liked that ALEKS had students periodically revisit concepts and problem types to ensure mastery. This also helped this particular instructor know whether a student had full or partial mastery of a topic.

Students and instructors had mixed reactions about the appropriateness of the reading levels. Most of the instructors and some students noted that some explanations in the courseware were difficult for some students. However, other students felt that the reading levels of the explanatory text in ALEKS were appropriate; one student also reported particularly enjoying the positive reinforcement messages that ALEKS provided after the student completed a problem.

In general, most students interviewed liked solving problems within ALEKS and the support it provided, particularly compared to completing assignments on paper-pencil worksheets in class. For example, one student commented that she found the explanations of concepts and procedures in ALEKS "were a lot clearer than having a conversation with a teacher. Being in a classroom with five or six other students, [the] teacher can't always focus on you. On the computer, it's just you and the computer."

Product: Core Skills Mastery

Urban Nonprofit, Illinois (Site 3)

Product used	Core Skills Mastery (CSM)
Organization type	Nonprofit community-based organization focused on workforce training
Location	Northeast Illinois
Program goal	Careers in healthcare and manufacturing
Targeted Course	Instruction in basic literacy and numeracy
Use Model Type	Two models were piloted: entirely online for a concentrated 2 weeks the first semester and then hybrid—largely online and self-paced with some instruction for remediation or test preparation.
Planned frequency (weekly)	Two models were piloted: (1) all instructional time during first 2 weeks of a 16-week session (40 total hours) and (2) 5 hours of class time per week as lab time.

Site Portrait

Site 3, a nonprofit organization in Northeast Illinois founded in the late 1970s, supports adults with workforce training in health careers, manufacturing, and computer technology. Site 3 targets urban Latino and African American populations and offers literacy instruction (in students' native language), vocational English as a Second Language (ESL), and college prerequisites. Site 3 aids adults in their transition to tailored job training and community college courses.

Students are accepted into Site 3 after an application process that includes providing proof of income and transcripts and participating in an in-person interview. Throughout the application process, staff are looking for barriers to success, and the result is that Site 3 students are very motivated. Site 3 serves approximately 400 students yearly and has a very good retention rate. Some students even help as tutors after completing their Site 3 program.

All students are assigned both a case manager and an academic advisor to pave the way for community college admission. Literacy and numeracy instruction is used to prepare students entering the career pathways or workforce development program; there are separate entry-level classes for health care and for manufacturing pathways. Literacy is emphasized in the context of work-specific terminology, such as the medical industry or manufacturing (e.g., reading blueprints and manuals).

The average age of the students in the Site 3 career pathways programs is 35–40; all students are over age 18. The healthcare pathway has predominately Latina enrolled, whereas the Manufacturing Training students are predominantly men, approximately half African American and half Latino. For both pathways programs, only 50% of the students are employed.

Use Model

Site 3 students in the healthcare career pathways start their training on one of three "bridges" based on their pre-program competencies:

1. Health ESL for those at a 6th- to 8th-grade reading level

2. Pre-Certified Nursing Assistants (CNA) for those at an 8th- to 10th-grade reading level, followed by CNA health assistant training when they achieve a 9th-grade level

3. Pre-Licensed Practice Nursing for those at a 10th- to 12th-grade reading level.

These bridge courses are 16 weeks long in the fall and spring and 8–10 weeks long in the summer. They are held in the evening (fall 2015 courses were 6:00–10:00 p.m. and spring and summer 2016 were 5:30–9:30 p.m.) in a Site 3 facility that hosts regular high school classes during the day. Manufacturing offers a 10-week basics course that emphasizes practical skills such a blueprint reading and applied math for shop, with portions set aside for instruction in literacy and numeracy skills. The course pathway for Manufacturing is based on stackable credentials, common in manufacturing training.

Core Skills Mastery (CSM) was used for improving reading, mathematics, problem solving, and use of technology (e.g., emailing and messaging). The CSM pedagogical approach is to provide content in a self-paced learning environment with built-in motivational strategies, where instructors are coaches and students are encouraged develop skills in self-regulation.

Site 3 tried two different implementations of CSM in its bridge courses. First, it devoted all the class time during the first 2 weeks of a 16-week course (a total of 40 hours) for students to complete CSM. Four instructors who were not math teaching experts served as coaches for this pilot. The second and more successful approach spread CSM use over the entire 16-week course, setting aside 5 hours of class time per week as lab time. Students used CSM in a computer lab for about 1 hour and 20 minutes with a math instructor present, followed by direct instruction with the same instructor. Students worked individually through problems, rereading instructions or finding alternative resources on the Internet, as needed. Students also used paper notebooks to work through the math problems.

The math instructor had face-to-face contact with the students each week and was less likely to use the CSM reports or coaching messages because the face-to-face interaction allowed the instructor to tailor instruction based on observations of students' work during the lab or based on what would be tested when the course was completed.

Key Implementation Supports and Lessons Learned

Integrating CSM regularly across the entire 10- or 16-week session seemed more effective than limiting its use to the first 2 weeks of a course. At first, students tried to complete CSM in the first 2 weeks of the course by using it every evening as the sole source of instruction. Spreading it out over the entire bridge course worked better: Students could finish at their own pace (although not all students did), had more time to get used to navigating through CSM, and were less likely to show signs of frustration while using the software.

Site 3's initial approach of using case managers, rather than trained teachers, to supervise the CSM portion of the health care bridge course was not as successful as planned. The case managers felt that they did not know the mathematics well enough to support students. Eventually, a certified math teacher was hired and assigned to supervise students using CSM. This instructor who joined Site 3 during the second pilot study was trained in the use of CSM by CSM staff and felt more comfortable with it than instructors in the first pilot. CSM staff members explained the coaching philosophy and demonstrated the instructor toolkit. Both the case managers and the instructors also found value in the CSM feature of being able to experience the course as a student. The Site 3 staff also benefited from regular check-ins from CSM personnel.

Self-Reported Benefits and Challenges

CSM teaches not only math content and terminology, but also explicit problem-solving approaches. Students who wanted to rush through the CSM course found this slowed them down because CSM teaches problem solving step by step and shows multiple approaches to solving problems. Most of the students we spoke to (four total) became self-motivated learners through CSM's goal achievement focus: Breaking goals down into smaller ones made achieving them seem less overwhelming, and students learned problem-solving strategies they could apply from one lesson to the next. However, it was clear from our interviews with students and instructors that some less patient students may find the mastery learning approach frustrating, and they need to be carefully monitored and supported to help them make progress and succeed in CSM.

CSM's motivational strategies built into both the program and the coaching worked well. Students are required to succeed at all problems (i.e., 100% pass rate is required to progress to the next topic). Students thus not only learn to persist, but are also coached to take breaks and move on to a new set of problems after repeated unsuccessful attempts at one set (students are later guided back to the problems that were skipped). CSM encourages achievement through a reward system (earning karate-like belts), and some students reported that they liked the sense of accomplishment that came with earning the belts.

Students had mixed feelings about the motivational aspects built into CSM. They liked the achievement aspects (belts) but not necessarily the effort messages because some felt unfairly judged. Some students also felt that, despite the built-in motivational supports, working on the computer was isolating, especially for those who were reentering formal schooling for the first time in many years.

Product: Core Skills Mastery

Urban Community College Adult Diploma Program (Site 4)

Product used	Core Skills Mastery (CSM)
Organization type	Community college program for workforce training
Location	Northwest Ohio
Targeted Course	Adult Diploma Program preparation course
Program goal	To prepare students for Adult Diploma Program
Use model type	Online only, self-paced at home or in a computer lab
Planned frequency (weekly)	Drop in lab otherwise use at home.

Site Portrait

The Adult Diploma Program (ADP) at Site 4 is a new competency-based, career-focused, high school diploma program for adults in Ohio. The state created it to help adults earn a diploma, prepare for job training, and earn certifications in high-demand jobs such as machining, nursing, security, and medical billing. The program is free to Ohio adults who are over 22 years old and must be completed within 2 years. Students in ADP are eligible for scholarships for career training programs. Scholarship awards are based on students' scores on the WorkKeys assessment.

ADP is geared to county residents who do not have a high school diploma or its equivalent, have basic desktop/laptop computer and Internet skills, and have a fifth-grade reading level or above. Most of the students in the course (approximately 90%) are African American females, ages 22–60.

