Multiplying Impact: Five Frameworks for Investment in EdTech for Adult Learners

Power in Numbers
Advancing Math for Adult Learners

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Introduction

In _The Math Gap: Implications for Investing in America's Workforce_, the Power in Numbers team examined the potential for technology and digital tools to enhance the quality of adult advanced mathematics education. In this report, we will build upon that thesis, making the case for further investment in technology solutions for adult education.

The scope for technology to impact adult education is vast. Here, we present five opportunity areas where we believe technology can drive maximum impact. While not exhaustive or representative of all potential applications for adult education, these opportunity areas offer compelling use cases for transforming adult learners' experiences and better preparing them for the workforce of the future.

In _The Math Gap_, we also addressed key problems inherent to adult education: the lack of digital literacy among adult learners and the dearth of professional development opportunities among adult educators, both underpinned by a scarcity of resources. In the last report we looked at problems; now we are going to explore solutions—those that exist today and those that we hope to see in the future.
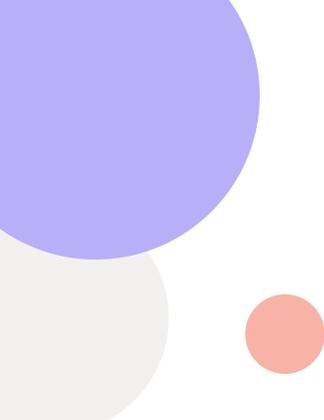
We propose that edtech investors and developers focus on five key opportunities, and invest in technology solutions to improve adult education outcomes:
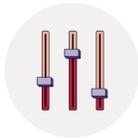
Supplement the Instructor
Technology tools need to optimize instructors' scarce time and resources.

Design for Life
Technology needs to allow for learners' lives and reduce friction in attendance.

Engage the Learner
Technology must capture learners' attention, then retain it.

Build the Community
Technology can foster community and collaboration for better learning outcomes.

Connect the Dots
Teaching and learning resources need to connect content to learners' personal contexts, in life and at work.

With the right attention and funding, investment in the development of digital tools and technology solutions can not only tap into an underserved market, but also radically transform the experiences of adult learners and educators in math and beyond.

1. Supplement the Instructor

Technology tools need to optimize instructors' scarce time and resources.
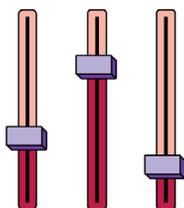
The Issue

Adult education refers to academic instruction below the postsecondary level that increases students' abilities to read, write, speak in English, and perform mathematics and other activities. These skills can be in pursuit of either a secondary school diploma (or equivalents), transition to postsecondary education and training, or obtaining employment.[1] Within this population, there is potential for huge variance within any adult classroom — differences in age, ethnicity, language abilities, work experience, and family makeups abound. This spectrum of backgrounds, competencies, and experiences places a burden on adult educators tasked with delivering unified content to these diverse classes.

Adult educators face time constraints including their own part-time status (in many cases) and the unpredictable schedules of their students. The result can be classrooms where educators are unable to sufficiently personalize the learning experience for individuals with different backgrounds as much as they would like.

> *"I never feel like I have enough time to prepare materials and lessons for my students, so any way technology can support me with this is great! My students often have very little time to invest in their own education, so wherever we can use technology to keep their experience rich while still using their time as efficiently as possible is good." — Adult educator, Minnesota*

The Opportunity

Technology tools hold the potential to enhance adult education outcomes by optimizing educators' time and better enabling educators to devote attention to the unique and varied needs of adult learners.

Successful technology solutions will thus seek to enhance and support these crucial human interactions, but not replace them.[2] This support can happen in a number of ways, discussed in the following examples.

Technology Examples

Artificial intelligence-enabled grading can help free up educator time. Many automated grading tools are powered by artificial intelligence (AI) and can be particularly useful in subjects like mathematics. For example, existing tools support teacher grading of math problems; using AI to scan uploaded written responses to problems, platforms can group similar responses (both right and wrong). Educators can then use the AI-recommended groupings to address common issues or themes within a class. AI can help optimize educators' time and augment their instruction.

