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Ready for College and Career?

Achieving the Common Core Standards and Beyond through Deeper, Student-Centered Learning

Karin Hess, Senior Associate
Brian Gong, Executive Director
National Center for the Improvement of Educational Assessment
with Katie Bayerl

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INTRODUCTION

College and career readiness is the fundamental underpinning of the *Common Core State Standards* (CCSS). Along with the *Next Generation Science Standards*, the CCSS – which have been adopted by 45 states, the District of Columbia, four territories, and the Department of Defense Education Activity – were explicitly designed to ensure college and career readiness for all students. Key weaknesses in the states-based standards movement were a major impetus for this effort: research showed that proficiency standards varied widely across states, while there was little evidence that the standards themselves fostered – or even were designed to foster –post-secondary success, which is considered necessary for individuals and the country to compete economically. College and career readiness has become the anchor concept for resolving these uncertainties about student achievement, and the CCSS are widely touted as that resolution.

There is widespread agreement that focusing on college and career readiness means shifting from helping high school students become eligible for college (by taking the right courses, amassing credits towards graduation, and scoring well on the SAT) to getting them ready for college. Many questions remain, however, about what this really means. How, for instance, can we identify the critical skills and dispositions needed for deeper learning? And then how can we target and support their development? Once we know what students need, how can we help school systems and organizations assess the effectiveness of their efforts to prepare students for college and careers?

To move toward answering such questions, this paper takes the CCSS as a starting point, rather than a result. In other words, we see the CCSS as a first step toward addressing the challenge of ensuring that America's youth are ready for college and careers, rather than the solution to that challenge. Taking it as a given that the CCSS are designed to ensure that all U.S. students reach the same academic milestones, we explore the skills and dispositions that will actually enable them to succeed, along with the teaching and learning approaches that will support the development of those skills and dispositions.

We posit that truly preparing students for college and careers will call for multiple pathways, new approaches, and a broader set of skills and dispositions than the standards articulated in the Common Core. Without additional individual and systemic supports, those academic content standards cannot ensure that all students will graduate from high school ready for college and careers. As Conley and McGaughy (2012) state, "As convenient as it would be to declare that college readiness and career readiness are one and the same, evidence suggests that it's more complicated than that" (p. 33). One key question, then, is: what skills and dispositions, beyond the learning indicators described in the CCSS, have proven to be strong indicators of future college or career success?

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A second question we explore relates to the fact that traditional school designs for curriculum, assessment, and instruction do not necessarily support these cross-cutting skills and dispositions. Sturgis (2013) summarizes the issue: "We know that dispositions such as perseverance and problem-solving skills are equally if not more important to our success in life as academic content knowledge. However, our current systems emphasize academics over other aspects of development. As we begin to separate students' progress on academic learning progressions from the skills and dispositions, we are going to find ourselves face to face with the problem that our schools are not designed to help students build those skills and dispositions." In light of this emerging reality, we look specifically to student-centered learning approaches, asking how they can support students in both meeting the expectations of the CCSS and developing these additional skills and dispositions.

This paper has three parts. Part I, "From Proficiency to College and Career Readiness," provides an overview of the troubling data that lead to the current focus on college and career readiness, outlines the new academic standards designed to make students college and career ready, and points to the limitations of a purely academic approach to this task. In Part II, "A Broader Framework for College and Career Readiness," we review the existing research on the skills and dispositions that, along with academic learning, enable college and career success, and we identify three highly-effective cross-cutting college and career readiness skill sets that can be taught in connection with academic content. Part III, "Student-Centered Learning as a Path to College and Career Readiness," suggests that student-centered learning provides a powerful vehicle for implementing these skill sets and offers three propositions for curriculum and school redesign that we believe can support both deeper learning and college and career readiness.

I: FROM PROFICIENCY TO COLLEGE AND CAREER READINESS

The Need for Common Standards

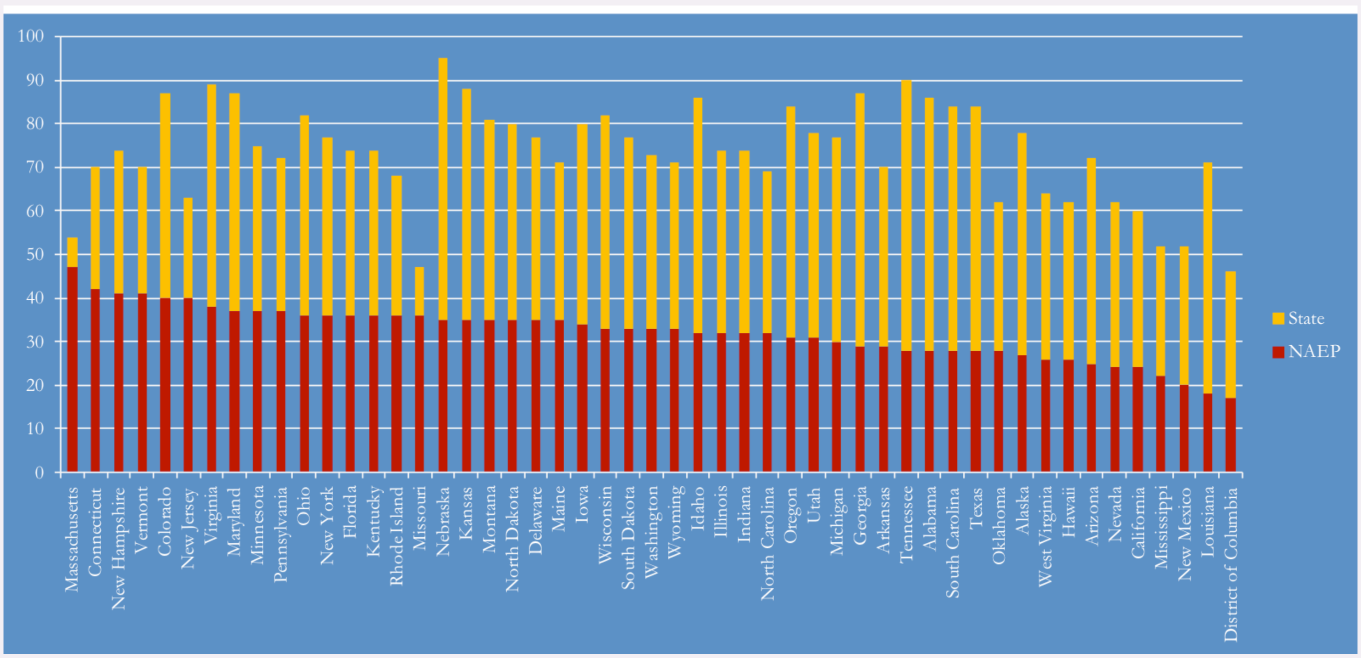
The recent history of education in the United States helps us to understand how and why the Common Core State Standards were created and adopted so widely and rapidly.

