EdResearch for Action

MAKING LEARNING REAL: DESIGN PRINCIPLES AND EVIDENCE FOR APPLIED LEARNING IN SCHOOLS

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We gratefully acknowledge the EdResearch for Action Advisory Board members— Ginger Cole-Leffel, Hannah Gbenro, Ashley Kearney, Rachael Grech-Scott, Jill Gurtner, Anjali Bhatt, Connie Parham, Abigail Quirk, and Ryan Otero —whose expertise as education leaders brought critical, practice-driven insights to guide this brief.

Overview Brief

BRIEF #36
OCTOBER 2025

Annenberg Institute BROWN UNIVERSITY

RESULTS FOR AMERICA

MAKING LEARNING REAL: DESIGN PRINCIPLES AND EVIDENCE FOR APPLIED LEARNING IN SCHOOLS

SUMMARY OF EVIDENCE-BASED PRACTICES

This research brief summarizes decades of research to offer clear, evidence-based answers to the biggest questions about designing and implementing effective Applied Learning (AL) programs.

EVIDENCE-BASED PRACTICES

- Developing a coherent, clear, shared vision of learner success can strengthen the ability of school systems to implement and spread high-quality AL.
- High-quality curriculum materials and aligned assessment tasks can encourage AL, help increase the quality and consistency of AL experiences, and lead to improved academic outcomes.
- Staffing structures and schedules that facilitate AL-aligned professional learning supports can help teachers develop vital experience and expertise.
- School schedules permitting longer blocks, flexible time-use, and learning outside of the school building enable students to engage deeply in projects, off-site learning, and other applied experiences that can be more challenging to fit within traditional bell schedules.
- Flexible credit policies and alternative pathways to graduation through career-technical education, work-based learning, and visual and performing arts can prepare students for related postsecondary education and career options.
- Adopting performance assessments and performance-based grading systems supports AL by allowing educators to measure complex skills and knowledge that standardized tests often overlook, including problem-solving, transfer to real-world contexts, and collaboration.
- With the benefit of the enabling structures described above, teachers can develop their ability to successfully use AL approaches in classrooms with their students.

PRACTICES TO AVOID

- Reversion to the status quo, away from AL, manifests through parent pressure, culture of individualism, the challenge of paradigm shifts, and limited financial resources.
- Time restrictions limit planning, collaboration, and flexibility, while student and/or teacher absenteeism directly impacts teaching and learning opportunities.
- Learning standards that are too broad and shallow, and narrow assessments resulting in superficial coverage at the expense of cognitive rigor, compromise successful AL.

The EdResearch for Action Overview Series summarizes the research on key topics to provide K-12 education decision makers and advocates with an evidence base to ground discussions about how to best serve students. Authors – leading experts from across the field of education research – are charged with highlighting key findings from research that provide concrete, strategic insight on persistent challenges sourced from district and state leaders.

CENTRAL QUESTION: What is applied learning, how can it benefit all students, and what are the enablers of and barriers to successful implementation?

BREAKING DOWN THE ISSUE

High-quality curriculum and instructional practices designed to make learning relevant and engaging, while also boosting cognitive challenge, can help to address low student engagement, chronic absenteeism, and lags in student mastery of content and skills. While these challenges affect students broadly, they tend to be most pronounced in under-resourced schools and among students who have been historically disadvantaged by the education system.

Applied learning definition:

Applied learning (AL) is an umbrella term for educational approaches in which students learn through the active application of knowledge and skills to real-world tasks, with strategically-timed direct instruction and performance-based assessments supporting learning. Approaches fitting within this umbrella category include, but are not limited to: Project-Based Learning, Problem-Based Learning, Experiential Learning, Inquiry-Based Instruction, Linked Learning, and Career and Technical Education. Key features across these various AL approaches include authenticity, cognitive challenge, active learning, and sustained experiences.

Purposes of this research brief:

We intend for this brief to help K-12 school and district leaders to do the following: 1) understand the key characteristics of AL; 2) explore the evidence base for the learning benefits of well-executed AL; and 3) identify what they can do to support the spread and successful implementation of AL approaches. Additionally, this brief addresses common misconceptions about and critiques of AL.

