

Mosaic™ by ACT®: Adaptive Academic Learning Theory of Action

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Introduction

Learning is a complex process. The journey from introducing new concepts to mastery can be a long one and is influenced by many cognitive and affective processes. Students often encounter challenges as they work to learn new content. They may have difficulty differentiating what they already know versus what they still need to learn, experience frustration with course content that is either over-challenging or under-challenging, and struggle to remain engaged for long periods.

Many learning tools are ineffective in meeting these needs (Blasiman, Dunlosky, & Rawson, 2017). Instead, students need engaging tools that can help them to learn efficiently and effectively.

Educators also need effective tools to support student learning. Educators are increasingly asked to do more with limited time and resources, including—among other things--addressing state standards, individualizing instruction, providing scaffolded support for struggling students, and frequently assessing their students and providing timely feedback. These challenges to students and educators also affect administrators, who need to drive the implementation of best practices, help their teachers develop professionally, and

demonstrate school and district growth. One solution to meeting these challenges is the adoption and use of well-designed, adaptive learning solutions.

Solution

Mosaic™ by ACT®: Adaptive Academic Learning is a technology-driven adaptive learning platform that is designed to meet the aforementioned challenges faced during learning. The platform provides standards-aligned learning paths and content aligned to math and ELA curricula.

The system has comprehensive coverage spanning kindergarten through 8th grade. How can Adaptive Academic Learning address the challenges students, teachers and administrators face?

To **facilitate** effective, efficient, and engaging student learning experiences, the platform leverages evidence-based learning strategies gleaned from best practices in learning science and engagement features from research on gamification.

To **reduce** the demands on educators' limited time, the platform provides standards-aligned, ready-made learning paths that adapt to each student, scaffolded supports, automatic grading, and real-time reports.

Finally, to **help** administrators demonstrate school and district growth, the platform provides administrators actionable data to inform programming decisions.

Purpose of the Theory of Action

The current document outlines a Theory of Action for Mosaic by ACT: Adaptive Academic Learning. A Theory of Action is a working model that articulates how and why the design of a learning tool accomplishes its intended goals and improves user outcomes.

To provide context for this model, we first define important terminology related to the model and then denote the intended users and the platform's specific constraints. We then describe the potential consequences that follow from this model.

Consequences are results that logically and theoretically follow use of the learning tool but are more aspirational than the directly measurable outcomes documented in the Theory of Action. For instance, increasing the school culture of caring is noted as a consequence, but this is a broad and aspirational potential result of using the platform. In contrast, support for important learning outcomes is a noted outcome, and one way to measure this directly is with a delayed definition recall test. As with any platform, consequences can either be intended or unintended.

In addition to these consequences, we note any potential opportunities to achieve the intended goals more effectively. Next, we outline each model's basic organization, including the inputs, activities, user experiences, and outcomes. Finally, we describe the detailed model for each of the main stakeholder groups including students, educators, and administrators.

List of Important Terms

1. **Theory of Action (TOA):** A working model that articulates how and why the design of a platform accomplishes the intended goals.
2. **Input:** Specific features that differentiate Mosaic by ACT: Adaptive Academic Learning from other learning platforms and are relevant to the specific stakeholder.
3. **Activities:** Specify how the stakeholder is expected to use Mosaic by ACT: Adaptive Academic Learning.
4. **User Experiences:** Specify what the data demonstrate regarding the experiences of using Mosaic by ACT: Adaptive Academic Learning for each stakeholder.
5. **Outcomes:** The specific, measurable changes to knowledge, behavior, and skills expected from using Mosaic by ACT: Adaptive Academic Learning. Outcomes are divided into three categories based on time required (i.e., short-term < 1 year of use; medium-term 1-3 years following use; long-term 3 or more years following use).
6. **Intended Users:** Specify the groups of individuals that are expected to use Mosaic by ACT: Adaptive Academic Learning
7. **Constraints:** Specify the necessary requirements for using Mosaic by ACT: Adaptive Academic Learning effectively including technological and contextual requirements.
8. **Consequences:** Specify results that logically follow from using Mosaic by ACT: Adaptive Academic Learning but are more aspirational than the outcomes documented in the Theory of Action that are directly measurable.
9. **Opportunities:** Specify any potential chances to better achieve the intended goals.
10. **Scaffolding:** On-platform processes that provide additional instructional supports, such as providing instruction on pre-requisite concepts.
11. **Intervention:** External instructional support sources such as teacher-led instruction.

Intended Users

Intended users for Adaptive Academic Learning include:

- **Students** - Students in grades K-8 studying math, reading, spelling, and ELA
- **Educators** - Teachers and paraprofessionals for grades K-8 focused on math, reading, spelling, and ELA in classroom settings and during out of school time
- **Administrators** - School and district administrators for grades K-8
- **Organizations** - Schools, districts, states, charter, private & parochial schools, after-school and out-of-school programs, and third-party organizations (e.g., GEAR UP, Avid, Boys & Girls Club)

Consequences

The intended consequences of using Adaptive Academic Learning include:

- Increased student engagement
- Improved student/teacher awareness of state & Common Core academic standards
- Increased student self-regulatory skills
- Increased student familiarity with technology
- Increased student problem-solving skills
- Increased student mastery goal orientation
- Increased school culture of caring
- Increased educator satisfaction
- Increased preparation for standards-aligned benchmark exams
- Increased scores on standards-aligned benchmark exams

The unintended consequences include:

- Data from the platform is used to judge teacher and school performance
- Negative reactions students, teachers, and/or administrators may have to the leaderboard or other features (e.g., increased competitiveness)
- Used to make placement decisions for students or in other high stakes contexts
- Inappropriate use of the class wall by students
- Increase in the total amount of screen time for students

Constraints

There are a number of constraints, which include:

- Internet connectivity required
- Device requirements: Device must have a screen larger than seven inches and the platform is not compatible with mobile phones ([see this link for additional system requirements](#))
- Limited by how "transitioned" schools/districts are to offer blended or digital learning

Opportunities

There are a number of opportunities that can be explored in the future by Adaptive Academic Learning, including:

- Expansion of text-to-speech to cover all content on the platform and further development of accessibility features
- Expansion of the curriculum to high-school grade levels
- Expansion of the curriculum to science and social studies
- Examination of the adaptive algorithm to identify areas for improvement
- Integration of Adaptive Academic Learning with ACT Aspire, particularly its interim assessments
- Integration of Adaptive Academic Learning with ACT's social and emotional learning solutions
- Integration of Adaptive Academic Learning with content from the Cross-Cutting Capabilities domain of the ACT Holistic Framework
- Increased support for home-schooling use
- Increased translation and ELL support for bilingual students and parents

BASIC LAYOUT OF EACH MODEL

Figures 1 through 3 in this section display logic models describing how Mosaic by ACT: Adaptive Academic Learning aims to improve outcomes for three key stakeholder groups: learners, educators, and administrators.

The model specifies the intended inputs, activities, user experiences, and expected outcomes for each stakeholder group. Each input describes a specific feature that differentiates the platform from other learning platforms. Each of the activities specifies how the stakeholders are expected to use the platform. The user experiences specify what data currently demonstrate regarding the expected experiences for stakeholders using the platform.

