

COLLEGE & CAREER READINESS & SUCCESS Center

at American Institutes for Research ■

Predictors of Postsecondary Success

The purpose of this brief is to provide information to state, district, and school personnel seeking support to determine whether their students are on a path to postsecondary success. The College and Career Readiness and Success Center (CCRS Center) has received technical assistance requests from a number of states regarding factors that predict postsecondary success, and this brief summarizes and expands on the information shared with these states. Specifically, we summarize early childhood through early postsecondary education research that identifies student skills, behaviors, and other characteristics that predict future academic and workplace success. We have attempted to focus on a variety of measures drawn from readily available data that schools, districts, and states are likely to have. Through this information, policymakers and practitioners can begin to inform the development and validation of factors to identify students who are not on a path to postsecondary success as early as prekindergarten and as late as their senior year of high school. These factors can inform practice and can be integrated into a longitudinal tracking mechanism to identify and monitor individual students who may need additional resources or supports at any point during their schooling. In addition, tracking and measuring factors of success across prekindergarten to early postsecondary education offer a prime opportunity to develop and evaluate systemwide improvement efforts. For example, these data may help identify particular grades, schools, or subgroups of students (e.g., English language learners) that need additional support, enabling both school and district personnel to develop and monitor the impact of policies, programs, or interventions designed to improve outcomes for targeted groups or for the system in general.

General Approach

We began our review of the research looking for studies that identify measures of postsecondary success. Our goal was to identify factors at all levels of education that predict future academic attainment and economic security. Not surprisingly, we found very few studies that link early childhood, elementary, or middle school characteristics with postsecondary success. Even at the secondary level, the limited research linking secondary characteristics to postsecondary readiness and success focuses primarily on course taking, test scores, and early postsecondary outcomes, such as college enrollment and attainment of industry certification. The fact that state longitudinal data systems have not been in existence long enough to support such analyses is

NOVEMBER 2013

Prepared for the College and Career Readiness and Success Center by Vanessa Hein and Becky Smerdon, Quill Research Associates, LLC, and Megan Sambolt, American Institutes for Research



AMERICAN INSTITUTES FOR RESEARCH®



most likely a significant contributing cause. For this reason, we instead searched for studies across all grade levels that identify factors that predict future, more proximal academic success (e.g., kindergarten readiness correlated with third-grade reading proficiency) and conducted an explicit search for studies examining predictors of career success. In this way, the brief is not a research summary of secondary and postsecondary success factors per se; instead, this brief presents a continuum of key factors at each level of education that are linked to future achievement and attainment. The information provided in this brief offers a starting point that states, districts, and schools may use to develop and test contextually valid and reliable factors that measure progression toward postsecondary success along the PK–16 spectrum.

For the purposes of the brief, we chose to include a broad range of benchmarks of future success and present our findings using three categories: (1) indicators, (2) predictors, and (3) other potential factors.

- **Indicators** are measures with an established threshold. Students who perform at or above the threshold (e.g., students who earn a 3.0 grade point average [GPA] or higher) are more likely to be prepared for their college and career pursuits.
- **Predictors** are measures that are strongly correlated with improved postsecondary outcomes but for which a numeric threshold has not been established.
- **Other potential factors** are skills and attributes that have been identified as important to students' success and are driven by sound theoretical arguments (e.g., collaborative skills are important for future success) but for which reliable metrics have not yet been developed or tested independently of other factors.

None of the indicators, predictors, or other potential factors are intended to be used independently; rather, they are potentially valuable components of a comprehensive data-informed decision process designed to improve postsecondary success for all students.

To focus our search, we used key search terms, such as *21st century learning skills*, *predictors of college success*, *college and career readiness measures*, *college and career ready predictors*, *indicators and standards*, *college admissions criteria*, and *workforce skills and capabilities*, and included studies that met the CCRS Center's review criteria.¹ We reviewed more than 80 research studies and summarized and sorted the information by measure type (indicator, predictor, and other potential factors).

Research on this topic is fairly new; thus, there is a need for additional research and evaluation of identified measures. This brief is not intended to serve as a complete or comprehensive guide, and there are two important limitations to consider. First, most of the measures included in this brief have not been directly linked to postsecondary

¹ Those criteria include: published from 2000 forward, published in a peer-reviewed journal, released by the Institute of Education Sciences, What Works Clearinghouse review, National Center for Education Statistics report, or published by an organization with rigorous internal review procedures.



success. Instead, as mentioned previously, the measures have been linked to more proximal academic successes. Second, there is very little research that focuses specifically on special student populations, such as English language learners, students with disabilities, or private or home schooled students (Kearns et al., 2011). Thus, this brief is not designed to identify factors that predict postsecondary readiness and success for specific student subgroups.

Summary of Research

In the pages that follow, we summarize the research findings organized by level of education: early childhood (prenatal through kindergarten, elementary (Grades 1–4), middle years (Grades 5–8), high school (Grades 9–12), postsecondary (Years 1 and 2 at both two- and four-year institutions), and adult education.