Summary of the evidence base:

AL approaches show strong evidence of improving academic and long-term outcomes across disciplines. Randomized controlled trials (RCTs) have demonstrated that Project-Based Learning can improve academic performance in Advanced Placement courses, middle school science, and elementary science and literacy for students from a range of prior performance and demographic backgrounds.

A meta-analysis across nearly 100 observational studies shows Problem-Based Learning can lead to gains in strategic thinking and the ability to design solutions to complex, real-world challenges. RCTs have shown that inquiry-based instruction can improve middle school math scores and understanding of statistics, as well as high school science proficiency.

Experiential learning can boost outcomes through various formats, such as labs and service learning. Career and Technical Education and Linked Learning are associated with higher graduation rates, college enrollment, and earnings, particularly benefiting low-income and ethnic minority students.

Less-advantaged and lower-performing students have traditionally had less access to high-quality instruction, including well-implemented AL. However, there is evidence of successfully implemented AL teaching and learning across diverse contexts. Recently funded federal, state, and local Project-Based Learning, Career and Technical Education, and Linked Learning initiatives, along with the growth of multiple AL school networks, are helping to expand access.

Summary of criticisms and responses:

Some skeptics criticize AL for being too unstructured for students who lack foundational literacy and numeracy skills, while others suggest AL is inherently lacking in academic challenge. The brief responds to these criticisms by demonstrating that AL can be accessible, cognitively demanding, and beneficial for all learners when implemented rigorously. In addition, the brief addresses concerns about time and resource constraints by suggesting that AL does not necessarily demand expensive materials or major scheduling shifts.

Limitations of this brief:

- "Applied Learning" is an umbrella term. We highlight research relevant to key characteristics and instructional practices within the umbrella.
- This research brief is not intended to be a guide to classroom-level implementation. It can guide teachers to explore AL design principles and associated evidence before consulting relevant pedagogical resources.
- With poor implementation and/or lack of adherence to the following key characteristics of AL—for any of a host of reasons documented in the "Evidence-based practices" and "Practices to avoid" sections of this brief—AL can result in no benefits for students.

KEY CHARACTERISTICS OF APPLIED LEARNING

In this section, we describe four key characteristics of teaching and learning approaches that fall under the umbrella of AL: 1) Authenticity, 2) Cognitive Challenge, 3) Active Learning, and 4) Sustained Experiences. For each of the characteristics, we provide examples, non-examples, descriptions of what to look for in classrooms, and ideas for how teachers new to AL might begin to shift their practice.

1. AUTHENTICITY. Authentic learning connects students to the world beyond school.

- Authentic purposes: Student learning is connected to overarching essential questions (e.g., open-ended, requiring higher-order thinking, related to real-life problems), learning goals, and/or real-world problems that are truly worth learning.
- Authentic ways of knowing: Students practice thinking like scientists, historians, engineers, or other relevant subject-area experts, within academic, professional and practical domains.
- Authentic tools and activities: Learning tools and activities mirror those used by experts working in relevant domains. Learning experiences are aligned to developmentally appropriate academic and/or industry standards.
- Authentic audiences: Students share their work with classroom peers, other members of their school communities, stakeholders, and/or relevant external audiences.
- Authentic personal meaning: Learning is meaningful to students' own experiences, interests, and/or aspirations.

Look For*:* Learners can provide non-generic answers to questions such as: "Why are you learning this?" "How does this connect to the ways that experts in this field do their work?" and, "How might this apply to my personal, professional, and/or civic life."

Example	Non-example
Tenth-grade history students learn about the civil rights movement by interviewing community members and family elders, and by reading and analyzing primary- and secondary-source texts. They compile their interviews, along with their evidence-based reflections on personal and community impacts, into posters exhibited at a local community center. Students also write op-eds taking a position on a local civil rights-related issue and submit them to the school newspaper.	Tenth-grade history students learn about the civil rights movement by reading a textbook chapter and watching a documentary film, after which they take a multiple-choice test and then write a five-paragraph essay.