Since the late 1980s, the prevailing educational paradigm in the United States has been standards-based education. This movement sought to remedy problems evident in earlier educational practices that defined educational attainment not in terms of what students learned, but according to how they performed relative to others on norm-referenced tests.

In this context, what students should learn was rarely defined, and the definitions that were proffered tended toward small facts and routine skills, such as those commonly assessed on standardized multiple-choice tests provided by textbook publishers and the like (see, for example, Hamilton, Stecher, & Yuan, 2009). The remedy offered by standards-based education rested on two central tenets: 1) virtually all students can learn at high levels; and 2) content standards that articulate what students should know and be able to do, along with performance standards that define how well students will demonstrate their knowledge, are the best mechanisms for helping students attain high levels of learning.

But after three decades of standards-based education, there was widespread dissatisfaction with American standards and their results. One source of this dissatisfaction was the lack of consistency among state definitions of proficiency, as well as between state definitions and other proficiency indicators. As shown in Figure 1, there were large differences between state proficiency rates and proficiency rates on the National Assessment of Educational Progress (NAEP) (in this discussion, "proficiency rates" is defined as the percentage of students scoring proficient or above). Even more striking were the differences in state proficiency rates between states with similar levels of achievement on NAEP. For example, of two states with proficiency rates of 37 percent on NAEP, one had a 68 percent proficiency rate on its state assessment while the other's was 47 percent. Conversely, two states with 71 percent proficiency rates on their state assessments had, respectively, 32 percent and 18 percent proficiency rates on NAEP. These widely publicized discrepancies spurred states and educational policy makers to seek more consistent and rigorous definitions of proficiency.

Figure 1: Proficiency rates on state assessments and NAEP (proficient and above), Reading, Grade 4, 2009

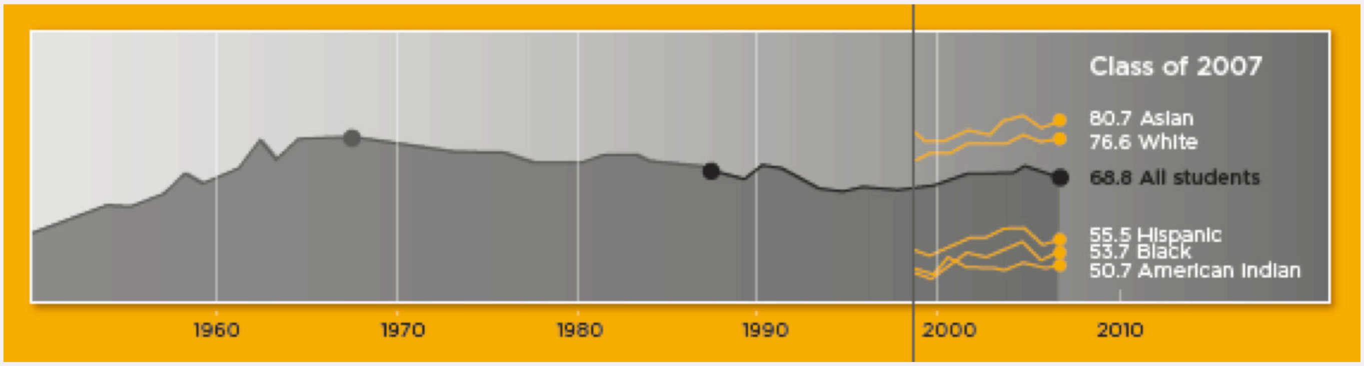


Data Source: *The Nation's Report Card, Reading 2009* (NCES, 2010)

At the same time as educational policy makers were reconsidering state definitions of proficiency, revised methods of calculating drop-out and graduation rates revealed that fewer students were making it through the high school pipeline to completion than had been reported (see, for example, Murnane, 2011). In addition, disaggregation of results by racial/ethnic subgroups revealed stark achievement gaps among students in schools.

A new graduation rate formula that assessed how many students in each ninth grade cohort graduated within four years revealed that the U.S. had an average high school graduation rate of less than 80 percent, rather than the 95 percent rate that had been assumed on the basis of states reporting one to five percent of students dropping out each year (see Figure 2; for more information, see Stillwell & Sable, 2013). White students graduated at a rate almost 50 percent higher than Hispanic or Black students (77 percent compared with 56 percent and 54 percent respectively).

Figure 2: U.S. High School Graduation Rates: 1955-2007



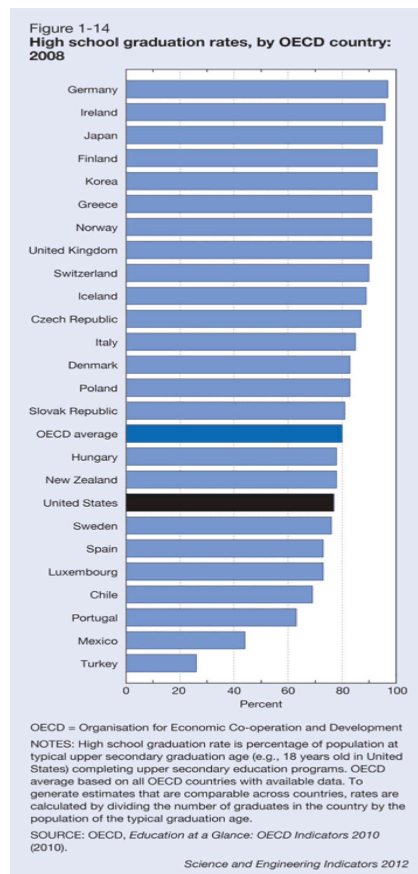
Source: Blackboard Institute, (no date).

Moreover, depending on the data used, the U.S. high school graduation rate had declined, or at best stagnated, between 1968 and 2007. Meanwhile, as other countries increased their graduation rates, the U.S. slipped from having one of the highest high school graduation rates in the world to lower than the international average. In 2008, for example, the U.S. graduation rate ranked in the bottom third of nations in the Organization for Economic Cooperation and Development (OECD) (see Figure 3, OECD, 2012).

Finally, new data emerged about college enrollment and performance. Several studies showed that, nationwide, a minority of students who started high school enrolled in college, and only about 65 percent of high school graduates enrolled in college the fall after they graduated (NCHEMS, 2013). Among high school graduates who did enroll in college, a startling proportion were deemed not ready to enroll in credit-bearing college courses: 20-40 percent of entering students in public four-year institutions and 30-60 percent of entering community college students had to enroll in remedial courses (Attewell et al., 2006). The impact of these high remediation rates on continued enrollment and eventual graduation from college is significant and raises concerns for many states and institutions (Collins, 2009; Glenn & Wagner, 2006; for a fascinating look at ethnic subgroup differences by college campus, see also the California State University remediation data at http://www.asd.calstate.edu/remediation/12/index.shtml).