The outcomes specify the intended changes to knowledge, behavior, and skills expected from using the platform. These outcomes are divided into three categories based on the time required. Short-term outcomes can be achieved in approximately the first year of using the platform. Outcomes that occur between one to three years following the use of the platform are classified as medium-term. Outcomes that occur in three years or more following the use of the platform are classified as long-term.

Together, the inputs, activities, and user experiences specify the hypothesized causal mechanisms responsible for each expected outcome. Although some of the inputs, user experiences, and other features are similar across these models, the details and impact of these features differ by stakeholder.

Therefore, we describe the models for each of the stakeholders separately below. Further, although each outcome has links to specific inputs, activities, and user experiences, these outcomes are hypothesized to result from the combinatorial effects of these components. As such, we describe the influence of each relevant component in the outcome section.





DESCRIPTION OF THE MOSAIC BY ACT: ADAPTIVE ACADEMIC LEARNING THEORY OF ACTION FOR STUDENTS

Figure 1 shows the logic model capturing the theory of action for students divided into four overall portions: inputs, activities, user experiences, and outcomes.

Inputs <i>What makes Mosaic by ACT: Adaptive Academic Learning special?</i>	Activities <i>What will users do with Mosaic by ACT: Adaptive Academic Learning?</i>	User Experiences <i>What do the data tell us about experiences using Mosaic by ACT: Adaptive Academic Learning?</i>	Outcomes <i>What does research tell us about the potential benefits of Mosaic by ACT: Adaptive Academic Learning?</i>
Differentiated Practice <ul style="list-style-type: none"> Personalized learning approach includes: Adaptive and automated learning paths Teacher-driven enrichment Just-in time instructional videos Increasing levels of competence Adaptive learning algorithm Evidence-based learning techniques 	Learn Anywhere and Anytime <ul style="list-style-type: none"> Students can access 24/7 from most internet enabled device except for phones Safe and secure data storage Use research-based techniques Supports most Universal Design for Learning (UDL) guidelines 	Knowledge and Skills <ul style="list-style-type: none"> Adaptive Academic Learning use helps students gain knowledge by incorporating evidence-backed learning techniques that support knowledge acquisition 	Short Term Outcomes <ul style="list-style-type: none"> The "right resources" for every learner (based on fit to learner Increased student engagement with learning content Support for target learning outcomes & needs)
Technology-Enhanced Assessments <ul style="list-style-type: none"> Automated & teacher-driven assessments include: 50+ item types that are automatically graded Formative, interim, and comprehensive Mastery checks strategically placed Learning profile from adaptive diagnostic 	Track Learning Progress <ul style="list-style-type: none"> Access learning profiles to see which concepts have been mastered See real-time updates on progress towards weekly learning goals Receive immediate feedback during practice 	More Accurately Track Learning Progress <ul style="list-style-type: none"> Adaptive Academic Learning helps students accurately gauge their learning progress with reports and real-time updated and immediate feedback. 	Medium Term Outcomes <ul style="list-style-type: none"> Greater academic achievement in middle school Lower remediation rates Higher digital literacy
Automatic Scaffolding and Enrichment <ul style="list-style-type: none"> Automatic scaffolding process involves: Detecting knowledge gaps Just-in-time instruction As needed instruction on pre-requisites Enrichment with harder content as students reach mastery within learning paths 	Engage with Learning Content <ul style="list-style-type: none"> Earn coins for learning progress that can be traded for rewards Move up on the class leaderboard Customize avatars and trade in coins for animated avatars 	Engagement, Motivation and Enjoyment <ul style="list-style-type: none"> In case studies about Adaptive Academic Learning with around 30 schools, over three quarters specifically mentioned student enjoyment, engagement, and/or motivation 	Long Term Outcomes <ul style="list-style-type: none"> More successful transition to high school Increased high school retention Increased academic achievement in high school
Standards and Textbook Alignment <ul style="list-style-type: none"> Comprehensive coverage of K-8 includes: Common Core standards Unique state-specific standards (14) Aligned to popular Math & ELA textbooks (20) 	Individualized Content <ul style="list-style-type: none"> Management of learning resources to ensure alignment to learning goals Local teachers can further customize content to match what is being taught at your school Assessment resources 		
Accessible <ul style="list-style-type: none"> Text-to-speech support for specific content Accessibility tools including: zoom, color contrast, screen reader, masking 			

Figure 1. Logic model for students for Mosaic by ACT: Adaptive Academic Learning

Inputs¹

Differentiated Practice Adaptive Academic Learning takes a personalized approach to learning, known as differentiated practice. This approach involves six main pillars: learning paths, educator-driven enrichment, instructional videos, increasing competence, adaptive learning, and evidence-based learning. The adaptive and automated learning paths involve standards-aligned or textbook-aligned content that starts with a placement test and continues with practice that adapts to changing student proficiency. The educator-driven enrichment involves educators assigning additional targeted practice based on the content selected from the content bank or customized by the educator. The just-in-time

instructional videos involve short, engaging videos selected based on their alignment to specific concepts and demonstrated student proficiency. As students demonstrate proficiency, more difficult concepts are introduced. The adaptive learning platform supports blended learning models of instruction regardless of the core ELA and mathematics curriculum. Finally, evidence-based learning techniques involve incorporating evidence-based learning techniques such as retrieval practice and interleaving.

Technology-Enhanced Assessments In Adaptive Academic Learning, students have numerous opportunities to demonstrate their knowledge on various assessments. The system has a selection of formative, interim, and comprehensive

assessments, all of which make use of different question formats; the system offers 50 technology enhanced item types. Teachers can also customize their own assessments to assign to students. Students receive immediate feedback on their performance as a result of automatic grading. Students can also demonstrate their long-term learning of content on the delayed mastery check. Based on these mastery checks, students can see which content they've mastered versus still need to practice in their learning profiles.

Automatic Scaffolding and Enrichment Adaptive Academic Learning automatically provides struggling students with scaffolded supports and those ready for more advanced content with enrichment. The platform uses an initial placement test to assess student knowledge of each independent concept. The platform then uses practice questions and mastery checks to detect gaps in student knowledge. If a student is struggling with a concept, they receive instruction and additional practice with that concept. Those who struggle following this instruction receive automatic scaffolded supports involving practice and instruction on pre-requisite concepts. In contrast, when a student reaches mastery for specific concepts, the system advances them to new concepts within their assigned learning paths.

Standards and Textbook Alignment Standards and textbook alignment ensure students are learning relevant content. Students learn from curricula aligned to kindergarten through eighth grade math and ELA standards. Students can complete learning paths aligned to their specific state or to general college- and career ready standards. Students can also complete learning paths aligned to their Math and English core curricula, including popular curricula like Eureka Math & Reading Street.

Accessibility To support learning for all students, the platform provides many built-in accessibility features. These features include text-to-speech for applicable content, magnifier, font size controls, and a highlighter. For assessment items, the platform provides zoom, color contrast, screen reader, answer masking, line reader mask; and, text-to-speech features. In addition, teachers can

use Google Translate when printing out invitation letters for parents.

Activities

Learn Anywhere and Anytime Students have access to Adaptive Academic Learning 24/7 from most internet-enabled devices. Regardless of how they access the platform, data are safe and secure. For instance, children are not required or allowed to share personally identifiable information on the platform. Additionally, all actions are processed through several permission verification checks to prevent attacks from web browsers and malicious scripts. For more information about the security policy please use this [link](#). While using the system, students utilize various research-based learning techniques such as retrieval practice and spacing. The platform also supports most Universal Design for Learning (UDL) guidelines. Adaptive Academic Learning currently provides strong coverage of Engagement, and also provides some coverage for Representation, Action & Expression. The Appendix includes tables that crosswalk the extent to which the platform currently meets UDL guidelines.