Core Skills Mastery (CSM) is being used to prepare students for entering ADP. Prospective students must meet several requirements to apply to ADP, one being 100% completion of CSM. Students must also pass the ACT WorkKeys test on applied math and reading for information and locating information. While they are working to complete CSM for admission to ADP, they also work on WorkKeys preparation modules and practice tests. CSM is used to ensure that students are prepared to succeed in ADP by developing skills to problem solve in a technology-rich environment. At the time of the study, approximately 100 ADP students had completed CSM, amassing a total of 12,000 hours on the system.

According to the ADP program coordinator, the ADP differs from GED programs offered by the same community college in its emphasis on applied versus academic knowledge. The program coordinator believes that the workplace orientation of CSM's instructional approach is more effective and motivating for this population than a more traditional approach that replicates instruction in a typical K–12 school setting, where many of these students struggled to learn in the past.

Use Model

To prepare students for CSM, Site 4 holds an orientation session that includes a workshop on how to use CSM. The students also are introduced to the lead instructor for the course and receive a virtual introduction to their assigned CSM coach. Two coaches, students at the college, were hired for this study, working under the guidance of a college instructor. The main support for learners once they begin working in CSM comes from these coaches who have experience in online learning. Students work at their own pace within CSM. Since completion of CSM is a requirement for admission to ADP, motivation is high.

Coaches manage a caseload of 25–30 students. While students have access to the lead instructor, most of the instruction is provided via CSM. Coaches contact participants weekly via CSM's messaging feature, email, telephone, and video chat to provide support, motivation, regular updates, and (if needed) just-in-time instruction. They also assist students in finding out how to get help through CSM or via external supports, advise them with time management, and help them develop learning skills such as taking notes or printing CSM lessons to use as a study guide.

Students are expected to spend 10–12 hours a week to complete the course in 6–10 weeks. Students have access to the college's Technology and Learning Center, a dedicated drop-in computer lab, 6 hours per week, 6 days per week. Use of the lab to access CSM is not mandatory, and some students completed CSM without ever going to the lab. Students are provided with referrals and encouragement to use free computer and Internet access at a variety of local nonprofit organizations and libraries (e.g., students could check out a Wi-Fi hotspot and computer from a library), and they are free to use their own laptop/desktop computer in their homes. However, the use of mobile devices is strongly discouraged to ensure that participants develop strong computer and digital literacy skills using a desktop or laptop computer.

CSM's dashboard provides coaches with reports on students' progress and effort. For example, the reports show coaches how many unsuccessful attempts a student made to solve a practice problem and the extent to which the student interacted with the digital instructional materials before attempting the problem. When necessary, after reviewing a report, a coach might message the student and prompt him or her to spend more time reviewing the instructional materials. Coaches' use of the reports varied: One coach who was interviewed reviewed and messaged her 25 students at least twice a week, while another coach reported he reviewed the CSM dashboard reports only after a student reached out to him and asked for help.

Many students sought out their peers or the lead instructor when they needed additional support. When students needed assistance, they often messaged the instructor or, more often, relied on each other for help rather than seeking help from the coaches. Students knew that others were working on CSM and took it upon themselves to find students to work with. Some students who went to the drop-in labs when they needed help found other students there who were working on the same problems, worked together, and even worked at each other's homes. Every other month, the coaches hosted "meet and greets" that encouraged students to come to campus to interact and collaborate.

Key Implementation Supports and Lessons Learned

Although CSM discourages students from using other web resources while working on CSM (marking this as "off-task" behavior), the coaches encouraged Site 4 students to seek out and use external resources to support their learning, such as Khan Academy or YouTube tutorial videos. Coaches reported that some students found the outside resources more effective in helping them learn certain topics than the instructional approach taken by CSM.

The program coordinator provided general support to coaches, but for the most part the coaches operated independently. The coaches reported they found value in setting up their own accounts and working through the CSM units themselves before working with students; this helped them review concepts they had not studied since high school.

Both coaches reported that the training was useful and helped them learn how to serve as a coach, such as messaging the students. One of the coaches received training on CSM through a 2-hour videoconference course with CSM. During the training, the coach received a walk-through of the CSM administrative functions and subsequently completed half of CSM as a student (as recommended by CSM authors). This coach felt comfortable with the material taught and used the CSM dashboards to check student progress regularly.

Each coach tracked students' progress using the CSM dashboard and had weekly meetings with the lead instructor. To prevent attrition, coaches called or emailed students to make sure they did not fall behind. One coach called each student weekly to ask how his or her studies were coming along. Students who were not making progress could be referred to a tutoring program at Site 4.

Self-Reported Benefits and Challenges

Both coaches felt that the students benefited from the motivational messages that CSM provides throughout the instruction. The program coordinator also reported value in CSM's motivational messages after students answered a problem incorrectly, such as, "20% of all adults struggle with this concept." He felt that it was useful for these adult learners to receive feedback that they are not the only ones struggling with difficult topics.

Coaches reported that students' reading skills hindered their ability to make progress in CSM. According to the coaches, many students taking CSM are below a ninth-grade reading level and found it difficult to complete the math portion of CSM because they had difficulty comprehending CSM's text-rich explanations and problem scenarios. However, the coaches also reported that the reading instruction components of CSM helped students understand the importance of reading for comprehension, especially because the reading comprehension sections reiterated the importance of reading in everyday, real-world problem solving. One coach reported that many students eventually realized that it was best to read a math question more than once before attempting to solve the problem.

Coaches reported that students found CSM's use of "belts" to signal progress a significant motivating factor. As students make progress, CSM issues them different levels of belts (e.g., yellow and black, as in karate) and other tokens of achievements. The coaches said students enjoyed the belts and viewed them as confirmation that they succeeded at something: "They are something you can see and show other people."

Students did not always understand or appreciate the relationship between their work on CSM and their preparation for the ACT WorkKeys test, which they needed to pass to be eligible for the ADP. The coaches had to remind them of the different ways CSM was preparing them for the WorkKeys and learning in later courses. Although CSM is not directly aligned with the ACT WorkKeys test, coaches reported that in general it prepared students for the test by teaching them reading comprehension strategies such as locating information in a story or paragraph.

The coaches said they believe that CSM is effective, helps build students' confidence that they can learn independently, and makes students more persistent; they did note that it takes students time to get used to CSM's mastery learning approach. According to one of the coaches, students perceived CSM as more demanding, difficult, and, at times, more frustrating than the online ACT WorkKeys preparation modules that they were also assigned after they completed their work on CSM. CSM does not allow students to progress in the software unless they answer all problems at the end of a unit correctly (100%); in contrast, in the WorkKeys modules 70% correct allows students to pass to another level. The greatest challenge for students according to the coaches and students is accepting that they must complete CSM and thus continue to make progress to be eligible for the ADP.

Coaches reported that students liked not having to come to the campus to work on CSM because they preferred working in their own environment. When students were struggling on their own, they often used the drop-in lab as resource for support, particularly from other students. According the coaches, this was the primary use of the drop-in lab, as a place for support and tutoring, rather than as the primary location where students accessed CSM. One coach estimated that 1 in 5 students used the drop-in lab weekly and commented that the extended lab hours were helpful for students.

Coaches also believed that students' computer literacy increased with CSM use. In addition, one instructor said that CSM's messaging functions helped overcome problems with students' lack of familiarity with using email because, according to this instructor, the messaging system in CSM is easier to use than your typical email program.

Product: Core Skills Mastery

Nonprofit Community-Based Organization, North Central Colorado (Site 5)

Product used	Core Skills Mastery (CSM)
Organization type	Nonprofit community-based organization focused on college preparation and workforce training
Location	North Central Colorado
Program goal	GED achievement, remedial college courses, basic literacy
Targeted Course	Various Adult Basic Education courses, including GED preparation, math college preparation, and workforce education courses
Use model type	Supplemental—largely online and self-paced at the various facilities
Planned frequency (weekly)	Ranges from one lab session per week to 1 or 1.5 hours per day for 2–3 days per week; time spent on product ranges from 1.5–5 hours per week depending on class schedules.

Site Portrait

Founded in 1964, Site 5 is a large community-based organization that does outreach in numerous educational facilities throughout North Central Colorado to improve education and workforce opportunities for adults and families. It receives funding from a variety of sources including the state department of education, local K–12 school systems, community colleges, philanthropy, and, more recently, local companies.

