In the following report, Hanover Research expands its previous research brief on college and career readiness. Information is provided on college and career preparedness in general, and for students with disabilities specifically. Examples of the readiness standards employed by several postsecondary institutions are also provided.
## Table of Contents

**Executive Summary** .................................................................................................................. 3  
**Discussion** ................................................................................................................................. 3  
**Key Findings** ............................................................................................................................... 3  

### Section I: College and Career Readiness Standards ........................................................................ 6
  - **The Common Core State Standards Initiative** ................................................................. 7  
  - English Language Arts (ELA) ............................................................................................... 8  
  - Mathematics ...................................................................................................................... 10  
  - Common Core Standards and College and Career Readiness ........................................... 11
  
### Section II: Socio-Emotional Readiness ..................................................................................... 15  

### Section III: Special Education and College and Career Preparedness ........................................ 18
  - Post-High School Outcomes of Young Adults with Disabilities ........................................ 18
  - Postsecondary Education ................................................................................................. 18
  - Postsecondary Employment ............................................................................................ 19
  
### Section IV: College Readiness Standards Employed by Postsecondary Institutions .......... 25
  - Columbus State Community College ................................................................................. 25
  - The Ohio State University ............................................................................................... 27
  - Harvard University .......................................................................................................... 28
  
**Appendix: The ASSET and COMPASS College Placement Exams** ........................................... 31
EXECUTIVE SUMMARY

In this report, Hanover Research presents a general overview of research related to college and career readiness standards. Following a discussion of common academic indicators, we present information related to socio-emotional factors impacting student college- and career-readiness. Next, a discussion of college- and career-readiness as related to students with disabilities is provided. Finally, we provide examples of the readiness standards employed by various types of postsecondary institutions.

DISCUSSION

College and career readiness is widely measured by the Common Core State Standards Initiative, which focuses on English Language Arts and mathematics. Another popular set of indicators for college readiness comes from the Educational Policy Improvement Center, which highlights content knowledge, cognitive strategies, learning skills and techniques, and transition knowledge and skills as the four key dimensions of college- and career-readiness. Research has also highlighted the centrality of socio-emotional factors – such as self-discipline, personal commitment, self-regulation, and family involvement – in promoting readiness.

Literature specific to urban school districts suggests that supporting college readiness among urban student populations may in some cases require more rigorous intervention and remediation strategies. Literature suggests that the promotion of college- and career-readiness should be integrated in broad, district-level strategies, and that data-driven decision-making and community involvement are pivotal.

With respect to students with disabilities, common readiness standards may be out of reach; however, researchers caution that lowering standards risks depriving students of the opportunity to obtain important knowledge and skills. Inclusion in mainstream classrooms is a strong predictor of post-high school success, in both education and employment. Other important factors contributing to successful secondary transitions for this student population include learning life skills and practicing self-care/independent living.

KEY FINDINGS

- Adopted by all but nine U.S. states and territories, the Common Core State Standards Initiative is arguably the most dominant voice in the discussion of American K-12 college- and career-readiness education. The Common Core standards focus on English Language Arts (ELA) and mathematics, addressing specific fundamental skills for each grade level while maintaining a focus on the universal outcome of college- and career-readiness for each student.

- While the Common Core focuses specifically on ELA and mathematics, other definitions of college and career readiness have adopted a more holistic approach. Researchers with the Educational Policy Improvement Center (EPIC), for instance,
have identified four key dimensions of college and career readiness: **content knowledge, cognitive strategies, learning skills and techniques, and transition knowledge and skills.** These four dimensions incorporate auxiliary skills, including study habits and financial literacy, into a broader conception of college- and career-readiness.

- **While research on college and career readiness is often characterized by a broad focus, scholars have noted lower levels of college- and career-readiness among minority and low-income students. A 2009 *Urban Advocate* article noted that “a key determining factor in college readiness – particularly among minority students – is exposure to academically rigorous courses.”**

  - Research suggests that strategies for supporting readiness among urban student populations may require a more intensive approach, although associated strategies (intervention, remediation, standards implementation) are not fundamentally divergent from those promoted for broader student populations.

- **In order for urban school districts to promote college readiness, efforts must be comprehensive. Increasing college readiness will require the urban school district to measure success through indicators that build accountability, moving beyond traditional indicators (e.g., graduation rates) to ensure alignment with district and student objectives. Data-driven decision-making and community involvement can be important aspects of this process.**

- **Socio-emotional readiness is also an important aspect of college readiness.** Key psycho-social dimensions of readiness include self-discipline and personal commitment to school work, as well as self-regulation, including a student’s emotional control and confidence level; family factors, such as parents’ attitudes toward education and parental involvement in a student’s school-related activities; and career planning factors, such as identifying an appropriate match between a student’s interests and potential paths for postsecondary education.

- **Advocates argue that while established college and career readiness standards may appear unrealistic for students with disabilities, lowering standards risks depriving these students of the opportunity to obtain important knowledge and skills. Researchers highlight a focus on fluency in reading, writing, and math, communication skills, social skills, and independent work behaviors as central to supporting special needs populations in moving toward college and career preparation.**

- **In an April 2010 study, the National Secondary Transition Technical Assistance Center (NSTTAC) identified 33 effective evidence-based practices in secondary transition for students with disabilities.** Of these, 26 focused on teaching students life skills, educational skills, and social skills. These factors in the "student

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development” category far outweighed all other categories, suggesting a focus on student-level skills development is key to successful secondary transition.

- The NSTTAC has also identified 16 evidence-based predictors of post-school success for students with disabilities (as measured by education, employment and independent living). These predictors include student support, self-care/independent living, and inclusion in general education. The role of inclusion in promoting effective transitions has also been highlighted by the Maryland Coalition for Inclusion Education, which found that more time spent in general education classrooms was positively correlated with better outcomes, both during and post-high school.
SECTION I: COLLEGE AND CAREER READINESS STANDARDS

In a 2006 report prepared for the *Chronicle of Higher Education*, the Maguire Associates noted that many studies of college- and career-readiness tended to overlook instructor perspectives. In an effort to redress the apparent discrepancy in perspective sources, the Maguire Associates surveyed instructors on issues related to college and career-readiness, receiving responses from 746 secondary and 1,098 postsecondary instructors. In some cases, secondary and postsecondary instructors agreed on questions—both, for instance, believed that students tended to leave high school underprepared for college work. However, in many more cases, secondary and postsecondary instructors “differed substantially” in their expectations and assessments of students. The study noted:

> When high-school teachers were asked how well they personally understood “the level of preparation that is required for your students to succeed in college,” 30% said “somewhat well,” and 68% said “very well.” By contrast, when college faculty members were asked if they believed that “public secondary schools are adequately conveying to their students what colleges will expect of them academically,” 60% said “Somewhat,” 37% said “Not at all,” and only 2% said “Very much so.”

Over the years, a variety of different educators and policymakers in different states have grappled with the issue of college and career readiness. Much of the discussion on college and career readiness centers on the Common Core State Standards Initiative (CCSSI), a state-led effort to coordinate K-12 educational standards across the United States. The Common Core State Standards have been adopted by all but eight U.S. states and territories (including the District of Columbia). College readiness as defined by the Common Core is commonly accepted by postsecondary institutions throughout the nation.