Track Learning Progress Adaptive Academic Learning has a robust student learning profile feature that students can access at any time to see their learning progress. Different views within their learning profiles allow them to see exactly how much progress they have made and what they have left to learn. Additionally, as they complete practice problems, they can see real-time updates in the progress they have made towards their weekly learning goals. Further, they automatically receive immediate feedback on their performance during practice.

Engage with Learning Content Adaptive Academic Learning is designed with student motivation in mind and includes features such as avatars, a reward system, and a class leaderboard. When students initially set up their account, they choose their own avatar to fit their individual style and preferences. As students complete assignments, they earn coins. These coins can be traded for rewards in the system, including

animated avatars, wallpapers, different colors, and games. Additionally, students can view the class leaderboard and see themselves move up as they continue to solve problems.

Individualized Content - Students only practice content that aligns with their learning objectives and current knowledge levels. Educators can also customize the content their students' practice. Students can also prepare for upcoming tests with assessments selected and customized by their teachers.

User Experiences

Knowledge and Skills The platform is designed for students to gain valuable skills and knowledge and includes features such as differentiated practice, frequent retrieval, and bite-sized instructional videos. Support for these intended benefits comes from case studies with Adaptive Academic Learning users. In case studies with 30 schools, many schools specifically mentioned benefits to student performance or academic achievement. For instance, one school said, "So far, 100% of students are on proficiency by the time they head to the next grade."

More Accurately Track Learning Progress

Students often have substantial difficulty differentiating what they know from what they still need to learn. The platform simplifies this process by providing automatic feedback to students. In addition, students can access their learning profiles at any point to see their current learning progress. In fact, in case studies with 30 schools, half specifically mentioned the reports and assessments. For instance, one school mentioned how these reports helps students reach their learning goals.

Engagement, Motivation and Enjoyment The system aims to foster engagement, motivation, and engagement with several features such as the reward system, avatars, and interactive data dashboards. Support for these intended benefits comes from case studies with Adaptive Academic Learning users. In case studies with 30 schools, 24 schools specifically mentioned student enjoyment,

engagement, and/or motivation. Some school administrators mentioned that students were motivated by the reward system, avatars, and other features. Others mentioned students were motivated by the progress they and their teachers saw from using the platform.

Outcomes

The outcomes section of the Adaptive Academic Learning theory of action is divided into 3 portions.

Short-to-moderate term outcomes include:

The "right resources" for every learner (based on fit to learner needs) Several features of the platform ensure each learner receives content that addresses their individual needs, including differentiated practice, automatic scaffolding and enrichment, and aligned practice. Each of these features is detailed further above. In brief, differentiated practice ensures that instruction in the platform is personalized to each learner, including practice that adapts to the learners changing proficiency. Automatic scaffolding and enrichment ensure each learner is given appropriately challenging content. Alignment to academic standards and popular textbooks ensures students receive relevant content. As a result, Adaptive Academic Learning provides every learner with appropriate resources.

Increased student engagement with learning content

In addition to data from case studies, research shows that various features implemented in the platform support student engagement, including avatar customization, the coin system, and the leaderboard. Research shows that avatar customization increases sustained attention and engagement (Birk & Mandryk, 2018). Additionally, studies have demonstrated that point systems like the platform's coin system and leaderboards increase student engagement (Subhash & Cudney, 2018). Furthermore, growth mindset interventions have been shown to increase students' likelihood of taking rigorous coursework (Yeager et al., 2020). Based on these results, growth mindset interventions in the system may encourage students to engage with challenging content.

Support for Target Learning Outcomes

Research shows that several techniques incorporated in Adaptive Academic Learning enhance performance on complex and important learning outcomes. Several techniques incorporated in the platform enhance student ability to recall information at a delay (i.e., delayed retention) including retrieval practice, and spacing. In addition, several techniques incorporated in the platform support student ability to apply learned content in new contexts (i.e. transfer) including retrieval practice, interleaving, knowledge segmentation, and computer-based scaffolding. In addition to comprehensive coverage of these important learning outcomes, the platform incorporates techniques that support other important outcomes such as problem solving and reduced cognitive load. The learning benefits of these techniques are documented in several recent meta-analyses and comprehensive reviews (Adesope, Trevisan, & Sundararajan, 2017; Belland, Walker, Kim, & Lefler, 2017; Brunmair & Richter, 2019; Carpenter, Cepeda, Rohrer, Kang, & Pashler, 2012; Pan & Rickard, 2018; Rey et al., 2019; Wiseheart et al., 2019). For a detailed discussion of the learning techniques incorporated in the platform including evaluative information see the white paper entitled, [“The Science Behind Mosaic by ACT: Adaptive Academic Learning: The Science driving ACT’s powerful personalized mastery learning platform”](#).

Moderate-to-long term outcomes include:

Greater Academic Achievement in Middle School

Adaptive Academic Learning incorporates various techniques that support academic achievement. These techniques include differentiated instruction, growth mindset interventions, mastery learning, and feedback. The benefits of these techniques are documented in several recent meta-analyses (Batdi, 2019; Deunk, Smale-Jacobse, de Boer, Doolaard, & Bosker, 2018; Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018; Smale-Jacobse, Meijer, Helms-Lorenz, & Maulana, 2019; Wisniewski, Zierer, & Hattie, 2020). In addition to the overall learning benefits of these techniques, prior research demonstrates the benefits of several of these techniques with

economically disadvantaged students, including growth mindset interventions and mastery learning (Batdi, 2019; Sisk et al., 2018).

Lower remediation rates Several features in Adaptive Academic Learning help students make progress toward mastery and may reduce the need for formal remediation. These features include individualized content, mastery learning, and automatic scaffolded supports. Individualized content provided by the platform ensures students receive content fit to their current and changing knowledge and skills. Additionally, the platform’s mastery-based approach allows students to learn target content at their own rate. Further, automatic scaffolded supports combined with just-in-time instruction, allow students who initially struggle to continue making learning progress. This combination of appropriate content, mastery learning, and automatic support may allow students to make learning progress and avoid remediation.

Higher digital literacy Practice with the platform can help increase students’ familiarity with using technology for learning. For instance, students using the platform will practice reading and comprehending content from screens. Additionally, students may gain problem-solving skills from solving technology-related challenges. As a result of these experiences, students will likely gain digital literacy from the use of Adaptive Academic Learning.

Long-term outcomes include:

More successful transition to high school

Adaptive Academic Learning supports academic achievement in middle school, which in turn can support a more successful transition to high school. Research shows that earning better middle school grades predicts early high school grades (Casillas et al., 2012; McKee & Caldarella, 2016). Further, this research shows that performance on standardized math tests in middle school predicts grades in ninth grade (McKee & Caldarella, 2016). Additionally, research shows that greater academic achievement in eighth grade predicts students’ grade point average in ninth grade more strongly than important academic behaviors such as academic discipline and orderly conduct (ACT, 2008). Based

on this research, support for academic achievement in middle school may also support academic achievement in early high school. In addition to the relationship between middle and early high school grades, preparation in middle school influences how instructional time is spent in high school. A survey found that Algebra 1 and grade 9 English teachers spent a quarter and a third of their time respectively re-teaching prerequisite content from middle school (ACT, 2007). If students come into high school with a greater knowledge of middle school content, this re-teaching can be avoided, and time can be allocated to supporting student learning of high school content. In sum, academic achievement in middle school and mastery of core content can support a successful transition to high school by increasing students' grades and decreasing time required for re-teaching.

