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Supplementary Learning Strategies to Support Student Success in Algebra I

Research Brief

This research brief is one of five that summarize the literature in different topic areas[1] related to helping struggling students in Grades 6–9 succeed in algebra. The research briefs are part of the *Promoting Student Success in Algebra I* (PSSA) project funded by the U.S. Department of Education's High School Graduation Initiative (HSGI). The PSSA project at American Institutes for Research is designed to provide actionable information for educational program developers/administrators in three ways. First, these research briefs together will summarize research on five strategies being implemented by HSGI grantees that help struggling students succeed in Algebra I, a critical gateway course for high school graduation and enrollment in college. Second, the project includes a forum for practitioners—district program developers/administrators and teachers—to make connections between the findings from the research briefs and their daily work, with the results of these discussions published in a series of perspective briefs. Third, the project includes profiles of practices that provide an in-depth look at implementation of these five strategies.

This brief describes what is known about supplementary learning opportunities for struggling students in Algebra I, focusing specifically on double-dose algebra and expanded learning opportunities (ELOs). Many districts now require students to successfully complete Algebra I in order to graduate from high school, and the course is often a prerequisite for subsequent mathematics courses that are essential for college admission. Yet, as districts encourage or require success in the course for all students, some will be underprepared and will struggle to master the course content. Failing Algebra I places these struggling students at high risk of dropping out, particularly in urban districts (e.g., Oriheula, 2006; Silver, Saunders, & Zarate, 2008).

[1] The five topic areas are Curricular Alignment, Instructional Practices, Supplementary Learning Supports, Professional Development, and Instructional Coaching.

Implementation of more rigorous College and Career Readiness Standards in mathematics and the wide-scale adoption of the Common Core State Standards for Mathematics (National Governors Association Center for Best Practices [NGACBP] & Council of Chief State School Officers [CCSSO], 2010), which incorporates mathematics standards from high-performing countries, raises the bar for both what and how students learn (Kober & Rentner, 2012). Thus, helping struggling algebra students succeed in this instructional context will be more challenging than ever, and supplementary supports for struggling students will need to be even more effective.

Helping struggling algebra students to succeed under higher standards for student learning will be more challenging than ever, and supplementary supports for struggling students will need to be even more effective.

What does research say about supplementary learning opportunities for helping struggling students succeed in Algebra I? To address this question, we conducted a literature review (see the Appendix for the process used to conduct this review). This review focuses on supplementary learning opportunities for struggling students that "expand" students' exposure to course content in algebra and mathematics in and out of the classroom. Although educators incorporate a wide range of supplementary support strategies, this review focuses specifically on double-dose algebra and ELOs, given their increasing use in the field as strategies to support student success in algebra and mathematics. Double-dose algebra, also called stretch algebra, gives struggling students a second class period during the school day to focus on algebraic content beyond their standard Algebra I course. In contrast, ELOs, also called out-of-school time (OST) programs, include a range of student programs and activities that occur beyond the traditional school hours (before and after school, weekends, evenings, and summers) to support and enrich student learning (Stonehill et al., 2011).

Research on double-dose algebra and ELOs suggests some promise for helping struggling students succeed. As detailed more fully below, double-dose algebra can improve students' algebra skills and long-term academic outcomes (test scores, graduation rates, college enrollment), but there is little to no evidence for overall improvements in Algebra I passing rates. A large body of research on ELOs in general shows positive impacts of ELOs on students' mathematics achievement. However, these positive findings are inconsistent across studies and depend heavily on the quality of implementation.

These findings also have important limitations. Despite the widespread use of these strategies across the country, research on double-dose algebra focuses almost entirely on Chicago Public Schools' (CPS) double-dose algebra policy, and very little research on ELOs focuses specifically on algebra. In addition, some of the research reviewed does not meet the highest level of rigor described by the What Works Clearinghouse.[2] Although the evidence has limitations, this emerging body of work provides a host of important and interesting findings for program developers and administrators to consider.