Overall, the preparation of U.S. high school students for post-secondary endeavors was deemed disappointing in terms of: **quality**, as indicated by graduation and college remediation rates; **equity**, with regard to subgroup gaps; and **relative performance**, as seen in international comparisons. This analysis prompted policy makers to shift their attention from state-defined notions of proficiency to more empirically-defined conceptions of college and career readiness, which in turn led to the creation of the Common Core State Standards.

Figure 3: U.S. High School Graduation Rate, compared with OECD countries, 2008



Source: OECD, (2012)

The Common Core as an Important but Not Sufficient Step

The Common Core State Standards were developed to explicitly address these issues with proficiency, achievement, and post-secondary performance. Specifically, the CCSS define the knowledge and skills students need for college and careers, while also providing a common definition of readiness for the states that adopt them. The CCSS assessments currently being designed are supposed to establish definitions of readiness that are empirically based on college requirements, among other data points.

The CCSS explicitly address academic knowledge and skills in two content areas: English Language Arts/Literacy and Mathematics. The ELA standards include Reading, Writing, Speaking and Listening, and Language standards for grades K-12, while the accompanying literacy standards have nearly identical Reading and Writing standards for History/Social Studies, Science, and Technical Subjects.

In Mathematics, there are also two sets of Common Core standards, but they address different aspects of math, rather than different content areas. The first set of standards are Content Standards that describe what students need to know in domains ranging from *Counting & Cardinality* and *Operations & Algebraic Thinking,* to *Geometry, Expressions & Equations,* and *Statistics & Probability*. The second set is the Standards for Mathematical Practice. These eight cross-cutting standards apply to every grade and content domain, and cover such practices as problem solving and perseverance, reasoning, modeling, using math tools, and attending to precision.

Although they are not explicitly part of the CCSS, states have articulated key instructional shifts for implementing the ELA/Literacy and Mathematics standards that further articulate their scope and expectations. While different states have their own iterations of the shifts, New York's are representative (New York State Education Department, 2011):

Shifts in ELA/Literacy

Shift 1	**Balancing Informational & Literary Text**	Students read a true balance of informational and literary texts.
Shift 2	**Knowledge in the Disciplines**	Students build knowledge about the world (domains/content areas) through TEXT rather than the teacher or activities.
Shift 3	**Staircase of Complexity**	Students read the central, grade appropriate text around which instruction is centered. Teachers are patient, create more time and space and support in the curriculum for close reading.
Shift 4	**Text-based Answers**	Students engage in rich and rigorous evidence based conversations about text.
Shift 5	**Writing from Sources**	Writing emphasizes use of evidence from sources to inform or make an argument.
Shift 6	**Academic Vocabulary**	Students constantly build the transferable vocabulary they need to access grade level complex texts.

Shifts in Mathematics

Shift 1	**Focus**	Teachers significantly narrow and deepen the scope of how time and energy is spent in the math classroom. They do so in order to focus deeply on only the concepts that are prioritized in the standards.
Shift 2	**Coherence**	Principals and teachers carefully connect the learning within and across grades so that students can build new understanding onto foundations built in previous years.
Shift 3	**Fluency**	Students are expected to have speed and accuracy with simple calculations; teachers structure class time and/or homework time for students to memorize, through repetition, core functions.
Shift 4	**Deep Understanding**	Students deeply understand and can operate easily within a math concept before moving on. They learn more than the trick to get the answer right. They learn the math.
Shift 5	**Application**	Students are expected to use math and choose the appropriate concept for application even when they are not prompted to do so.
Shift 6	**Dual Intensity**	Students are practicing and understanding. There is more than a balance between these two things in the classroom – both are occurring with intensity.

Although the Next Generation Science Standards (NGSS) are not technically part of the Common Core, they align with the CCSS as an effort to prepare students for college and career. The NGSS cover Disciplinary Core Ideas in four areas: Physical Sciences, Life Sciences, Earth and Space Sciences, and Engineering, Technology, and Applications of Science. Specific topics range from *Pushes and Pulls, Animals, Plants, and their Environment,* and *Weather and Climate* in kindergarten, to *Waves and Electromagnetic Radiation and Inheritance and Variation of Traits* in high school. The conceptual shifts embodied in the NGSS, which somewhat resemble the CCSS instructional shifts, are described below. These conceptual shifts are attached to the NGSS standards themselves, rather than state interpretive materials:

1. K-12 science education should reflect the interconnected nature of science as it is practiced and experienced in the real world.
2. The Next Generation Science Standards are student performance expectations – NOT curriculum.
3. The science concepts in the NGSS build coherently from K-12.
4. The NGSS focus on deeper understanding of content as well as application of content.
5. Science and engineering are integrated in the NGSS, from K-12.
6. The NGSS are designed to prepare students for college, career, and citizenship.
7. The NGSS and Common Core State Standards (English Language Arts and Mathematics) are aligned (Achieve, Inc., 2013).

The CCSS instructional shifts and the NGSS conceptual shifts largely cover how curriculum will be organized and the roles of students and teachers in the learning process, but, to varying degrees, they do suggest that there are important learning skills and dispositions that intersect with academic content. However, the standards themselves provide educators with little guidance for integrating these skills with content, making it less likely that such integration will occur consistently or be part of curriculum and instruction. We also know, from past experience, that what gets tested is what gets instructional attention. If CCSS and NGSS assessments only test academic skills and concepts, schools will have little incentive to focus on the skills that lead to deeper understanding and the ability to transfer learning to new contexts, that is, the skills that the next section suggests are crucial for success in college and careers.

In 2011, the Educational Policy Improvement Center surveyed 1900 postsecondary faculty members across a broad range of disciplines, asking them to evaluate whether the CCSS standards would ensure that students acquired the skills and concepts essential to their college courses (Conley, Drummond, de Gonzalez, Rooseboom, & Stout, 2011). While respondents overwhelmingly agreed that the standards as a whole are sufficiently challenging to prepare students academically, the study identified several instructive caveats (p. 99), which suggest that college and career readiness is a multidimensional construct, with academic content knowledge representing only one of several key dimensions.

Although the CCSS identify some key sectors of that content knowledge and, when taken together with the instructional shifts, some valuable cognitive strategies, caution should be exercised when describing them as a complete set of specifications for college and career readiness. They do not address other dimensions that are critical to achieving this goal, dimensions that are unlikely to be assessed by the CCSS common assessments currently under development by the Partnership for the Assessment of Readiness for College and Careers and the Smarter Balanced Assessment Consortium.