Increased high school retention Adaptive Academic Learning supports academic achievement in middle school, which in turn can support academic performance and retention in high school. Research shows that grades in middle school predict whether students will drop out in high school (Rumberger & Lim, 2008). Further, as described above, better performance in middle school prepares students for a more successful transition to high school. In turn, this more successful transition can also support high school retention. Unfortunately, students often face significant difficulty with the transition to high school, thus resulting in ninth grade having the highest failure rate of any grade (Kennelly & Monrad, 2007). The difficulty students face with this transition has also been found to be a key mechanism in high school attrition (Pharris-Ciurej,

Hirschman, & Willhoft, 2012). Additionally, research shows that a substantial portion of those who fail to progress from ninth to tenth grade on time ultimately drop out of school (Kemple, Herlihy, & Smith, 2005). In addition to those who fail ninth grade, those who face substantial setbacks in ninth grade, such as failing a course, can have difficulty staying on track for an on-time graduation from high school (Kennelly & Monrad, 2007; Neild, 2009). Based on these results, support for middle school academic performance and the transition to high school can also support high school retention.

Increased academic achievement in High School Adaptive Academic Learning's support for engagement and, in turn, lower burnout can support academic achievement. Support for this relationship between engagement and academic achievement was found in a recent meta-analysis involving 196,473 first through 12th-grade students (Lei, Cui, & Zhou, 2018). In addition, greater student engagement is associated with lower levels of burnout (Paloş, Maricuţoiu, & Costea, 2019). A recent meta-analysis, including 109,396 primary through college students, found a negative relationship between burnout and academic achievement (Madigan & Curran, 2020). Based on these results, increasing engagement and lowering burnout can support student academic achievement.

¹ In addition to these uses, the platform can be used by students in various settings outside the classroom. The flexibility to learn anywhere is particularly helpful in addressing learning needs when students are away from the classroom for a period of time. Further, Adaptive Academic Learning could mitigate learning loss over the summer or the COVID-19 pandemic.



DESCRIPTION OF THE MOSAIC BY ACT: ADAPTIVE ACADEMIC LEARNING THEORY OF ACTION FOR EDUCATORS

Figure 2 shows the logic model capturing the theory of action for educators.

Inputs <i>What makes Mosaic by ACT: Adaptive Academic Learning special?</i>	Activities <i>What will users do with Mosaic by ACT: Adaptive Academic Learning?</i>	User Experiences <i>What does the data tell us about experiences using Mosaic by ACT: Adaptive Academic Learning?</i>	Outcomes <i>What does research tell us about the potential benefits of Mosaic by ACT: Adaptive Academic Learning?</i>
Technology-Enhanced Assessments <ul style="list-style-type: none"> Automated and teacher-driven assessments include: Diagnostic adapts to changing student proficiency Teachers can create, browse, and assign from formative, interim, and comprehensive varieties Automatic grading Mastery checks strategically spaced Over 50+ tech-enhanced item formats 	Content Available Anywhere & Anytime <ul style="list-style-type: none"> Educators can access 24/7 from most internet enabled device except for phones Flexibility in adjusting settings including rewards, the proficiency level required for mastery, and the rigor of practice 	Increased Student Retention and Transfer <ul style="list-style-type: none"> Meta-analysis shows that learning techniques incorporated in Adaptive Academic Learning increase student transfer and/or retention, including: <ul style="list-style-type: none"> Retrieval Practice Spacing Interleaving Computer-Based Scaffolding Knowledge Segmentation 	Short Term Outcomes <ul style="list-style-type: none"> The "right resources" for every learner (based on fit to learner needs) Saved time therefore more instructional time Peace of mind
Automatic Scaffolding and Enrichment <ul style="list-style-type: none"> Automatic scaffolding process involves: <ul style="list-style-type: none"> Detecting student knowledge gaps Providing just-in-time instruction As needed instruction on pre-requisites Predict struggling students so teachers can assign targeted interventions Enrichment with harder content as students reach mastery within learning paths 	Individualized Content <ul style="list-style-type: none"> Management of learning resources to ensure alignment to learning goals Select ready-made learning paths Assessment resources Teachers can further customize content to match what is being taught at your school Browse content from teachers in the school, district, and Adaptive Academic Learning community 	Saved Educator Time <ul style="list-style-type: none"> In case studies about Adaptive Academic Learning with around 30 schools, teachers mentioned saving time with Adaptive Academic Learning on finding content aligned to standards, grading, and crafting assignments 	Medium Term Outcomes <ul style="list-style-type: none"> More flexibility of instruction More updated information (compared to textbooks) More job satisfaction Less stress and burnout
Standards and Textbook Alignment <ul style="list-style-type: none"> Comprehensive coverage of K-8 includes: <ul style="list-style-type: none"> Common Core standards Unique state-specific standards (14) Aligned to popular Math & ELA textbooks (20) such as Eureka Math & Reading Street 	Student Reports <ul style="list-style-type: none"> Reports (by users, by standard) including: <ul style="list-style-type: none"> Student performance via class dashboard Activities students complete Student progress towards mastery Student growth between assessments Just-in time alerts for due dates 	Increased Knowledge of Student Learning <ul style="list-style-type: none"> Adaptive Academic Learning helps educators accurately gauge their students learning progress with reports and real-time updated and immediate feedback. 	Long Term Outcomes <ul style="list-style-type: none"> Greater learning transparency Better teacher retention
Educator Professional Development <ul style="list-style-type: none"> Access to PD resources including: <ul style="list-style-type: none"> Live webinars held by Adaptive Academic Learning experts Virtual or onsite bootcamp On-demand videos, Step-by-step instructions 	Integrate Additional Resources <ul style="list-style-type: none"> Teachers can select additional targeted practice to address students' demonstrated areas of need Teachers can choose supplemental enrichment activities including writing, spelling, and ebook reading 		

Figure 2. Logic model for educators for Mosaic by ACT: Adaptive Academic Learning

Inputs

Technology-Enhanced Assessments Educators also have the ability to create custom assessments with a user-friendly interface. They can customize assessments by selecting pre-made questions or creating questions in over 50 different technology-enhanced formats. These assessments are also automatically graded, saving educators valuable time. In addition to teacher-driven assessments, the platform provides automatic formative, interim, and comprehensive assessments. Educators can be confident their students have gained long-term knowledge of content due to assessments automatically delivered during practice including the delayed mastery checks and practice questions that adapt to changing student proficiency.

Automatic Scaffolding and Enrichment As described above, the platform provides automatic scaffolded supports and enrichment, which saves educators time. In addition, the platform notifies educators when students are struggling with concepts. The educators can then browse the content bank and assign targeted interventions for their students or create their own content with the user-friendly interface.

Academic Standards and Textbook Alignment Educators can ensure that content in Adaptive Academic Learning addresses the academic standards their school follows. The system provides curricula aligned to math and English Language Arts standards with comprehensive coverage spanning kindergarten through eighth grade. The system provides coverage of college and career-ready standards, and unique standards for 14

states. The system also offers learning paths aligned to 20 popular math & ELA textbooks, such as Eureka Math & Reading Street.