However, the Common Core standards are not the sole measure of college and career readiness. Data from a recent report produced by Achieve Inc. provide valuable information on the state of state standards, assessments, graduation requirements, and accountability systems related to college and career readiness. Each year, Achieve Inc. conducts an annual policy survey of all 50 states and the District of Columbia, which asks whether these states “have adopted standards, graduation requirements, assessments and accountability systems aligned to the expectations of two- and four-year colleges and employers.”

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5 Ibid, p. 18.


According to the most recent Achieve report, “Closing the Expectations Gap: 50-State Progress Report on the Alignment of K-12 Policies and Practice with the Demands of College and Careers,” all 50 states and the District of Columbia have academic content standards aligned with the “skills colleges and employers demand of high school graduates.” Of these, forty-six states and the District of Columbia have adopted the Common Core State Standards, while the remaining four states have developed their own standards. Achieve considers state standards to be aligned with college and career ready expectations if they align with best available evidence for success in postsecondary education and careers. Such evidence includes considerations related to:

... whether the state’s development process was guided by the expectations of the state’s postsecondary and business communities, whether those communities verified that the resulting standards articulate the knowledge and skills required for success in college and the workplace, and whether an external organization verified the standards’ alignment to CCR expectations.

**THE COMMON CORE STATE STANDARDS INITIATIVE**

The Common Core State Standards Initiative is the product of collaboration between the Council of Chief State School Officers (CCSSO), the National Governors Association (NGA), and teachers, school administrators, and education scholars across the country. The standards provide a set of guidelines for preparing students for college and the workplace by outlining the essential skills and knowledge necessary for postsecondary success. Specifically, the standards aim to prepare students to be “able to succeed in entry-level, credit-bearing academic college courses and in workforce training programs.” These standards may provide guidance for districts seeking to better prepare their students for higher education.

Each Common Core standard has satisfied a series of conditions to ensure relevance and effectiveness. As outlined on its website, CCSSI ensures that the standards:

- Are aligned with college and work expectations;
- Are clear, understandable and consistent;
- Include rigorous content and application of knowledge through high-order skills;
- Build upon strengths and lessons of current state standards;
- Are informed by other top performing countries, so that all students are prepared to succeed in our global economy and society; and
- Are evidence-based.

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9 Ibid, p. 3.
11 “About the Standards.” CCSSI. http://www.corestandards.org/about-the-standards
12 Ibid.
The Common Core standards focus on two main subject areas: English Language Arts (ELA) and Mathematics. The following two subsections briefly outline the organization and key aspects of each.

**ENGLISH LANGUAGE ARTS (ELA)**

The standards for English language arts are divided into two further classifications: the College and Career Readiness (CCR) standards and the grade-specific standards. The CCR standards – which were developed as part of a prior initiative of CCSSO and NGA – act as the core upon which the grade-specific standards are based. The CCR standards represent the skills a student should have acquired by the time he or she graduates from high school. The grade-specific standards are modified versions of the CCR standards: they correspond and complement the CCR standards, but are adjusted appropriately for each grade level. In short, a student who meets the grade-specific standards each year is on track to satisfy the CCR standards by graduation from high school.

**Figure 1.1: English Language Arts (ELA) Pillars**

<table>
<thead>
<tr>
<th>Reading</th>
<th>Writing</th>
<th>Speaking &amp; Listening</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key Ideas and Details</td>
<td>Text Types and Purposes</td>
<td>Comprehension and Collaboration</td>
<td>Conventions of Standard English</td>
</tr>
<tr>
<td>Craft and Structure</td>
<td>Production and Distribution of Writing</td>
<td>Presentation of Knowledge and Ideas</td>
<td>Knowledge of Language</td>
</tr>
<tr>
<td>Integration of Knowledge and Ideas</td>
<td>Research to Build and Present Knowledge</td>
<td>Range of Writing</td>
<td>Vocabulary Acquisition and Use</td>
</tr>
<tr>
<td>Range of Reading and Level of Text Complexity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Common Core State Standards Initiative

These ELA standards are divided into four primary pillars: Reading; Writing; Speaking and Listening; and Language (see figure above). Additionally, grades 6-12 include pillars for reading and writing literacy in History/Social Studies, and Science and Technical Subjects. Each of these pillars comprises six to ten CCR anchor standards, which are divided into four skills groups. The figure on the following page shows the CCR standards for the reading pillar.

As mentioned above, the grade-specific standards complement and correspond with the ELA CCR standards. The result is a set of standards that address specific fundamental skills for each grade level while maintaining a focus on the ultimate outcome: college- and career-readiness. Indeed, as researchers from the Thomas B. Fordham Institute concluded:

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15 Ibid.
“Despite their imperfections, the Common Core ELA standards are far superior to those now in place in many states, districts, and classrooms.”

Figure 1.2: CRR Anchor Standards for the Reading Pillar (ELA)

<table>
<thead>
<tr>
<th>Key Ideas and Details</th>
<th>Craft and Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Read closely to determine what the test says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.</td>
<td>▪ Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyzes how specific word choices shape meaning or tone.</td>
</tr>
<tr>
<td>▪ Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.</td>
<td>▪ Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.</td>
</tr>
<tr>
<td>▪ Analyze how and why individuals, events, or ideas develop and interact over the course of a text</td>
<td>▪ Assess how point of view or purpose shapes the content and style of a text.</td>
</tr>
</tbody>
</table>

Integration of Knowledge and Ideas | Range of Reading and Level of Text Complexity

| ▪ Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words. | ▪ Read and comprehend complex literary and informational texts independently and proficiently. |
| ▪ Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. | |
| ▪ Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take. | |

Source: Common Core State Standards Initiative

Lastly – pursuant to this section’s aim of exploring the dimensions of college-readiness – it is helpful to look at the description provided by the Common Core of the characteristics that a college- and career-ready student should display in the area of English language arts.

Students must:

▪ **Demonstrate independence**: students “become self-directed learners, effectively seeking out and using resources to assist them.”

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- **Build strong content knowledge**: students “establish a base of knowledge across a wide range of subject matter.”

- **Respond to the varying demands of audience, task, purpose, and discipline**: students adapt their communication and language use appropriately; they understand the importance of nuance and connotation.

- **Comprehend as well as critique**: students “work diligently to understand precisely what an author or speaker is saying, but they also question an author’s or speaker’s assumptions and premises and assess the veracity of claims and soundness of reasoning.”

- **Value evidence**: “students cite evidence when offering an oral or written interpretation of a text;” they “constructively evaluate others’ use of evidence.”

- **Use technology and digital media strategically and capably**: students “are familiar with the strengths and limitations of various technological tools and mediums and can select and use those best suited to their communication goals.”

- **Come to understand other perspectives and cultures**: “students appreciate that the twenty-first century classroom and workplace are settings in which people from often widely divergent cultures and who represent diverse experiences and perspectives must learn and work together.”

**MATHEMATICS**

While the ELA standards are organized around the CCR pillars, the **mathematics standards are organized around eight guiding standards for mathematical practice that focus on “processes and proficiencies.”**¹⁸ These standards represent an amalgamation of process standards from the National Council of Teachers of Mathematics (NCTM) and strands of proficiency identified in a National Research Council report titled *Adding It Up.*¹⁹ The eight guiding standards are displayed below in the figure below.