Tips for getting started with Authenticity:

- Include regular opportunities for students to reflect on and discuss questions such as, "How is what I'm learning relevant to my life, now and in the future?
- Plan for students to share their work with audiences beyond the teacher and each other. For instance, invite another class, school leaders, and/or community members to visit on a designated "share your learning" day.
- Schedule an informational interview with an expert on topics relevant to an upcoming unit. (E.g., a local zoologist for a wildlife biology unit). Incorporate connections to "authentic ways of knowing" that your interview surfaces.

2. COGNITIVE CHALLENGE. Learning goals, processes, and outcomes prioritize deep learning, complex thinking, and usable knowledge.

- Deep Learning: Educators prioritize thorough and accurate student mastery of grade-level knowledge, skills, and conceptual understanding—including foundational literacy and numeracy—over broad, shallow coverage.
- Complex Thinking: Learners engage in complex thinking as described by Bloom, Marzano, and/or Webb. They move beyond recall and comprehension: analyzing and evaluating information, synthesizing concepts across disciplines, applying knowledge and skills to novel situations, designing solutions, justifying, and reflecting on decision-making processes.
- Usable Knowledge: Students master knowledge, skills, understandings, and/or dispositions well enough to be able to put their knowledge to use—or transfer it— to other contexts outside of the classroom.

Look For: Classroom tasks require and support learners to engage in complex thinking, develop mastery of grade-level content and skills, and transfer them across contexts beyond the classroom. Spiraling curriculum is one way to build in practice and foster improvement and transferability.

Example	Non-example
Seventh-grade math students investigate the issue of water pollution in two local lakes, using real-world data sets as well as the results from their own water testing. Using statistical evidence, they engage in a structured debate about which lake should be the first to be designated as a state clean water site. The students then assemble and present a portfolio that includes their data analysis, debate notes, and a reflection on other issues to which they could apply the math skills gained during the unit.	Seventh-grade math students take notes on a lecture about measures of center. They complete worksheet practice problems, calculating mean, median, and mode for a series of data sets. Then, weekly quizzes and a final test

Tips for getting started with Cognitive Challenge:

- Using a learning taxonomy such as Bloom's or Marzano's, audit your teaching materials to ensure tasks require students to engage in complex cognitive work. To increase complexity, shift question stems to "why," "how," and "in what ways" questions.
- Cultivate a culture of elaboration by asking follow-up questions such as "What makes you say that?" and "Can you share another example of…?"
- Include opportunities for students to reflect on and share how they might apply a given set of knowledge or skills to other situations or phenomena.

3. ACTIVE LEARNING. Students actively drive their own learning through experience and collaboration, guided by teachers' strategic use of direct instruction.

- Learning through experience: Students primarily learn through purposively designed experiences, experimentation, iteration, dialogue, collaboration, and reflection. This *might* include "hands-on" work with physical materials, though that is not a necessary precondition for AL.
- Student-driven: Learning tasks encourage student agency, choice, active sense-making and opportunities to share perspectives, rather than passive reception of information.
- Student collaboration: Students often work together on learning tasks, in pairs or groups, cultivating inter- and intrapersonal skills such as collaboration, communication, and compassion. Teachers' grading schemes account for individual and joint contributions to work products.
- Strategic use of direct instruction: Teachers use lectures and demonstrations strategically and when it is "time for telling." Additionally, with teacher-driven monitoring and feedback routines, individual students or small groups present content to their classmates. Experts may share experiences and knowledge with students.

Look For: Classrooms with more on-task speaking among students than back-and-forth question-and-answer between the teacher and individual students.

Example	Non-example
Third-grade students explore a local park to identify human impacts on the environment. As a class, they focus on the destruction of animal habitats. Small groups create presentations on animals of choice, incorporating factual and literary elements from diverse texts to inform and call to action. The teacher reinforces literacy skills through periodic mini-lessons and one-on-one conferences. Finally, students hold a "wildlife conservation fair" where they share their work with peers, parents, and community members.	Third-grade students take notes on daily teacher lectures about human environmental impacts, then individually read, summarize, and answer comprehension questions about teacher-selected texts, before going over answers as a whole group. At the end of the unit, each student writes an essay on the importance of protecting the environment.