Educator Professional Development Adaptive Academic Learning provides a variety of professional development tools that allow educators to quickly become more familiar with the platform and leverage it to its full potential. For those who want to learn more about specific features, step-by-step instructions and on-demand videos are available. In addition, the system offers virtual and onsite professional learning services to deepen educator knowledge and skills (e.g., how to build a comprehensive curriculum offering by integrating the platform and other available learning resources, and how to use data from the platform to make instructional decisions).

Activities

Content Available Anywhere and Anytime As with students, educators can access Adaptive Academic Learning 24/7 from most internet-enabled devices. They can further customize the system to fit their classroom needs with a variety of settings. For instance, they can motivate their students by offering specific rewards. They can also adjust the number of questions students must answer, and the percentage of those questions they must get correct to achieve mastery.

Individualized Content Educators can select ready-made learning paths that directly align with their learning objectives. Educators can further customize the content their students practice ensuring a close match to their in-class lessons. They can choose who can use this customized content from only their students to the entire school, or district. In turn, they can browse and adapt content crafted by other educators. Educators can also access pre-made simulations such as CAASPP for California and NWEA to monitor student progress. These simulations provide immediate, actionable results.

Student Reports Adaptive Academic Learning provides a variety of reports to ensure educators always know where their students stand. In the activity dashboard, educators can easily see how

many questions each of their students attempted and the number they answered correctly. They can dig deeper into these reports and see which activities students have completed, their performance by concept, and even the specific questions they attempted. They can also monitor their students' progress towards mastery with the mastery grid that provides the mastery status and mastery scores for each student. For assessments, they can see assessment performance by concept, student, and growth between assessments. They can also receive alerts before due dates and send their students reminders.

Integrate Additional Resources Educators can supplement primary instruction with fact fluency, spelling, writing, and eBook content. Educators can assign the adaptive fact fluency module to help students improve their speed and accuracy in the foundational math facts or they can assign and manage each students' practice rigor and sequence of the operations. Educators can assign pre-built grade-aligned spelling word lists and learning paths for grades K through 8 or create their custom word lists. For eBooks, educators can select ebooks from the online library of over 400 GRL-aligned eBooks. The system delivers self-paced reading and spelling practice to students using the industry's first adaptive spelling and eBooks solutions. Educators can also assign and review writing assignments and offer feedback to multiple students quickly and easily.

User Experiences

Increased Student Retention and Transfer Educators have a lot of material to teach and a limited time to devote to each topic. As a result, educators may be unable to devote additional time to re-teaching as they must move on to new material in order to cover everything. Nevertheless, educators want to ensure their students have gained the knowledge and skills they need. With Adaptive Academic Learning, educators can ensure their students have gained long-term knowledge that they can apply in their academic work and everyday lives. As detailed above, the system incorporates evidence-based techniques to create an efficient and effective learning experience for their students. Educators can see this learning

progress quickly with their dashboard that displays progress towards weekly goals in math and ELA. Knowing that their students are gaining the knowledge and skills they need can help educators stay on track and keep class time focused on new content.

Saved Educator Time Teachers have many time-consuming activities such as planning lessons and grading assessments on their plates. The platform can reduce time spent on these activities. Consistent with this possibility, in case studies with 30 schools, many participants mentioned that educators saved time with Adaptive Academic Learning. The platform gave educators time back that they would normally spend finding content aligned to academic standards, grading, and crafting assignments.

Increased Knowledge of Student Learning Adaptive Academic Learning features ensure teachers can easily track content students are learning and the progress they make. In the platform, teachers can view which specific concepts and standards students are assigned on learning paths. Teachers can further view reports showing relevant information on students including student proficiency on each concept, student mastery status, and student mastery score. Teachers can also see concepts receiving scaffolded supports and examine growth on assessments by each concept. In support for the benefits of these reports and assessments, in case studies with 30 schools, many participants mentioned the benefits of the assessments and report features in Adaptive Academic Learning. The platform provided quick and seamless data that educators could use to formatively guide their instruction.

Outcomes

Short-to-moderate term outcomes include:

Saved time (and therefore more instructional time): As detailed above, features in Adaptive Academic Learning save educators time. Research shows teachers can spend almost one-third of their time on lesson planning and around a quarter of their time grading (Philipp & Kunter, 2013). The platform can save educators time on these tasks by providing ready-made learning content and

automatic grading. In addition, The platform saves time spent intervening. In a recent national survey, only 29% of teachers agreed that their schools often meet the needs of students who are performing below grade level (Morris & Stone, 2020). Clearly, teachers need additional resources to support students with needs for additional interventions. The platform can provide these resources, including automatic scaffolded supports, an intervention monitor, and a high-quality content bank. Each of these features is described in greater detail above. In brief, students who struggle in the platform are given automatic support via instruction on pre-requisite concepts. Teachers see which of their students receive this support, allowing them to monitor which students may need additional support easily. Then, they can browse the content bank and assign ready-made targeted practice to these students. As a result, teachers save time re-teaching, determining which students need additional support, and creating resources to support these students. With the platform's time-saving features, educators have more time to spend on instruction.

Peace of mind Educators may sometimes struggle to judge how well their students have learned material (Thiede et al., 2015). For instance, a teacher may ask their student a question about a recent lesson and get no answer from the student. Their silence may mean their student has not learned the information well, but it may also mean they failed to hear the question as they talked with a friend or their zoom audio cut out. A better indication of their student's knowledge would be student performance on an assessment aligned to clearly defined learning goals (Thiede et al., 2015). Teachers understand the need for these assessments, but a national survey of teachers found that only 34% of teachers agree that their school's assessment material accurately evaluates student learning (Morris & Stone, 2020). Further, these teachers suggested better alignment to classroom curricula as one of the top ways to improve these assessments. Adaptive Academic Learning provides assessments aligned to standards and curriculum, automatic grading, and reports. These tools allow teachers to accurately assess student understanding to adapt their instruction, provide feedback, and identify

struggling students. In turn, this increased understanding of student learning can bring teachers peace of mind.

Moderate-to-long term outcomes include:

More flexibility of instruction: Adaptive Academic Learning features provide teachers flexibility to create and customize content, and control over exactly what their students learn and how. Teachers using the system can preview ready-made learning paths to see the concepts and standards targeted. They can also preview assessments to see the questions their students will be asked. Further, those who want to add their own content can create assessments and instructional content with the user-friendly authoring tool. They can also select content shared by other teachers in their school or district. Taken together, these tools ensure teachers can efficiently control the learning experience for their students in the system.

More updated information (compared to textbooks): Teachers need updated and standards-aligned content that meets the needs of all their students. In fact, a national survey of teachers found that only 40% of teachers agreed that they have a high-quality curriculum well aligned with learning standards (Morris & Stone, 2020). Further, only 31% agreed that their curricula are accessible and applicable to all learners (Morris & Stone, 2020). The platform provides high-quality content aligned to standards that fit each learners' individual needs. As described above, two independent reviewers ensure the system content is aligned to relevant standards and is accurate. In contrast, an examination of 29 science textbooks found an average of one error per page (King, 2010). Further, poor quality textbooks and textbooks with out-of-date information are more prevalent in schools serving low-income students and schools serving English language learners (Earthman, 2002). This disparity in access to quality material is particularly problematic given that economically disadvantaged students may not have other access to books and other learning materials (Earthman, 2002). Based on these problems with existing textbook materials, the system provides a valuable resource for quality content that can

especially benefit underserved students who may be less likely to have access to high quality content.