EARLY CHILDHOOD

At this time, there are no studies that identify early childhood indicators of postsecondary success (see Table 1). There are only a small number of early childhood predictors of postsecondary readiness (e.g., academic and social adjustment) and considerably more other potential factors.

The early childhood predictors that we found are components of a larger set of classroom competencies, or early approaches to learning, which have been researched across grade levels and relate to future readiness (e.g., mathematics and reading scores in the third grade and grade promotion in the fourth grade) (Li-Grining, Votruba-Drzal, Maldonado-Carreño, & Haas, 2010). These predictors include persistence, emotion regulation, and attentiveness (Hair, Halle, Terry, Lavelle, & Calkins, 2006). In addition, participation in school-readiness screenings and preschool programming has been significantly related to future school success. Finally, the following predictors also have been identified as contributing to children's readiness for school: physical health, social-emotional development, approaches to learning, language, and cognitive development (Hair et al., 2006; Li-Grining et al., 2010).

Some of the other potential factors that we found that relate to school readiness include: working memory skills; the display of positive play interactions with other students, teachers, and family members; and the ability to remain engaged in a task until the task is complete (Coolahan, Fantuzzo, Mendez, & McDermott, 2000; DiLalla, Marcus, & Wright-Phillips, 2004; Fantuzzo & McWayne, 2002; McClelland, Acock, Piccinin, Rhea, & Stallings, 2012). Research on these factors has found these skills are related to spelling and writing scores through age 7, and students who exhibit these skills and behaviors are more likely to be successful in the core subject areas of reading and mathematics from kindergarten to the fifth grade (Gathercole, Brown, & Pickering, 2003).



Table 1. Early Childhood Correlates of School Readiness and Elementary Performance

Early Childhood		
Indicator	Predictor	Other Potential Factor
	<ul style="list-style-type: none"> ■ Participation in child care and early education^a ■ Early approaches to learning^b ■ Positive “school readiness risk profile”^c 	<ul style="list-style-type: none"> ■ Cognitive understanding and cognitive control^d ■ Positive play interaction behaviors at home and school^e ■ Emergent literacy^f ■ Working memory skills^g ■ Social-emotional learning^h ■ Attention span persistenceⁱ

^aMagnuson, Meyers, Rhum, & Waldfogel, 2004; ^bLi-Grining et al., 2010; ^cHair et al., 2006; ^dLeerkes, Paradise, O’Brien, Calkins, & Lange, 2008; ^eCoolahan et al., 2000; Dilalla et al., 2004; Fantuzzo & McWayne, 2002; ^fDoctoroff, Greer, & Arnold, 2006; ^gGathercole et al., 2003; ^hDenham & Brown, 2010; ⁱMcClelland et al., 2012

ELEMENTARY SCHOOL

Within the elementary school research literature, we did not find studies that identify elementary school indicators of postsecondary success. However, research did identify two elementary school indicators that predict proximal, future academic success (see Table 2). First, achieving literacy by the third grade is correlated with reading and English language arts (ELA) proficiency on state assessments at the middle grades level (ACT, 2008; Silver & Saunders, 2008). Moreover, students in Grades K–3 who are absent fewer than 10 percent of the time are more likely to be promoted to the next grade and to receive higher grades in core subject areas.²

We also found that certain social skills and behavioral predictors are correlated with future academic achievement. The Social Skills Rating System assesses components of student behavior, which have been shown to be linked with relationships and which, in turn, are associated with improved social adjustment and academic achievement (Malecki & Elliot, 2002). The multi-rater tool collects perspectives from teachers, parents, and students and assesses the following social skills: cooperation, assertion, responsibility, empathy, and self-control.

The most common other potential factor at the elementary school level is the demonstration of social competence. Social competence is the ability to develop and maintain interpersonal relationships with others (Cotugno, 2009). However, the definition of *social competence* is not consistent across studies, nor is its measurement. However, social competence is still considered a potential predictor of both academic and social progress (Rubin & Rose-Krasnor, 1992).

² A variety of psycho-social skills assessments, including Grit Scales, and their measurements can found at: http://www.positivepsychology.org.nz/uploads/3/8/0/4/3804146/workshop_4_-_dr_aaron_jarden_-_positive_psychological_assessment_workbook.pdf



Table 2. Elementary School Correlates of Elementary and Middle Grades Success and Secondary Readiness

Elementary School		
Indicator	Predictor	Other Potential Factor
<ul style="list-style-type: none"> ■ Reading by the third grade^a ■ < 10 percent absenteeism in elementary school^b 	<ul style="list-style-type: none"> ■ Being rated highly by teachers on attention span and classroom participation^c ■ High scores on the Social Skills Rating System^d 	<ul style="list-style-type: none"> ■ Social competence^e

^aThe Annie E. Casey Foundation, 2010; Hernandez, 2012; ^bChang & Mariajose, 2008; ^cAlexander, Entwisle, & Dauber, 1993; ^dMalecki & Elliot, 2002; ^eWelsh, Parke, Widaman, & O’Neil, 2001