Site 5 serves approximately 2,200 students per year across 33 locations. Enrollees enter with a range of educational backgrounds and skills and are typically emerging and struggling readers with an incomplete K–12 education, students with a high school degree who need to pass a math exam to be accepted to college, or recent immigrants with degrees from other countries. Students vary in their employment status, stability of living situation, and family responsibilities. Courses offered vary across the 33 locations to meet local needs but typically are 15 weeks in duration with 8–12 contact hours per week.

Use Model

Site 5 used Core Skills Mastery (CSM) at four sites: two community colleges, a workforce education program, and a community-based GED preparation program. Objectives of the courses in which CSM was used include improving basic adult numeracy skills, helping students pass the GED, and preparing students for college-level math courses (as measured by passing a college math entrance exam).

The CSM curriculum was used to supplement traditional instruction in mathematics. The use model for CSM was almost purely online—either in class or in a separate lab—with instructors present to answer students' questions and serving in the CSM role of coach. Some instructors provided direct instruction for small groups when they noticed, through a review of the system's dashboard, that several students were struggling on the same topics within CSM.

Students' progress in CSM is self-paced. For each module, students first take a formative assessment and are assumed to have mastery over the content covered in that module if they answer all the test items correctly. Otherwise, they are offered the opportunity to master the content through additional resources, lessons, and examples before being given the opportunity to take another assessment to gauge their understanding of the content.

Students use CSM during regular class time, sometimes with classroom laptops and sometimes in a separate computer lab. Planned usage of CSM varied from 1.5 to 5 hours per week depending on the schedule for a particular class (typical classes last 15 weeks). Some portion of class time may be set aside for direct instruction the instructor deems necessary. Students were encouraged to use CSM at home. Because students complete CSM at different rates, students who finished before the end of the term were provided with additional online instructional materials, including an online component to a math textbook purchased by the organization and made available to different campuses.

Key Implementation Supports and Lessons Learned

Program implementation would have benefited from a stronger technology infrastructure across many of the participating sites at the outset of the study. Although the research team attempted to recruit sites with the appropriate technology infrastructure, some Site 5 program sites did not have enough computers to provide the necessary flexibility of having students use computers in class, as originally planned, rather than needing to schedule the use of a computer lab. Some sites also lacked sufficient Internet access or Wi-Fi speed. Program administrators and/or local technicians needed to provide technical support to get some sites up and running because the instructors did not have the technical knowledge to troubleshoot Internet access issues and had to work through the IT department at their host location (e.g., community college) to get help, install software, and the like. One site bought new laptops for in-classroom use.

To implement CSM, instructors (or others) must be trained as coaches to support students while they are working in CSM. Some instructors used in-class tutors to provide direct instruction when students struggled to understand concepts within CSM.

Some instructors reported needing more training and support than was provided by CSM to learn how to effectively coach and facilitate with CSM. Instructors received only 1 hour of training on the use of the product from the vendor. Instructors reported that they used their own time to learn about CSM and its features (including the coaches' portal or dashboard), and many did not learn about the available digital supports (such as the "playground" and YouTube videos) until later in the implementation.

Overall, the instructors found the coaches' portal helpful. Once they learned how to run reports, the instructors made regular use of the portal, which displays student progress, effort, and learning indicators and individual student strengths and topics of concern. Instructors used the reports to identify and address specific topics students were struggling with in CSM and thus did not have to rely on students seeking them out for help. Instructors particularly liked the simplicity of the indicators for student progress (black/red/yellow karate belt-like levels), found the interface easy to navigate, and liked the "coaches notes" feature where they can record notes that are visible only to them (not to the students).

Self-Reported Benefits and Challenges

Instructors' and administrators' overall reaction to the product was positive. Each instructor appreciated the personalized approach to learning that CSM provides and that the problem scenarios attempt to connect to the adult learners' lives. Instructors liked that CSM accommodates students' different skill levels and individually differentiates instruction based on what a student needs to learn. The instructors also reported that the use of CSM adds variety to instruction and gives students another way to learn to math content. Students, instructors, and administrators also appreciated that CSM is available to students from anywhere they have Internet access. Instructors encouraged students to work on CSM outside class, and some students even continued work after completing their 15-week course. However, some instructors felt that the mastery design (requiring a perfect score on a unit assessment in order to progress) might lead to greater frustration for some students.

At the same time, students working independently, off campus, reported they missed being able to ask their peers or the instructor questions when they were having difficulty with a topic or concept. Some of these students said they relied on family members for help. Some nonnative English-speaking students who struggled with understanding the text-rich explanations within CSM reported they relied on other web-based resources such as YouTube videos in their native language on various math topics.

Instructors also appreciated that CSM content was geared toward adults with a low reading level, although most commented that the content may not be appropriate for students scoring at a reading level of grade 4 or below.

Product: GED Academy

Urban Community College, Adult Basic and Literacy Education, Northwest Ohio (Site 6)

Product used	GED Academy
Organization type	Community college
Location	Northwest Ohio
Program goal	GED preparation
Targeted Course	GED preparatory courses
Use Model Type	Blended
Planned frequency (weekly)	Varies by instructor and campus, 3-4 days per week, typically 1.5 to 3 hours per day

Site Portrait

The goal of the Adult Basic and Literacy Education (ABLE) program at Site 6 is to build adults' basic skills in reading, math, and language so they can pass the GED. In addition to the GED preparation courses, the ABLE program offers distance education opportunities, corrections education, courses for English for Speakers of Other Languages (ESOL), and family literacy. Site 6's adult education programs also aim to bridge students from noncredit-bearing Adult Basic Education (ABE) and Adult Secondary Education (ASE) courses into credit-bearing community college programs, job training, and employment.

The ABLE program at Site 6 serves a variety of students. It had projected enrollment of 2,750 for 2016. Approximately 67% of ABE students need remedial education (to move them up to eighth grade-level skills), 28% are ESOL students, and 5% are in ASE courses on a path toward a high school education. Students range in age from 16 to 60-plus, with more than half in the 19–24 range. Forty-one percent of the students are male and 59% are female. A total of 38-affiliated institutions offer ABLE courses through Site 6.

Despite high initial enrollment in GED preparation courses, only 70–80% of students are likely to attend their first class, with substantially fewer completing their course. Numerous factors affect these adult learners' abilities to pursue and complete their education: changing work schedules, disruption to their home lives, child care needs, transportation needs, and their own motivation and ability to persist on the path to a GED.

Use Model

GED Academy was used in GED preparatory courses at five different campuses in the Site 6 network. These courses generally met 3–4 days per week for 3 hours per session. Each instructor had discretion over how he or she organized the class around GED Academy, with most instructors splitting the time equally between direct instruction and time on the product. At least one instructor used GED Academy as the primary curriculum and mode of instruction. However, this instructor supplemented the GED Academy instruction with one-on-one direct instruction on more advanced math topics and essay writing. Within the class time devoted to GED Academy, students' work was self-paced. Students worked on modules selected by the GED Academy software based on a diagnostic assessment administered within the product in each of four subjects (Reading/Language/Writing, Math, Social Studies, and Science). In an attempt to boost attendance at classes during the study period, the ABLE program required students to attend 50% of their classes.

The availability of technology influenced how some instructors organized and planned their instruction. For example, at one program site that had fewer computers than students, students rotated between using GED Academy, group work, self-study using the textbook, attending a pullout session in small groups with the instructor, or working with a volunteer tutor. At another program site at a community center, the instructor had to ensure she had scheduled the use of the computers for her class ahead of time.

Key Implementation Supports and Lessons Learned

Instructors' reports about the adequacy of the vendor's support were mixed. Some teachers felt the availability of GED Academy technical support (through a toll-free number) was adequate to support their use of the product with their students, but others expressed a desire for additional follow-up sessions, particularly before the start of the term.

Both students and instructors reported that they preferred the blending of direct instruction and group work in class with time on GED Academy over only direct instruction or only GED Academy. However, coordinating the self-paced GED Academy instruction with teacher-led curriculum was a challenge: During any session or week, individual students may be working on different modules, making it difficult for the instructors to align their direct instruction with what students are working on.

The ABE program's decision to purchase the textbooks that accompany GED Academy for the students seemed to be an important motivating factor for many students. Many students said they were excited to have their own physical book that they could highlight and write in as well as use for review at home.

Self-Reported Benefits and Challenges

In general, students, instructors, and administrators reported that they appreciated the opportunity to use GED Academy and wished to continue using it. Even individuals who were somewhat critical in their feedback said that enjoyed the experience and found the product helpful. Instructors believed the product helped them facilitate each student's learning. Instructors also reported that the blended model gave them more time, during students' use of GED Academy, to answer individual questions and work with individual students with the greatest needs. Students enjoyed working at their own pace, being able to skip topics they were already proficient on and repeat topics they were struggling with.