Increased job satisfaction: Research and teacher surveys reveal that job dissatisfaction is a substantial concern, citing dissatisfaction as a reason behind many educators who choose to leave the profession (Carver-Thomas & Darling-Hammond, 2017). In particular, three of the top issues driving dissatisfaction are a lack of supports to prepare students for assessments, too many intrusions on teaching time, and lack of autonomy in the classroom (Carver-Thomas & Darling-Hammond, 2017). Adaptive Academic Learning helps to address each of these main drivers of dissatisfaction. With the system, teachers have appropriate, standards aligned assessments. Additionally, features like ready-made content and automatic grading can save teachers time. Further, the system affords teachers flexibility in their instruction because they can create and customize the content, and control exactly what their students learn and how. In turn, these features may lead to greater job satisfaction.

Less burnout: Research on burnout shows that workload and time pressure are strongly and consistently related to burnout (Maslach, Schaufeli, & Leiter, 2001). In addition, lower job satisfaction is associated with increased burnout (Fisher, 2011; Mahmoodi-Shahrehabaki, 2018). Based on these results, reducing teachers' workload and saving them time, and increasing job satisfaction can potentially reduce burnout. As detailed above, features in Adaptive Academic Learning can save teachers' time and increase job satisfaction.

Long-term outcomes include:

Greater learning transparency: With Adaptive Academic Learning teachers can access student learning progress as detailed above further. Additionally, teachers can share this learning progress with everyone involved in the student's education such as parents, caretakers, and administrators. By sharing their current learning progress, everyone stays informed on the most up-to-date information.

Better educator retention: Teacher turnover is a significant problem, especially for beginning teachers. One study found that 19-30% of teachers leave the profession within the first five years (Sutcher, Darling-Hammond, & Carver-Thomas, 2016). Additionally, attrition rates have increased in recent years (Sutcher, Darling-Hammond, & Carver-Thomas, 2016). Consistent with this rise in attrition, only 46% of teachers in a recent survey said they are very likely to spend their entire career as a classroom teacher (Morris & Stone, 2020). Regarding why teachers reported wanting to leave

the profession, 26% reported not having the resources they need to do their job well (Morris & Stone, 2020). In addition, dissatisfaction and burnout can lead to attrition (Mahmoodi - Shahrehabaki, 2018; Sutcher, Darling-Hammond, & Carver-Thomas, 2016). Adaptive Academic Learning can help address this problem by providing resources that teachers need and saving teachers' time, which is associated with decreased burnout (Maslach, Schaufeli, & Leiter, 2001).



DESCRIPTION OF THE MOSAIC BY ACT: ADAPTIVE ACADEMIC LEARNING FOR ADMINISTRATORS

Figure 3 shows the logic model capturing the theory of action for administrators.

Inputs <i>What makes Mosaic by ACT: Adaptive Academic Learning special?</i>	Activities <i>What will users do with Mosaic by ACT: Adaptive Academic Learning?</i>	User Experiences <i>What does the data tell us about experiences using Mosaic by ACT: Adaptive Academic Learning?</i>	Outcomes <i>What does research tell us about the potential benefits of Mosaic by ACT: Adaptive Academic Learning?</i>
Standards and Textbook Alignment <ul style="list-style-type: none"> Comprehensive coverage of K-8 includes: <ul style="list-style-type: none"> Common Core standards Unique state-specific standards (14) Aligned to popular Math & ELA textbooks (20) such as Eureka Math & Reading Street 	Content Available Anywhere & Anytime <ul style="list-style-type: none"> Administrators can access 24/7 from most internet enabled device except for phones Flexibility in adjusting settings including classroom defaults, general settings, SSO and LTI 	Increased Student Retention and Transfer <ul style="list-style-type: none"> Meta-analysis shows that learning techniques incorporated in Adaptive Academic Learning increase transfer and/or retention, including: <ul style="list-style-type: none"> Retrieval Practice Spacing Interleaving Computer-Based Scaffolding Knowledge Segmentation 	Short Term Outcomes <ul style="list-style-type: none"> Saved teacher time Decreased spending on paper and printing Peace of mind
Administrator Professional Development <ul style="list-style-type: none"> Access to PD resources including: <ul style="list-style-type: none"> Live webinars held by Adaptive Academic Learning experts Virtual or onsite bootcamp On-demand videos, Step-by-step instructions Customized workshops on request Quarterly check-points to ensure impactful implementation 	Site-Wide Data and Reports <ul style="list-style-type: none"> Proficiency reports by school, grade, teacher, classroom, domain Overall usage reports including active users, summary of activity and summary of learning stats Comprehensive standards report with mastery and assessment data 	Preparation for Benchmark Tests <ul style="list-style-type: none"> Administrators find Adaptive Academic Learning helps students gain familiarity with assessments that parallel high-stakes assessments Administrators find Adaptive Academic Learning helps them utilize assessment data such as MAP scores and fill student knowledge gaps 	Medium Term Outcomes <ul style="list-style-type: none"> Facilitate Leader as Learner modeling for teachers Actionable data to drive programming decisions Less educator burnout
Trusted Content <ul style="list-style-type: none"> Trusted content and process developed by education leaders and researchers Before content earns verified status and is released an independent reviewer ensures: <ul style="list-style-type: none"> Alignment to the concept Clarity of question stem, directions, and answer choices Difficulty level, DOK and accuracy of answer 	Build Content for School/District <ul style="list-style-type: none"> Flexibility for teachers and administrators to collaborate and customize content across the school or district Create learning paths mapped to curriculum maps and pacing guides Create assessments using 50+ item types or from the free item bank Create spelling and ebook reading lists 		Long Term Outcomes <ul style="list-style-type: none"> Greater learning transparency Better teacher retention Better school and district performance on benchmark tests
Fully Compliant with Security Regulations <ul style="list-style-type: none"> Safe and secure data storage Signatory on Student Privacy Pledge Compliance with COPPA and FERPA Adaptive Academic Learning never sells or rents student and teacher information 	Manage teachers and students <ul style="list-style-type: none"> Quick and easy rostering Import classrooms directly from Google Classroom and Clever One-click login through supported LMS systems 		

Figure 3. Logic model for administrators for Mosaic by ACT: Adaptive Academic Learning

Inputs

Academic Standards and Textbook Alignment

Administrators can ensure content addresses the academic standards their school or district follows with comprehensive coverage of Common Core and unique state-specific standards and popular textbooks.

Administrator Professional Development The platform offers a variety of professional development tools, specifically for administrators. In addition to options offered to educators, administrators can request customized workshops. Additionally, Adaptive Academic Learning implements quarterly checkpoints to ensure full and impactful implementation.

Trusted Content Administrators can be confident that students only receive relevant and appropriate content due to Adaptive Academic Learning's trusted content and process developed by education leaders and researchers. Two reviewers examine the content before being released to students. These reviewers ensure the content fully covers the concept of interest. They also check that questions, directions, and answer choices are clearly worded and ensure the accuracy of answers. Further, they assign a difficulty level or DOK to make sure students receive content at the appropriate level of difficulty.