![Figure 1.3: Eight Guiding Standards for Common Core Mathematics](image)

<table>
<thead>
<tr>
<th>Mathematics Guiding Standards</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sense of problems and persevere in solving them</td>
<td>Use appropriate tools strategically</td>
</tr>
<tr>
<td>Reason abstractly and quantitatively</td>
<td>Attend to precision</td>
</tr>
<tr>
<td>Construct viable arguments and critique the reasoning of others</td>
<td>Look for and make use of structure</td>
</tr>
<tr>
<td>Model with mathematics</td>
<td>Look for and express regularity in repeated reasoning</td>
</tr>
</tbody>
</table>

Source: Common Core State Standards Initiative

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¹⁹ Ibid.
As in ELA, the broader mathematics standards are complemented by grade level and subject-specific standards. After grade 8, the standards no longer correspond with a grade level. Instead, they are based upon the course subject (e.g., Algebra, Geometry, Statistics). The CCSSI states, “...the high school portion of the Standards for Mathematical Content specifies the mathematics all students should study for college and career readiness.”

High school standards are focused on the following subject areas:

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

COMMON CORE STANDARDS AND COLLEGE AND CAREER READINESS

As with any movement in the education arena, there has been significant debate over the value and validity of the Common Core standards. While many educators, administrators, policymakers, and education scholars have avidly supported the movement, others have vehemently protested against CCS implementation. Of most relevance to the present is skepticism of whether the Common Core standards accurately reflect educator and employer conceptions of college- and career-readiness. As one recent Educational Policy Improvement Center (EPIC) report notes, “Major questions remain to be answered about these standards, chief among them the degree to which they reflect what is necessary to be ready for college and careers.”

In an attempt to gauge the relevance of the Common Core standards to common definitions of college- and career-readiness, EPIC administered a survey to a national sample of postsecondary instructors in 2011. The survey population, which consisted of instructors who taught at either a two-year or four-year institution and who were engaged in one of 25 different course categories, yielded a total of 1,897 responses. The survey asked participants to first rate the general applicability of each of the Common Core standards to their particular course. If the instructors confirmed that the given standard was indeed

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21 Ibid.
relevant to their course, the survey then asked them to rate (on a four-point scale, where 4 indicates “most important”) its level of importance to success in the course.\textsuperscript{24}

Overall, the targeted courses covered seven major subject areas, including: “English language arts, mathematics, science, social science, business management, computer technology, and healthcare.”\textsuperscript{25} To an extent, the 25 individual course categories selected for the survey reflected both college and career preparation—14 of the selected courses were common general education requirements for a baccalaureate degree, while 11 were more career-oriented, and were often required for completion of two-year certificates or career-focused four-year degrees.\textsuperscript{26} The characteristics of the survey population, including geographic distribution, institutional sector, and academic subject, are presented at right.\textsuperscript{27}

Though the exploratory nature of the survey required EPIC to rely on instructors to self-report the relevance of the standards, the authors note:\textsuperscript{28}

\begin{quote}
EPIC has collected this type of self-reported information previously and has found 70\% to 90\% consistency of instructor ratings of the standards with independent third-party expert analysis of course syllabi from these instructors. [...] The study does not cover the whole landscape of personnel who could provide information on college- and career-readiness, nor do the selected courses comprehensively cover all content areas. The data does, however, give insight on the Common Core standards from college instructors in a number of different fields and contexts.
\end{quote}

The survey yielded the following results:\textsuperscript{29}

- **Relevance of ELA and Literacy Strands**: The relevance ratings for non-literary reading and writing standards were very high. Two specific strands—Reading for Informational Texts and Writing—were rated highly within the context of general ELA and the literacy, subject-specific versions. Furthermore, “with few exceptions, a large percent of instructors across all content areas [rated] the Speaking and Listening strand and Language strand as applicable.”

\begin{quote}
\textsuperscript{24} Ibid, p. 3.
\textsuperscript{25} Ibid, p. 4.
\textsuperscript{26} Ibid, p. 4.
\textsuperscript{27} Ibid, pp. 4-5.
\textsuperscript{28} Ibid, p. 4.
\textsuperscript{29} Ibid., pp. 3-6.
\end{quote}
• **Relevance of Mathematics Standards:** Reported applicability ratings for mathematics strands were more variable, with broad standards, such as the Standards for Mathematical Practice, relevant to a large swath of the sample, and standards with a narrower focus, such as Functions and Geometry, relevant to a much smaller percentage of instructors. Overall, “a majority of instructors in almost all content areas rated the Mathematical Practices as applicable.”

• **Role in Course Success:** If deemed relevant to the course, instructors were asked to rate the importance of the standard to success in the course on a four-point scale. Notably, nearly every standard received an average rating above 2.5 (the midpoint between “less important” and “more important”). In fact, most of the standards received an average rating above a 3 (“more important”). Overall, therefore, instructors who deemed a certain standard to be relevant to their course also considered it to be important to their course.

In general, these results suggest that the Common Core standards are generally relevant and important to success in higher education, suggesting that they may provide some use in curriculum development focused on college preparation.

**COLLEGE READINESS IN URBAN SCHOOL DISTRICTS**

College readiness poses an even more daunting challenge to urban districts, which serve large numbers of underprivileged, underperforming groups. Recent studies indicate that in New York City, for example, only one in four high school students is college-ready, and only 13 percent of African American and Latino students are college ready. In Dallas, only 3 percent of African American students graduate ready for college.30

Research on college- and career-readiness in urban school districts is typically characterized by a broad focus. A 2009 *Urban Advocate* article noted that “a key determining factor in college readiness – particularly among minority students – is exposure to academically rigorous courses.”31 Research suggests that strategies for supporting readiness among urban student populations may require a more intensive approach, although associated strategies (intervention, remediation, standards implementation) are not fundamentally divergent from those promoted for broader student populations.32

Generally speaking, scholars note that efforts to increase college-readiness in urban school districts must be a comprehensive effort that reaches every branch of the school district.

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districts should focus on closing the aspiration-achievement gap faced by low-income and minority students. In order to close this gap, students must be provided the opportunity to develop a strong foundation in core academic skills, behavioral skills, and essential college knowledge.\textsuperscript{33}

Researchers suggest that in order to promote college- and career-readiness, urban districts should focus on developing rigorous indicators of college readiness and promoting accountability. While some school districts still gauge success based on traditional measures (such as graduating high school), administrators should ensure that indicators are aligned with the demands of postsecondary education and the needs of the workforce, and that students are provided with strong signals and sufficient incentive to perform. Urban districts are also advised to ensure that instructors are provided with adequate support in meeting the instructional needs of diverse student populations. Overall, increasing college readiness and supporting students in an urban district must be a comprehensive effort that reaches every branch of the school district.\textsuperscript{34}

The Annenberg Institute for School Reform at Brown University has developed tools and resources to help districts prepare students for college. The Institute promotes a “smart district” approach, characterized by data-driven decision-making, along with community engagement and a “smart education system,” which promotes student learning based on collaboration between districts and communities.\textsuperscript{35}