In general, students interviewed appeared to be were highly engaged with GED Academy. They said that using a computer to access GED Academy prepared them better for the computer-administered GED exam. Many students, but not all, said they liked the video-based lessons presented by the animated instructor teaching a virtual class; students reported they preferred this mode of instruction over text-based content that put a greater demand on their literacy skills. Instructors interviewed also approved and felt that the student-characters asked relevant and intelligent questions. However, some students found the animated characters in the virtual classroom reflected negative stereotypes or characters they could not relate with.

The instructors' overall response was positive, although some expressed concern about how students might experience their struggles to progress in GED Academy. Instructors generally believed that when some students struggle to master a topic or skill and are continuously reminded they have not reached mastery (for example, each time they enter an incorrect response), they may become less confident about their ability to learn the subject. The instructors believed that these students need extra monitoring and support. In addition, the instructors reported they found that GED Academy content was not appropriate for students with the lowest skill levels, i.e., TABE scores at level 1 or level 2.

Several students and instructors noted issues with the formats that were acceptable for solutions to practice problems and assessments in GED Academy. They reported that occasionally solutions entered for quizzes were marked incorrect when they were conceptually correct but the format for the solution was not. For example, the software requires students to enter decimals with a leading 0 (0.5 instead of .5). However, students reported they did not always receive a notification when they did not receive credit for an item because of a format error.

Most students did not have access to computers outside class and thus found it difficult to use GED Academy outside scheduled class time. In general, use in the home was low because of a lack of technology access or because students had to juggle work schedules and family obligations. As a result, to get extra time on GED Academy, some students came early to campus before class started, some stayed late and used it after class, and others accessed the product in one of the campus' computer labs.

In at least one campus, technology difficulties hindered use of GED Academy. GED Academy expects students to review materials as PDF files that they download and print using a link in the product. Students reported they could not download these files onto the local program's computers and thus were unable to review the recommended materials.

Product: GED Academy

Urban Nonprofit, South-Central Kansas (Site 7)

Product used	GED Academy
Organization type	Nonprofit organization
Location	South Central Kansas
Program goal	GED preparation/high school diploma
Targeted Course	GED preparation class
Use model type	Supplemental
Planned frequency (weekly)	One hour per day, 4 days per week

Site Portrait

The mission of the nonprofit organization Site 7 is to "provide basic skills training to meet the changing educational requirements of the workplace, and to help students meet their education and career goals." Site 7 offers a variety of classes that meet throughout the year including over the summer. It provides GED preparation classes in English and Spanish for adults age 16 years and older. Students enrolled in the Adult Basic Education (ABE) classes are working on improving their basic skills and TABE scores so they can transition to the GED preparation classes. Site 7 also offers the English for Speakers of Other Languages (ESOL) program and a training program for the construction trade.

GED Academy was used in classes in the GED preparation program. Classes are offered in English, day and evening, and in Spanish. (Students in the Spanish GED program were not included in the study.) Enrollment is "rolling," with students admitted on a weekly basis. Class attendance is not mandatory.

Site 7 serves approximately 700 students a year. A majority of the students in the study were male, which is consistent with the general student demographics at this site. Most of the students have completed at least an eighth-grade education but have average reading and math skills, at the fourth- and fifth-grade levels. A majority of students enter the program at or below the poverty level; if they are employed, they work mostly in minimum-wage, entry-level positions and often work at multiple jobs. Students who attend the evening courses are often employed and studying to advance their careers. For example, some of the evening students are Certified Nurse's Aides (CNAs), positions that do not require a GED or diploma. Site 7's evening courses enable these adult students to acquire their GED or earn their high school diploma so they can advance in their profession.

The program has a total of four instructors: two teach the day classes, and two teach the evening classes. Two new instructors were hired in April 2016 to replace two instructors who left the program in March 2016.

Use Model

The use of GED Academy was originally planned to support students in the morning GED preparation session. This session met for 3 hours starting at 9:00 a.m., Monday through Thursday. To accommodate the use of GED Academy, a 1-hour drop-in lab starting at 8:00 was added to the morning session. The expectation was that students would use GED Academy for up to 4 hours per week before their direct instruction classes, with instructors being available to answer students' specific questions. Because Site 7 has an open attendance policy, attendance at the drop-in lab was not required. While most students did work on GED Academy during that hour, some students preferred to instead use that time to work with the instructor one on one. In general, the students generally preferred not to stay late after class or come in early before class to use GED Academy because they need to balance family, work, and school, and many are constrained by the public transportation schedules.

The original instructors started using GED Academy at the beginning of the study, in fall 2015. The new instructors, who started at Site 7 in April, used GED Academy significantly less frequently than the original instructors.

As the year progressed, GED Academy use evolved. The product was used differently by two groups of students in the GED preparation course. One group worked on GED Academy during the drop-in lab, and the other worked mostly online on GED Academy and rarely came into class. The director of the program was the instructor for this group of remote online students and tracked their progress through the GED Academy dashboard. Two of the highest users in the Site 7 sample were from this group of students. Instructors reported that roughly half the class came to the lab regularly.

For students attending class in person, the math instructor was available during the drop-in lab. For the most part, students worked independently on GED Academy during this time (the topics they worked on were assigned by the product), with the math instructor answering questions when students needed help. However, some students preferred to use the drop-in lab to meet with the instructor one on one rather than use GED Academy. For the students working remotely, the program director provided individualized feedback via emails and phone calls based on her review of the GED Academy student progress reports.

Both groups of students had access to digital copies of the textbook, Kaplan's 2014 *GED Test Strategies, Practice, and Review*, and some students chose to purchase their own copies. The GED Academy product aligns well with the content in this textbook, even to the extent of listing the pages that students should read if they need help while working on the product.

Key Implementation Supports and Lessons Learned

All instructors and students agreed that having access to the Kaplan textbook, in both online and physical form, was helpful because when students were struggling with a particular skill or concept, they could use the textbook to review the topics recommended by GED Academy.

Site 7 planned to require that all students in the participating classes use GED Academy. Site 7's open attendance policy and the use of GED Academy as supplemental activity, however, made this difficult to enforce. Thus, not all students used it, and many did not use it consistently. Further, the instructors who joined the program in April 2016 may not have received the same orientation training on the use of GED Academy by the vendor as the original instructors and thus may have been less committed to using it with their students, limiting these students' exposure.

Self-Reported Benefits and Challenges

In general, the original instructors were very positive about their experience. They reported they preferred using GED Academy to other online products they had used in their classes, primarily because of the engagement they observed while students were using and talking about the product; the instructors felt that the animated virtual classroom and instructor engaged students in ways other products had not. Several other features that instructors believed supported students' learning were the ability to highlight text within the online lessons, links to external websites giving access to additional online math resources, printable worksheets, and the online dictionary.

In interviews, some of the students commented on the flexibility of GED Academy provided them, allowing them to fit time in to build their skills at various times of the day. These students described using the product late at night and on weekends. Some students also reported using it on their mobile devices.

Yet overall time on GED Academy was limited by the factors mentioned above (use of product as a supplemental activity, open attendance policy, instructor turnover). In addition, the new instructors reported they did not have the time to effectively integrate GED Academy into their curriculum. Nor did they have the time to regularly review students' individual progress reports from GED Academy and provide feedback; provision of feedback was also hindered because of many students unavailability for meetings outside regularly scheduled class time due to transportation and work schedules.

Some students resisted using the product, particularly while on campus. These students said they preferred to use their time on campus learning from the instructor directly (the instructors confirmed these reports). One student commented, "I can do [online learning] anyways at home; why should I come here for that?" Some of these students liked the ability to use GED Academy at home, but when they were on site they preferred being taught by the instructor.

For more effective use of GED Academy, some students said they wanted a more thorough orientation to the software so they could better use the all its features and resources. In the future, Site 7 plans to have a more in-depth training for instructors on all the product's features so they can better inform their students about their utility. The program director also would like to see a blended integration of GED Academy into the curriculum by using the product to provide primary instruction on skills and concepts and then use the direct classroom instruction to clarify difficult concepts. The director's other plans to encourage regular use of GED Academy include making the computer lab time integral to the instructors' lesson plans and scheduling use during regularly scheduled class time.