Tips for getting started with Active Learning:

- Plan a "launch" experience for your unit that sparks curiosity and delays direct instruction by at least a day. For example, students beginning a unit on projectiles could spend a day trying to build a rocket out of classroom materials.
- Schedule guided opportunities for students to take on a teaching role, for example, by presenting content to each other, leading discussions, and/or critiquing each other's work.
- Assign students specified roles in group work.

4. SUSTAINED EXPERIENCES: AL takes place over weeks or months. It is not a single lesson that has a hands-on component, or a "dessert" task like building a diorama at the end of a unit.

Look For: Courses, programs, and/or curriculum units with core design features exemplifying the other characteristics of AL.

Example	Non-example
Over the course of eight weeks, twelfth-grade physics students design and build their own rockets, use them to launch weather balloons into the upper atmosphere, geolocate and recover the balloons when they return to earth, analyze the data, make a short film about the process, and then reflect on what they learned about physics, the world, and themselves.	Over the course of eight weeks, twelfth-grade physics students learn about the properties and components of rockets by taking notes on lectures, completing worksheets, and taking quizzes. In the final week of the unit, they work in teams to design and launch a rocket of their own.

Tips for getting started with Sustained Experiences:

- Ask yourself, "What can students create or work toward over the course of this unit to put their learning to use?".
- Plan backwards to turn a final AL assignment into a task that recurs or spans the whole unit. For example, have students start by trying to design a rocket with no formal prior instruction. Then, return to it iteratively every week, as they gain knowledge and skills.

RESEARCH BASE FOR APPLIED LEARNING INSTRUCTIONAL APPROACHES

AL is an umbrella term for educational approaches featuring the characteristics described above. Some of the most common, rigorously researched approaches include Project-Based Learning, Problem-Based Learning, inquiry-based learning, experiential learning, Linked Learning, and career-technical education. Below, we define these six approaches, summarize the defining features of each, and refer to relevant evidence for each.

The purposes of the examples below are to 1) substantiate the research base for AL and 2) help our audiences identify where AL may already be taking place. Notably, we did not attempt to exhaustively reference every impact study of approaches to AL as evidence in support of AL's efficacy. Instead, below we reference the most rigorous recent quantitative studies available for each of the six types.

We define well-executed randomized controlled trials (RCTs) and regression discontinuities as the most rigorous type of quantitative evidence, followed by other types of quantitative evidence (e.g., meta-analysis, correlational).

Project-Based Learning: Students engage in authentic, teacher and student-posed learning challenges, working alone and in groups on complex tasks organized around driving questions, and produce final public work products. Most of the evidence is in the K-12 setting.

- Design Elements: challenging problem or question, sustained inquiry, authenticity, student voice & choice, reflection, critique & revision, public product.
- Outcomes/Demonstrated Benefits:
    - Improved high school student science and social science achievement, engagement. Effects were significant and of similar positive magnitude for students from lower- and higher-income households, districts serving majority lower- and higher-income students, and across course subjects. (RCT)
    - Improved middle school student science achievement. Effects were significant and of similar positive magnitude for students regardless of their parents' education level or their own race/ethnicity. (RCT)
    - Improved elementary science achievement, reflection, and collaboration. Results were similar for students across the distribution of reading ability. (RCT)
    - Improved elementary literacy in low-income schools with a baseline of low academic performance. (RCT)
    - Improved ability to use knowledge/transfer social studies knowledge to novel scenarios. (Correlational)

Problem-Based Learning: Students working collaboratively learn by resolving complex, minimally structured, cross-disciplinary problems representative of professional practice. Problem-based units are generally shorter—a week or two—than project-based, which more typically take a month or two. Problem-Based Learning does not necessarily include student development of artifacts, though Project-Based Learning does. Most of the evidence is in the post-secondary setting, though with a few exceptions as specified.

- Design Elements: authentic, minimally structured problems, student-centered approach, teachers as facilitators.
- Outcomes/Demonstrated Benefits (spanning K-12 and postsecondary education):
    - Improved science knowledge and skill development, long-term retention, and student and teacher satisfaction. (Meta-synthesis)
    - Gains in strategic thinking, designing solutions to complex challenges. (Meta-synthesis, primarily post-secondary, particularly medical education)
    - Improved middle school science scores and demonstrated conceptual understanding. (Qualitative and pre-post comparison)

Inquiry-Based Learning: Development of knowledge and skills through active investigation of student-developed research questions. Most research evidence comes from K-12 settings.