Standards are neither a program nor a curriculum; they are not an assessment nor are they a guide to how students will (or could) learn academic content. Rather, standards articulate the intended learning endpoints associated with the knowledge and skills that will be assessed in end-of-year, summative assessments. The CCSS and NGSS instructional shifts should help guide instruction and curriculum development based on the standards. However, simply teaching the standards and attempting to address the shifts will not be enough, because this approach still focuses on what students will learn, rather than how to support student learning.

In short, true college and career readiness will require more than the CCSS offers. In the next section, we examine what that means.

II. A BROADER FRAMEWORK FOR COLLEGE AND CAREER READINESS

Although the CCSS address valuable academic content knowledge and skills for ELA/Literacy and Mathematics, they do not ensure that students will be able to make decisions, interact with others, or be successful in contexts such as college or work (Conley, 2007). Although there has been much study and discussion of such cross-cutting knowledge, skills, and aptitudes, the CCSS authors and sponsoring organizations purposefully did not include them. Since the CCSS have yet to be fully implemented, there is no definitive answer as to whether its purely academic focus will be sufficient to prepare students for college and careers.

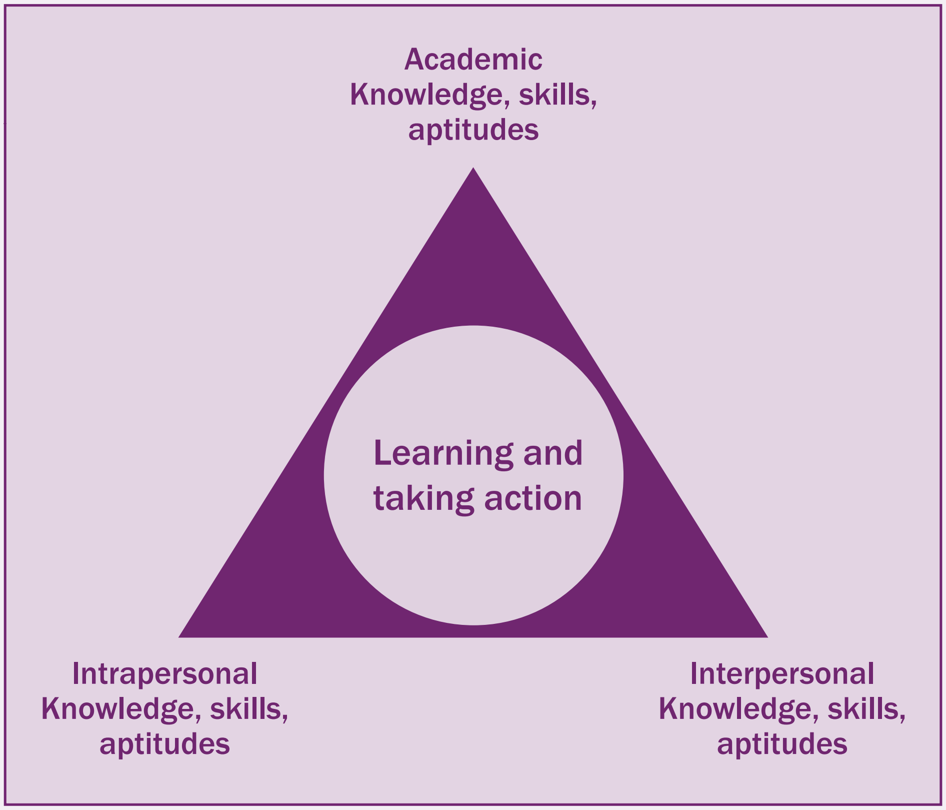
It has already been shown, however, that purported tests of developed academic knowledge and ability, such as the SAT and ACT, bear little relation to college success. Numerous studies have indicated that the relationship between SAT/ACT scores and first-semester grades in related college courses is at best weak to moderate (Coyle, & Pillow, 2008; Zwick & Skalr, 2005), suggesting that much of the variance in college grades is attributable to factors other than those measured by the SAT/ACT. In addition, the predictive strength of SAT/ACT scores decreases over time, suggesting that factors such as academic self-efficacy, grade goal, effort regulation, and performance orientation may be more predictive of students persisting in college (Richardson, Abraham, & Bond, 2012). If these data suggest that academic standards and performance are insufficient for fully defining college and career readiness, there is a significant body of evidence that speaks to the role of cross-cutting skills and dispositions in effectively preparing students for college and careers.

Success is More than Academic

The emerging consensus on a general framework for college and career readiness includes three broad types of knowledge, skills, and aptitudes (see Figure 4). Researcher David Conley, the National Research Council (NRC), The Partnership for 21st Century Skills, and others have developed various compilations of these competencies, but on the whole, the three types include:

1. academic knowledge, skills, and aptitudes
2. intrapersonal knowledge, skills, and aptitudes
3. interpersonal knowledge, skills, and aptitudes

Figure 4: Types of knowledge/skills/aptitudes



One iteration of this triad was developed out of an extensive review of CCR skills conducted by the authors of *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century* (NRC, 2012a). They began by analyzing different lists of 21st-century skills alongside research-based taxonomies of cognitive, intrapersonal, and interpersonal skills and abilities. They then developed a classification scheme that groups these skills and dispositions into clusters of competencies within each of three domains:

- The Cognitive Domain includes three clusters of competencies: cognitive processes and strategies, knowledge, and creativity. These clusters include competencies such as critical thinking, information literacy, reasoning and argumentation, and innovation.
- The Intrapersonal Domain includes three clusters of competencies: intellectual openness, work ethic and conscientiousness, and positive core self-evaluation. These clusters include competencies such as flexibility, initiative, appreciation for diversity, and metacognition.
- The Interpersonal Domain includes two clusters of competencies: teamwork and collaboration, and leadership. These clusters include competencies such as communication, collaboration, responsibility, and conflict resolution.

Conley's Framework (2007) suggests that intrapersonal and interpersonal knowledge, skills, and aptitudes can occur at a variety of levels. What he calls foundational dispositions are rarely intentionally taught and may or may not be nurtured; these include self-efficacy, adaptability, personal and social responsibility, initiative, and self-control. More general cognitive strategies and abilities – such as critical thinking, problem solving, collaboration, self-awareness, study skills, and time and goal management – are learned. Disciplinary knowledge can develop over time, while context- and knowledge-specific skills are usually taught and learned. Figure 5 (below) illustrates the relationships among the three NRC domains, Conley's levels, and the CCSS.