[2] The What Works Clearinghouse was created in 2002 by the Institute of Education Sciences to be a source of information regarding what works in education. See http://ies.ed.gov/ncee/wwc/DocumentSum.aspx?sid=19 for the standards used to evaluate studies.

Synthesis of the Literature

Below, we summarize research on double-dose algebra and ELOs separately, given important differences in their structure (in-school time, out-of-school time) and focus. Implications for program developers and administrators are highlighted at the end of this brief.

Double-Dose Algebra

Nearly half of large urban districts have reported double-dose mathematics instruction as the most common form of support for struggling students (Council of the Great City Schools, 2009). In its most common form, a standard Algebra I course is supplemented with a second support period (usually in place of an elective course) for students to engage with the course material. Some schools simply use block scheduling, which changes the length of a class to two periods. In either format, struggling students receive twice as much instruction focused on Algebra I. The evidence base for double-dose algebra has expanded considerably in recent years, with most studies showing at least some positive results.

Despite districts' and schools' widespread use of double-dose instruction, nearly all the strongest evidence to date assessing the effectiveness of the strategy comes from a specific model of double-dose algebra implemented in Chicago. As part of the effort to increase the rigor of student coursework, in fall 1997, CPS eliminated all lower-level and general mathematics courses and required all first-year high school students to enroll in Algebra I (or a higher course) in ninth grade. Although this policy resulted in greater Algebra I enrollments (as expected), many students were unable to master the course material, resulting in lower grades and pass rates on average (Allensworth, Nomi, Montgomery, & Lee, 2009). To address lower passing rates, in 2003, CPS initiated a districtwide double-dose algebra policy requiring all first-time ninth graders testing below the national median on the mathematics section of the Grade 8 Iowa Tests of Basic Skills (ITBS) to enroll in two periods of algebra—a full year of Algebra I plus a full-year algebra support class. CPS also strongly encouraged schools to schedule their algebra support classes such that students would have the same teacher for both classes, the two algebra periods would be offered consecutively, and students would attend both classes with the same peers.[3]

[3] In the second year of the policy, CPS removed the requirement that the same teacher be assigned to both classes following schools' objections to scheduling challenges, although 54 percent of students continued to have the same teacher (Nomi & Allensworth, 2009).

Double-Dose Algebra Improves Test Scores and Longer-Term Outcomes but Not Overall Algebra I Passing Rates

Using rigorous quasi-experimental designs, research has looked at both short- and long-term benefits of the CPS double-dose policy. The policy improved algebra skills, as measured by test scores, which increased substantially among students enrolled in the double-dose algebra courses (Nomi & Allensworth, 2009). These improved algebra test scores unfortunately were not accompanied by overall increases in Algebra I passing rates across the district.

Why did overall passing rates across the district not improve? More recent analyses reveal that Algebra I passing rates actually decreased for some higher-performing students who scored above the median on the ITBS and consequently were not enrolled in the double-dose course under the CPS policy (Nomi & Allensworth, 2013). That is, students enrolled in double-dose algebra were more likely to pass Algebra I, but these improvements were offset by students above the cut-off point who were less likely to pass the course and who were enrolled in Algebra I courses with higher-performing peers (a finding explored further in the next section). Another possible explanation is that course content and instruction were inadequate. However, course failures can be more closely tied to lack of student engagement (e.g., participation, attendance) than to skills and proficiency. For this reason, program developers/administrators should carefully consider whether strategies focused exclusively on increasing students' skills in algebra will increase overall Algebra I passing rates. Failure in one course is often coupled with failures in other core courses. As a result, struggling students may need a wider range of supports to improve engagement and participation in school if improvements in algebra skills are to translate into improved Algebra I course performance.