Product: GED Academy

Rural Nonprofit, Northwest Kentucky (Site 8)

Product used	GED Academy
Organization type	Nonprofit adult education center
Location	Northwest Kentucky
Program goal	GED certification
Targeted Course	GED preparation
Use Model Type	Online at school
Planned frequency (weekly)	Varies by instructor, 2–4 days per week, typically 2 hours per day

Site Portrait

Site 8 provides basic education for adults working toward their GED certification as well as English as a Second Language classes for students in northwest Kentucky. Site 8 recently added college preparation programs, including classes in ACT test preparation and COMPASS test preparation (for community college). Site 8 also provides basic computer skills courses to help adults become comfortable using technology (e.g., how to use a computer mouse, conduct searches, and navigate websites). To help students achieve their goals, Site 8 tries to remove obstacles by providing transportation and child care. It also offers a separate program for adults in the Ohio correctional system.

Site 8 enrolls approximately 300 students, down from 500 since the release in 2014 of the newly designed GED test, according to the program director. Classes are offered both during the day and in the evening. The typical student is under 35 years old and white, with a few Hispanic and African American students. A majority of the daytime students are unemployed or working part time. These students typically have reading and math skill levels ranging from second- to sixth-grade level. Most of the evening students are employed and working full time. Low class attendance is a recurring issue at Site 8.

The GED preparation program has seven instructors, including the program director. All of them taught the students participating in the research study. The instructors described math as the weak area for most students in the program, and math was the focus of the GED Academy use, although students used it to cover social science and science content as well. The GED preparation classes met four times a week for 2 hours per session, for a total of 8 hours per week.

Use Model

In general, instructors and students used GED Academy during class time. Students worked remotely in one course, with the program director serving as the instructor and progress monitor. In the on-campus classes, students took GED Readiness tests that helped the instructors and students identify which subjects or topics they needed to focus on. Students received individualized instruction on these topics, with instructors providing group lectures and instruction when needed (there was little whole-class instruction). According to instructors, time on GED Academy was assigned more to students who had more advanced incoming math skills and less for students at the lowest skill levels, particularly with students who had less experience with technology and computers. Some instructors felt that GED Academy and its adaptive features would be most valuable for students working on more advanced math (e.g., algebra, geometry, and slope). They felt that students working on the lower skill levels (e.g., fractions, decimals) might become overly frustrated with the slow pace of their progress within GED Academy, particularly when they were assigned content they had been exposed to multiple times during their formal school years.

In the one class of students who worked on GED Academy remotely with the program director tracking their progress online, the director used the reports provided by the system to track student progress and effort and provide encouragement and reminders as needed. When the director noticed students' lack of progress on specific topics, he encouraged the students to come to campus for one-one-one instructional support from the instructors teaching the on-campus courses.

Students used GED Academy across all subject areas on the GED exam—math, language arts, social studies, and science. The subject-specific use of GED Academy was informed mostly by how students had performed on external tests, such as the GED Readiness test, along with instructors' own assessment of students' progress. Students were encouraged to use GED Academy outside class as well. Once students started scoring sufficiently well on the GED practice tests within GED Academy, they were encouraged to take the GED exam.

Key Implementation Supports and Lessons Learned

To support students working independently on GED Academy either outside or during regular class time, the instructors reviewed the product's dashboard each week to monitor student progress and then follow up with students if needed.

Self-Reported Benefits and Challenges

The instructors reported that they plan to continue using GED Academy after the study. The primary factors behind this decision were the product's user-friendly interface and detailed reports of students' mastery of concepts. The instructors found the detailed student reports, which are based on the formative tests, particularly beneficial as they helped them identify the topics students still needed to master.

Instructors reported that students regularly reviewed their own progress reports and found this motivating. Students understand they can "test out" of a subject area within GED Academy based on their scores on the built-in GED practice tests.

Another advantage of GED Academy instructors reported was how well the product mapped onto the GED practice tests. The instructors took advantage of this by having their advanced students use GED Academy when they were close to being ready to take the GED exam. Additionally, because the GED exam is computer based, instructors felt that having students work on GED Academy helps them become comfortable with taking computer-based tests as well as build their general computer technology skills.

However, instructor feedback on the product was not all positive. Instructors reported that they believed the animated characters used in the virtual classroom GED Academy might be ineffective for students who are not native English speakers and for older adults. They mentioned that the colloquial references used by the characters may hinder motivation and learning for these students.

Product: MyFoundationsLab

Community College, South Central Arizona (Site 9)

Product used	MyFoundationsLab (MFL)
Organization type	Community college
Location	South Central Arizona
Program goal	High school equivalency
Targeted Course	High school equivalency
Use model type	Blended and hybrid
Planned frequency (weekly)	1 day per week for 3 hours

Site Portrait

Site 9, a member of a large community college system, provides many online courses in its training, certificate, and degree programs, including its Adult Basic Education (ABE) programs. Its College Bridge Pathways, the focus of the study at Site 9, helps students reach high school equivalency and serves as a bridge to college-level programs. Bridge programs are offered at six campuses across the county. Students are encouraged to concentrate on earning their GED to pursue the path to higher education or professional certification. College Bridge Pathways students range from 16 to 60-plus in age, and the program has 11 full-time and more than 75 part-time instructors. The program offers “managed enrollment,” whereby new students are accepted every 2 weeks.

The Arizona Department of Education recently adopted MyFoundationsLab (MFL) as the required online component for all ABE programs (the state had used PLATO Learning), and Site 9 has incorporated it into College Bridge Pathways. As part of the program, Site 9 offers two course tracks on High School Equivalency (HSE): College Bridge Pathways and English Language Acquisition for Adults. Approximately half the students are in the HSE track. All six Site 9 campuses that offer HSE courses participated in this study.

Use Model

Site 9's HSE courses focus on basic skills development and preparation for the four GED subject exams. Courses meet three times per week for 3 hours per session. Two days per week are spent on traditional classroom instruction, and 1 day is set aside for MFL Lab in the campus computer lab.

All students start in the Foundations course and then continue to higher level HSE courses, depending on their TABE scores. Differentiated classes enable instructors to adapt instruction to student learning needs. During lab periods, however, classes may be mixed because of scheduling and space.

The 3-hour MFL lab sessions are primarily self-directed and self-paced. Students initially take a PathBuilder diagnostic test within MFL for each of the four content areas. Students are shown their areas of mastery and areas where they require additional work. Although some instructors assigned MFL modules during the lab sessions that corresponded with what they were teaching in class, for most of the MFL lab time students chose the subjects they wanted to work on among the modules recommended to them based on their PathBuilder diagnostic.

Key Implementation Supports and Lessons Learned

All instructors attended an 8-hour face-to-face training seminar at the Arizona Department of Education delivered by a Pearson representative. Instructors also had access to Pearson 1-hour web tutorials on the MFL functions available to them. In addition to this support from Pearson, instructors and some administrators attended a 3-hour seminar by Mockingbird Education on technology integration in teaching.

During students' 3-hour lab session, a technician was available in the room to help with logging in and basic MFL use-related issues. This was especially helpful for new students. Students also relied on other students for help with both technical and content issues. Finally, students reported consulting other online instructional resources when needed.

Students gave mixed reviews to Site 9's decision to separate in time and space the periods of direct instruction and online instruction using MFL. While some students said they preferred having two periods per week of direct whole-class instruction and one period dedicated to the MFL lab, others reported they would have preferred having each class period split into direct and online instruction, thus reducing the time spent online from 3 hours per session to 1.5 hours and possibly the fatigue associated with prolonged work in the online environment. Program administrators seemed to agree. The administrators reported that they felt the lab sessions would be more effective if they were shorter and if instructors were available in the lab to address students' content-related questions and provide support and motivation.

Students were strongly encouraged to continue their studies at home using MFL. In practice, their use of MFL outside class varied depending on access, schedule, and motivation. While some students had no opportunity or motivation to use the software outside the required lab period, others reported using it for anywhere from an hour per week to an hour per day.

Self-Reported Benefits and Challenges

Students' reviews of the MFL program varied widely. Some students thought highly of it, gave it a "5 star" rating, and told us that before using it they had not been very successful in trying to improve their basic skills using online resources. Students liked the flexibility of using MFL whenever they wanted, of having choice over the topics they worked on, and of being able to have all their work and progress saved each day and being able to continue to work where they left off the next time they logged on. However, several students reported they would have preferred that the course be taught entirely by their instructors and would not have used MFL if use had not been mandatory.