Figure 5: Combined types of knowledge/skills/dispositions and levels

Knowledge & Skills Addressed in the Common Core State Standards (adapted from the work of David Conley)				
		Domains of College and Career Readiness		
		Cognitive	Intrapersonal	Interpersonal
Conley's College Readiness Framework	Context-specific knowledge and skills	Identified, but not well specified in CCSS *Examples: applying math skills to job situations; innovation; information literacy*	Not specified in CCSS *Examples: work ethic, conscientiousness, initiative*	Not specified in CCSS *Examples: teamwork, collaboration, leadership*
	Acquired disciplinary knowledge and skills	Well-developed in CCSS math and English language arts/literacy *Examples: using evidence to support text analysis, solving a multi-variable problem*	Not specified in CCSS *Examples: intellectual openness, flexibility*	Not specified in CCSS *Example: group problem solving*
	Learned cognitive skills	Some but not all content identified or developed in CCSS *Examples: critical thinking, reasoning, argumentation*	Only one skill area (metacognition) mentioned in CCSS *Examples: self-awareness, time and goal management*	Some communication and technology skills identified in CCSS *Example: collaboration*
	Foundational dispositions	Not specified in CCSS	Not specified in CCSS *Examples: self-efficacy, adaptability, personal responsibility, initiative, and self-control*	Not specified in CCSS *Example: social responsibility*

Differentiating these types of knowledge, skills, and dispositions can help us better understand what they are and how they might be connected both to each other and to college and career readiness. Meaningfully integrating them into classroom practice is a much bigger project, but that project has significant potential for yielding a better guide (than academic standards alone) to designing curriculum and delivering instruction and assessment that will make students ready for college and careers.

Toward an Integrated Model of College and Career Readiness

Preparing students for 21st-century college and careers requires a new conceptual framework for K-12 curriculum, instruction, and assessment that intentionally weaves together academic and cross-cutting skills and dispositions, in order to provide a more comprehensive understanding of college and career readiness and a clearer direction for supporting all students to attain it. In other words, we seek to balance academic and cross-cutting content and skills with the needs and strengths of learners. Ultimately, this will call for new ways of teaching and new approaches to monitoring progress, including the use of student-centered assessments (Andrade, Huff, & Brooke, 2012). Combining new assessments aligned to standards and designed to promote growth with new approaches to curriculum design has the potential to produce – and provide comprehensive information about – deeper learning and true career and college readiness for all students.

The framework proffered here is built on a close examination of the recent research on deeper learning, student engagement, and academic success, and, by necessity, redefines the roles of 21st-century teachers and students. A discussion of the research-based connections among academic and cross-cutting content and skills will contextualize the framework, which is embodied in three cross-cutting college and career readiness skill sets.

For more than two decades, researchers have attempted to identify and define the characteristics of learners who are successful in school and prepared for success after high school. Costa and Kallick (2000, 2008) laid early groundwork for this discussion by defining habits of mind in terms of a disposition toward behaving intelligently when confronted with problems to which the answers are not immediately evident. In doing so, they identified 16 patterns of intellectual behavior, including many that have regularly recurred in subsequent research, standards, and discussions of college and career readiness; these include, among others, persisting, questioning, striving for accuracy, using precise language and thinking, applying the past to new situations, creating, and metacognition.

In 2011, the Partnership for 21st Century Skills argued that ensuring student success in college and careers requires the integration of four essential skills into the core academic subjects: critical thinking and problem solving, communication, collaboration, and creativity and innovation (p. 2). A research report by Casner-Lotto and Barrington (2006) ranked six key skills that employers identify as crucial to success in the workplace: critical thinking and problem solving was identified as the most important, while the other five were information technology application, teamwork and collaboration, creativity and innovation, diversity, and leadership.

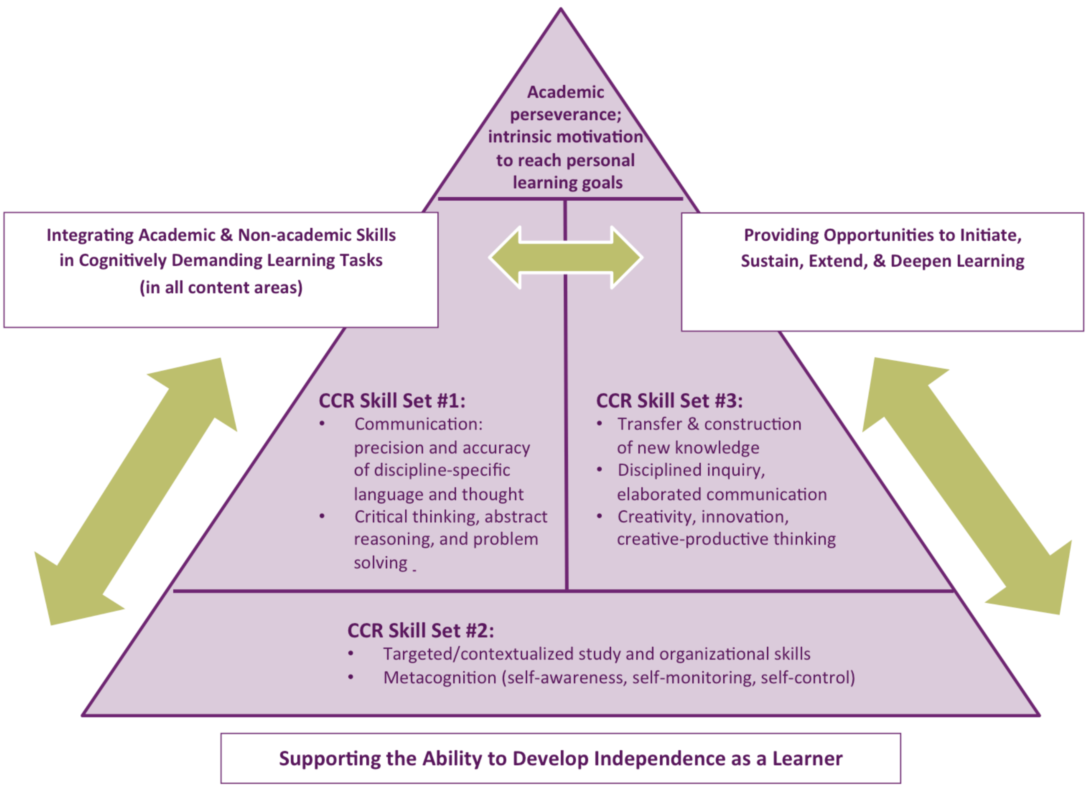
In the more recent literature, terms such as soft skills (Adams, 2012), developmental college and career readiness skills (Savitz-Romer & Bouffard, 2012), cognitive strategies and academic behaviors (Conley, 2007), non-cognitive factors (Farrington, Roderick, Allensworth, Nagaoka, Keyes, Johnson, & Beechum, 2012), and non-academic skills (Sparks, 2010) have emerged through the attempt to expand our understanding of college and career readiness beyond academic standards. While it is not the intent of this paper to articulate the scope of each of these models, we can nevertheless identify a convergence between earlier thinking about habits of mind and these various iterations of what we might term 21st-century or cross-cutting (rather than content-specific) skills and dispositions.