Despite disappointing results on overall Algebra I passing rates, the CPS policy increased the proportion of students earning a B or better in Algebra I by 9.4 percentage points (Cortes, Goodman, & Nomi, 2013). These findings suggest that the double-dose policy improved grades for higher-achieving double-dose students but had less impact on the passing rates of lower-achieving double-dose students. The policy also improved performance in subsequent mathematics course taking—double-dose students were more likely to pass trigonometry (a Grade 11 course) and had higher grade point averages (GPAs) on average for all mathematics courses taken after their freshman year than their counterparts who did not enroll in the course prior to the implementation of the policy. Further, students who took double-dose algebra had significantly higher algebra test scores on the Grade 11 preliminary ACT (called PLAN), with similar statistically significant effects on the mathematics portion of the ACT (spring of Grade 11). Perhaps most impressive, double-dose students showed substantially improved four-year and five-year (8.7 percentage points and 7.9 percentage points, respectively) high school graduation rates and college enrollment rates (8.6 percentage points; Cortes et al., 2013) relative to

their counterparts prior to the implementation of the policy. Because Algebra I credit is required for graduation in Chicago, it is possible that double-dose students who fail Algebra I are more likely to go on to recover credit and graduate. Most of the effects were stronger for students with weaker reading abilities; in fact, the overall impact of double-dose algebra on college enrollment was almost entirely accounted for by impacts on below-average readers, a finding that is explored further below.

The "What," "Why," and "How" of Double-Dose Algebra Are Important

Chicago's double-dose algebra policy fostered impressive educational benefits for students enrolled in the double-dose course, including improved algebra and mathematics test scores, performance in subsequent mathematics courses, and graduation and college enrollment rates, but had little impact on Algebra I passing rates across the district. These findings may have resulted from one, or a combination, of three key components of Chicago's double-dose algebra program: expanded instructional time, improved instructional resources, and grouping of students in algebra classes on the basis of prior proficiency. Beyond the added instructional time, double-dose teachers were offered two supplementary curricula, Agile Mind and Cognitive Tutor (Nomi & Allensworth, 2009; Durwood, Krone, & Mazzeo, 2010). Teachers also received lesson plans and three professional development workshops each year, where they were given suggestions for how to use the extended instructional time. These resources may have played an important role in improving student outcomes. Indeed, double-dose students more frequently wrote sentences explaining how they solved a math problem, explained to the class how they solved a problem, wrote math problems for other students to solve, discussed possible solutions to problems with other students, and applied mathematics to situations in life outside of school (Nomi & Allensworth, 2013). It is possible that this increased focus on explaining and writing about math problems contributed to greater improvements in double-dose algebra outcomes for students with below-average reading skills (as highlighted above), although further research is needed to better understand whether and how these instructional practices might explain these findings.

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Perhaps most noteworthy, the double-dose policy implemented in Chicago inadvertently grouped students by prior proficiency, introducing greater homogeneity into Algebra I classrooms. Recall that students were assigned to enroll in double-dose algebra on the basis of a cut point. As a result, those students just above the cut point found themselves in educational contexts different from those of students just below the cut point, despite sharing similar levels of preparation

for Algebra I. Those students just above the cut point were in more challenging classes with higher-performing students and no supplementary supports. These structural changes to the classroom environment had important effects on student outcomes. For example, although the district did not see improved Algebra I passing rates on average, students below the cut point who were assigned to double-dose algebra were more likely to pass Algebra I. Unfortunately, these improvements were offset by higher failure rates for students just above the cut point who were not enrolled in double-dose algebra and who found themselves in more challenging Algebra I classrooms (see Nomi & Allensworth, 2009).

Program developers and administrators need to carefully consider how to enroll students in extended instructional periods and the impact of those decisions on the composition of classes.