MIDDLE GRADES

At the middle grades level, we found a number of indicators of secondary-level success (see Table 3). For example, attendance rates have a relationship with on-time high school graduation. Students who do not exceed the critical threshold of 20 percent absences per year display a lower rate of core course failure and grade retention in the middle grades (Balfanz, 2009). In the fifth and sixth grades, passing all ELA and mathematics courses is correlated with meeting benchmarks on assessments in future grades. Furthermore, beginning in the eighth grade, indicators specify course-taking pathways and benchmark scores on national assessments that relate to future success, such as passing Algebra I and scoring at or above 292 on the National Assessment of Educational Progress (NAEP) in mathematics (Wimberly & Noeth, 2005). ACT and SAT also have established college preparatory exam thresholds for middle grades students that correlate with high school academic success, such as meeting benchmark scores on state-administered proficiency tests in core subject areas and enrollment in honors and accelerated courses (ACT, 2008; Silver & Saunders, 2008).

Predictors of future success for middle grades students include meeting the benchmark scores on cognitive assessments, such as the Grit Scale, a self-assessment that measures student characteristics (e.g., focus, interest levels, commitment, and follow-through) that have been shown to predict student ability to continue the pursuit of academic goals despite uncertainty, risk of failure, or feelings of frustration. High scores on the Grit Scale are correlated with positive outcomes at multiple levels. In the middle grades, high scores are correlated with higher student GPAs, and one study asserts that, in adulthood, high scores also correlate with fewer career changes over time (Duckworth & Quinn, 2009).³

³ A variety of psycho-social skills assessments, including Grit Scales, and their measurements can be found at: http://www.positivepsychology.org.nz/uploads/3/8/0/4/3804146/workshop_4_-_dr_aaron_jarden_-_positive_psychological_assessment_workbook.pdf



The literature also suggests other potential factors in the middle grades, such as critical thinking and the ability to make informed decisions, which have been correlated with secondary-level academic achievement. For example, one study found a correlation between seventh-grade predictors and 10th-grade academic achievement (Fleming et al., 2005). In addition, social and emotional learning (SEL) skills that have been found to be related to future achievement include emotional expression, support-seeking behaviors, and direct problem-solving and cognitive decision-making skills (Fedorowicz, 1995).⁴

Table 3. Middle Grades Correlates of Secondary Success and Postsecondary Readiness

Middle Grades		
Indicator	Predictor	Other Potential Factor
<ul style="list-style-type: none"> ■ < 20 percent absenteeism in the middle grades^a ■ Remaining at the same school through the middle grades^b ■ Receiving no unsatisfactory behavior grades in sixth grade^c ■ Passing all ELA and mathematics courses and meeting benchmarks on state exams^d ■ Passing Algebra I in the eighth grade^e ■ NAEP mathematics score of > 292 in eighth grade^f ■ Meeting the following benchmarks on college preparatory exams: ACT EXPLORE test scores of English 13, mathematics 17, science 20 and reading 15^g; SAT-9 score > 50th percentile^h 	<ul style="list-style-type: none"> ■ Taking rigorous coursework in the middle gradesⁱ ■ High scores on the Grit-S and Grit-O scales^j 	<ul style="list-style-type: none"> ■ Social-emotional and decision-making skills^k

^aBalfanz, 2009; Balfanz, Herzog, & Mac Iver, 2007; Rumberger, 1995; Rumberger & Larson, 1998; ^bMac Iver, Durham, Plank, Farley-Ripple, & Balfanz, 2008; Rumberger & Larson, 1998; ^cBalfanz et al., 2007; ^dBalfanz et al., 2007; Cumpton, Schexnayder, & King, (2012); ^eKurlaender, Reardon, & Jackson, 2008; Wimberly & Noeth, 2005; ^fLee, 2013; ^gACT, 2008; ^hSilver & Saunders, 2008; ⁱAtanda, 1999; Wimberly & Noeth, 2005; ^jDuckworth & Quinn, 2009; ^kFleming et al., 2005

HIGH SCHOOL

At the high school level, we found numerous indicators, predictors, and other potential factors due to the breadth of research conducted on this particular school-level transition (see Table 4). The most frequently noted indicators at this level are attendance, GPA, and test scores. Missing no more than 10 percent of school days per grade level is primarily associated with on-track high school graduation (Allensworth & Easton, 2007). Maintaining higher than a 3.0 high school GPA or passing high school exit exams or college entrance