Adaptive features. Even in a classroom where every student is at the same level, teachers can't provide exclusive one-on-one instruction. In an adult classroom with learners at different levels, it's even more difficult. Tools that lead students through different levels of content at their own pace can reduce the burden on educators and give them greater flexibility. Current tools create "learning maps" that guide students depending on their level of competency in the subject matter. This enables teachers to quickly identify the competency of a specific student and allocate their time to teaching only the information needed.[3] These adaptive pathways can serve as the first layer of personalization in the classroom. Educators still need to oversee the use of adaptive pathways and provide support where needed, but these tools can reduce the burden of adapting new content for each level of proficiency within a classroom.

Live assessment tools allow instructors to monitor all students' progress and responses concurrently and in real-time.[4] This provides instructors with data on common mistakes, how students are progressing in aggregate, as well as where individual students are getting stuck or excelling. Instructors are able to provide tailored and in-the-moment guidance to individual students or the class as a whole, depending on the output. Instructors receive greater insight more quickly — a real-time assessment that would be nearly impossible to conduct manually.

> *"Often students in the room are each working on a different lesson. Technology that means I don't need to be present in real time for a component of the lesson is very helpful in keeping everyone as productive as possible...when components of each lesson are based in technology, it allows students to work while I help others." — Adult educator, Minnesota*
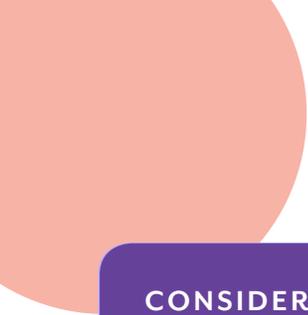
Tools must support, not replace, educator-student interactions.

Even the most passionate advocates of AI tools in adult education recognize that automation within technology tools is to support human instruction. In a paper making the case for AI in education, educational products company Pearson envisions "a future in which the role of the teacher continues to evolve and is eventually transformed; one where their time is used more effectively and efficiently, and where their expertise is better deployed, leveraged, and augmented."[5]
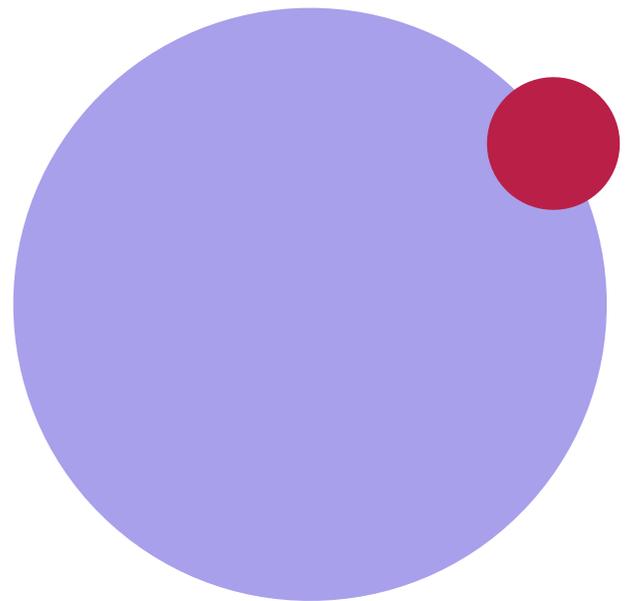
2. Design for Life

Technology needs to allow for learners' lives and reduce friction in attendance.
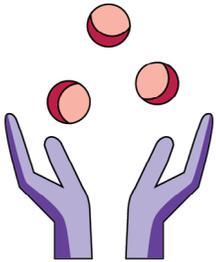
The Issue

In addition to motivational barriers, adult learners face immense structural obstacles to achieving their education goals. Adult learners are often balancing class attendance with unpredictable work schedules and family responsibilities.[6]

The unpredictability of attendance places a burden not only on the learner, but also on educators, and technology resources are only effective when they're flexible enough to ease that burden. A technology application only available through an in-class desktop computer, for example, is of limited use to a learner who will not be able to attend the in-person class with regularity.

