Advance Student Achievement while Lowering Costs through Digital Learning

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At this critical moment, policy makers and education leaders have an obligation to take learning to the next level by maximizing the opportunities that digital learning and technology offer for all students.¹

Educators continually strive to find proven, innovative, and affordable programs that will improve student achievement. The influences of changing policies and educational shifts, such as the No Child Left Behind Act of 2001 and the Common Core State Standards, require increased accountability as well as flexible, timely, and effective solutions.²,³ Digital learning programs offer one potential solution to help students realize achievement gains, while providing educators with on-demand access to student performance data.⁴

Ultimately, educators are tasked with raising student achievement using limited financial resources. Education funding has been unstable in recent years, with districts looking for new ways to allocate current resources without increasing spending. Digital learning programs provide an instructional alternative to print-based programs, and depending on the nature of the digital program, can result in cost savings while propelling students toward greater academic achievement.⁵ With the rapid advancements in digital learning tools, platforms, and programs, educators must compare the student achievement impacts and costs of digital learning programs versus print-based programs to make the most informed decision.

This white paper presents research findings related to the impacts of digital learning programs on student achievement and key considerations related to program costs. Using the example of supplementary test preparation and progress monitoring products from Archipelago Learning’s digital learning suite, the paper highlights key programmatic and design features that hold promise for helping all students meet state standards while requiring minimal expenditures.

Digital Learning and Achievement

In the K-12 educational research literature, several studies have examined the impact of digital learning programs designed to support traditional classroom instruction. Two meta-analyses found student achievement and attitude gains when schools integrated digital learning with traditional classroom instruction.⁶,⁷ Meta-analyses and experimental studies also find that integrated digital learning programs have positive effects on both math and reading achievement.⁸,⁹,¹⁰,¹¹,¹²,¹³ Effect sizes for integrated digital learning programs are presented in the Appendix and show a range of positive achievement gains when K-12 schools implement these programs in their classrooms.
Though many studies attempt to investigate the impact of digital learning programs on student achievement, the reality is that no two programs will be exactly the same, and more importantly, variations in program design can have differing impacts on the level of student achievement gains.\textsuperscript{15,16} Despite this limitation, one meta-analysis finds that time on task and student control over learning experiences potentially serve as important variables in understanding why the impacts of digital learning programs on student achievement differ. Specifically, more time on task in digital learning environments has a greater impact on achievement compared to equitable amounts of time spent using print-based materials.\textsuperscript{17} Additionally, digital learning programs are more effective, compared to print-based alternatives, when students are given control over the digital learning environment and have opportunities to reflect on their knowledge.\textsuperscript{18} The opportunity for individual control and reflection in digital learning programs allows for individualized and interactive learning experiences, providing students with tailored and engaging instruction capable of meeting a wide variety of classroom needs.\textsuperscript{19,20,21,22}

Digital learning programs have the potential to strongly impact student achievement when integrated with traditional classroom instruction, and provide students with additional time on task and a sense of control over their learning experience.

Digital Learning and Potential Cost Savings

Across numerous studies, researchers investigated how digital learning programs compare to print-based options with respect to cost effectiveness and cost-benefit analyses. These studies ultimately find that total costs vary by digital learning program and are dependent upon each of the following four factors:

A) Costs related to instruction and teacher time. Several studies examine costs as they relate to instruction and teacher time.\textsuperscript{23,24,25,26,27} Some digital learning programs save teachers time by providing students with extra practice on course content, therefore saving costs associated with hiring instructional specialists. For example, one study found that students in digital learning programs required one-third less instructional time as those students in traditional classrooms using print-based programs.\textsuperscript{28}

B) Costs related to the program or license. Cost-effectiveness studies also examine potential costs related to purchasing digital programs or licenses, finding that digital program costs vary based upon setup (i.e., required delivery platform) and content license costs.\textsuperscript{29,30,31,32,33,34,35,36,37} As a result, the costs associated with purchasing a digital learning program or license might be less than purchasing a new print-based program for the classroom, depending on the program setup requirements and actual program license costs.
C) Costs related to updating content. Researchers frequently examine potential costs related to updating program content.\textsuperscript{38,39} Digital learning programs can be updated instantaneously with new content, providing students and teachers access to the latest information, oftentimes at no additional cost.\textsuperscript{40,41,42} In contrast, in order to update print-based programs, districts and schools need to purchase and coordinate delivery of new material.