Students' views of the effectiveness of the text-rich instructional content also varied. Some students reported that the instructional format was effective and helped them develop reading comprehension skills, while other students found this format "boring" and not very engaging. Many students (even those who spoke favorably overall about MFL) mentioned that the product could benefit from some video-based instruction. Several students cited Khan Academy as an example of a program they found more engaging and preferable "because it feels like someone is teaching you instead of you just reading."

Product: MyFoundationsLab

Multisite Community College, Indiana (Site 10)

Product used	MyFoundationsLab (MFL)
Organization type	Community college
Location	Indiana (multiple sites)
Program goal	Career pathway preparation
Targeted Course	Foundations (math and reading skills remediation)
Use model type	Online and hybrid
Planned frequency (weekly)	3–6 hours per week; 8 or 16 week terms

Site Portrait

Site 10, Indiana's community college system, has more than 30 campuses across the state and serves nearly 200,000 students annually.

MyFoundationsLab (MFL) is used at all Site 10's campuses in Foundations, a course for students with reading, writing, and math remediation needs who plan to pursue technical tracks, such as welding, automotive, and HVAC. Those tracks can lead to 2-year associate degrees or two- to three-semester certificates. The student population for Foundations is predominantly male, and students are age 17 and older. Before entering the course, all students take a customized ACCUPLACER diagnostic exam and are provided with an individualized study path in MFL based on the ACCUPLACER score. Some students require remediation in both math and reading and some in only one subject area. For the purpose of this research, we focused only on those students with a reading requirement and who were planning to enroll in a math-related career pathway. We were interested in whether students in the Foundations course who used MFL were better prepared for the first English course in their career pathway than students who also had a reading remediation requirement but did not use MFL.

Use Model

MFL is the centerpiece of the Foundations course. During class time, students work independently on MFL within their individual study paths. The goal is to achieve mastery of the required modules. Only Modules 1–4 in MFL (in both math and reading) are required content in Foundation classes. Course grades are based 90% on MFL competencies and 10% on other factors. Classes meet for 3–6 hours per week (depending on the campus schedule) in computer labs. Classes and can be as small as 3 students and as large as 15. Courses meet for 8 to 16 weeks.

Instructors are present in the lab when students are using MFL. The instructors' main role is to provide individual tutoring for students who are struggling with a concept in MFL. They also monitor students' progress on MFL and help them set goals and stay on task. For example, an instructor told us when students struggled with reading tasks, she checked how they were taking notes on the reading passages to see whether they were identifying the core concepts. According to instructors, students in the Foundations course often have trouble managing their time, so instructors constantly meet with them to talk about how to stay on track. As an instructor noted, students "need encouragement, motivation, and pushing."

In the Site 10 use model, some instructors had students work on MFL for the entire class period, while others gave short lectures or held class discussions to start the class before turning to work on MFL. During the lab sessions, students were allowed to refer to other online resources such as Khan Academy on the belief that such supplemental alternative approaches to the course instruction supported their learning of various concepts covered by MFL. Students were not required to work in MFL outside class time, but instructors encouraged them to, particularly students who had too many MFL modules to complete during class time alone.

Instructors typically receive 1 hour of training from Pearson, the publisher of MFL. Instructors also receive a 1-hour training session from Site 10 support staff on how to teach Foundations with MFL.

Self-Reported Benefits and Challenges

MFL was used in Foundations courses during both 8- and 16-week terms. During the 8-week term students spent 4 or 6 hours per week in the computer lab, and during the 16-week term they spent 3 hours per week. The instructors interviewed felt that the 8-week term was more effective for most students because of the more intensive time spent on MFL.

The coordinator for the Foundations course emphasized that Site 10 uses MFL because it is correlated to the customized ACCUPLACER diagnostic. Students work only on those modules on which they have not demonstrated proficiency. The coordinator believes that the program has worked well for students who need remediation in reading and math.

Of the five instructors interviewed, most had generally positive views about the mastery-based approach of MFL. They believed it works well for their students, who start with a wide range of abilities and gaps. Using MFL also permits more individualized instruction, so that students can work on their areas of need, and instructors can work with students one on one. It would not be possible to provide this kind of instruction without the technology.

Instructors reported that some students, especially the older ones, struggled with the technology at first because they lacked basic computer literacy skills. These students tended to need more help logging on the system and performing some basic tasks like attaching files to email. After an initial adjustment period, the struggles with technology tended to drop off. However, one instructor observed that a reluctance to use MFL persisted throughout the course for some of her older students due to their preference for working directly with their instructor rather than the software.

According to the instructors interviewed, many students found value in MFL's individualized progress reports, helping them visualize their progress in the online system. As one instructor reported,

> Especially in a remediation situation, students feel like they've been in remediation before, [they] feel like they're not going to get through it.... In this case, they felt like they could complete the tasks, see the bar filling up; they felt like they were actually getting something done.

While instructors believe that the difficulty level of the reading passages is appropriate for their students, they did express some concerns about whether students find the content sufficiently engaging. One instructor observed that the passages tend to be about politics or history, which are not topics necessarily relevant to the students' interests. "It's very rare that they get something technical related to their expertise," one mentioned. "They never get the opportunity to use their skill in their reading. Topics are always far from being relevant to what [a] student plans to do or is good at."

Another instructor suggested that including fiction passages might help students become more engaged with reading.

Instructors also observed that some students seem to get frustrated by the presentation of the content. One instructor said, “I have students who say this doesn’t teach you, it just makes you do the work. It just shows you the same thing over and over, if [you] don’t understand you’re kind of stuck, it doesn’t show you an alternative way.”

Product: MyFoundationsLab

Multisite Nonprofit Adult Learning Center, Rhode Island (Site 11)

Product used	MyFoundationsLab (MFL)
Organization type	Nonprofit organization for adult basic education
Location	Rhode Island (multiple sites)
Program goal	Skills improvement and high school credentialing
Targeted Course	Math and English language arts
Use model type	Hybrid
Planned frequency (weekly)	3 hours per week

Site Portrait

Site 11 was established in the late 1970s as a regional learning center for the Rhode Island Department of Education. Site 11 has three main facilities in three cities and two smaller operations in two of these cities. Students are age 16 and up, with about 50% between the ages of 25 and 44. The main goal for students is to earn a high school credential through the GED or National External Diploma Program (NEDP). Roughly half the students are employed.

To meet a range of student needs, Site 11 offers multiple programs including courses for Adult Basic Education (ABE), preparation for a high school credential, English as a Second Language, and a transition to college program. Classes are offered in a classroom environment at learning resource centers. Course topics include math, English language arts, social studies, and science.

Site 11's courses are offered during fixed fall, winter, spring, and summer term dates rather than on open or rolling enrollment. The courses are offered in both day and evening sessions. At the larger centers, math classes are roughly grouped by skill level. Students work their way through various skill levels, receiving both group and personalized instruction. The length of time students spend in the program depends on their skill level on entry and the time and effort they can dedicate to their studies.

Site 11 offers counseling and training to support students in adult education and to assist with the transition to college and careers, including case management, life skills training, referrals, and individualized career planning and advising. Site 11 also provides assessment services, including the administration of the Comprehensive Adult Student Assessment System (CASAS), the GED, and National External Diploma Program assessments, and serves as an authorized test center for work-related and certification tests for a test publisher.

Use Model

Site 11 staff used MyFoundationsLab (MFL) to provide personalized instruction addressing the widely ranging skill levels of the students enrolled in ABE courses. In the intermediate and advanced ABE courses in two cities, students were required to use MFL for 3 hours per week in math and English language arts classes, amounting to about half the class time (the amount recommended by Pearson).

During these 3 hours per week, the different instructors used MFL differently in their course sessions. One instructor used whole-class instruction (e.g., solving problems on the white board) for the first half of class and then had students work independently in MFL for the second half. During this time, she walked around to help students when they were stuck and to make sure they were staying on task. The instructor assigned everyone to work on a particular topic in MFL, and once they were finished, the students were allowed to choose what to work on in MFL. Another instructor assigned students to work together in pairs on problems in MFL. When new students joined the class, she paired them with other students to observe how to navigate MFL. Students then worked individually or pairs on problems in MFL. Students at the smaller sites and in the beginner ABE level in one of the larger ABE programs had a more flexible model for MFL use. They had the opportunity to use MFL during class time but were not required to. According to the instructor, students in the beginner ABE class did not use MFL consistently during class because she felt that it was not appropriate for her students.