⁴ More information on the Children's Coping Strategies Checklist can be found at: <http://www.excellenceforchildand youth.ca/support-tools/measure-profile?id=352>



exams correlated with enrolling in and successfully completing credit-bearing entry-level college courses (ACT, 2012; Mishook et al., 2012).⁵ Meeting or exceeding benchmark scores on state and national assessments also are indicative of future success (Cumpton et al., 2012). Specific course-taking pathways and participation in college preparatory programming also have been shown to be correlated with future success. For example, the completion of Algebra I in the eighth grade and Algebra II in the ninth grade is inversely correlated with the need for remediation at the postsecondary level (CRIS Annenberg Institute for School Reform, 2010; Klepfer & Hull, 2012; Lee, 2012, 2013). Scoring a 3 or higher on Advanced Placement (AP) final exams or a 4 or higher on the International Baccalaureate (IB) final exam in any AP or IB course, or participation in dual enrollment programming, is positively correlated with college enrollment and persistence rates in the first two years of a degree or certificate-seeking program (Karp, Calcagno, Hughes, Jeong, & Bailey, 2007; Nagaoka, Roderick, & Coca, 2009; Rumberger & Larson, 1998; Wiley, Wyatt, & Camara, 2010). Similarly, findings from research conducted by SAT and ACT indicate thresholds on their respective college entry exams positively correlate with college- and career-readiness outcomes, such as enrollment in a two- or four-year degree program and completion of credit-bearing, entry-level courses without remediation (ACT, 2010). In addition, the submission of both the Free Application for Federal Student Aid (FAFSA) and a college application, coupled with immediate, full-time enrollment in a postsecondary academic or career-focused program, also are positively correlated with postsecondary persistence (Nagaoka et al., 2009).

Other indicators that have more recently gained attention are participation in college preparatory activities, such as summer transition and orientation programs, as well as high school-to-college bridge programs (Barnett et al., 2012; Mishook, 2012). Some of these programs include the opportunity to earn college credit but focus primarily on conative skill development and easing the transition process. Program activities include meeting with academic advisors and guidance counselors and completing college-readiness lessons or pretests for college entrance exams (Barnett et al., 2012; Mishook, 2012). As with all of the measures described in this brief, it is important to note that this research is based on correlational studies, not causal studies. In addition, none of the studies we reviewed track students beyond the completion of the second year of postsecondary schooling.

At this level, there also are a few predictors of secondary and postsecondary success. For example, low-mobility or school transfer rates between grades have been widely studied and identified as predictors of academic success. One study found that even one school transfer between Grades 8 and 12 is correlated with a dropout rate that is twice as high as observed for students who do not transfer (Rumberger & Larson, 1998).

⁵ SAT College and Career Readiness Benchmark can be found at <http://press.collegeboard.org/sat/sat-college-and-career-readiness-benchmark>.



Other potential factors at the secondary level are primarily derived from emergent research. For example, research suggests that students who possess five core SEL skill sets (self-awareness, self-management, social awareness, relationship skills, and responsible decision making) exhibit higher academic performance in college and better manage the anxiety and workload that college courses entail when compared with students who do not possess these skills (Dymnicki, Sambolt, & Kidron, 2013). In addition, these five core skill sets of SEL, as well as other SEL skills, are valuable to prospective employers and have been included in numerous work standards, suggesting that those who exhibit these skills may have an increased likelihood of becoming employed. For example, the National Work Readiness Credential (NWRC) measures skills such as time management, conscientiousness, self-efficacy, cooperative behavior, and openness to new ideas to assess the degree to which potential employees exhibit 21st century workforce skills (ACT, 2011). Demonstration of these skills increases employability for entry-level positions in high-demand jobs because obtaining the NWRC places the work-ready applicant into a referral network of business and industry leaders seeking employees with these specific skill sets (Casner-Lotto & Barrington, 2006).



Table 4. High School Correlates of Secondary and Postsecondary Success

High School and Career and Technical Education		
Indicator	Predictor	Other Potential Factor
<ul style="list-style-type: none"> ■ < 10 percent absences^a ■ No more than one failure of ninth-grade subjects^b ■ Completing the following mathematics sequence: Algebra II (ninth grade), geometry (10th grade), Algebra III and trigonometry or higher (11th grade), precalculus or calculus (12th grade)^c ■ 3.0+ HS GPA^d ■ AP Exam: 3 or higher; IB Exam: 4 or higher^e ■ Dual enrollment participation^f ■ Passing state exams^g ■ FAFSA completion^h ■ Meeting the following benchmarks on national assessments: 10th grade NELS⁶ Scale Score > 54; 12th grade NAEP Score > 320; 12th grade ECLS⁷ Score > 141ⁱ ■ Meeting the following benchmarks on college preparatory exams: SAT > 1550⁸; PLAN⁹ test scores: English 15, reading 17, mathematics 19, and science 21; ACT scores: English 18, mathematics 22, reading 21, and science 24^j ■ Participation in the following: summer bridge programs, school year transition programs, senior year transition courses, and early assessment and intervention programs ■ College Knowledge target outreach programs such as: multiyear college-readiness programs, embedded college counseling, and college-readiness lessons^k 	<ul style="list-style-type: none"> ■ Few school transfers between grades^l ■ Early Assessment Program (EAP) and Preliminary Scholastic Aptitude Test (PSAT) completion^m 	<ul style="list-style-type: none"> ■ Participation in SEL interventionⁿ ■ Meeting with academic advisor^o ■ ACT Work Keys^p, NWRC based on Equipped for the Future standards, and the CASAS Workforce ■ Skills Certification System^q