The effects of grouping students by prior proficiency as part of Chicago's double-dose policy are complicated and have been explored extensively (Nomi & Allensworth, 2013) but are beyond the scope of this brief. In short, grouping by prior performance tends to benefit the highest performing students and has negative consequences for those students just above the cut point as noted above. The negative effects for students below the cut point of being placed in a classroom with low-achieving peers (e.g., greater concentration of behavior problems) appear to be offset by the benefits of the extended instructional time, which in Chicago incorporated more student-centered, interactive pedagogical practices (Nomi & Allensworth, 2013). Although it is difficult to disentangle the parallel effects of double-dose algebra and changes to classroom composition, a recent analysis found that the most effective schools in Chicago were those that strongly encouraged students below the cut point to take double-dose algebra and also minimized grouping students on the basis of prior achievement (Nomi & Raudenbush, 2013). In other words, grouping all students below a cut point in the same standard Algebra I classroom with an additional double-dose period may be less beneficial than enrolling students with a wider range of skills and preparation in the Algebra I course and providing additional instructional time for those students who need further support. In short, these findings make clear that program developers and administrators need to carefully consider how to enroll students in extended instructional periods and the impact of those decisions on the composition of classes.

Together, these findings from Chicago provide evidence for the effectiveness of double-dose algebra as a strategy to improve students' algebra skills (measured by test scores) and long-term academic outcomes but provide little to no evidence for increasing overall Algebra I passing rates across the district. Although research to date has employed strong quasi-experimental designs with large samples of students, the evidence base has been largely focused on a specific form of implementing this practice in one large urban district. The findings cannot disentangle the effects of extended learning time, increased professional development and curricular resources, and the grouping of students on the basis of prior test performance. In addition, because the analyses compared students above and below the cut point for enrollment in double-dose algebra, the findings may not generalize to very low performing students (far below the cut point), who may need more intensive supports.

An Alternative Model: Use Extra Instructional Time to Better Prepare Students for Algebra I

A unique example of double-dose instruction is embedded in the Talent Development High School (TDHS) Model, which has been implemented in at least 15 states and the District of Columbia (Kemple, Herlihy, & Smith, 2005; Mac Iver, Balfanz, & Plank, 1998). Rather than enroll in a standard double-dose instructional period that shadows the standard Algebra I course, under the TDHS model, students take a course called Transition to Advanced Mathematics (TAM) on a block schedule during the first semester and then take the standard Algebra I course in the second semester. Unlike a typical double-dose algebra course, which uses extra instructional time to focus on Algebra I content, TAM uses this extra instructional time to better prepare students for success in Algebra I before they take the course. TAM is designed to improve the conceptual understanding and skills needed for success in Algebra I without directly repeating elementary mathematics.[4] An early study examining the effect of TDHS in Baltimore and Philadelphia used a matched comparison design and found positive results on mathematics achievement (Balfanz, Legters, & Jordan, 2004), although these findings reflect the outcomes of the comprehensive model, not the TAM course alone. Using a rigorous experimental design, a more recent study (Sweet, 2010) conducted a head-to-head test of TAM and a standard double-dose algebra course and found that TAM students outperformed typical double-dose students on general mathematics skills but did not differ on an algebra test. Although TAM students had half the exposure to Algebra I content but more exposure to general mathematics content and skills in the TAM course than did double-dose students, they demonstrated similar algebra skills and better general mathematics skills.

Investing extra instructional time (in the context of a blocked schedule) on improving conceptual understanding and skills deemed important in preparing for Algebra I instead of using that time entirely for greater exposure to Algebra I content may be a better use of resources.

These findings suggest that investing extra instructional time (in the context of a blocked schedule) on improving conceptual understanding and skills deemed important in preparing for Algebra I instead of using that time entirely for greater exposure to Algebra I content may be a better use of resources. However, we know very little about what double-dose algebra teachers did with their extra instructional time in this study. For example, if the double-dose curriculum had been standardized with specific supplementary resources and supports, the double-dose algebra program might have had a greater impact on algebra skills. In any case, this study suggests that it is worth considering the potential benefits of focusing on early algebra skills for struggling students over simply doubling exposure to the same Algebra I content.

[4] Unit topics include rational numbers, integers, coordinate geometry, measurement, and functions.