> *"Time and distance constraints could be removed if my group 'telecommuted' and sessions could be recorded for access by someone who missed a class meeting." — Adult educator, New Jersey*

The Opportunity

Distance learning is an instructional approach that connects learners with the resources they need, mostly through media and technology, regardless of space or time.[7] Distance learning technologies have great potential to alleviate many of the structural barriers that adult learners face.
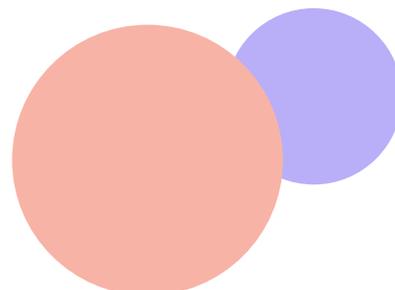
Technology Examples

AI-enabled chat functionality can provide the close support and on-demand responses to questions that give adults the confidence they need to succeed. Much as we have come to expect from customer service experiences, chat and AI technologies can come together to provide a framework for on-demand resources.[8] Frequent feedback is key to engagement and motivation, and since constant access to educators for questions or support is unfeasible, AI and chat features can help alleviate the potential isolation of being a learner at home. Basic questions like how to locate a file or how to upload an assignment could be addressed by an AI-enabled chatbot to provide a layer of support outside of the classroom.

Mobile tools that enable distance learning can help instruction become agnostic to adult learners' constraints outside of the classroom. They can help bridge the gap between students with unpredictable schedules or with unreliable access to internet outside of the classroom. As of 2016, 54% of adults with no high-school certification had a smartphone.[9] Text reminders are already used across a variety of industries to help enable people to meet their obligations. For example, New York City's Office of Court Administration recently piloted a text reminder service for people with court summons. These "digital nudges" contained information about the court appearance and advice for making a plan to attend.[10] With the right information — motivational reminders paired with logistical support — similar solutions could help adults overcome obstacles in getting to class.
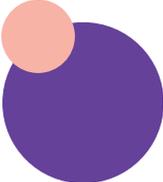
> *"Many of my learners are willing to spend money on an updated cellphone where they wouldn't on a computer, so mobile accessibility (like the ability to submit assignments through a picture on a phone) is crucial."*
> *— Adult educator, Kansas*

Video conferencing software can facilitate face-to-face interaction when it may not otherwise be possible. A seemingly simple feature can have huge impacts on learning experiences when something as simple as regular attendance is by no means guaranteed. Video conferencing can support distance learning and provide an approximation of the in-classroom experience.

> *"Technology allows me to be in one location and instruct students anywhere in the world. The video component enhances that instruction – visual cues are crucial in student-teacher communication." — Adult educator, New Jersey*

CONSIDERATIONS

Distance learning can cause isolation.

Distance learning can solve some scheduling problems, but comes with inherent difficulties. Some learners can procrastinate and lose interest without the immediacy of the in-class experience.[11] It is by no means the right solution for everyone.

Digital literacy and access are not guaranteed.
Though levels of smartphone ownership and home internet access are ever-increasing,[12] any solution that relies on at-home interaction relies heavily on digital literacy. Without educators or fellow learners to help with usage issues, design must be accessible, and support functionalities take on greater importance.

3. Engage the Learner

Technology must capture learners' attention, then retain it.
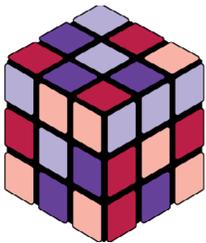
The Issue

Adult education programs face unique obstacles when it comes to engaging and retaining learners. Unlike children, adult learners must actively choose to participate.[13] The choice to attend is usually driven by a goal — ranging from career advancement to personal fulfillment — but the key is that each adult learner has an objective.[14]

There are a multitude of factors that may prevent adult learners from attending a class. If a learner feels that a class or program is not supporting achievement of their original goal, they are less likely to remain engaged.[15]

The Opportunity

Technology must capture and maintain the interest of adult learners. The quality and design of a technology tool has a clear implication for initial levels of engagement: a tool that delights the learner and enhances enjoyment of learning concepts is likely to be more impactful. A tool that is delivered in a format that is familiar, inviting, or comfortable for a learner is even more likely to succeed.