^aAllensworth & Easton, 2007; ^bKemple, Segeritz, & Stevenson, 2013; ^cKlepfer & Hull, 2012; ^dMishook et al., 2012; ^eNagaoka et al., 2009; Wiley et al., 2010; ^fKarp et al., 2007; ^gCumpton et al., 2012; ^hNagaoka et al., 2009; ⁱLee, 2012, 2013; ^jACT, 2012; ^kBarnett et al., 2012; Mishook et al., 2012; ^lRumberger & Larson, 1998; ^mMishook et al., 2012; ⁿTaylor & Dymnicki, 2007; ^oKlepfer & Hull, 2012; ^pBragg & Ruud, 2007; ^qDarche & Stern, 2013

⁶ The National Education Longitudinal Study (NELS)

⁷ The Early Childhood Longitudinal Program (ECLS)

⁸ SAT College and Career Readiness Benchmark retrieved from <http://press.collegeboard.org/sat/sat-college-and-career-readiness-benchmark>

⁹ The PLAN is a 10th-grade assessment developed by ACT that measures progress at the secondary level in the four core subject areas of mathematics, English, reading, and science.



POSTSECONDARY AND BEYOND

Indicators of postsecondary success include high GPA, adequate credit load, and passing general education courses without the need for remediation within the first two years of college (see Table 5) (Moore & Shulock, 2009; Roderick, Nagaoka, & Coca, 2009). Maintaining a 3.0 GPA or higher and attending college full-time, as defined by earning 30 credits within the first year, are correlated with on-time degree completion (Leinbach & Jenkins, 2008). Similarly, college students enrolled in four-year institutions who take remedial courses are more likely to drop out of college or transfer to a two-year institution (Attewell, Lavin, Domina, & Levey, 2006; Bettinger & Long, 2004). For students transferring to four-year institutions from community colleges, completing foundational or “gateway courses” in mathematics and English and one college-level science course within the first two years has been strongly correlated with future postsecondary success as well (Moore & Shulock, 2009). For adult education, two indicators for success have been identified: obtaining a GED and receiving a Comprehensive Adult Student Assessment Systems (CASAS) composite score above 256 (Wachen, Jenkins, & Van Noy, 2010). The CASAS assessment was designed to measure adult mathematics, reading, writing, listening, and speaking skills in order to identify career pathways that are best suited to students’ abilities.

The predictors of postsecondary success include participation in college and career orientation and baccalaureate transfer programs and maintaining a combination of full-time enrollment and part-time employment status (Leinbach & Jenkins, 2008). Some research has found that involvement in extracurricular activities and membership in on-campus student organizations predict success in the form of sustained positive academic, psychological, and civic engagement (Aud, Ramani, & Frohlich, 2011; Fredricks & Eccles, 2006).

Other potential factors that relate to postsecondary success are limited to the area of adult education and are largely dependent on data provided by workforce innovation agencies. Findings from research conducted on the Integrated Basic Education and Skills Training (I-BEST) model suggest that adult students who enroll in postsecondary programs with the intentions of pursuing a vocational career fare better in achieving their career-oriented goals when compared to other adult students enrolling in postsecondary programs strictly for academic purposes (Wachen et al., 2010).¹⁰

¹⁰More information on I-BEST can be found at http://www.sbctc.ctc.edu/college/e_integratedbasiceducationandskillstraining.aspx



Table 5. Postsecondary Correlates of Subsequent Postsecondary Success

Postsecondary and Beyond		
Indicator	Predictor	Other Potential Factor
Two- and Four-Year Institutions <ul style="list-style-type: none"> Completion of mathematics and English gateway courses and career exploration course^a 15 credits per quarter^b Experience and orientation program > 3.0 GPA^c Adult Education <ul style="list-style-type: none"> GED; < 256 on mathematics, reading, and listening on CASAS^d 	Two- and Four-Year Institutions <ul style="list-style-type: none"> Enrollment in a baccalaureate transfer program^e Immediate enrollment after high school graduation Working less than 15 hours per week Participation in extracurricular activities; high educational expectations for self^f 	Adult Education <ul style="list-style-type: none"> Vocational intent^g

^aMoore & Shulock, 2009; ^bLeinbach & Jenkins, 2008; ^cMoore & Shulock, 2009; ^dWachen et al., 2010; ^eLeinbach & Jenkins, 2008; ^fAud et al., 2011; ^gConley, 2007

REFLECTIONS ON THE REVIEW OF LITERATURE

In our review of the literature, we identified potential directions for research that may prove useful in informing both policy formulation and practical application. First, as previously mentioned in this brief, research on benchmarks for postsecondary success is emergent, and there is a dearth of reliable indicators of postsecondary success. Second, there is little, if any, research on special student populations. Therefore, the field would benefit from more empirical research. Third, the research that we reviewed is correlational and not causal; thus, indicators, predictors, and other potential factors should not be considered causes of future outcomes. Finally, from what we have gleaned from the review of the research, these studies tend to test factors independently of, rather than in conjunction with, other proposed factors of success. There is little evidence to suggest that postsecondary predictors are being used together to provide students with a comprehensive snapshot of their own level of preparedness as they move through each grade level (Conley, 2007). If postsecondary predictors are used collectively, states, districts, and schools can develop self-assessment tools or checklists that can serve as personal tracking guides for students as they progress through school.