Expanded Learning Opportunities

As highlighted earlier, ELOs encompass a wide range of educational programming and support for struggling students (e.g., tutorial services, academic/cultural enrichment, youth development activities, drug and violence prevention, technology education, arts and music activities, counseling, character education). Unlike double-dose algebra, ELOs aim to enrich students' learning outside the typical school day (e.g., before or after school, during the summer). ELOs have grown substantially over the past two decades. In 1994, the 21st Century Community Learning Centers (CCLC) program was developed to provide funding to low-performing schools to expand educational services beyond the school day to help these schools meet academic standards.[5] This program has grown to include more than 10 thousand centers and a 2014 fiscal appropriation of over $1.15 billion (U.S. Department of Education, 2014).

Given the sizable financial investment of the federal government and the expansion of ELOs around the country, a number of comprehensive and rigorous reviews of existing research have been conducted on ELOs and their effects on student achievement (e.g., Bodilly & Beckett, 2005; Durlak & Weissberg, 2007; Lauer et al., 2006; Redd et al., 2012; Zief, Lauver, & Maynard, 2006). Some of these reviews included quantitative meta-analytic summaries of the literature. For this reason, we draw heavily on these rigorous reviews but focus specifically on those studies and findings most relevant to promoting student success in Algebra I.

Expanded Learning Opportunities Can Improve Algebra Readiness and Mathematics Achievement

Our search of the literature on expanded learning programs produced very few studies that focused directly on success in algebra. This result is not surprising, given that ELOs are focused broadly on engaging and enriching student learning in core academic areas. Only a few programs with documented evidence targeted algebra performance or readiness specifically. For example, a recent quasi-experimental study investigated the effectiveness of a locally developed summer algebra readiness program in a large suburban school district in New Jersey (Birnbohm, 2010). This study found significant improvements in test scores, with larger effects for special education students. After completing the program, 42 percent of the participants enrolled in Algebra I in Grade

[5] Available research on ELOs focuses on programs that occur beyond the traditional school hours. The terms ELO and expanded learning time (ELT) are distinct educational concepts. While 21st CCLC program funds support academic and enrichment programming before school, after school, and during summer months, under the Elementary and Secondary Education Act (ESEA) of 1965 flexibility provisions, states that request a waiver of ESEA sections 4201 (b)(1)(A) and 4204 (b)(2)(A) may use 21st CCLC program funds to support academic and enrichment programming during ELT in addition to continued support of activities during nonschool hours or periods when school is not in session. As defined for purposes of flexibility under the ESEA, ELT is the time that a local educational agency or school significantly extends its normal school day, week, or year to provide additional instruction or educational programs for all students beyond the state-mandated requirements for the minimum number of hours in a school day, days in a week, or days or weeks in a school year.

9 in contrast to only 6 percent of the students who declined to participate in the summer program. In another study of the Middle School Math Academy, researchers found pre-post improvements in students' algebra readiness (assessed with district mathematics assessments) and interest in mathematics (Gamble, Kim, & An, 2012). The Middle School Math Academy is a single-gender afterschool program focused on improving academic engagement and achievement for boys, with a special emphasis on algebra readiness.

An earlier assessment of a 15-session afterschool linear functions course for students in Grades 7–9 demonstrated significant pre-post gains on standard test items across two subgroups—a middle school group of high-achieving volunteers and a group of at-risk Grade 9 students (Hegedus & Kaput, 2003). The course (SimCalc within a connected MathWorlds classroom) was aimed at developing core concepts in Algebra I, including slope as rate, linear functions modeling, simultaneous equations, and an additional topic focused on parametric variation. Although these studies employed designs that the What Works Clearinghouse framework would classify as low evidence with limited generalizability, the results suggest some promise for summer and afterschool programs targeting improved algebra skills and preparation to enroll in Algebra I in Grade 9 for struggling students.