Fully Compliant with Security Regulations The platform is built with embedded data and privacy frameworks, offering robust safeguards. Adaptive Academic Learning is committed to storing data safely and securely as affirmed by signing the

Student Privacy Pledge along with pioneers such as Google, Apple, and Microsoft. The platform is fully COPPA-compliant. Students are not allowed to create their accounts--only educators and parents can do so. The system supports FERPA and helps schools stay fully FERPA-compliant. Adaptive Academic Learning's Privacy Policy also commits to never selling or renting information to third parties, including advertisers.

Activities

Content Available Anywhere and Anytime

Administrators can access the platform 24/7 from most internet-enabled devices. They can further adjust general settings and classroom defaults like deciding if students immediately receive feedback on incorrect answers or if they should have access to the class wall. Administrators can also enable access via SSO and LTI integration from the settings.

Site-Wide Data and Reports Adaptive Academic Learning provides a variety of reports to ensure administrators always have information about performance by students, classrooms, and educators. The usage statistics provide a quick at a glance review of how educators and students spent time in the system, including the number of active users, hours spent, questions solved, and even trees saved. Administrators can also dig deeper into performance during practice with reports showing proficiency by school, grade, educator, and classroom. Administrators can further view the comprehensive standards report with practice data and assessment data across each standard. For assessment data, administrators can easily view performance on assessments and dig down to the student view to see the performance by student and even performance by standard, concept, and question. These reports allow administrators real-time information that they can use to check-in with educators and students.

Build Content for School/District Administrators have the flexibility to collaborate with educators to customize content across the school or district. Customizing material as an administrator creates a standardized curriculum across all classrooms to meet state and district academic standards.

Administrators can also leverage the system's pre-built Common Core and state-specific learning paths. In addition to these ready-made paths, administrators can build learning paths aligned to their Curriculum Maps and pacing guides. Administrators can also assign assessments from a wide variety of pre-built assessments such as entry/exit tickets and SBAC/PARCC Simulations. In addition to pre-made assessments, administrators can create custom assessments by picking questions from the included item bank. For added flexibility, the user-friendly authoring tools make it easy for administrators to create their own technology-enhanced questions. Administrators can also create spelling and eBook reading lists.

Manage educators and students Administrators can easily set up new educators and manage the assignment of educators to their respective classrooms. Administrators can directly import classrooms from Google Classroom and Clever. Additionally, administrators can set up One-click login through supported LMS systems, including Google Classroom, Schoology, Canvas, Engrade, and ClassLink.

User Experiences

Increased Student Retention and Transfer

Administrators aim to demonstrate school and district growth. Students need to master content targeted by academic standards and retain their knowledge of this content over time to demonstrate this growth. Because the platform aligns content to academic standards, administrators can be confident their students are gaining the necessary knowledge. Importantly, because the platform incorporates evidence-based learning techniques, administrators can be confident that their students will retain this knowledge over time and demonstrate this knowledge on benchmark tests.

Preparation for Benchmark Tests Administrators find the platform provides good preparation for benchmark tests. The platform helps students gain familiarity with questions and question formats similar to those found on assessments that simulate high-stakes assessments. Additionally, the platform helps them utilize assessment data such

as MAP scores to inform student learning and to fill student knowledge gaps.

Outcomes

Short-to-moderate term outcomes include:

Saved educator time: Administrators can help support their teachers by reducing some of their workload. One way to do this with the platform is to collaborate with teachers to customize content. As detailed above, features in the platform make it easy for administrators to collaborate and customize content such as assessments and learning paths. This content can then be shared with all of the teachers in their school or district so teachers can access this ready-made material. In addition, the platform includes many features that can save teachers time such as automatic assessment, grading, and scaffolded supports.

Decreased spending on paper and printing: The platform provides all content digitally, avoiding the need to spend money printing instructional packets or purchase workbooks. Students can work directly from their computer or tablet to complete practice assignments and assessments in the system. In addition to saving money on printing, this also provides practice for students to read and comprehend information from computers.

Peace of mind: Adaptive Academic Learning takes care of content, so administrators don't need to worry about quality or relevance. The platform provides high-quality content aligned to standards and addresses each learners' individual needs. This content goes through a review process to ensure relevance and accuracy. Administrators can also customize content in the platform with the user-friendly authoring tool to ensure consistency across their school or district.

Moderate-to-long term outcomes include:

Facilitate Leader as Learner modeling for educators: Administrators can be an important part of setting a culture of learning in their schools that includes themselves, staff, and parents. One way to set this culture of learning is for administrators to model being a lifelong learner. For instance, administrators can participate in professional

development opportunities. Adaptive Academic Learning provides a variety of professional development resources for administrators, including customized workshops and quarterly checkpoints. As a result of these professional development activities, administrators can continue to improve their knowledge and demonstrate their commitment to lifelong learning.

Actionable data to drive programming

decisions: Adaptive Academic Learning includes assessments aligned to academic standards and curriculum, automatic grading, and reports. Administrators can easily access these reports to see proficiency by grade, school, and classroom. Administrators can also view proficiency by domain and standard. In addition to these reports, the insights-heatmap ranks content in the system as relatively easy, medium, and hard based on over a million data points. These information sources can help drive decisions about which content may need additional support and the extent to which additional practice is needed.

Less educator burnout: Given the goal of helping their teachers develop professionally, burnout is a significant problem for administrators, with higher burnout in professionals involved with human services than other professions (Mahmoodi-Shahreabaki, 2018). For instance, one recent study of Kindergarten through 4th grade teachers from 9 schools found that 93% of teachers had high levels of stress, and one-third of teachers experienced moderate to high burnout (Herman, Hickman-Rosa, & Reinke, 2019). As detailed above, the system can help address this issue. In particular, the system reduces some of teachers many responsibilities and can save them time and may increase job satisfaction. Given the relationship between increased burnout, workload, and job satisfaction, use of Adaptive Academic Learning may increase teacher job satisfaction and reduce teacher burnout, therefore helping administrators achieve their goal of supporting their teachers.

Long-term outcomes include:

Greater learning transparency: Administrators can easily track the content students are learning

and the progress they make in the system. In addition, administrators can examine overall patterns of usage, including problems solved and practice activities completed. Administrators can discuss this progress with teachers or students directly, and they can easily share this information with others, such as parents.

Better educator retention: As detailed previously, teacher turnover is a significant problem. Many sources contribute to turnover, including a lack of resources and teacher burnout. The system can help address this problem by providing resources that teachers need and saving teachers' time, which is associated with decreased burnout (Maslach, Schaufeli, & Leiter, 2001).

Better school and district performance on benchmark tests: The system provides pre-built,

end-of-year assessment simulations such as CAASPP for California, AIR for Ohio, and PARCC among others. In addition, administrators can build their own end of year assessment based on their state's academic standards. Students can easily take these tests online, and teachers and administrators can immediately view results. These results provide insights by students, concepts, and questions. These insights allow administrators to spot trends, and they can then go and assign targeted practice on concepts students still need to master. Administrators can even have students complete one version of the assessment and then complete another version with new questions addressing the same concepts to measure their growth. These tools allow administrators a clear idea of learning progress, so classroom instruction can be targeted to prepare students for benchmark tests.

CONCLUSION

In summary, Mosaic by ACT: Adaptive Academic Learning is a powerful learning tool that helps students, educators, and administrators overcome many challenges typically faced in student learning.