- Design Elements: student-developed research questions, data collection, analysis, presentation of research findings, and reflection.
- Outcomes/Demonstrated Benefits:
    - Improved middle school math scores; increased belief in real-world applicability of math. (RCT)
    - Improved understanding of statistics, students engaged in higher cognitive complexity tasks. (RCT)
    - Improved high school science proficiency. (RCT)

Experiential Learning: Concrete, authentically contextualized experiences lead to reflective thinking, abstract conceptualization, and active experimentation. Most of the evidence is from post-secondary settings.

- Design Elements: concrete experience, reflective observation, abstract conceptualization, active experimentation. Common forms include: service learning, class projects, labs, simulations, and travel programs integrated into before and after classroom learning.
- Outcomes/Demonstrated Benefits (The vast majority of research addressing experiential learning is in the postsecondary education setting):
    - Improved learning outcomes across service learning, labs, and simulations in college business, pre-med, and engineering courses. (Meta-analysis)
    - Reduced time to college graduation, increased likelihood of attending graduate school and/or finding employment after graduation. (Correlational)
    - Increased plans for civic action; improved self-assessments of interpersonal, problem-solving, and leadership skills; and course satisfaction. (Correlational)

Linked Learning: An educational approach for high-school students that combines college-focused academics, rigorous technical education, work-based learning, and personalized student supports. Most research evidence comes from K-12 settings.

- Design Elements: rigorous academics, career technical education, work-based learning, comprehensive support services.
- Outcomes/Demonstrated Benefits:
    - Improved 11th-grade ELA scores (SBAC); increases in credits accumulated, perceived teacher support, and belonging. (RCT)
    - Increased HS graduation rates, credits earned, students classified as college-ready in ELA, exempted from remediation; decreased dropout rate. Similar benefits for English Learners (credits, dropout rates, 4-year college enrollment), African American (credits, 4-year college enrollment), and Latino (credits, dropout rate, graduation) students. (Correlational)
    - Improved HS graduation rate, meeting of A-G requirements; lower suspension rates. (Quasi-experimental)

Career and Technical Education (CTE): Courses and programs that integrate core academic knowledge with technical and occupational skills required for specific jobs and fields of work. Most research evidence comes from K-12 settings

- Design elements: Courses and programs focusing on knowledge and skills required for specific jobs and fields of work.
- Outcomes/Demonstrated Benefits:
    - Increased rates of on-time HS graduation, particularly for low-income students; test score benefit for low-income students; and more students earning industry-recognized credentials. (Regression Discontinuity)
    - Increased earnings, attending college, especially among low-income, Black, and Latino students, and those with disability. (Correlational)
    - Improved HS graduation rates, particularly among low-income students and those concentrating in CTE; higher wages. (Review article)

Table 1: Summary of RCT evidence demonstrating positive impacts of AL approaches on students' standardized test scores, probability of high school graduation, and probability of college enrollment.

	Grade Level	Academic Achievement	High School Graduation	College Enrollment
Project-Based Learning	ES, MS, HS	✓		
Problem-Based Learning	MS, PSE	✓		
Inquiry-Based Learning	MS, HS	✓		
Linked Learning	HS	✓	✓	✓
CTE	HS	✓	✓	✓

**Blank boxes do not necessarily mean the given AL approaches do not improve given outcomes. Rather, our work did not surface rigorously causal evidence demonstrating the positive impact of the approach on the outcome.*

BROAD VARIATION IN MODELS AND CONTEXTS

AL does not have to be all or nothing. While there are a few examples in the United States of entire systems of schools designed to effectively offer AL approaches, this is not the norm. Educators typically offer AL opportunities within courses, as units or other forms of curriculum supplementation, in course-based formats, and/or through extracurricular activities. Some offer school-wide AL.