Although the evidence for algebra-specific ELOs is limited, a sizable body of research documents improvements in mathematics achievement more generally. A rigorous meta-analysis of 22 ELO studies that included a control or comparison group[6] and were published between 1985 and 2003 examined students' mathematics achievement and found an overall small, but positive, effect of ELOs on standardized mathematics assessments (Lauer et al., 2006). Effect sizes ranged considerably across studies but were generally positive. Of the 33 effect sizes[7] calculated across the 22 studies, all but 8 (76 percent) showed positive improvements in students' mathematics achievement, although only 11 effects (33 percent) were both positive and statistically significant. Because the ELOs varied considerably in structure and implementation, this meta-analysis also examined whether the effects differed for programs with certain characteristics. A number of noteworthy findings emerged: (a) effects did not significantly differ for afterschool and summer programs, (b) effects were largest for high school students followed by middle-grades students, (c) effects were larger for ELOs that combined an academic and a social focus relative to programs that were strictly academic, (d) effects were significant only

Effects were larger for ELOs that combined an academic and a social focus relative to programs that were strictly academic.

[6] Baker & Witt (1996); Branch, Milliner, & Bumbaugh (1986); Cosden, Morrison, Albanese, & Macias (2001); D'Agostino & Hiestand (1995); Finch (1997); Harlow & Baenen (2001); Hink (1986); Kociemba (1995); LeBoff (1995); Legro (1990); Leslie (1998); McKinney (1995); McMillan & Snyder (2002); Prenovost (2001); Ravietz & Bousquet (1987); Rembert, Calvert, & Watson (1986); Riley (1997); Smeallie (1997); Ward (1989); Weber (1996); Welsh, Russell, Williams, Reisner, & White (2002); Zia, Larson, & Mostow (1999)

[7] Nineteen of the effects calculated across the studies included students from one of Grades 6–9, although some of these effects included students from earlier and later grades as well.

for programs with a duration of more than 45 hours, (e) programs with a duration of 46 to 75 hours demonstrated larger effects than programs longer than 75 hours, and (f) studies that employed more rigorous designs produced the largest effects.

A more recent review of the literature (Redd et al., 2012) provided an updated picture of the impact of ELOs, focusing on more rigorous research that incorporated experimental, quasi-experimental, or matched comparison group designs. The authors classified all studies that met inclusion criteria as "not proven to work" (nonsignificant or marginally significant impacts), "mixed review" (evidence from experimentally evaluated programs with impacts that varied for a particular outcome area[8] at different times or across key subgroups), "found to work" (experimental evidence for positive and significant impacts on particular outcomes), or "promising bets" (quasi-experimental evidence for programs associated with positive and significant improvements). A list of ELOs "found to work" based on experimental evidence demonstrating an impact on students' mathematics achievement, along with a list of "promising bets" based on quasi-experimental evidence, is provided in Table 1.

Table 1. Expanded Learning Programs With Demonstrated Impact on Students' Mathematics Achievement

Found to Work (based on experimental evidence)	Promising Bets (based on quasi-experimental evidence)
• **21st Century Community Learning Centers' Enhanced Academic Instruction** (improved short-term mathematics achievement) • **Children's Aid Society Carrera** (improved mathematics test scores) • **Project BELONG** (improved course passing rates in mathematics)	• **Boys & Girls Club Educational Enhancement Program** (improved grades in mathematics) • **Supplemental Educational Services** (improved mathematics test scores) • **Citizen Schools** (improved course passing rates in mathematics, improved test scores) • **AfterZone** (improved grades in mathematics)

In short, a large and growing body of research on ELOs suggests some promise for improving performance in Algebra I and mathematics, but strong attendance is crucial; ineffective programs often suffer from low participation rates (Redd et al., 2013). Given the extent to which ELOs differ in structure and implementation, it is difficult to make strong conclusions about the effectiveness of ELOs as a general strategy, but research makes clear that high-quality implementation is important. Specifically, Redd and colleagues (2013) provide recommendations for high-quality implementation: (a) recruit and select qualified staff who appreciate the negative impact of high turnover on student outcomes, (b) ensure that programs are intentional and focused as shown by the use of manuals or an established curriculum, (c) provide individualized attention to students through tutoring and mentoring, (d) incorporate regular observations by senior staff, (e) use targeted and age-appropriate programming, (f) provide structure and clear expectations to participants, (g) use culturally competent materials, and (h) monitor performance.