One could make the case that almost any combination of the skills described in this literature could prepare students for postsecondary success. But long lists of disconnected skills offer little guidance to educators, so we have synthesized the existing research into three evidence-based high-utility college and career readiness skill sets that support both the core academic knowledge described in the CCSS and a broader vision of what it takes to be ready for college and careers. Our criteria for prioritizing skills included:

- Cognitive skills and thinking processes that can be integrated with academic instruction and assessed
- Intrapersonal skills and dispositions that correlate with success in college and careers
- Context-specific cognitive skills that support deeper understanding, creative-productive thinking, and deep disciplinary knowledge.

The resulting three skill sets encompass: **Tackling Cognitively Demanding Learning Tasks; Developing Independence as a Learner; and Initiating, Sustaining, Extending, and Deepening Learning.** They target a short, research-based list of essential cross-cutting skills, including thinking behaviors, that form a strong foundation for developing the other cognitive, intrapersonal, and interpersonal skills and competencies needed for success in college or careers (see Figure 6). They are meant to be integrated with academic content (rather than taught in isolation), in contexts that add relevance and rigor to that content.

Figure 6: Cross-Cutting College and Career Readiness Skills and Thinking Behaviors



Developing these skill sets will help students become successful self-directed, autonomous learners across content areas. In other words, as we will suggest in the final section of this paper, they serve as indicators of student-centeredness, providing a rationale both for the educational program shifts we recommend and for redefining the roles of 21st-century students and teachers.

Cross-Cutting Skill Set #1: Tackling Cognitively Demanding Learning Tasks

The first set of cross-cutting college and career readiness skills focuses on the key cognitive processes of **precision of thought, critical thinking**, and application of **abstract reasoning**, that allow students to **solve new or non-routine problems** in specific content domains. These essential skills appear on most longer 21st century skill and competency lists (NRC, 2012a) and are often discussed in reference to supporting dispositions, such as the ability to determine significance, identify a point of view, or strive for accuracy and precision in communication (Costa & Kallick, 2014). While these terms are familiar to most readers, it's worth expanding upon them for our purposes, because we often find that there are also many misconceptions about teaching and assessing them. Various definitions of critical thinking are discussed by Stobaugh (2013) including descriptions such as being "analytical and deliberate…involving original thinking … (and) deeply processing knowledge to identify connections across disciplines in order to find potential creative solutions to problems" (p. 2).

The key understanding we want to stress about this first skill set is that these skills must interact within the context of a specific content domain and engaging tasks. Teaching or assessing them in isolation or applying them within simplistic contexts (e.g., math word problems versus math problem solving) falls short of the goals of deeper learning and college and career readiness. Use of rich performance tasks are one excellent means of integrating these key cognitive processes in meaningful, student-centered ways. When integrated with specific academic content, these cross-cutting skills yield more challenging – and ideally more engaging – learning activities for students (Paige, Sizemore, & Neace, 2013).

Evidence suggests that when **precision of thought, critical thinking**, application of **abstract reasoning**, and **solving new or non-routine problems** is sustained instructionally, both in daily content lessons and across the K-12 curriculum, students begin to build expertise in the discipline-specific knowledge and dispositions they will need in college and future careers: reasoning like a mathematician; investigating like a scientist; reading like an historian, technician, or literary critic. When curriculum developers and educators systematically base classroom discourse, instruction, and assessment tasks on these skills, they take a critical first step to preparing students for the challenges of post-secondary learning. McTighe, (2014, page 231) captures this CCR mindset in this way:

> Planning our teaching 'backward' from desired performances on rich, authentic tasks helps teachers focus on what matters most. With this performance orientation, teachers are less likely to simply march through lists of content objectives or pages in a textbook. Remember that what we assess sends a strong signal to students about what is important for them to learn. When authentic performance tasks play a key role in teaching and assessing, students will know that we expect them to apply their knowledge in ways valued in the world beyond the classroom.

Cross-Cutting Skill Set #2: Developing Independence as a Learner

The second set of college and career readiness skills and dispositions includes key intrapersonal skills that, according to the research, facilitate the achievement of short- and long-term goals, in the classroom and beyond. **Study and organizational skills** help students manage time and sustain the effort needed to learn complex content. These skills can easily be embedded in curricular projects and extended performance tasks.

Metacognitive skills are more abstract than organizational skills, but equally important. Students with a grasp of **metacognition** can reflect on their own learning, develop identities as learners, and frame their own learning and career goals. Because traditional curriculums do not typically include metacognitive activities, many students do not learn how to capitalize on their learning or develop self-efficacy (Savitz-Romer & Bouffard, 2012). Educators can develop metacognitive skills through carefully-planned activities such as reflective writing, learning portfolios, and conferencing with adults, peers, and outside mentors.

The most abstract intrapersonal disposition in this skill set is **academic perseverance**. Although some researchers caution that more research is needed to determine the causal relationship between perseverance and performance (Farrington, et al. 2012), several studies of motivation and perseverance suggest that grit, defined by researchers as perseverance and passion for long-term goals, may be a better predictor of college and career success than either IQ or test scores (Duckworth, Peterson, Matthews, & Kelly, 2007). People with grit work strenuously towards challenges, maintaining effort and interest over time, whatever the adversities they face. Because vague extrinsic goals, such as getting a college degree or high-paying job,

"While some students are more likely to persist in tasks or exhibit self-discipline than others, all students are more likely to demonstrate perseverance if the school or classroom context helps them develop positive mindsets and effective learning strategies. In other words, the mechanisms through which teachers can lead students to exhibit greater perseverance and better academic behaviors in their classes are through attention to academic mindsets and development of students' metacognitive and self-regulatory skills, rather than trying to change their innate tendency to persevere. This appears to be particularly true as adolescents move from the middle grades to high school, and it again becomes important in the transition to college."

can rarely sustain learners in the long run, perseverance depends on **intrinsic motivation**, which gives individuals the stamina to reach personal long-term goals (Duckworth, et al.).

Self-efficacy, academic perseverance, and intrinsic motivation cannot be taught, but they can be developed and nurtured through concrete strategies that emphasize the real-world relevance of academic content, provide effort-oriented feedback, and encourage students to develop meaningful, personal rationales for their long-term goals. Farrington, et al. (2012) confirmed the value of such strategies:

> While some students are more likely to persist in tasks or exhibit self-discipline than others, all students are more likely to demonstrate perseverance if the school or classroom context helps them develop positive mindsets and effective learning strategies. In other words, the mechanisms through which teachers can lead students to exhibit greater perseverance and better academic behaviors in their classes are through attention to academic mindsets and development of students' metacognitive and self-regulatory skills, rather than trying to change their innate tendency to persevere. This appears to be particularly true as adolescents move from the middle grades to high school, and it again becomes important in the transition to college. (p. 7)

Cross-Cutting Skill Set #3: Initiating, Sustaining, Extending, and Deepening Learning

The third college and career readiness skill set prepares students for deep learning, which is defined by the NRC (2012a) as "the process by which an individual becomes capable of taking what was learned in one situation and applying it to new situations" (pp. 5-6). This skill set develops when teachers and curriculums routinely expect students to extend prior content learning, think flexibly, and apply the key cognitive skills of Skill Set #1 to initiate and solve authentic, complex problems requiring **transfer *and* construction of new knowledge**.