The approach has been used in Hamilton County, TN, Montgomery County, MD, Naperville, IL, and Philadelphia, PA to help districts identify students at risk of attrition or underperformance. Scholars note that the “smart education approach” helps to create a data-driven culture in school districts, allowing for greater accessibility of information about the effectiveness of school district policies and practices. A focus on community engagement also helps to generate community buy-in, promoting interest in and support for positive student outcomes. The Annenberg Institute asserts that using these tactics, organized around a “pillar” of college readiness, can effectively generate significant change in urban school districts.\textsuperscript{36}

\textsuperscript{33} Roderick, M; Nagaoka, J; and Coca, V. Op. cit., p. 185.
\textsuperscript{34} Ibid, PP. 202-204.
\textsuperscript{35} Mishook, J. “College Readiness and Smart Education Systems.” Op cit.
\textsuperscript{36} Ibid.
SECTION II: SOCIO-EMOTIONAL READINESS

While academic preparation is the central factor in college-readiness, scholars widely note that non-academic, “socio-emotional” factors are also significant in impacting students’ potential for postsecondary and career success. A 2007 report by the ACT noted that relevant non-academic factors can be classified into three separate groups:37

- **Individual psychosocial factors**: Examples include motivational factors such as self-discipline and personal commitment to school work, as well as self-regulation, including a student’s emotional control and confidence level.
- **Family factors**: Examples include parents’ and family members’ attitudes toward education and their involvement in a student’s school-related activities.
- **Career planning**: Identifying an appropriate match between a student’s interests and potential paths for postsecondary education.

Certainly, non-academic factors are not substitutes for academic performance, though it is worth noting that they play important roles in many students’ preparedness for postsecondary education and careers.

Further perspective on socio-emotional college readiness is provided by the Educational Policy Improvement Center (EPIC), which has focused heavily on the issues of school standards and college readiness, and released a publication in 2011 entitled *Redefining College Readiness Volume 5*.38 In the opening paragraphs of the publication, David Conley—author of the publication and founder of EPIC—takes exception to the fact that “the term college readiness continues to be defined primarily in terms of high school courses taken and grades received, combined with scores on national tests.”39 Conley argues that a more accurate definition of college readiness may be summarized as follows:40

[T]he level of preparation a student needs in order to enroll and succeed—without remediation—in a credit-bearing general education course at a postsecondary institution that offers a baccalaureate degree or transfer to a baccalaureate program. “Succeed” is defined as completing entry level courses at a level of understanding and proficiency that makes it possible for the student to consider taking the next course in the sequence or the next level of course in the subject area.

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In his work, Conley identifies **four key facets of college readiness**, outlined below. These concepts were presented in Conley’s article titled “Redefining College Readiness,”[^41] and have served as a foundation to his later work, including the presentations “Exploring Innovative Schools and Policies that Prepare Students to be College and Career Ready”[^42] and “Four Keys to College and Career Readiness.” The four key concepts are:

- **Key content knowledge**;
- **Key cognitive strategies**;
- **Key learning skills and techniques**; and
- **Key transition knowledge and skills**.

**Key content knowledge** is the dimension most similar to “traditional” notions of college preparedness. It includes knowledge of key terms/terminology and factual information, as well as proficiency in linking ideas and organizing concepts.[^43] **Key cognitive strategies** include “systematic approaches to achieve key learning goals” and the ability to “choose among alternative learning approaches ... to solve a problem or complete a complex task.”[^44] Key cognitive strategies and key content knowledge are “co-equal” and “interdependent,” as students develop cognitive strategies when dealing with challenging content.[^45]

The third of Conley’s four dimensions, **key learning skills and techniques**, focuses on the personal, self-management skills that students must develop to successfully manage study and work habits in their postsecondary careers. Some of the key skills that Conley lists within this category include: time management; study skills; goal setting; persistence; and student ownership of learning.[^46]

The final dimension, **key transition knowledge and skills**, acknowledges the need for practical knowledge about the transition from secondary school to college. A few of the practical skills Conley describes within this dimension include:[^47]

- **Contextual knowledge**: knowledge about different options for postsecondary education;
- **Procedural knowledge**: familiarity with application and enrollment procedures;

[^41]: Conley, D. “Redefining College Readiness.” *Op. Cit*
[^44]: Ibid, p. 15.
[^47]: Ibid., p. 25.
- **Financial knowledge**: knowledge of options for paying for college;
- **Cultural knowledge**: familiarity and comfort with the behavioral norms of postsecondary education; and
- **Personal knowledge**: ability to appropriately and effectively advocate for oneself within the framework of postsecondary education.

These social-emotional content areas suggest that school districts aiming to prepare students for post-secondary education may best serve students by offering a variety of opportunities focused on both academic and socio-emotional readiness, including, for instance, college readiness fairs and presentations that focus on the practical aspects of postsecondary education (applying for and paying for postsecondary education), as well as discussing focused on what students can expect from their postsecondary experience.
SECTION III: SPECIAL EDUCATION AND COLLEGE AND CAREER PREPAREDNESS

In the following section, Hanover Research outlines postsecondary outcomes as well as practices and predictors related to college- and career-readiness for students with disabilities. Students in special education graduate from high school at lower rates than their peers, and districts may in some cases award alternative diplomas to students in special education, which do not connote the same level of achievement as a standard high school diploma.48 Research suggests that a key step in promoting college- and career-readiness among students with disabilities is to raise expectations for achievement, and to accompany these expectations with appropriate levels of support.

POST-HIGH SCHOOL OUTCOMES OF YOUNG ADULTS WITH DISABILITIES

In September 2011, the National Center for Special Education Research published the results of a 10-year-long study on the post-high school outcomes of young adults with disabilities, tracking information up to six years after high school.49 Below, findings related to both postsecondary education and postsecondary employment are discussed in detail.

POSTSECONDARY EDUCATION

Postsecondary education findings related to young adults with disabilities who had been out of high school up to six years included the following:50

- 55 percent reported continuing on to postsecondary education after leaving high school, in comparison to 62 percent of same-age peers in the general population.
- Students with disabilities who completed high school were three times as likely to enroll in postsecondary education as peers who did not complete high school (59 percent vs. 17 percent). This finding held true across all three varieties of postsecondary education evaluated: two year or community college (40 percent vs. 12 percent), vocational, business, or technical schools (31 percent vs. six percent), and four-year colleges (16 percent vs. less than one percent).
- Young adults with disabilities were more likely to have ever been enrolled in two-year or community colleges (37 percent) than in vocational, business, or technical schools (28 percent) or 4-year colleges or universities (15 percent).

Figure 3.1 depicts the percentage of young adults enrolled in post-secondary education within six years after high school by disability.