Students in the Site 11 ABE courses were encouraged but not required to use MFL outside class to accelerate their progress. Students' use outside class varied: Some reported spending hours per week on MFL on their own time, whereas others did not use it at all.

Some, but not all, Site 11 staff involved in the study were able to attend a 1-hour webinar provided by Pearson. Program directors participated in a webinar that covered the information the product provides to help instructors monitor student progress and performance in MFL.

Mockingbird Education also delivered a full-day in-person training session with Site 11 staff in March 2016. This training did not focus on MFL or blended learning per se but rather on instructional strategies to address the challenges of teaching vulnerable learners.

Key Implementation Supports and Lessons Learned

Internet connection and computers appeared to be sufficient for the study. Students in classrooms all had access to laptop computers or tablets. Staff and students interviewed were satisfied with the available Internet connection and reliability.

Some students had Internet access and were able to work on MFL at home, but others did not. Because MFL is not formatted for smartphones, many students without home Internet access were not able to work on it outside class.

Students sometimes used hand-held calculators to help solve problems in MFL. One instructor encouraged students to do so because students can use calculators for the GED and high school diploma program exams.

Self-Reported Benefits and Challenges

Instructors and students identified various benefits of MFL. Instructors cited the ability to personalize and differentiate instruction and increase student accountability. Students liked the ability to work at their own pace, the opportunities MFL provides to practice skills, and the immediate feedback they received when attempting to solve problems. One student who reported feeling anxious about speaking out in class said she particularly appreciated being able to work independently.

Instructors and students also raised several challenges in the use of MFL. Some instructors found the MFL ABE and GED content too advanced for students with low math and reading skills, particularly the vocabulary and general reading level of the overview sections of the main instructional passages. Some instructors also believed the text-rich instructional passages were not topical and did not appear to be engaging or inspiring for students. Some students said they had difficulty comprehending the overview sections when reading off the computer screen and often printed hard copies of these sections so they could highlight key terms and concepts and take notes. Some instructors also felt that the content was not well aligned with the content of the GED exam. Some students were openly resistant to learning online with MFL and said they preferred learning directly from the instructor.

All instructors interviewed reported that they struggled with implementing MFL and would have benefited from earlier and more frequent training and support. Nine of 15 staff members involved in the study did not participate in any Pearson-provided training on MFL.

Product: Reading Horizons Elevate

Urban Multisite Adult Charter School, Northwest Illinois (Site 12)

Product used	Reading Horizons Elevate
Organization type	K–12 charter school
Location	Northwest Illinois
Program goal	High school diploma
Targeted Course	Reading intervention (pullout)
Use model type	Supplemental
Planned frequency (weekly)	Varied by campus schedule

Site Portrait

Site 12 provides alternative education programs for dropouts and at-risk youth, ages 16–20, in a large urban area through a multicampus system. A charter school within the city's school district, Site 12 operates at 19 sites, often within existing high schools. Many Site 12 students have reenrolled in school after a 3-month to 1-year period of disengagement, with some students having been out of school for up to 3 years. Students in Illinois are eligible to receive a high school diploma until age 21. Students are typically enrolled in Site 12 schools for 18 months.

The mission of Site 12 goes beyond simply attainment of a high school diploma. Site 12 provides academic classes, academic remediation, and support for social emotional development to help students earn a diploma through multiple pathways tailored to their needs. Site 12 also offers career pathways, support for college enrollment, and support services for workforce readiness.

Site 12 students face multiple barriers that lessen their engagement with traditional schooling: poverty, transient living situations, truancy, interactions with the criminal justice system, and low literacy (e.g., fourth- to sixth-grade reading levels). Students who enter the program with low reading levels, and whose schools have the appropriate technology infrastructure, are placed in an online reading intervention course. The goal of the intervention is to boost students' basic literacy skills so they have a better chance of passing their general education courses and recovering credits needed for graduation, as well as being successful in the workforce.

Use Model

Reading Horizons Elevate, familiar to Site 12 through use in its special education instructional program, is used by students in a literacy lab as a pullout program taught by reading coaches or specialists. Each site has its own way of implementing the literacy lab. The literacy intervention must fit within the existing high school curriculum, with a focus on accumulating general education credits for graduation. As a result, the reading intervention cannot always be in the form of a full course. Depending on the site, during the study the intervention was delivered as part of an English language arts course, an extra session during lunchtime or study period, a pullout activity during a regular class, or as an elective credit. The literacy intervention labs are rarely scheduled for before or after school, however, because students would be unlikely to attend at those times.

The literacy intervention labs and the use of Reading Horizons Elevate is overseen by a group of reading specialists assigned to sites for this purpose, some with certification in reading instruction. These specialist work directly with the students. The program coordinator for the literacy intervention labs also acts as a coach for these specialists, providing help with literacy labs setup, student motivation, technology use, and reading pedagogy. She also helps make sure the intervention is consistently implemented across the sites, with an emphasis on competency-based achievement.

How Reading Horizons Elevate was used with the labs varied depending on the site. For sites with shorter literacy lab periods, instructors monitored students' self-paced work in a computer lab or library and answered questions as needed. In other cases, instructors felt that working on the computer for an entire class period was too much for the students, so they combined Reading Horizons Elevate with off-computer activities. One teacher let each student have one day to read a book of their choosing during class. Another mixed in direct instruction or reading Lexile-leveled articles from another product (Newsela) related to the social justice theme of the school.

Even though Reading Horizons Elevate allows students to alternate between decoding practice, reading-in-context, and reading comprehension activities, the program coordinator felt that, over time, the use of the product as part of the literacy intervention would evolve to a mixed-mode model. In this future model, students use of Reading Horizons Elevate to learn and practice basic skills would be combined with non-computer-based reading activities that would allow students to apply and reinforce their improved skills by reading texts of their own choosing.

Key Implementation Supports and Lessons Learned

The program coordinator, and her coaching of the reading specialists, was critical to the successful use of the Reading Horizons Elevate program in Site 12. She served as both a pedagogical coach and technical support specialist for the instructors. The participating instructors had different backgrounds in teaching reading to low-skilled adult readers. Typically, high school English teachers are not prepared to teach basic reading skills and so are not familiar with the decoding system that is the basis for the Reading Horizons Elevate pedagogical approach. Thus, Reading Horizons Elevate professional development teaches instructors not only how to use the software, but also how to approach the teaching of reading for low-skilled adults.

Self-Reported Benefits and Challenges

Students interviewed felt that Reading Horizons Elevate was helping them learn by “breaking words down and putting them back together.” They felt that the word decoding and reading practice built into the product helped them learn and that the variety in the program helped them stay engaged. Students also said that they applied the word decoding skills they learned with the product in their other classes.

From the outset of the study, the instructors believed it was unlikely that the students would work on Reading Horizons on their own outside the literacy lab. In the literacy lab, instructors adopted a variety of strategies to motivate students to make progress in the product (e.g., incentives such as gift cards to local fast-food restaurants), yet some instructors still reported they were disappointed in students’ progress.

Some instructors also noted that students may have viewed the content as too remedial or “juvenile,” not geared toward adults and not relevant for the workplace, thus influencing these students’ use of the product.

Product: Reading Horizons Elevate

Rural School District, Northern Utah (Site 13)

Product used	Reading Horizons Elevate
Organization type	School district
Location	Northern Utah
Program goal	High school equivalency
Targeted Course	Reading Improvement; two 2-hour sessions per week
Use Model Type	Hybrid
Planned frequency (weekly)	30 minutes per session; 1 hour per week

Site Portrait

Site 13 is one of six specialty schools in a rural school district located in Northern Utah. Site 13 offers programs specifically designed to meet the needs of adult learners, most of whom pursue one of the following: a high school diploma, a GED certificate, English as a Second Language (ESL) skill development, literacy or numeracy instruction (starting at or below a high school graduate level), or a transition to community college.

The program serves about 200 students each day, about 70% of whom are employed. Students range in age from 16–50, although most are between 18 and 25. While the majority of the students enrolled in the Site 13 school are white, the program does have disproportionately more minorities than the surrounding area.

Each class is taught by one instructor. Classes meet twice per week for 2 hours per session typically over a 5-week period (students usually enroll in more than one 5-week session). On average, each class has 15–20 students. After every 40 hours of instruction, each student is tested using the TABE assessment.