Newmann, King, and Carmichael (2007) called this kind of learning "authentic intellectual work," which they described as complex intellectual work that is socially or personally meaningful. Its key components include construction of knowledge, use of disciplined inquiry, and products that have value beyond school. As opposed to routine use of procedures or recall of facts, construction of knowledge involves the original application of knowledge via skills like interpreting, evaluating, and synthesizing. Through **disciplined inquiry**, students produce deeper understanding by building upon prior knowledge to investigate novel problems and complex ideas. In workplaces and schools, authentic intellectual work relies on sophisticated forms of **elaborated communication** for both conducting the work and presenting its results. Elaborated communication extends CCSS skills and Skill Set #1, making complex use of verbal, symbolic, and visual information to clarify, elaborate on, and defend claims and information.

Creative-productive thinking is another key element of this skill set. Perkins (1984) emphasized the relationship between creativity and productivity: "Creative thinking is thinking patterned in a way that leads to creative results.... The ultimate criterion for creativity is output. We call a person creative when that person consistently gets creative results, meaning, roughly speaking, original and otherwise appropriate results by the criteria of the domain in question" (pp. 18-19). Productive thinking often involves a tension between evaluative critical thinking and innovation. Transferable knowledge can help students view a situation or topic from new perspectives, which in turn increases creativity, sparking creative-productive thinking and new ideas and ways of thinking. Creative-productive thinking not only encourages risk taking and flexible thinking behaviors, but expands the ability to construct (rather than just reproduce) knowledge.

Construction of knowledge, disciplined inquiry, creative-productive thinking, and deeper learning are clearly interdependent. For most students, they will not develop by chance, but they can be nurtured. Studies of authentic intellectual work in grades 3-12 found that, across the content areas and regardless of race, gender, or socioeconomic status, students who experienced instruction that promoted these skills demonstrated higher achievement than students who experienced more traditional curricular approaches (Newmann, King, & Carmichael, 2007).

This third skill set goes further than most expectations for college and career readiness, but it articulates essential abilities that, supported by the other two skill sets, will prepare students to succeed in high-level courses, design extended projects, and conduct complex investigations. Successful adults in all walks of life deploy these skills. Developing them in students will require transformative curriculum and instructional approaches that systematically provide opportunities to extend the explicit content articulated in the CCSS.

Interpersonal Skills and Digital Literacy

Although many descriptions of 21st-century skills include interpersonal skills and digital literacy (e.g., NRC, 2012; Partnership for 21st Century Skills, 2011), we have not included them in the three cross-cutting college and career readiness skill sets for several reasons. First, while research suggests that collaboration is essential to workplace success, it is not a proven indicator of success in college courses. Although collaboration and teamwork can be powerful instructional vehicles, and research suggests that these skills support creative and deeper thinking, they are not necessarily essential skills. Rather, they can be valuable elements of K-16 instructional programs, especially as vehicles for redefining the roles of students and teachers (see part III).

In addition, all three skill sets emphasize strong communication skills, which in turn call for collaboration and leadership skills, as well as the development of digital literacy skills. In other words, technology and digital literacy, like collaboration and teamwork, are important vehicles for learning, rather than college and career readiness skills in their own right. (We did not find research that directly links college and career readiness to specific technology skills.)

Finally, and most importantly, the three CCR skill sets are not intended to encompass all possible 21st-century skills. Instead, they are limited to the academic and cross-cutting skills that, according to the research, clearly support college and career readiness, and can be taught, learned and reliably assessed. To effectively target those skills, educators will need to reconsider their instructional approaches, the topic to which we turn in the next section.

Table 1: Interrelated Cross-Cutting College and Career Readiness Skills & Thinking Behaviors with Supporting Student-Centered Learning (SCL) Practices

	Skill Set #1: Ability to Tackle Cognitively Demanding Learning Tasks	Skill Set #2: Ability to Develop Independence as a Learner	Skill Set #3: Ability to Initiate, Sustain, Extend, and Deepen Learning
Value of these skills and dispositions for college and careers	Cognitive skills and processes closely connected to the academic rigor implied in content standards	Critical skills and dispositions for personal development, managing complex tasks, and needed for success in college and careers	Context-specific skills needed for success in high-level courses (extended learning, research, etc.) and in most careers and leadership
A short list of skills and dispositions to teach and assess	Communication: precision and accuracy of discipline-specific language and thought Critical thinking, abstract reasoning, and problem solving	Targeted study and organizational skills Metacognition (self-awareness, self-monitoring, self-control) Academic perseverance and intrinsic motivation to reach personal learning goals	Transfer and construction of new knowledge Disciplined inquiry, elaborated communication Creativity, innovation, creative-productive thinking
SCL learning and assessment practices that can support each skill set	SCL uses a variety of ongoing assessments to monitor learning and tailor instruction to promote learning and self-reflection SCL supplements traditional assessment with performance assessments, which require deeper understanding, and portfolio assessments, which promote growth over time Teachers analyze student work so they can adjust instruction and provide descriptive feedback to students	SCL capitalizes on student strengths and has the flexibility to focus on particular needs SCL addresses the emotion aspects of learning by nurturing positive relationships, teaching emotional regulation skills, and providing shelter from harmful stresses SCL supplements formal assessment with individualized measures (self and peer assessment, individual learning plans) that promote self-regulation, self-monitoring, and development of metacognitive skills	SCL empowers students to plan and engage in active, discovery-based learning experiences that are relevant to their lives and learning goals SCL incorporates a variety of nontraditional learning experiences, such as afterschool enrichment, field work, internships, independent studies, and service learning SCL expands traditional assessment practices to include exhibitions, Capstone projects, graduation portfolios, and other demonstrations of mastery to authentic audiences

III. STUDENT-CENTERED LEARNING AS ONE PATH TO COLLEGE AND CAREER READINESS

Over the last several years, a plethora of documents have described the need for more rigorous academic content standards that will better prepare students for college and careers. A similar plethora provides various descriptions of 21st-century skills that will help prepare contemporary American students for college and careers. However, few of these approaches offer guidance for systemically integrating these standards and skills into the educational programs of the future. We believe that student-centered learning (SCL) has great potential for systemically operationalizing our college and career readiness skill sets, so that educators and schools can successfully prepare students for college and careers (see Table 1).