50 Ibid. Bullet points quoted from source.
Figure 3.1: Postsecondary Education Enrollment, by Disability

<table>
<thead>
<tr>
<th>DISABILITY</th>
<th>ANY POSTSECONDARY SCHOOL (%)</th>
<th>TWO-YEAR OR COMMUNITY COLLEGE (%)</th>
<th>VOCATIONAL, BUSINESS, OR TECHNICAL SCHOOL (%)</th>
<th>FOUR-YEAR COLLEGE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Disability</td>
<td>60.9</td>
<td>41.0</td>
<td>31.5</td>
<td>15.5</td>
</tr>
<tr>
<td>Speech/Language Impairment</td>
<td>63.0</td>
<td>40.9</td>
<td>21.3</td>
<td>29.1</td>
</tr>
<tr>
<td>Mental Retardation</td>
<td>27.6</td>
<td>21.5</td>
<td>15.2</td>
<td>6.3</td>
</tr>
<tr>
<td>Emotional Disturbance</td>
<td>44.9</td>
<td>29.7</td>
<td>28.1</td>
<td>7.6</td>
</tr>
<tr>
<td>Hearing Impairment</td>
<td>70.6</td>
<td>44.9</td>
<td>36.8</td>
<td>31.3</td>
</tr>
<tr>
<td>Visual Impairment</td>
<td>70.8</td>
<td>47.0</td>
<td>21.2</td>
<td>22.5</td>
</tr>
<tr>
<td>Orthopedic Impairment</td>
<td>59.8</td>
<td>45.5</td>
<td>21.2</td>
<td>22.5</td>
</tr>
<tr>
<td>Other Health Impairment</td>
<td>56.6</td>
<td>42.9</td>
<td>27.7</td>
<td>19.5</td>
</tr>
<tr>
<td>Autism</td>
<td>46.6</td>
<td>32.6</td>
<td>20.4</td>
<td>15.5</td>
</tr>
<tr>
<td>Traumatic Brain Injury</td>
<td>56.2</td>
<td>33.5</td>
<td>33.6</td>
<td>15.7</td>
</tr>
<tr>
<td>Multiple Disabilities</td>
<td>31.3</td>
<td>17.2</td>
<td>14.8</td>
<td>8.0</td>
</tr>
<tr>
<td>Deaf-Blindness</td>
<td>48.8</td>
<td>29.1</td>
<td>18.9</td>
<td>18.2</td>
</tr>
</tbody>
</table>

Source: National Center for Special Education Research

**Enrollment varied widely by disability.** Students with hearing and visual impairments were most likely to attend postsecondary school (71 percent), followed by students with speech/language impairments (63 percent), learning disabilities (61 percent), and orthopedic impairments (60 percent). Students with mental retardation (28 percent) and multiple disabilities (31 percent) were least likely to attend postsecondary school. With only one exception, students with disabilities were more likely to attend a two-year or community college than other postsecondary options (students with traumatic brain injuries were 0.1 percent more likely to attend vocational, business, or technical school).

**Postsecondary Employment**

People with disabilities have a much higher unemployment rate than the overall population, and low adult employment is associated with poor quality of life for individuals with disabilities and their families. Employment-related findings for young adults with disabilities who had been out of high school up to six years included the following.\(^{51}\)

- At the time of the interview, 71.1 percent of young adults with disabilities had a paid job other than working around the house, in comparison to 70.7 percent of same-age peers in the general population.
- Young adults with disabilities who completed high school were more likely to be employed than peers who did not complete high school (73 percent vs. 52 percent).
- The mean wage of employed young adults with disabilities was $9.40 per hour, in comparison to a mean of $13.20 for their peers in the general population.

\(^{51}\) Ibid. Bullet points quoted from source.
Figure 3.2 depicts the percentage of young adults employed outside the home, by disability.

<table>
<thead>
<tr>
<th>DISABILITY</th>
<th>% EMPLOYED AT TIME OF INTERVIEW</th>
<th>AVERAGE HOURLY WAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Disability</td>
<td>78.6</td>
<td>$9.60</td>
</tr>
<tr>
<td>Speech/Language Impairment</td>
<td>67.8</td>
<td>$9.30</td>
</tr>
<tr>
<td>Mental Retardation</td>
<td>46.0</td>
<td>$7.60</td>
</tr>
<tr>
<td>Emotional Disturbance</td>
<td>64.5</td>
<td>$9.70</td>
</tr>
<tr>
<td>Hearing Impairment</td>
<td>63.9</td>
<td>$9.30</td>
</tr>
<tr>
<td>Visual Impairment</td>
<td>40.3</td>
<td>$9.50</td>
</tr>
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<td>Orthopedic Impairment</td>
<td>37.7</td>
<td>$8.10</td>
</tr>
<tr>
<td>Other Health Impairment</td>
<td>68.2</td>
<td>$9.20</td>
</tr>
<tr>
<td>Autism</td>
<td>45.2</td>
<td>$7.70</td>
</tr>
<tr>
<td>Traumatic Brain Injury</td>
<td>44.1</td>
<td>$8.10</td>
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<tr>
<td>Multiple Disabilities</td>
<td>46.1</td>
<td>$9.30</td>
</tr>
<tr>
<td>Deaf-Blindness</td>
<td>29.8</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Source: National Center for Special Education Research

COLLEGE AND CAREER READINESS FOR STUDENTS WITH DISABILITIES

Below, we highlight the key findings of several reports focused on college and career readiness as related to students with disabilities.

NATIONAL ALTERNATE ASSESSMENT CENTER REPORT

A 2011 report by the National Alternate Assessment Center entitled “What Does ‘College and Career Ready’ mean for Students with Significant Cognitive Disabilities” addresses the implications of college and career readiness for students with significant cognitive disabilities, defined as students who take state alternative assessments. According to the report, this subpopulation represents less than 1 percent of all students.52 The authors acknowledge that commonly accepted college and career-readiness indicators may seem out of reach for students with cognitive disabilities, but note that the skill-sets associated with these indicators are nonetheless important for all students. The authors assert that “by lowering the ‘standard,’ the risk increases that students will lose access to important knowledge and skills.”53 The following specific goals are recommended in serving special needs populations in moving toward college and career preparation:54

- Recognizing and developing communicative competence should be addressed for students with significant cognitive disabilities by kindergarten.

53 Ibid, p. 23.
54 Ibid., pp. 24-25. Bullet points quoted from source.
- Fluency in reading, writing, and math are necessary for the pursuit of information whether used for lifelong learning, leisure, or vocational purposes.
- Age appropriate social skills and the ability to work effectively in small groups are essential for future educational as well as vocational pursuits.
- Independent work behaviors, as well as assistance seeking behaviors, are critical for lifelong learning pursuits, including vocational success.
- Skills in assessing support systems are essential for long-term success.

In order to increase positive outcomes, school districts can better support transitioning students with disabilities and their families through coordinating with appropriate local, state, and federal agencies which provide assistance to transitioning young adults with disabilities.

THE NATIONAL SECONDARY TRANSITION TECHNICAL ASSISTANCE CENTER

The National Secondary Transition Technical Assistance Center (NSTTAC) is a national technical assistance center specializing in evidence-based practices to improve academic and functional achievement for students with disabilities, particularly in preparing students for college, other postsecondary education, or the workforce.55

In an April 2010 study, the NSTTAC identified 33 evidence-based practices in secondary transition. Practices are organized into broader categories taken from Kohler’s Taxonomy for Transition Programming model for organizing, planning, and evaluating transition education, services, and programs. 56 The categories include Student-Focused Planning, Student Development, Interagency Collaboration, Program Structure, and Family Involvement. 57 Among the 33 evidence-based practices, three were in the area of ‘Student-Focused Planning,’ 26 were in ‘Student Development,’ one was in ‘Family Involvement,’ and three fell into the category of ‘Program Structure.’ 58 Thus, a substantial majority of evidence-based practices are focused on imparting fundamental skill-sets: life skills, educational skills, and social skills. The complete list of effective, evidence-based secondary transition practices is shown in the figure below.