> *"Take math...putting math into a tool that visualizes it is important. They see the impact of how a graph changes. You can do the math, but when you see the math, that is most powerful. My students can play with and manipulate visuals. This leads to manipulating of numbers and leads to engagement. They can see how math impacts their life on a daily basis." — Adult educator, Kansas*

Once adopted, technology tools can achieve ongoing impact both by supporting learner goals, and mitigating against common obstacles and reasons for attrition.

> *"Any tech platform needs to be simple to learn for the teacher and students. The students and I won't be together all year, and neither they nor I have a lot of time to invest in learning the software." — Adult educator, Kansas*

Technology Examples

Games, as a delivery mechanism, have the potential to capture and retain adult learners' interest and focus. The majority of adults play video and computer games, and about one-fifth of them play daily, usually on computers.[16] Once the interest and engagement of the learner is gained, games can enhance learning by increasing time spent on tasks, maintaining motivation, and encouraging self-regulated activities.[17] Games can also provide the framework to simulate real-life situations. This low-risk environment not only encourages experimentation, but also provides feedback and analysis on the impact of decisions far faster than in real-world situations.[18]

Family-friendly interfaces can support adoption and inspire further learning. If designed correctly, these tools offer a secondary benefit of involving family members. For example, children watching a parent use a tool can join in and help, provided the design is appropriately inviting and engaging. Learning can thus become a family activity, increasing motivation for adults, and modeling education practices for children.[19] Technology that integrates seamlessly into the life of adult learners outside of the classroom can extend both its reach and relevance.

Learning management systems (LMSs) can be a one-stop shop for many technology needs and interactions between adult learners and educators. For learners, knowing that they can find all they need in one place can be reassuring.[20] A good LMS can circumvent digital literacy issues: if learners and educators know that they only need to master one system, that system is likely to have greater impact. Centralized solutions can reduce friction in both onboarding and retention of adult learners.

CONSIDERATIONS

Engagement in games must be balanced with substance.

Comprehensive content and assessments need to be balanced against the "nongermane game components." These are the aspects of a game that are necessary for flow of the experience, but may distract from the core skills and knowledge being transferred. [21]

LMSs come with inherent trade-offs.

Some LMSs are free and open-source. While low cost can be appealing, and the collaborative nature of open-source tools encourages a community of content creators, they can come at the expense of rigorous implementation.[22] High-quality customer service and educator training for classroom integration of paid services is often expensive.

4. Build the Community

Technology can foster community and collaboration for better learning outcomes.
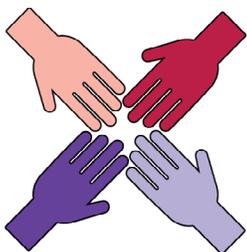
The Issue

Collaboration and a sense of community can yield powerful results among adult learners. Working collaboratively increases the social-emotional memories of a learning experience, which facilitates continued and longer-lasting learning. This is true across most types of learning. For adult learners, these connections hold even more value, as they are reinforced by the affirmation that fellow adult learners are coping with similar constraints and challenges.[23]

However, collaboration and community are not always guaranteed with adult learning solutions. As mentioned previously, an unintended consequence of distance learning can be the direct hindrance of a collaborative environment and, worse, isolation. A lack of in-person interaction can be detrimental to adult learners' continued motivation.[24]

The Opportunity

Technology tools that foster collaboration and build a sense of connection within an adult education group have great potential for impact. This can be achieved directly, by enabling collaboration within a technology application, or indirectly, by simply facilitating more frequent and meaningful interactions between learners and educators and between fellow learners.

Collaborative learning can enhance motivation; if students are invested in the group, they become more engaged with tasks and achieve better learning outcomes, creating a positive feedback loop while holding each other accountable.[25]
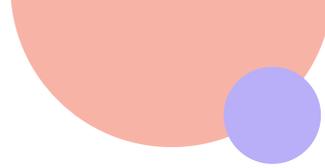
Technology Examples

Communication forums, including Q&A message boards, Facebook groups, and group chat tools, are easy (and often free) ways of creating an online network and community for groups of adult learners. Students can have discussions with each other on course-related topics, contributing to the discussion by asking questions, sharing insights, or posting materials. These forums support learning outside of the classroom by drawing from the collective expertise of a larger community, supplementing the formal instruction and providing a new context in which to build and maintain relationships.