D) Costs related to online assessments. Other studies have examined cost-benefits associated with using online assessments.\textsuperscript{43,44,45} Studies find that by lessening reliance on paper-based assessments, schools reduce costs to the environment, offering a green alternative to paper-based options.\textsuperscript{46,47,48}

Online assessments also provide a cost-effective alternative compared to several other policy initiatives designed to improve student achievement outcomes. Specifically, digital assessment and progress monitoring systems are the most cost effective method for improving student achievement compared to 21 other policies, including comprehensive school reform, extending school days, peer tutoring, and other strategies.\textsuperscript{49,50,51}

Some of the benefits and costs related with online assessment systems might be because of the immediate feedback and progress monitoring potential offered by these platforms, which is in contrast to the delayed feedback and lack of ongoing progress monitoring offered by print-based programs. Through digital learning avenues, students have multiple opportunities to practice material and receive immediate feedback, providing teachers with a continual assessment of student performance.\textsuperscript{52,53} Assessment and feedback experiences also provide teachers with additional opportunities to track student progress and follow up in areas where students need additional support, thus creating a course of action that allows each student to achieve at his/her highest level.\textsuperscript{54,55}

There are many cost considerations when looking at digital learning and print-based programs. By considering costs related to instructional time, paper or digital product costs, updating paper or digital content, and paper versus digital assessment costs and benefits, educators can fully appreciate the potential cost-benefits of specific digital learning programs.

Archipelago Learning Digital Product Suite

Archipelago Learning’s suite of research-based digital learning products, Study Island, EducationCity, Reading Eggs, Reading Eggspress, ESL ReadingSmart, ReadingMate and Northstar Learning, are designed to meet and support a wide variety of student needs in Pre-Kindergarten through Post-Secondary education. For example, Study Island is a K-12 standards-based digital learning program built from state and Common Core standards, with product

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\textbf{Archipelago Learning Products}

\textbf{How Archipelago Learning Products Promote Cost Savings}

\begin{itemize}
  \item Products save instructors time in assessing students and provide immediate progress feedback
  \item Program costs are low and dependent on the number of students requiring access
  \item Online content can be updated immediately as standards change with no additional investment
  \item Products can be accessed 24/7 from anywhere with an internet connection on several platforms (e.g., computer, tablet)
\end{itemize}
features grounded in a solid research base of 185 foundational studies. The research base addresses links between achievement or motivation and research-based strategies in assessment, student learning and teacher professional development. By incorporating research-supported elements into the program, Study Island aims to improve student performance outcomes.

Similarly, all Archipelago Learning products support students with additional time on task, providing supplemental instruction and practice in key content areas, such as math and literacy. For example, Reading Eggs and Reading Eggspress provide students with the opportunity to practice and strengthen foundational reading skills, such as phonemic awareness and phonics.

In each digital product, students are given control over their own learning and have the opportunity to progress through lessons and assessments at their own pace. Within Archipelago Learning’s lessons, students receive immediate feedback, and are provided with numerous opportunities to continually assess current performance levels. By offering an approach that is unique to each individual student, students benefit from an additional source of individualized classroom instruction. For example, ReadingMate provides students with tailored reading support and is designed to help reading intervention students read at grade level, and ESL ReadingSmart includes Lexiled® reading passages and differentiated support based on the needs of each English Language Learner. Additionally, Northstar Learning provides postsecondary students with the opportunity to receive immediate feedback in order to improve, study or prepare for career assessments or college courses.

The digital learning programs offered by Archipelago Learning have relatively low costs. Archipelago Learning digital program licenses are more cost effective than a series of print-based texts addressing the same topic areas. For instance, purchasing a digital program license to support student literacy and math understanding as it relates to Common Core State Standards is less expensive than purchasing several different books to support the same concepts. The costs for updating digital program content are minimal, as this feature is included in product license fees, whereas print-based programs require added expenses for obtaining updated content. Additionally, Archipelago Learning’s digital products run on several platforms (e.g., computer, tablet, mobile phone) and can be accessed with any Internet connection, offering multiple forms of accessibility, 24/7.

Through the use of Archipelago Learning products, teachers save time in assessing students and providing content area practice and feedback. Not only do teachers benefit from time savings, they also benefit from real-time information on student progress and explicit lesson plans, activities and in-class support. For example, EducationCity provides teachers with interactive classroom activities, whiteboard-ready tools, and lesson plans mapped to state and common core standards.

Archipelago Learning’s suite of digital learning products offers students and teachers affordable solutions for individualized instruction, immediate feedback, and standards-aligned content. Cost-savings features such as online assessments, instantaneous product updates,
online lesson plans, and ubiquitous access allow teachers to use their instructional time efficiently and effectively to support students in achieving learning goals. With low setup and licensing costs, as well as no additional costs for updating program content, the products offer a promising alternative to print-based programs for educators.

References


4 Schwartzbeck & Wolf (2012)


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24 Levin, Leitner, & Meister (1986)


28 Kulik & Kulik (1991)


31 Levin, Leitner, & Meister (1986)

32 Lewis et al. (2010)

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Appendix. Effect Sizes of Research

To understand the strength of a set of findings, readers can take effect sizes into consideration. Effect sizes explain the difference in standardized deviation between two groups of interest. In other words, an effect size of 1.00 means that an average person in the treatment condition scored 1 standard deviation or 32 percentile points, higher than the average person in the control condition. The table below details the effect sizes of referenced studies when effect sizes were available.

<table>
<thead>
<tr>
<th>Area</th>
<th>Range of effect sizes</th>
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<tbody>
<tr>
<td>Integrated digital learning programs and student achievement (K-12)</td>
<td>0.23-2.70</td>
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57 Blachowichz et al. (2009)  
58 Cole & Hillard (2006)  
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