RECOMMENDATIONS

Based on our review of the research and our experience working with states, districts, and schools using data to inform decision making, we have developed a list of recommendations for consideration when using postsecondary success indicators, predictors, and other potential factors:

1. Continue building comprehensive, user-friendly state, district, and school data systems that allow data linkages across prekindergarten to workforce in order to identify indicators for readiness and success that are applicable across grade levels and in both career-related and academic postsecondary environments.
2. Create measures that correlate with postsecondary success and other proximal outcomes, and test the measures with multiple cohorts of students who have moved or are moving through your system. This testing will ensure these measures are valid and reliable in your local context. Examine potential differences, by student subgroups, to make sure the measures work for all students in your schools, and adjust as necessary if there are subgroup differences.
3. Integrate measures of readiness and success into your data systems, and use these measures and data systems to identify and intervene with struggling students and to evaluate the effectiveness of interventions and school reform initiatives.

The development of a reliable set of indicators will provide states, districts, and schools as well as students and their families with the ability to map and track students along a trajectory that leads to long-term and transferable success. The set of indicators also will inform the development of tools that will allow students and their families to see where students are on a trajectory toward a particular goal. We can begin with local validation efforts that utilize indicators that have undergone rigorous review in a variety of contexts. Further, additional research on predictors and other potential factors will refine measurement and improve data-based decision making.



References

- ACT. (2008). *The forgotten middle: Ensuring that all students are on track for college and career readiness before high school*. Iowa City, IA: Author.
- ACT. (2010). *The alignment of Common Core and ACT's College and Career Readiness System*. Iowa City, IA: Author.
- ACT. (2011). *Defining credentials for the public workforce system: A policy brief*. Iowa City, IA: Author.
- ACT. (2012). *The condition of college & career readiness*. Iowa City, IA: Author.
- Alexander, K. L., Entwisle, D. R., & Dauber, S. L. (1993). First-grade classroom behavior: Its short- and long-term consequences for school performance. *Child Development*, 64(3), 801–814.
- Allensworth, E. M., & Easton, J. Q. (2007). What matters for staying on track and graduating in Chicago Public High Schools: A close look at course grades, failures, and attendance in the freshmen year. Chicago: Consortium on Chicago School Research. Retrieved from <http://ccsr.uchicago.edu/sites/default/files/publications/07%20What%20Matters%20Final.pdf>
- The Annie E. Casey Foundation. (2010). *Early warning: Why reading by the end of third-grade matters*. Baltimore: Author.
- Atanda, R. (1999). *Do gatekeeper courses expand education options?* Washington, DC: National Center for Education Statistics.
- Attewell, P., Lavin, D., Domina, T., & Levey, T. (2006). New evidence on college remediation. *Journal of Higher Education*, vol. #(issue # if applicable), 886–924.
- Aud, S., Ramani, A. K., & Frohlich, L. (2011). *America's youth: Transitions to adulthood*. Statistical Analysis Report. National Center for Education Statistics. Retrieved from http://nces.ed.gov/pubs2012/2012026/chapter2_16.asp
- Balfanz, R. (2009). *Putting middle grades students on the graduation path*. Baltimore: Everyone Graduates Center.
- Balfanz, R., Herzog, L., & Mac Iver, D. J. (2007). Preventing student disengagement and keeping students on the graduation path in urban middle-grades schools: Early identification and effective interventions. *Educational Psychologist*, 42(4), 223–235.
- Barnett, E. A., Corrin, W., Nakanishi, A., Bork, R. H., Mitchell, C., Sepanik, C., et al. (2012). *Preparing high school students for college: An exploratory study of college readiness partnership programs in Texas*. New York: National Center for Postsecondary Research, Columbia University. Retrieved from <http://www.mdrc.org/sites/default/files/Preparing%20High%20School%20Students%20for%20College%20FR.pdf>
- Bettinger, E., & Long, B. T. (2004). *Shape up or ship out: The effects of remediation on students at four-year colleges* (No. w10369). Cambridge, MA: National Bureau of Economic Research.
- Bragg, D. D., & Ruud, C. M. (2007). *Career pathways, academic performance, and transition to college and careers: The impact of two select career and technical education (CTE) transition programs on student outcomes*. Champaign-Urbana, IL: Office of Community College Research and Leadership, University of Illinois.
- Casner-Lotto, J., & Barrington, L. (2006). *Are they really ready to work? Employers' perspectives on the basic knowledge and applied skills of new entrants to the 21st century U.S. workforce*. Washington, DC: Partnership for 21st Century Skills.
- Chang, H. N., & Mariajose, R. (2008). *Present, engaged and accounted for: The critical importance of addressing chronic absence in the early grades*. New York: National Center for Children in Poverty.
- Conley, D. T. (2007). *Redefining college readiness*. Eugene, OR: Educational Policy Improvement Center.