- Curriculum unit models: AL can happen as a subset of the curriculum within non-applied classes. This is the case when a teacher or teacher team includes a project-based unit, set of lessons, or a sustained real-world experience within an otherwise traditional course. Research suggests that AL is increasingly happening within STEM courses.
- Program- and course-based models: AL often underpins what happens in specific programs and courses within schools. Project Lead The Way is one example, and the College Board's AP program now includes project-based curricula and professional learning in several courses, plus project-based exams in others. Elements of AL are also embedded in arts education, career and technical programs, internships, and work-based learning, where students apply knowledge to authentic, real-world tasks.
- Whole-school models: In some cases, AL is the foundation for most or all of the learning experiences offered at a given school. This is true, for example, in schools that are dedicated to "wall-to-wall" Project-Based Learning, design thinking, and other AL models. It is also sometimes true in career academies where courses are connected via Linked Learning. International Baccalaureate Programmes are examples of whole-school inquiry-based models.
- Extracurricular models: Components of AL are commonly found in school-sponsored visual and performing arts and extracurricular activities, such as student newspapers and theater productions, debate teams, and sports teams. These settings vary in their deliberate inclusion of cognitive challenge as defined above.
- Network and system models: There are a few examples in which entire systems of schools are rooted in AL principles. This is the case within networks such as EL Education, High Tech High, New Tech Network, and Big Picture Learning.

EVIDENCE-BASED PRACTICES

In this "Evidence-Based Practices" section, and in the "Practices to Avoid" section below, we categorize and describe system-spanning enablers of and barriers to the successful implementation of AL. Some enablers and barriers apply to effective education policy and practices generally, while others are more specific to AL. Each of the following recommendations applies to state policymakers, district leaders, school leaders, and teachers. They apply under optimal and under challenging conditions, such as high student- and/or teacher-absenteeism, testing pressures, staffing shortages, etc. Within each recommendation, we link to seminal empirical and theoretical sources substantiating our points, and to practical examples.

Developing a coherent, clear, shared vision of learner success can strengthen the ability of school systems to implement and spread high-quality AL.

- Program, state, and district-level Graduate Profiles (sometimes called Portrait of a Graduate) clarify the essential skills and dispositions that students should demonstrate by graduation. Profiles of expected student outcomes typically include skills such as communication, collaboration, citizenship, and creativity, setting the stage for AL experiences, which can help to develop these qualities.
- For example, Kentucky's statewide Portrait of a Learner guides schools to design capstone projects, interdisciplinary performance assessments, and portfolio defenses reflecting AL approaches. Districts such as Anaheim Union High School District demonstrate the learner-centered transformations in curriculum and instruction, and the expansion of AL opportunities, that take place when these kinds of shared visions serve as a foundation for school transformation.

High-quality curriculum materials and aligned assessment tasks can encourage AL, help increase the quality and consistency of AL experiences, and lead to improved academic outcomes.

- State, district, and school leaders can improve access by offering technical support for vetting, developing, and implementing high-quality AL curricular materials, including aligned assessment tasks, that exemplify the key characteristics of AL. State and district innovation grants can further incentivize schools to adopt and adapt AL approaches.

Staffing structures and schedules that facilitate AL-aligned professional learning supports can help teachers develop vital experience and expertise.

- Schools that prioritize teacher collaboration by building shared planning time into the daily schedule foster professional learning, stronger curriculum development, and instructional coherence.
- Staffing structures and schedules designed to support AL prioritize the availability of, and time necessary for, mentorship, coaching, professional learning communities, and other ongoing and active professional learning supports for teachers.
- Well-implemented professional learning aligned to the curriculum supports teachers in experiencing and reflecting on the AL activities they will then guide their students to do.

School schedules permitting longer blocks, flexible time-use, and learning outside of the school building enable students to engage deeply in projects, off-site learning, and other applied experiences that can be more challenging to fit within traditional bell schedules.

- Block scheduling and interdisciplinary courses allow extended time for students to engage in projects and off-site learning. However, AL is also possible within traditional bell schedules.
- District support for field trip transportation and other learning opportunities beyond school walls can show students the relevance of classroom-based learning. However, students do not have to leave their classrooms to learn the relevance of what they are learning to their world beyond the classroom.