For students, Adaptive Academic Learning provides an engaging, mastery platform with individualized content and evidence-based learning strategies that support greater academic achievement.

For teachers, Adaptive Academic Learning provides a user-friendly platform with ready-made and customizable content aligned to academic standards that can save them valuable time and may mitigate burnout.

For administrators, Adaptive Academic Learning provides a user-friendly platform with trusted content and a variety of useful reports that can provide actionable insights and support performance on benchmark tests.

For all users, Adaptive Academic Learning can be accessed anywhere, anytime, and delivers an unparalleled student learning experience.



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APPENDIX

Table A1. Crosswalk for Adaptive Academic Learning and UDL guidelines regarding engagement

Engagement	Coverage	Example of Coverage in Mosaic by ACT: Adaptive Academic Learning
<u>Recruiting Interest (7)</u>	3 of 3	Adaptive Academic Learning currently provides strong support for recruiting interest.
Optimize individual choice and autonomy (7.1)	Yes	Students can choose from various rewards based on their coins, including animated avatars, games, wallpapers, and different colors.
Optimize relevance, value, and authenticity (7.2)	Yes	Several features in Adaptive Academic Learning ensure each learner receives content that addresses their individual needs, including differentiated practice, automatic scaffolding and enrichment, and aligned practice.
Minimize threats and distractions (7.3)	Yes	Students are given set weekly goals and can see progress updates in real-time to provide a predictable learning experience. Students are also given reminders automatically to inform them of upcoming and time-sensitive action items.
<u>Sustaining Effort & Persistence (8)</u>	4 of 4	Adaptive Academic Learning currently provides strong support for sustaining effort & persistence.
Heighten salience of goals and objectives (8.1)	Yes	Student learning profiles visually display student progress to allow students to see their progress easily.
Vary demands and resources to optimize challenge (8.2)	Yes	Teachers can adjust both the rigor of practice (i.e., the minimum number of practice questions required) and the mastery criteria. Additionally, automatic scaffolded supports are provided based on student knowledge.
Foster collaboration and community (8.3)	Yes	Opportunities for peer interaction are encouraged via the class wall. Students can post a message to the class on the class wall and respond to a teacher or peer's message. Students are also able to flag and like messages via the thumbs up feature.
Increase mastery-oriented feedback (8.4)	Yes	Growth mindset feedback messages are provided after each practice question and students see growth mindset quotes that emphasize student effort.
<u>Self-Regulation (9)</u>	2 of 3	Adaptive Academic Learning currently addresses criteria 9.1 and 9.3.
Promote expectations and beliefs that optimize motivation (9.1)	Yes	Educators can tack positive and negative student behaviors such as student outbursts.
Facilitate personal coping skills and strategies (9.2)	No	N/A
Develop self-assessment and reflection (9.3)	Yes	Students have access to various feedback displays, including graphics, charts, and question by question feedback on performance.
Engagement	9 of 10	Overall, Mosaic by ACT: Adaptive Academic Learning currently supports student engagement in multiple ways.

Table A2. Crosswalk for Adaptive Academic Learning and UDL guidelines regarding representation

Representation	Coverage	Example of Coverage in Mosaic by ACT: Adaptive Academic Learning
<u>Perception (1)</u>	2.5 of 3	Adaptive Academic Learning currently addresses criteria 1.1 and 1.2 and provides support for criteria 1.3 for some content.
Offer ways of customizing the display of information (1.1)	Yes	Adaptive Academic Learning provides tools for students to display information in flexible formats, including a magnifier, zoom, font size controls, color contrast, highlighter, and masking features.
Offer alternatives for auditory information (1.2)	Yes	Students watch short informational videos that involve text and various visuals, including pictures, diagrams, and charts.
Offer alternatives for visual information (1.3)	Possibly	To support the teaching and learning for all students, text-to-speech is available for applicable content.
<u>Language & Symbols (2)</u>	1.5 of 5	Adaptive Academic Learning currently addresses criteria 2.5 and provides some support for criteria 2.3.
Clarify vocabulary and symbols (2.1)	No	N/A
Clarify syntax and structure (2.2)	No	N/A
Support decoding of text, mathematical notation, and symbols (2.3)	Possibly	To support the teaching and learning for all students, text-to-speech is available for certain content
Promote understanding across languages (2.4)	No	N/A
Illustrate through multiple media (2.5)	Yes	Students watch short informational videos that involve text and various visuals including pictures, diagrams, and charts.
<u>Comprehension (3)</u>	4 out of 4	Adaptive Academic Learning currently provides strong support for comprehension.
Activate or supply background knowledge (3.1)	Yes	To connect unknown concepts to known concepts, instructional videos use relevant analogies and metaphors.
Highlight patterns, critical features, big ideas, and relationships (3.2)	Yes	Instructional videos make use of signaling to emphasize key concepts.
Guide information processing and visualization (3.3)	Yes	Bite-sized instructional videos break down content into small units to allow the learner to digest one concept before moving to the next.
Maximize transfer and generalization (3.4)	Yes	Students have multiple practice opportunities for each concept spaced over time involving different questions and question formats.
Representation	8 of 12	Overall, Mosaic by ACT: Adaptive Academic Learning currently supports comprehension and representation, whereas additional supports are needed for language and symbols.

Table A3. Crosswalk for Adaptive Academic Learning and UDL guidelines regarding action & expression

Action & Expression	Coverage	Example of Coverage in Mosaic by ACT: Adaptive Academic Learning
<u>Physical Action (4)</u>	.5 out of 2	Adaptive Academic Learning currently provides some support for criteria 4.2 as it is touch screen compatible.
Vary the methods for response and navigation (4.1)	No	N/A
Optimize access to tools and assistive technologies (4.2)	Possibly	Adaptive Academic Learning is compatible with most tablets that use touch screens.
<u>Expression & Communication (5)</u>	2.5 of 3	Adaptive Academic Learning currently provides some support for criteria 5.1 and 5.3 and provides some support for criteria 5.2.
Use multiple media for communication (5.1)	Yes	Students answer questions in over 50 different formats, including more traditional multiple-choice questions to creating a graph or shading in part of a shape. Additionally, the interactivity class wall allows students to post messages and interact with their peers' messages.
Use multiple tools for construction and composition (5.2)	Possibly	Spell check is available for applicable content. Additionally, text-to-speech is available for certain content.
Build fluencies with graduated levels of support for practice and performance (5.3)	Yes	During practice, practice problems are used to identify gaps in student knowledge. Adaptive Academic Learning provides automatic scaffolded support on pre-requisite concepts at or below the grade level of the practiced concept to fill these gaps.
<u>Executive Functions (6)</u>	2 of 4	Adaptive Academic Learning currently provides some support for criteria 6.1 and 6.4.
Guide appropriate goal-setting (6.1)	Yes	Students see their weekly goals on their main dashboard, along with their current progress.
Support planning and strategy development (6.2)	No	N/A
Facilitate managing information and resources (6.3)	No	N/A
Enhance capacity for monitoring progress (6.4)	Yes	Students frequently complete practice problems and receive immediate corrective feedback. Student learning profiles and weekly goal monitors track progress visually over time.
Action & Expression	5 of 9	Overall, Mosaic by ACT: Adaptive Academic Learning currently has some supports for executive functions, expression, and communication, whereas additional supports are needed for physical action.