[8] In some cases, studies were given "mixed reviews" if they demonstrated an impact on mathematics but not reading outcomes. For this brief, these studies were recategorized as "found to work" if they demonstrated effects on mathematics achievement.

Implications for Program Developers and Administrators

The research on double-dose algebra and expanded learning has limitations, although there are important findings for program developers/administrators to consider as they develop strategies to support struggling students through expanded learning opportunities in and out of the classroom. Tables 2 and 3 provide a summary of key research findings with implications for program development and implementation.

Table 2. Key Double-Dose Algebra Findings and Implications for Program Developers and Administrators

Double-dose algebra programs can...	Program developers and administrators should consider...
• Improve algebra test scores (PLAN and ACT), graduation rates, and college enrollment rates, but there is no evidence for improved overall Algebra I passing rates in Chicago.	• Incorporating the features of successful double-dose programs but couple these programs with additional supports that focus on improving student engagement and participation in school. Programs may need to address challenges for students that may not be algebra specific.
• Can critically change the peer composition and context of classrooms if students are grouped into courses on the basis of prior achievement.	• Developing course placement policies that support struggling students but minimize segregation based on prior achievement. If course placement policies place some average or struggling students in more challenging classrooms with higher-performing peers, it will be important to ensure that students have the supports they need to succeed in a course that may move at a more challenging pace.
• Have less benefit than alternative models that use the same amount of extra instructional time to focus on preparing students with foundational skills for Algebra I.	• Exploring the potential benefits of using extra instructional time to build the skills that struggling students need to succeed in algebra. Programs should use extra instructional time to focus on what struggling students need most rather than "more of the same" content and activities from the standard Algebra I course.

Table 3. Key ELO Findings and Implications for Program Developers and Administrators

Expanded learning programs can...	Program developers and administrators should consider...
• Improve algebra readiness, test scores, and mathematics achievement.	• Selecting ELOs that have demonstrated effectiveness or that rigorous research indicates are promising bets for improving mathematics achievement in Grades 6–9. Instead of building your own program, adopt programs or, at minimum, the core features of programs that have been shown to work in communities similar to yours.
• Produce larger impacts when they combine an academic and a social focus instead of focusing strictly on academics.	• Adopting ELOs that not only enrich student learning in core subject areas but also provide supports for improving social and behavioral skills (e.g., self-regulation, motivation, social and emotional learning).
• Have limited or no impact if the quality of implementation suffers and participation rates are low.	• Incorporating best implementation practices. Select qualified staff, use manuals or curricula for focused program activities, provide individualized attention and support to students, incorporate regular observations by senior staff, set clear expectations and structure for participants, use age- and culturally appropriate materials, and monitor program performance.

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Appendix

To conduct the literature review, we followed the same process used in other briefs in this series by including descriptive, theoretical, and explanatory research on double-dose algebra and ELOs that spans a wide range of methodological approaches (e.g., high-quality experiments, quasi-experimental studies, descriptive studies, case studies), sources (e.g., educational journals, research organizations, national content-specific organizations), and disciplines. In addition to conducting a rigorous search of existing literature, we contacted experts in the field who are conducting research on these educational programs to identify research findings not yet published and included them in this review. We used a four-part, hierarchical selection process as the basis for including the studies summarized in this brief: subject (algebra vs. mathematics vs. other subjects), grade level (Grades 6–9 vs. Grades 1–5), year of publication (since 2005 vs. before 2005), and level of evidence (strong vs. moderate vs. low, based on standards informed by the What Works Clearinghouse; see http://ies.ed.gov/ncee/wwc/). We prioritized studies that focused on algebra or mathematics in Grades 6–9, that were published since 2005, and that had strong or moderate evidence. A fully exhaustive review of the literature is beyond the scope of this brief. Instead, we focus on research studies that are most relevant for double-dose algebra and ELOs as strategies for promoting student success in Algebra I.

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