Flexible credit policies and alternative pathways to graduation through career-technical education, work-based learning, and visual and performing arts can prepare students for related postsecondary education and career options.

- When districts structure coursework and work hours to align with professional certifications, students can graduate with credentials that open direct pathways to employment and further education.

Adopting performance assessments and performance-based grading systems supports AL by allowing educators to measure complex skills and knowledge that standardized tests often overlook, including problem-solving, transfer to real-world contexts, and collaboration.

- Frequent, brief, targeted feedback from teachers to students is strongly linked to improved academic outcomes.
- Performance assessments can encourage teachers to use pedagogy designed to develop students' transferability of content and skills and improve their ability to do so, with positive impacts for students (Berry, Matsuda, and Fullan, forthcoming)

With the benefit of the enabling structures described above, teachers can develop their ability to successfully use AL approaches in classrooms with their students, including:

- Fostering a collaborative, inclusive, on-task classroom culture, including facilitating group work, individual and group grading, student movement, behavior, etc.
- Incorporating authenticity and student choice into their pedagogy in ways that promote cognitive challenge rather than undermine learning.
- Strategically using direct instruction when it is the "time to tell."
- Spiral/looping curriculum scope and sequence, as students need to address misunderstandings, deepen knowledge and understanding.
- Managing the depth versus the breadth of development of students' content and skill mastery.

While optimally, teachers would be able to use AL approaches in their classrooms with the benefit of enabling structural conditions, they often do not practice within this best-case. And still, some teachers successfully teach AL approaches.

PRACTICES TO AVOID

Misconceptions about Applied Learning include:

- Misconception 1: The best way for students to learn is through teachers actively sharing, for example, through lecture, and students receiving, for example, through taking notes.
    - *Instead, student-driven learning tasks lead to better student engagement and learning outcomes with enabling conditions in place.*
- Misconception 2: AL does not include direct instruction.
    - *Instead, after students establish some understanding of purpose/practical application through engagement in authentic learning tasks, it is the teachers' "time to tell." Also, AL can include students presenting to each other about content and skills they have mastered (with teachers and peers correcting any incorrect material) and outside experts sharing their experiences and knowledge through direct instruction.*
- Misconception 3: Teachers must always literally create hands-on experiences for learning to be considered "applied" (e.g., making something material).
    - *Instead, "cognitive realism," engaging in carefully designed and facilitated thought processes that mirror professional disciplines, can sometimes be just as beneficial as physical realism.*
- Misconception 4: As long as students sufficiently master content, skills, and/or concepts, they can automatically transfer their learning to other settings.
    - *Instead, students need to practice the skill of using knowledge. For example, they may learn to understand how to calculate compound interest in math class, but not be able to transfer that understanding to their actual loan conditions unless they have practice using their knowledge in other settings.*
- Misconception 5: Students need to gain foundational knowledge and skills through non-applied, teacher-driven approaches first before they will be ready to gain knowledge and skills through AL. For example, they need to develop their ability to work in groups outside of AL settings before they will successfully be able to learn through group work.
    - *Instead, demonstrated learning benefits of PBL interventions, for example, have been found not to be moderated by prior achievement; students acquire skills such as collaboration through engagement in AL.*
- Misconception 6: AL happens through a single lesson at the end of a unit.
    - *Instead, the "dessert at the end" format lacks the rigor and depth of exploration found in sustained AL projects.*

Reversion to the status quo, away from AL, manifests through parent pressure, culture of individualism, the challenge of paradigm shifts, and limited financial resources.

- Limited financial resources, in turn, limit investments in AL, particularly professional learning supports, as well as many of the other enablers discussed above.
- Parents and communities can pressure educators to use "traditional schooling" approaches (e.g., lecture-based instruction, traditional assessments, etc.) because those approaches reflect their own experiences, and they may be skeptical that other approaches can be effective.
- School and classroom culture promoting individualism and competition among students can undermine successful group work and productive classroom discussions.