The Site 13 school program has no formal sequence of literacy courses. Instead, students take (and repeat if needed) the literacy course Reading Improvement until they are prepared to take more advanced classes, based on the instructor's assessment of their progress.

Use Model

The Reading Improvement course in which Reading Horizons Elevate was used does not have a formal curriculum or textbook. Instead, each instructor prepares her own class and covers the skill areas of phonics, writing, reading aloud, and comprehension.

The instructor who participated in this study used Reading Horizons Elevate during the last 30 minutes of each 2-hour course session, providing a total of 1 hour per week of in-class use. Students were required to spend 7 hours total on Reading Horizons Elevate to pass the class, so they also needed to spend 2 more hours working with it outside class. To complete this requirement, some students chose to return to the school and work in the computer lab, whereas others worked from home.

The regular classroom had sufficient computers to accommodate all students. After 90 minutes of instructor-led instruction, students used the classroom desktop and laptop computers for Reading Horizons Elevate work. While students worked on Reading Horizons, the instructor circulated among them, checking in and working with individual students. Because of the adaptive design of Reading Horizons Elevate content, each student worked at his or her own level and pace, something the instructor appreciated. The instructor commented, “I have to teach to the middle [during whole-class instruction]. Using Reading Horizons Elevate is a way for them to have success at their level and improve but also feel part of the class.”

Key Implementation Supports and Lessons Learned

The school had sufficient technology hardware and infrastructure to use Reading Horizons Elevate. It had recently been awarded grants that provided a laptop cart in each classroom, to complement the four or five desktop computers in each room.

The instructor also mentioned that students were increasingly bringing their own computers into the classroom. As observed during a site visit, 3 of 12 students were using their own computers (one was a tablet) and easily navigated through the Reading Horizons Elevate screens. Two other students brought in their own headphones.

The instructor had received a full-day orientation to the program from Reading Horizons staff. She was positive about the experience and reported that on two additional occasions the Reading Horizons area representative had been helpful, providing a printed handbook of Reading Horizons materials and answering questions about the product’s Lexile scores. In general, the instructor felt that Reading Horizons Elevate was easy to learn and that the training and support were sufficient.

Self-Reported Benefits and Challenges

Site 13 participants had very positive reactions to Reading Horizons Elevate. The instructor, director, and students reported that it was a good addition to the Reading Improvement course. The students interviewed said they would not enroll in another Reading Improvement class unless it used Reading Horizons Elevate. The teacher and director emphasized that the students who seemed most enthusiastic about the product were ESL students.

Students reported that they found the online “short” books used for reading practice engaging and interesting. Others also liked being able to work on their own: “It’s more private than in the class. It’s just you and the computer. You don’t want others to know you can’t say the word. With this, others don’t know what you can’t say.” Other students added, “With the computer, you can keep repeating the word as much as you want,” and “It’s like you have your own teacher.”

Challenges to using Reading Horizons Elevate appeared to be minimal. The instructor and some students reported small technical issues, including a software bug in the Lexile test and occasionally having the program “freeze up” during use.

Product: Reading Horizons Elevate

Large School District Adult Education, Southern Kentucky (Site 14)

Product used	Reading Horizons Elevate
Organization type	School district
Location	Southern Kentucky
Program goal	High school equivalency
Targeted Course	Adult Basic Education, basic literacy
Use model type	Hybrid
Planned frequency (weekly)	Typically 90 minutes per day, 4 days per week for 3 weeks

Site Portrait

As part of a large school district in Kentucky, Site 14 offers programs for adults to improve basic skills and prepare for the GED test. It also offers English as a Second Language (ESL), vocational certifications, career training, and college preparation. Site 14 serves up to 5,000 adult students in a calendar year at 10 sites across a medium-sized city in Southern Kentucky.

Site 14 offers three levels of courses based on students incoming skills: Basic (lowest), Foundation (grades 4–6), Intermediate (grades 6–8), and Express (for those nearly ready to take the GED test). Students are placed according to their precourse TABE assessment results. Courses are typically 6 weeks long, and most classes meet for 3 hours per day, 4 days per week. These classes cover both reading and mathematics. On completion, students can reenroll at the same level or qualify with their posttest TABE score for a higher level course.

All TABE assessments were administered in a computer lab at the central program site. At this location, counselors were also available to help students make education and career preparation plans.

Use Model

Site 14 started using Reading Horizons Elevate in January 2016. Instructors were given flexibility in how to include it in their courses, and each used it slightly differently. Typically, the instructors interviewed reported having students use Reading Horizons Elevate for 90 minutes per class, 4 days a week, for the first 3 weeks of the session. The instructors then began direct instruction on TABE-related content for the remaining 3 weeks of the session. Reading Horizons Elevate was not integrated into any other reading instruction provided. Variations of this use model were as follows:

- Local Site 1. The instructor started her class (three meetings per week for a total of 4 hours) with a direct-instruction introductory phonics lesson using instructions provided by Reading Horizons. Students then worked individually for the remainder of the 90-minute session on Reading Horizons Elevate. The instructor used this format for the first three sessions before switching to having students work on the product for the entire 90-minute session. After 3.5 weeks (20 instructional hours), the instructor stopped using Reading Horizons Elevate and began teaching her own lessons.
- Local Site 2. The instructor used Reading Horizons Elevate through the first 3–4 weeks of her session, totaling 20 hours of instructional time. Students worked independently on the product for the entire 90-minute reading period.
- Local Site 3. The instructor also had students work on the product for the entire 90-minute class session. However, because the computers at this site needed updating, this instructor was not able to start using Reading Horizons Elevate with students for several weeks into the class, when arrangements were made for the class to use the computers in another classroom. The instructor provided direct instruction on reading in the weeks before and after the use of Reading Horizons Elevate.
- Local Site 4. The instructor supported student use of Reading Horizons Elevate during an “open” lab time. Students had the freedom to use the lab and product as much or as little as they wanted. The instructor was available to support all students in the lab, including those students not using Reading Horizons Elevate.

The use of the Reading Horizons Elevate dashboard also varied across the instructors interviewed. Two instructors referred to it regularly, checking the number of hours students were spending on the program. These instructors checked student Lexile scores and the scores that students earned on program modules. One instructor did not use the dashboard at all, and another used it to identify a few students who were struggling with specific skills so as to provide them with targeted supplemental materials.

Key Implementation Supports and Lessons Learned

At each of the adult education sites, computers were in the classrooms. Few students had computers of their own. One program staff member spent 2 to 3 weeks helping each site get started on Reading Horizons Elevate, such as providing headphones, helping students log in, and diagnosing issues when computers would freeze.

Reading Horizons personnel provided a full-day training in September 2015. They provided refresher training in late December 2015 remotely, and Site 14 began using Reading Horizons Elevate in January 2016. The Reading Horizons area representative reached out to Site 14 by email and provided clarification on a technical question the instructors wanted help on. Staff also participated in a 7-hour training in April 2016 provided by Mockingbird Education. This training was provided after instructors finished using Reading Horizons Elevate with their students.

Self-Reported Benefits and Challenges

Overall, instructors reported that students liked Reading Horizons Elevate and felt that the product is very effective. For many students, this was their first use of a computer. Instructors appreciated that this experience helped students gain confidence in using computers and build their computer literacy skills since the students will take an online version of the GED exam. As one student commented, “I loved it. At first I was scared to death, I thought I was going to break the computer or something, but I got the hang of it. Now I can read a lot. It brought up my skills.”

Instructors felt that ESL students used the product the most and benefited most from it. They also reported that those students who were more invested in their learning and motivated benefited more from the product than others. They believed that those who were less motivated were more likely to click through the lessons “mechanically,” with less reflection.

The instructors’ greatest concern was the product’s alignment with the content covered by the TABE assessment. They commented that because the content taught within Reading Horizons Elevate is not content directly tested in the TABE, use of the product took time away from teaching TABE-related content, and several instructors observed TABE scores for their students decrease over the course of the session when the product was used. As one instructor stated, “I got very positive feedback. Students loved it, and they got computer skills. My concern was that it was not connected to our content."

Some students reported issues associated with working on the product for extended periods of time. These students, who worked on Reading Horizons Elevate for up to 90 minutes per session, said they found the content and activities became tedious and less engaging as time passed during a session. Finally, some students expressed frustration that they could not skip ahead to the next lesson until they achieved a passing score on the assessment, forcing them to repeat lessons multiple times until they did so.

SRI Education

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