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55 “About NSTTAC.” NSTTAC. http://www.nsttac.org/content/about-nsttac
57 Ibid.
### Figure 3.3: NSTTAC Evidence-Based Practices in Secondary Transition

<table>
<thead>
<tr>
<th>Kohler’s Taxonomy Category</th>
<th>Evidence-Based Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Student-Focused Planning</strong></td>
<td>Involving students in the IEP process</td>
</tr>
<tr>
<td></td>
<td>Using the <em>Self-Advocacy Strategy</em></td>
</tr>
<tr>
<td></td>
<td>Using the <em>Self-Directed IEP</em></td>
</tr>
<tr>
<td><strong>Student Development</strong></td>
<td>Teaching functional life skills</td>
</tr>
<tr>
<td></td>
<td>Teaching restaurant purchasing skills</td>
</tr>
<tr>
<td></td>
<td>Teaching employment skills using CAI</td>
</tr>
<tr>
<td></td>
<td>Teaching grocery shopping skills</td>
</tr>
<tr>
<td></td>
<td>Teaching home maintenance</td>
</tr>
<tr>
<td></td>
<td>Teaching leisure skills</td>
</tr>
<tr>
<td></td>
<td>Teaching personal health skills</td>
</tr>
<tr>
<td></td>
<td>Teaching job specific employment skills</td>
</tr>
<tr>
<td></td>
<td>Teaching purchasing using the “one more than” strategy</td>
</tr>
<tr>
<td></td>
<td>Teaching life skills using CAI</td>
</tr>
<tr>
<td></td>
<td>Teaching life skills using CBI</td>
</tr>
<tr>
<td></td>
<td>Teaching self-care skills</td>
</tr>
<tr>
<td></td>
<td>Teaching safety skills</td>
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<tr>
<td></td>
<td>Teaching self-determination skills</td>
</tr>
<tr>
<td></td>
<td>Teaching banking skills</td>
</tr>
<tr>
<td></td>
<td>Teaching self-management for life skills</td>
</tr>
<tr>
<td></td>
<td>Teaching self-management for employment</td>
</tr>
<tr>
<td></td>
<td>Teaching self-advocacy skills</td>
</tr>
<tr>
<td></td>
<td>Teaching functional reading skills</td>
</tr>
<tr>
<td></td>
<td>Teaching functional math skills</td>
</tr>
<tr>
<td></td>
<td>Teaching social skills</td>
</tr>
<tr>
<td></td>
<td>Teaching purchasing skills</td>
</tr>
<tr>
<td></td>
<td>Teaching completing a job application</td>
</tr>
<tr>
<td></td>
<td>Teaching job-related social communication skills</td>
</tr>
<tr>
<td></td>
<td>Teaching cooking &amp; food prep skills</td>
</tr>
<tr>
<td></td>
<td>Teaching employment skills using CBI</td>
</tr>
<tr>
<td><strong>Family Involvement</strong></td>
<td>Training parents about transition issues</td>
</tr>
<tr>
<td><strong>Program Structure</strong></td>
<td>Providing community-based instruction</td>
</tr>
<tr>
<td></td>
<td>Extending services beyond secondary school</td>
</tr>
<tr>
<td></td>
<td>Using Check and Connect</td>
</tr>
</tbody>
</table>

Source: NSTTAC

In addition to these practices, NSTTAC identified 16 evidence-based predictors of post-school employment, education, and independent living success, derived from correlational research. In the chart below, several factors are listed; an X indicates that the factor was a predictor of education, employment, or independent living.
Several factors were predictors of post-school education, employment, and independent living. Student support, self-care/independent living, paid employment, and inclusion in general education were predictors for all three aspects of post-high school success.

NSTTAC stresses that there is a continued need for research in order to identify additional practices and predictors of success.⁵⁹ In particular, there is a need for research that strengthens the level of evidence currently established by NSTTAC. There is also a need for research that includes students representing all disability categories and ethnicities. Finally, NSTTAC notes that there is a need for research investigating the effects of existent secondary transition strategies.⁶⁰

**MARYLAND COALITION FOR INCLUSIVE EDUCATION**

While general education inclusion is among the strategies generally considered effective for students in special education, the Maryland Coalition for Inclusive Education asserts that students with cognitive disabilities are best prepared for college and careers through inclusive education in general classrooms.⁶¹ Inclusive education is linked to positive

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⁵⁹ Ibid, p. 5.
⁶⁰ Ibid.
http://webcache.googleusercontent.com/search?q=cache:4MrIfxVUBNwj:thecpsd.files.wordpress.com/2012/05/heat her.pptx+&cd=8&hl=en&ct=Clnk&gl=us
outcomes for students; the Coalition has found that more time spent in a mainstream general education classroom is correlated with:62

- Fewer absences from school;
- Fewer referrals for disruptive behavior; and
- Better outcomes after high school in the areas of employment and independent living.

The Maryland Coalition for Inclusive Education further asserts that inclusive classroom settings help develop skills needed in the 21st century including: academic skills such as math and reading; life skills such as problem solving, teamwork, collaboration, and communication; computer knowledge; and personal skills, such as dependability, getting along with others, appropriate dress and grooming, initiative, asking for help, and maintaining positive attitude.63

In sum, in order to increase college and career readiness for people with intellectual disabilities, the Coalition recommends inclusive placement, access to general education content, standards-based IEPs, and instruction geared toward the development of communicative competence and social skills needed to succeed in higher education and the workplace.64

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63 Ibid.
64 Ibid.
SECTION IV: COLLEGE READINESS STANDARDS EMPLOYED BY POSTSECONDARY INSTITUTIONS

This section provides examples of expectations for college readiness employed by Columbus State Community College, The Ohio State University, and Harvard University. Though the institutions represent varying degrees of selectivity, college readiness expectations remain remarkably consistent across the profiled colleges and universities. All institutions require students to demonstrate competence in, at minimum, Algebra I and II and Geometry prior to enrolling in college-level courses. Similarly, most institutions expect students to complete four years of English courses and to be adept with basic writing skills, though stated expectations for students’ writing abilities are vaguer than those posited for mathematics.

COLUMBUS STATE COMMUNITY COLLEGE

Columbus State Community College, located in Columbus, Ohio, is an open-enrollment institution. Though Columbus State Community College does not explicitly state desired mathematics and writing abilities of matriculating students, examination of the skills taught in developmental courses and evaluated in diagnostic tests reveals the institution’s expectations of the math and writing skills necessary to enroll and succeed in college-level courses.

At Columbus State Community College, most students are required to take a pre-enrollment assessment test: the COMPASS/ESL test or the ACT. While the ACT is a college admissions test, the COMPASS test is a skills assessment test, commonly administered to students enrolling in community colleges and other non-selective institutions of higher education. The COMPASS test evaluates and places students in courses according to their skill levels. A complete list of mathematics and writing concepts tested by COMPASS, as well as ASSET, a similar skills test, are provided in the Appendix of this report. At Columbus State Community College, students who are found to need additional preparation in subjects taught in K-12 education are enrolled in developmental courses to fill in knowledge gaps. Students who speak English as a Second Language are also required to complete a timed paper and pencil writing sample. Students who have completed the ACT test with a 22 or higher in math, 18 or higher in English, and 21 or higher in Reading are exempt from the COMPASS requirement.