- Teachers can undermine AL goals by modifying the "key characteristics" and reverting to their original direct instruction practice (e.g., students struggle with an open-ended problem, teachers scaffold so much that the students then just replicate their teacher's approach rather than learn how to address the problem themselves).
- The paradigm shift from teachers as "sage on the stage" and students as recipients of knowledge, to students driving their own learning with teachers more in a coaching role, can at first feel quite uncomfortable to both teachers and students. Students can think they learn less than they actually do.

Time restrictions limit planning, collaboration, and flexibility, while student and/or teacher absenteeism directly impacts teaching and learning opportunities.

- Educators and leaders at all levels need time to plan for and implement changes.
- Teachers need time to collaborate with one another. Particularly at the secondary level, departmentalization limits time for teachers to connect content and skills across subject areas; this is less of a challenge for elementary school teachers.
- Some AL is more effective in longer blocks, such as a double class period versus a standard 40-minute class. Though not a deal-breaker, inflexible bell schedules can limit the successful implementation and success of AL.
- High student and/or teacher absenteeism limits learning through applied and all other learning approaches.

Learning standards that are too broad and shallow, and narrow assessments resulting in superficial coverage at the expense of cognitive rigor, compromise successful AL.

- District-mandated curricula, pacing guides, and/or other expectations can prioritize breadth and low-cognitive-demand tasks over depth, complex thinking, and transfer.
- Narrow definitions of academic success over-prioritize traditional achievement metrics and exclude metrics related to 21st-century skills.

CRITICS CORNER

Below we outline five common criticisms of AL and offer context for understanding each.

Criticism 1: Students need strong literacy and numeracy before engaging in AL, which is seen as too unstructured for struggling learners.

- While foundational skills are essential and best developed through structured instruction, relying solely on direct instruction can limit engagement and deeper learning, as well as hinder the development of critical skills like communication and problem-solving.

Criticism 2: AL can serve as an excuse for lowering expectations for students.

- In reality, high-quality AL is cognitively demanding for all students and must be implemented rigorously to avoid superficial tasks that lack depth and challenge.

Criticism 3: AL is too time-consuming for test- and standards-driven teaching schedules.

- With a strong curriculum and sustained professional development, teachers can help students meet standards through AL—and even outperform peers on assessments like AP examinations.

Criticism 4: The cost of implementing AL, including materials or field trips, is too high.

- While some resources may be needed, AL can be done affordably, and when investments are made, the student benefits are often substantial.

Criticism 5: AL requires teachers to deeply and flexibly master their content.

- Teachers do need support, such as through professional learning and high-quality materials. Though currently in their early stages of development, emerging AI tools may help.

SUMMARY

In this research brief, we explore the concept of AL—educational approaches where students actively apply knowledge and skills to real-world tasks, supported by strategic instruction and assessments. We identify and describe four key characteristics of effective AL: authenticity, cognitive challenge, active learning, and sustained experiences. Strong evidence substantiates the claim that AL improves academic performance and long-term outcomes across disciplines and student demographics, especially through methods like project-based, problem-based, and inquiry-based learning. We also describe systemic enablers and barriers to successful implementation, address common misconceptions, and pose and respond to criticisms, emphasizing the importance of high-quality curriculum, professional development, and supportive policies. Overall, with this brief, we aim to guide K–12 leaders to understand and support the spread and successful implementation of AL practices to enhance student engagement and achievement.

Acknowledgements:

We are grateful for feedback on prior versions of this report from Christina Claiborne, Ben Daley, Gloria Harper, Zachary Hermann, Laura Hernandez, Anne Jones, Joseph Krajcik, Vanessa Lipschitz, David Lussier, David Perkins, Jen Perry, Michael Petrilli, Justin Reich, Jim Short, and Kelly Wilson. The authors assume full responsibility for the accuracy of the report's contents.

We gratefully acknowledge financial support for this research brief from the One8 Foundation. Findings and conclusions expressed in this brief are those of the authors and do not necessarily reflect reviewer or Foundation views.

Suggested Citation: Saavedra, A., Fine, S., Chacon, M. (2025). *Making Learning Real: Design Principles and Evidence for Applied Learning in Schools*. EdResearch for Action.

This EdResearch for Action brief is a collaboration among:

Annenberg Institute BROWN UNIVERSITY

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