- Coolahan, K. C., Fantuzzo, J., Mendez, J., & McDermott, P. (2000). Preschool peer interactions and readiness to learn: Relationships between classroom peer play and learning behaviors and conduct. *Journal of Educational Psychology, 92*, 458–465.
- Cotugno, A. J. (2009). Social competence and social skills training and intervention for children with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 39*(9), 1268–1277.
- CRIS Annenberg Institute for School Reform. (2010). Leading Indicator Spotlight Series. Webinar.
- Cumpton, G., Schexnayder, D., & King, D. T. (2012). *Factors associated with education and work after high school for the classes of 2008 and 2009*. Austin, TX: Central Texas Student Future Project.
- Darche, S., & Stern, D. (2013). *Making it real: How high schools can be held accountable for developing students' career readiness* (Policy Brief 13-2). Palo Alto, CA: Policy Analysis for California Education (PACE).
- Denham, S. A., & Brown, C. (2010). "Plays nice with others": Social-emotional learning and academic success. *Early Education and Development, 21*(5), 652–680.
- DiLalla, L. F., Marcus, J. L., & Wright-Phillips, M. V. (2004). Longitudinal effects of preschool behavioral styles on early adolescent school performance. *Journal of School Psychology, 42*(5), 385–401.
- Doctoroff, G. L., Greer, J. A., & Arnold, D. H. (2006). The relationship between social behavior and emergent literacy among preschool boys and girls. *Journal of Applied Developmental Psychology, 27*(1), 1–13.
- Duckworth, A. L., & Quinn, P. D. (2009). Development and validation of the short grit scale. *Journal of Personality Assessment, 91*(2), 166–174.
- Dymnicki, A., Sambolt, M., & Kidron, Y. (2013). *Improving college and career readiness by incorporating social and emotional learning*. Washington, DC: College and Career Readiness and Success Center.
- Fantuzzo, J., & McWayne, C. (2002). The relationship between peer-play interactions in the family context and dimensions of school readiness for low-income preschool children. *Journal of Educational Psychology, 94*(1), 79.
- Fedorowicz, A. E. (1995). *Children's coping questionnaire (CCQ): development and factor structure*. (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (ADD Accession Order No. [number])
- Fleming, C. B., Haggerty, K. P., Catalano, R. F., Harachi, T. W., Mazza, J. J., & Gruman, D.H.. (2005). Do social and behavioral characteristics targeted by preventive interventions predict standardized test scores and grades? *Journal of School Health, 75*(9), 342–349.
- Fredricks, J. A., & Eccles, J. S. (2006). Is extracurricular participation associated with beneficial outcomes? Concurrent and longitudinal relations. *Developmental Psychology, 42*(4), 698.
- Gathercole, S. E., Brown, L., & Pickering, S. J. (2003). Working memory assessments at school entry as longitudinal predictors of National Curriculum attainment levels. *Educational and Child Psychology, 20*(3), 109–122.
- Hair, E., Halle, T., Terry, E., Lavelle, B., & Calkins, J. (2006). Children's school readiness in the ECLS-K: Predictions to academic, health, and social outcomes in first grade. *Early Childhood Research Quarterly, 21*, 431–454.
- Hernandez, D. J. (2012). *Double jeopardy: How third-grade reading skills and poverty influence high school graduation*. Baltimore: The Annie E. Casey Foundation.
- Karp, M. M., Calcagno, J. C., Hughes, K. L., Jeong, D. W., & Bailey, T. R. (2007). *The postsecondary achievement of participants in dual enrollment: An analysis of student outcomes in two states*. St. Paul, MN: National Research Center for Career and Technical Education, University of Minnesota.