EXPECTATIONS FOR READINESS IN MATH, READING, AND WRITING

Descriptions of subjects covered in developmental courses lend insight to the math and writing abilities anticipated of students in college-level courses at Columbus State Community College.

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66 Ibid.
68 “Do I need to take the COMPASS test?” Columbus State Community College. http://www.csc.edu/admissions/need-compass.shtml
Community College. Course descriptions share may features of the concepts evaluated in the COMPASS test. Below, we review math and writing developmental coursework in greater detail.

Columbus State Community College offers four developmental Mathematics Courses:69

- **Basic Mathematics:** This class introduces students to whole numbers, fractions, and decimals.
- **Pre-Algebra:** This course introduces students to integers, expressions, linear equations, percentages, proportions, geometry, application problems, rational expressions, and graphing basic linear equations.
- **Master Math Pre-Algebra:** This course focuses on student success, including “discipline-based study skill work addressing math study, overcoming math anxiety, time management, calculator usage and other topics to assist students overcome barriers to success in math.”70 Concurrent enrollment in Pre-Algebra is required.
- **Developmental Math:** This course offers special topics in Math at the pre-college level to meet special needs and is available on demand.

Columbus State Community College also offers seven developmental Reading and Writing Courses:71

- **Vocabulary Development:** This course teaches spelling skills through memorization, word analysis, and the application of rules.
- **Intermediate Reading:** This course focuses on developing students’ basic reading skills.
- **Advanced Reading:** This course focuses on refining students’ critical reading skills.
- **Basic Grammar:** This course covers the identification of basic parts of speech, the identification and correction of verb errors, the identification and correction of sentence structure errors, and the correct structure and punctuation of compound and complex sentences.
- **Basic Punctuation:** This course covers punctuation skills, including the correct use of commas, semicolons, quotation marks, apostrophes, end marks, and the conventions of capitalization.
- **Basic Composition:** This course focuses on writing clear, coherent, and well-developed paragraphs and short essays.
- **Developmental English:** This course offers special topics in English at the pre-college level to meet special needs and is available on demand.

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70 Ibid.

THE OHIO STATE UNIVERSITY

The Ohio State University is located in Columbus, Ohio and has an admissions rate of 63 percent.\(^{72}\) Generally, the University recommends that high school students take “hard” classes, including Algebra I and II and “the highest sciences offered.”\(^{73}\)

EXPECTATIONS FOR READINESS IN MATH, READING, AND WRITING

More specifically, the minimum college preparation requirements for admission to the Ohio State University include:\(^{74}\)

- 4 units of English
- 3 (4) units of math
- 3 units of natural science with significant lab experience
- 2 (3) units of social science
- 2 (3) units of the same foreign language
- 1 unit of a visual or performing art
- 1 additional unit of the above courses

Requirements are not especially specific, but students are also required to take the ACT or the SAT in order to be considered for admission. Average scores for The Ohio State University are below.

![Figure 4.1: The Ohio State University Standardized Test Scores](image)

<table>
<thead>
<tr>
<th>Test</th>
<th>25th Percentile</th>
<th>75th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAT Composite</td>
<td>1690</td>
<td>2010</td>
</tr>
<tr>
<td>SAT Critical Reading</td>
<td>540</td>
<td>660</td>
</tr>
<tr>
<td>SAT Math</td>
<td>600</td>
<td>700</td>
</tr>
<tr>
<td>SAT Writing</td>
<td>550</td>
<td>650</td>
</tr>
<tr>
<td>ACT Composite</td>
<td>26</td>
<td>30</td>
</tr>
<tr>
<td>ACT English</td>
<td>25</td>
<td>31</td>
</tr>
<tr>
<td>ACT Math</td>
<td>26</td>
<td>31</td>
</tr>
<tr>
<td>ACT Writing</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Source: NCES

In comparison, the average SAT scores nationally for the class of 2012 were 496 in Critical Reading, 514 in Mathematics, and 488 in Writing.\(^{75}\) The average ACT scores nationally for

\(^{72}\) “Ohio State University-Main Campus.” College Navigator. http://nces.ed.gov/collegenavigator/?q=ohio+state+university&s=all&id=204796

\(^{73}\) “Access to Education.” The Ohio State University. http://www.osu.edu/access/family_resources.html

\(^{74}\) “Freshman admission.” The Ohio State University. http://undergrad.osu.edu/admissions/freshman/index.html?expandable=0
the class of 2012 were a 21.1 composite score, 20.5 in English, 21.1 in Math, and 7.1 in Writing.\textsuperscript{76} This suggests an overall higher expectation for students at The Ohio State University than average.

**Harvard University**

Harvard University, located in Cambridge, Massachusetts, has an admission rate of 6 percent and is one of most selective institutions of higher education in the United States.\textsuperscript{77} The skills and abilities Harvard expects of its entering students provide a useful representation of the standards employed by highly-selective postsecondary institutions.

The Admissions Office provides a detailed explanation of expectations for matriculating freshmen in its “Preparing for College” guidelines, authored by three successive deans of the Faculty of Arts and Sciences. The piece offers advice for students in selecting high school courses and in the overall development of academic ability and intellectual curiosity. The most relevant aspects of the mathematics and writing and research sections are highlighted below.

**Expectations for Readiness in Math, Reading, and Writing**

Harvard’s expectations for student preparation in math and writing are much more succinct than those provided by the three previously discussed institutions. Harvard expects students to have completed a minimum of four years of math in high school, including Algebra I, II, and Geometry, and stresses that the most important aspect of a student’s math preparation is the cultivation of curiosity and a willingness to solve new problems. While expectations in math do not significantly differ from The Ohio State University, discussion of expectations for students’ writing abilities indicates a higher level of anticipated proficiency. Students are expected to skillfully write in a variety of styles for a variety of purposes, with an emphasis on analytical, argumentative prose, and are expected to ably perform research with the appropriate selection, use, and citation of relevant sources. Harvard is the only profiled institution which addresses students’ research capabilities. Below, we review the math and writing/research expectations in greater detail.

**Mathematics\textsuperscript{78}**

Students are expected to:

- Study mathematics every year of secondary school. Select courses which require the solving of difficult problems, especially word problems.

\textsuperscript{75} “Average Scores.” College Board. http://professionals.collegeboard.com/testing/sat-reasoning/scores/averages
\textsuperscript{76} “National Score Trends.” ACT. http://www.act.org/newsroom/data/2012/trends.html
\textsuperscript{77} “Harvard University.” College Navigator. http://nces.ed.gov/collegenavigator/?q=Harvard&s=all&id=166027
\textsuperscript{78} Office of Admissions. “Preparing for College.” Bullet points quoted from source. Harvard University.
Acquire the habit of puzzling over mathematical relationships, questioning why formulas are true and why definitions are written as they are, to further understanding rather than memorization of mathematics.

Students should understand “the concept of a function, and its representation by a formula, a graph, or a table.” They are cautioned that a qualitative understanding of graphs, including the ability to sketch and interpret graphs without plotting or reading specific points, is as important as the ability to draw graphs point-by-point.

Students should “be thoroughly familiar with the graphs and behavior of exponential and logarithmic functions, including doubling times and percentage growth rates.”

“The trigonometric functions, and the ideas of amplitude, period, and phase, are important. Scientific notation and the ability to estimate orders of magnitude are frequently used.”