Collaborative software tools provide transparency and enable learners to solve problems together. Tools that transparently display group responses also build trust and encourage teamwork, leading to better educational outcomes, as students can learn from each other. This transparency also allows learners to be involved in the content creation process alongside educators — for example, creating math problem sets and solving them together. Collaboration and transparency enhance relationships while contributing to better educational outcomes.

Wikis or open-source websites can serve as repositories for program or class-related information, while doubling as a collaborative content creation tool. Ongoing maintenance can be integrated into learning activities that both enhance the knowledge of the collective group, and encourage teamwork and collaboration. Websites that are aligned to classes can be maintained and edited as a group, encouraging both accountability and collaboration.

> *"Twitter has been a great resource. I can tweet out to the world and the world responds — you get different perspectives. Sometimes in adult ed we get siloed, which isn't good for becoming a better educator. We need new experiences and to challenge ourselves with new ideas. The resources we tweet about and share help to build a community and, in turn, bring ideas into the classroom."*
> *— Adult educator, Kansas*
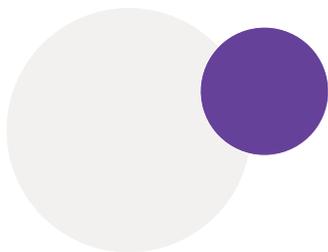
CONSIDERATIONS

Open-source websites need funding to be created.

Once created, they can be proliferated and maintained by both educators and learners, but they need initial support at launch. Full content creation on the part of the educator is a large burden — these resources need the funding of government and nonprofit institutions to kick-start movements.

Educators need to curate content.

Any open-source or collaborative tool is only as effective as it is accurate. Educators need to be empowered to effectively moderate accuracy of group-produced or volunteered content. This introduces a new responsibility to the already multifaceted role of the adult educator: content curator.

Community matters for educators too.

Educators also require tools to help them connect with fellow educators and share ideas, results, and experiences. The importance of collaboration and fostering communities extends to educators as well as students, and can be augmented through technology tools.

5. Connect the Dots

Teaching and learning resources need to connect content to learners' personal contexts, in life and at work.
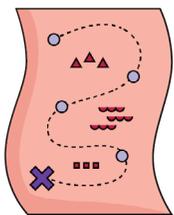
The Issue

Contextualization is the link between classroom learning and real-life application.[26] In adult education, contextualization is of enormous importance — teaching resources and approaches need to be rooted in the experiences and lives of adult learners. In *The Math Gap*, we outlined different types of contextualization and teaching/learning experiences designed to resonate with students' educational goals, lives and experiences, or career pathways.

With limited time in the adult classroom, and often unpredictable schedules and attendance, concepts need to be delivered efficiently and in ways that resonate with learners.

The Opportunity

Technology tools can help bridge the divide between the content delivered in adult education classrooms and their real-world relevance. The benefits could be wide-ranging: for employers, content could be more closely aligned to skills required for employment. Learners can experience course content that is rooted in real life, including culture, background, or future career aspirations.

Through this lens, math becomes more than just math — it becomes the key to adult learners helping their children with homework, maintaining personal finances, or managing family budgets. In the job market, this means designing adult education resources that directly relate to experiences learners could expect on the job. For a learner, it's the difference between percentages in the abstract, and calculating sales growth in their specific job.
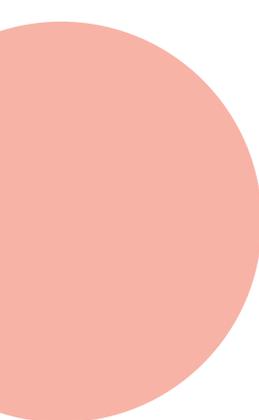
Technology Examples

Virtual Reality (VR) and Augmented Reality (AR) can help learners experience situations that would be expensive or prohibitive to experience otherwise. In doing so, VR and AR tools can provide windows into career opportunities and build foundations for career readiness. For example, VR programs that allow students interested in health to study biology through endoscopic "tours," or others to study geometry by constructing virtual structures, are highly engaging and directly relevant to careers. Immersive content delivery through VR/AR can be the difference between hearing about a job and truly knowing what a job looks and feels like. And for some learners, it's a gateway to discovering careers they may have never considered.