- Kearns, J., Kleinert, H., Harrison, B., Sheppard-Jones, K., Hall, M., & Jones, M. (2011). *What does college and career-ready mean for students with significant cognitive disabilities?* Lexington, KY: National Alternate Assessment Center.
- Kemple, J., Segeritz, M., & Stevenson, N. (2013). Building on-track indicators for high school graduation and college readiness: evidence from New York City. *Journal of Education for Students Placed at Risk, 18*, 17–28.
- Klepfer, K., & Hull, J. (2012). *High school rigor and good advice: Setting up students to succeed*. Alexandria, VA: The Center for Public Education. Retrieved from <http://www.centerforpubliceducation.org/Main-Menu/Staffingstudents/High-school-rigor-and-good-advice-Setting-up-students-to-succeed/High-school-rigor-and-good-advice-Setting-up-students-to-succeed-Full-Report.pdf>
- Kurlaender, M., Reardon, S., & Jackson, J. (2008). *Middle school predictors of high school achievement in three California school districts* (California School Dropout Research Project Report No. 14). Santa Barbara, CA: University of California.
- Lee, J. (2012). College for all: Gaps between desirable and actual P–12 math achievement trajectories for college readiness. *Educational Researcher, 41*(2), 43–55.
- Lee, J. (2013). College for all: Gaps between desirable and actual P–12 math achievement trajectories for college readiness. *Educational Researcher, 42*(2), 78–88.
- Leerkes, E. M., Paradise, M. J., O'Brien, M., Calkins, S. D., & Lange, G. (2008). Emotion and cognition processes in preschool children. *Merrill-Palmer Quarterly, 54*(1), 102–124.
- Leinbach, D. T., & Jenkins, D. (2008). *Using longitudinal data to increase community college student success: A guide to measuring milestone and momentum point attainment*. New York: Community College Research Center, Columbia University.
- Li-Grining, C. P., Votruba-Drzal, E., Maldonado-Carreño, C., & Haas, K. (2010). Children's early approaches to learning and academic trajectories through fifth grade. *Developmental Psychology, 46*(5), 1062–1077.
- Mac Iver, M. A., Durham, R. E., Plank, S. B., Farley-Ripple, E., & Balfanz, R. (2008). *The challenge of on-time arrival: The seven-year flight paths of Baltimore's sixth graders of 1999–2000*. Baltimore: Baltimore Education Research Consortium.
- Magnuson, K. A., Meyers, M. K., Ruhm, C. J., & Waldfogel, J. (2004). *American Educational Research Journal, 41*(1), 115–157.
- Malecki, C. K., & Elliot, S. N. (2002). *Children's social behaviors as predictors of academic achievement: A longitudinal analysis*. *School Psychology Quarterly, 17*(1), 1–23.
- McClelland, M. M., Acock, A. C., Piccinin, A., Rhea, S. A., & Stallings, M. C. (2012). Relations between preschool attention span-persistence and age 25 educational outcomes. *Early Childhood Research Quarterly, 28*(2), 314–324.
- Mishook, J., Gurantz, O., Borsato, G. N., Hewitson, M., Martinez, M., McGinnis, E., et al. (2012). *College readiness indicator*. Providence, RI: Annenberg Institute, Brown University. Retrieved from <http://annenberginstitute.org/sites/default/files/VUE35a.pdf>
- Moore, C., & Shulock, N. (2009). *Student progress toward degree completion: Lessons from the research literature*. Sacramento, CA: Institute for Higher Education Leadership & Policy, California State University.
- Nagaoka, J., Roderick, M., & Coca, V. (2009). *Barriers to college attainment: Lessons from Chicago*. Washington, DC: Center for American Progress.
- Roderick, M., Nagaoka, J., & Coca, V. (2009). College readiness for all: The challenge for urban high schools. *The Future of Children, 19*(1), 185–210.
- Rubin, K. H., & Rose-Krasnor, L. (1992). Interpersonal problem solving and social competence in children. In V. B. Van Hasselt & M. Hersen (Eds.), *Handbook of Social Development: A Lifespan Perspective* (pp. 283–323). New York: Plenum Press.



- Rumberger, R. W. (1995). Dropping out of middle school: A multilevel analysis of students and schools. *American Educational Research Journal*, 32(3), 583–625.
- Rumberger, R. W., & Larson, K. A. (1998). Student mobility and the increased risk of high school dropout. *American Journal of Education*, 107(1), 1–35.
- Silver, D., & Saunders, M. (2008). *What factors predict high school graduation in the Los Angeles unified school district?* Santa Barbara, CA: University of California.
- Taylor, R. D., & Dymnicki, A. B. (2007). Empirical evidence of social and emotional learning's influence on school success: A commentary on "Building academic success on social and emotional learning: What does the research say?," a book edited by Joseph E. Zins, Roger P. Weissberg, Margaret C. Wang and Herbert J. Walberg. *Journal of Education and Psychological Consultation*. 17(2&3); 225–231.
- Wachen, J., Jenkins, D., & Van Noy, M. (2010). *How I-BEST works: Findings from a field study of Washington State's Integrated Basic Education and Skills Training program*. New York: Community College Research Center, Columbia University.
- Welsh, M., Parke, R. D., Widaman, K., & O'Neil, R. (2001). Linkages between children's social and academic competence: A longitudinal analysis. *Journal of School Psychology*, 39(6), 463–481.
- Wiley, A., Wyatt, J., & Camara, W. J. (2010). *The development of a multidimensional college readiness index*. New York: The College Board . Retrieved from <http://research.collegeboard.org/sites/default/files/publications/2012/7/researchreport-2010-3-development-multidimensional-college-readiness-index.pdf>
- Wimberly, G. L., & Noeth, R. J. (2005). *College readiness begins in middle school*. Iowa City, IA: ACT.



1000 Thomas Jefferson Street NW
Washington, DC 20007-3835
202.403.5000 | TTY 877.334.3499

www.air.org

This work was originally produced with funds from the U.S Department of Education through the National High School Center under cooperative agreement number S283B050028 and through the College and Career Readiness and Success Center under cooperative agreement number S283B120034. The content does not necessarily reflect the position or policy of the Department of Education, nor does mention or visual representation of trade names, commercial products, or organizations imply endorsement by the federal government.