Students should also understand “the basic ideas of probability and statistics, such as mean, median, mode, and standard deviation.”

Students are advised not to rush into calculus, as “success in first-year quantitative courses at college is determined more by the strength of your proficiency in algebra, functions, and graphing than by whether or not you have studied calculus in secondary school.”

Finally, students are told that the courses they take in high school are not as important as the amount they have thought about mathematics, and that the willingness to tackle new problems is most important of all.

**Writing and Research**

The following standards are elaborated with regard to writing and research:

- Students must be able to identify the main features of texts and ideas examined in constructing an argument, and should be familiar with a wide range of fiction and non-fiction genres.

- In writing argumentative prose, “analysis means considering the line of reasoning, the nature of the audience, and the persuasive features of the style.”

- In writing a scholarly research paper, students should read carefully, asking themselves questions along the way. “If you read with curiosity and purpose, you will be able to take notes more easily, to weigh one author’s view against another, to categorize your research under leading questions, and to form your own observations and opinions.”

- Students without the ability to quote, paraphrase, and properly attribute sources will be “at a serious disadvantage in college.”

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79 Ibid. Bullet points quoted from source.
Students are encouraged to write often, both for pleasure and to examine their thinking, and are advised to have others read their writing and provide feedback to further development as a clear, precise writer, and to promote students’ abilities to act as their own critic and editor.
APPENDIX: THE ASSET AND COMPASS COLLEGE PLACEMENT EXAMS

Many open-enrollment and non-selective institutions of higher education use assessment exams to evaluate matriculating students’ abilities, particularly in mathematics and in writing. Some institutions develop their own diagnostic test, but others use the ASSET and COMPASS tests, developed and administered by ACT. Below we discuss the ASSET and COMPASS tests in mathematics and writing, and provide descriptions of tested content.

ASSET

The ASSET Student Success System is a pencil-and-paper exam and “a testing and advising program for placing students into post-secondary institutions.”

MATHEMATICS

Five ASSET tests evaluate students’ mathematics abilities:

Numerical Skills

The ASSET Numerical Skills Test is a 32-item, 25-minute test designed to assess basic numerical skills in the performance of operations with whole numbers, decimals, and fractions and basic word problem solving skills involving arithmetic. The content areas tested include:

- Arithmetic. The items in this category may include operations with whole numbers; decimals and fractions; factors and common factors; multiples and common multiples; comparison of fractions and decimals; ratio, proportion, and percent; conversion of fractions, decimals, and percents; and order of operations for real numbers.
- Pre-Algebra. The items in this category may include prime and composite numbers, complex fractions, signed numbers, absolute values, scientific notation, and square roots.

Elementary Algebra

The Elementary Algebra Test is designed to assess skills commonly acquired in the first high school algebra course. The content areas tested include:

- Evaluation of algebraic expressions

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80 “A Student Advising, Placement, and Retention Service.” ASSET. http://www.act.org/asset/
81 “Test Instruments.” ASSET. http://www.act.org/asset/tests/
Simplification of algebraic expressions
- Solution of quadratic equations
- Operations with polynomials
- Integer exponents
- Rational expressions
- Solution of linear equations

**Intermediate Algebra**

The Intermediate Algebra Test is designed to assess skills commonly acquired in a second high school algebra course. The content areas tested include:

- Solutions of polynomial equations by factoring
- Graphs of linear equations
- Operations with radical and rational expressions
- The distance formula
- Slope of a line
- Solution of linear inequalities
- Simplification of radicals

**College Algebra**

The College Algebra Test is designed to assess skills commonly acquired in a pre-calculus course. The content areas tested include:

- Exponential functions
- Factorials
- Operations with complex numbers
- Composition of functions
- Inverses of functions
- Linear inequalities
- Graphs of polynomials

**Geometry**

The Geometry Test is designed to assess skills commonly acquired in a high school geometry course. The content areas tested include: triangles, circles, lines, and other geometric figures.

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WRITING

“The Writing Skills Test” is the only ASSET test which evaluates writing.87 The ASSET Writing Skills Test is a 36-item, 25-minute test that measures the student's understanding of the conventions of standard written English in punctuation, grammar, sentence structure, strategy, organization, and style. Spelling, vocabulary, and rote recall of rules of grammar are not tested.88

The test consists of three prose passages, each accompanied by a sequence of 12 multiple-choice test items. To provide a variety of rhetorical situations, a range of passage types is employed. Items that measure usage and mechanics offer alternative responses, including "NO CHANGE," to underlined portions of the text. The student must decide which alternative employs the conventional practice in usage and mechanics that conforms to the sense of the context. Items that measure rhetorical skills may refer to an underlined portion of the text or may ask about a section of the passage or the passage as a whole. The student must decide which alternative response is most appropriate in a given rhetorical situation.

The elements of the Writing Skills Test and the approximate proportions of the test devoted to each are given below.

- **Punctuation.** Tests such conventions as the use and placement of commas, colons, semicolons, dashes, parentheses, apostrophes, question marks, and exclamation points.
- **Grammar.** Tests adjectives and adverbs, conjunctions, and agreement between subject and verb and between pronouns and their antecedents.
- **Sentence Structure.** Tests relationships between/among clauses, placement of modifiers, and shifts in construction.
- **Organization.** Tests the organization of ideas and the relevance of statements in context (order, coherence, unity).
- **Strategy.** Tests the appropriateness of expression in relation to audience and purpose, the strengthening of writing with appropriate supporting material, and the effective choice of statements of theme and purpose.
- **Style.** Tests precision and appropriateness in the choice of words and images, rhetorically effective management of sentence elements, avoidance of ambiguous pronoun references, and economy in writing.

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COMPASS

The COMPASS college placement test is “a computerized exam that “quickly evaluates[s] incoming students’ skill levels in Reading, Writing Skills, Writing Essay, Math, and English as a Second Language.”” The COMPASS website provides packets available for download with sample exam questions in “Numerical Skills/Pre-Algebra and Algebra” and “College Algebra, Geometry, and Trigonometry,” along with “Writing Skills.”

MATHEMATICS

The COMPASS Math Placement Test “is a multiple-choice test that evaluates students’ ability levels in terms of basic skills such as performing a sequence of basic operations, application skills such as applying sequences of basic operations to novel settings or in complex ways, and analysis skills such as demonstrating conceptual understanding of principles and relationships for mathematical operations.” The Math Placement Test offers up to five subject areas, including pre-algebra, algebra, college algebra, geometry, and trigonometry. The COMPASS Math Diagnostics Test evaluates students’ skills in areas within Pre-Algebra and Algebra. The subjects covered include:

Pre-Algebra
- Integers
- Decimals
- Exponents, square roots, and scientific notation
- Fractions
- Percentages
- Averages (means, medians, and modes)

Algebra
- Substituting values
- Setting up equations
- Factoring polynomials
- Exponents and radicals
- Basic operations/polynomials
- Linear equations/one variable
- Linear equations/two variables
- Rational expressions

89 “COMPASS.” COMPASS. http://www.act.org/compass/
92 Ibid.
93 Ibid.
WRITING

The COMPASS Writing Skills tests evaluates students’ skill levels in eight content domains:94

- Punctuation
- Spelling
- Capitalization
- Usage
- Verb formation/agreement
- Relationships of clauses
- Shifts in construction
- Organization

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