Open Educational Resources (OERs) are teaching and learning resources that are free, open-source, and can be redistributed and reused.[27] By their very nature, OERs are highly adaptable and customizable. Free from the constraints of static textbooks or resources, OERs can be continuously remixed or adapted to suit specific contexts. Such adaptation can ensure that content is both relevant to students' lives and to the specific skills and knowledge required for jobs they desire. In math, a generic problem set about savings, designed to teach compound interest, for example, can be adapted to include details of real people, real numbers, and real interest rates. This can be applied for any situation, topic, and classroom. The concept of proportions and conversion charts can appeal to aspiring cooks, probability can demystify the insurance industry, and geometry can empower the would-be construction worker. OERs make this level of customization commonplace. Employers can take OERs further and help guide the creation of teaching materials to better shape them towards their own employment needs. Students using OERs designed or endorsed by employers could have confidence that they are learning applicable and marketable skills.

Open data from real-world sources can have huge impact when integrated into edtech tools for adult learners. Real-life data like job applications or apartment listings can transform a tool's impact by directly relating to experiences important to learners. Learners can hone math skills while comparing apartment listing prices,[28] or practice writing skills while completing job application questions. Not only can a tool be educational, it can also prime learners for real-world challenges while increasing engagement with the content.

CONSIDERATIONS

Industry needs to come to the table.

In order for learners to benefit from resources that are truly aligned to skills required for jobs, employers need to define what these skills are and partner with content creators. In *The Math Gap*, we discussed research on the need for employers to define what advanced math skills are truly required for employment.[29] The next step is for employers to help shape the content that learners will receive.

Interoperability paves the way for open data set integration.

For edtech developers, interoperability is key when working with open data sets.[30] The ability to intake and integrate both current and future data sets needs to be considered in the early stages of designing tools in order to achieve maximum relevance and impact for adult learners.
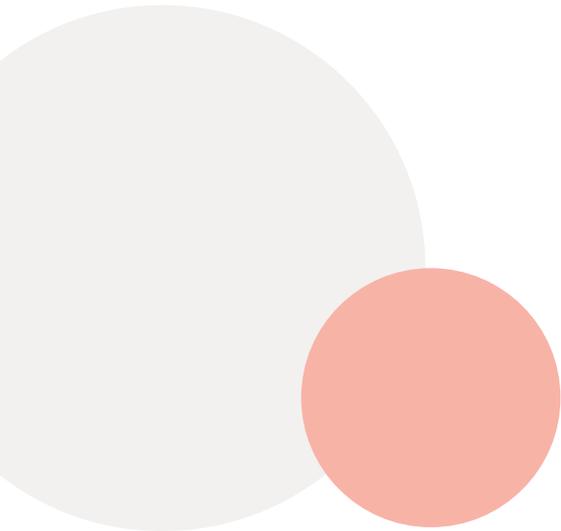
What the Future Holds

Each of the opportunity areas discussed above holds potential for investment to significantly improve adult educational outcomes. For investors looking to fund solutions to meet these needs, critical factors include the cost associated with their implementation, and the timeline for their development.

Some solutions are currently expensive and would require significant investment to bring affordable solutions to the adult classroom. Others are free, and investment could focus on content alignment or professional development.

Many solutions are aspirational and are included in this report as potential sources of impact in the mid- to long-term future. Features and new products would have to be developed in order for these technologies to fully realize their potential in adult education. Others exist today in various forms, and the challenge is for the adult education community either to fully adopt them, fund their dissemination, or provide appropriate professional development for educators to use them.

Below we summarize the spectrum of technologies, from those that are easy to implement, to those that are market-ready and in need of scaling investment, to those requiring further technical development.

Easy to Implement Today	Invest to Scale	Long-term Potential
Open Educational Resources	Adaptive features	Virtual Reality (VR)
Video conference software	Live assessment tools	Augmented Reality (AR)
Collaborative software tools	Mobile tools	AI-enabled grading
Communication forums	Games	Open data
Wikis	Family-friendly interfaces	AI-enabled chat
Learning Management Systems (LMS)		

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