The skill sets described in Part II not only support the acquisition of rigorous academic content, but also prepare students to become independent thinkers with the skills and perseverance to engage in authentic intellectual work. For these skill sets to achieve their promise, however, educators and school systems must systemically embrace all three, rather than cherry picking or teaching some skills some of the time. When educators and local school communities collectively develop a common understanding of what students need for college and careers, they can work together to support the development of those skills (Farrington, et al., 2012).

Systematic integration of academic content and the three skill sets will require long-term approaches that:

1. overhaul curriculum structure and design;
2. reshape learning environments, learning tasks, and day-to-day instruction; and
3. ultimately shift the roles of students and teachers in the learning process.

Current high school redesign efforts--including expeditionary, project-based, inquiry-based learning, and student-centered approaches--offer models for this work. In areas such as math practices for Latino/a and black adolescents (Gutierrez, & Irving, 2012), literacy practices for African-American male adolescents (Tatum, 2012), and motivation, student voice, and other non-cognitive factors that shape school performance (Barron & Darling-Hammond, 2008; Farrington, et al. 2012; Paige, Sizemore, & Neace, 2013; Toshalis & Nakkula, 2012), these models have demonstrated effectiveness in meeting the educational needs of struggling students. More comprehensive school-wide approaches have been shown to increase student engagement with complex material and reduce drop-out rates (Darling-Hammond, Alexander, & Price, 2002; Mojkowski & Washor, 2013).

We have used this research to identify three propositions that could enable full implementation of rigorous academic content and the college and career readiness skill sets:

> **Proposition 1:** Redesign curriculum and instruction to systematically integrate cross-cutting skills with challenging academic content to promote rigor and deeper learning in each content area.
>
> **Proposition 2:** Restructure the classroom and school day to create authentic learning opportunities that are relevant to college and career expectations, and use a range of assessment formats to measure learning, whenever and wherever it occurs.
>
> **Proposition 3:** Place students at the center of learning and expand the definition of teacher.

These propositions outline a vision of comprehensive support for college and career readiness that goes far beyond teaching the standards. While there are many potential pathways for accomplishing these propositions, we believe that among the most promising are student-centered learning approaches that support deeper learning.

Student-Centered Learning Approaches

At the end of the day, the CCSS and other lists of knowledge, skills, and dispositions describe what students should learn, not why or, most importantly, how they should learn it. Yet every set of learning goals or standards is based on what is valued and what we believe to be true about the nature of learning. Student-centered learning practices explicitly articulate social values and assumptions about the optimal nature of learning and schooling.

SCL is a broad term used to describe approaches to instruction--grounded in mind/brain research, learning theory, and youth development research--that motivate and engage students in deeper learning. SCL attends to a student's developing academic and personal identities through high expectations, a positive learning culture, and strong relationships. The theory and practice of SCL originated with the pioneering work of Piaget, Dewey, and Vygotsky, among others, who stressed that the potential for learning is highest when teaching focuses both on the learner's unique experiences, capacities, abilities, and interests, and on the learning environment (Dewey, 1938; Piaget, 1954; Vygotsky, 1962). These two elements provide the framework for classroom instruction that maximizes student engagement and learning (McCombs & Miller, 2007). Today, extensive research on the attributes of student-centered approaches to learning, much of it involving classroom and school-wide observations (NRC, 2000; Froyd & Simpson, 2008), has identified key SCL practices. These are divided into two major categories: student-centered instruction and student-involved assessment (Clark and Beasley, 2013).

In contrast to more traditional, adult-directed approaches to instruction, SCL adheres to four broad principles:

1. ***Learning is personalized:*** Each student is well known by adults and peers and benefits from individually paced learning tasks, tailored to their needs and interests. Collaboration with others and engaging, authentic, increasingly complex tasks deepen learning.
2. ***Learning is competency-based:*** Students move ahead when they demonstrate competency, and they have multiple means and opportunities to do so. Differentiated supports ensure that all students have what they need to achieve college and career readiness goals.
3. ***Learning takes place anytime, anywhere:*** Students learn outside the typical school day and year in a variety of settings, taking advantage of learning technologies and community resources, and receiving credit for learning, wherever it happens.
4. ***Students exert ownership over learning.*** Students understand that they improve by applying effort strategically. They have frequent opportunities to reflect on and understand their strengths and learning challenges. They take increasing responsibility for learning and assessment, and they support and celebrate each other's progress.

Propositions for College and Career Readiness

Proposition 1: Redesign curriculum and instruction to systematically integrate cross-cutting skills with challenging academic content to promote rigor and deeper learning in each content area.

Current research clearly indicates that cross-cutting skills must be integrated with academic content learning, and that this integration must be discipline-specific. Each content area has its own knowledge base, learning processes, and conventions. Even such universal skills as reasoning or problem solving need to be approached according to content norms:

> Teaching is specific with respect to task, time, place, participants, and content; and different subjects vary in those specifics...Thus learning to write an analytic essay in history is unlike solving algebra word problems, even though both can be considered a form of problem solving (Leinhardt, 2001, p. 334).

Mere exposure to rigorous content does not increase learning. The first stage in curriculum redesign is thus not simply to make academic content more difficult and complex, but rather to ensure that students learn content more deeply before moving on (this may mean teaching less content to facilitate more learning). Reframing the curriculum in this manner means that students develop cross-cutting skills along with content knowledge in each content area, which in turn forms the foundation for deeper, long-term learning. Students also learn that it is essential to think critically and communicate precisely about the specific concepts in each content area (Farrington, et al. 2012).

Deeper learning happens when students must regularly transfer and construct new knowledge through disciplined inquiry. The second phase of curriculum redesign entails systematically embedding increasingly challenging learning tasks at all grade levels. These may take the form of multi-faceted projects or extended performance tasks, but they should force students to think critically and creatively about content and give them time to do so. Useful resources for designing and evaluating such tasks include: Newmann, King, and Carmichael's (2007) framework for authentic intellectual work; various models for examining the demands of cognitive rigor (Hess, Carlock, Jones, & Walkup, 2009; Paige, Sizemore, & Neace, 2013); and research-based learning progressions that outline how individuals develop content expertise over time and how to design tasks that reflect that development (Bechard, Hess, Camacho, Russell, & Thomas, 2012; Corcoran, Mosher, & Rogat, 2009; Daro, Mosher, & Corcoran, 2011; Duschl, Schweingruber, & Shouse, 2007; Hess, 2010; Hess, 2011; Hill, 2001; Masters & Forster, 1996; NRC, 2012b; Wilson & Bertenthal, 2005).

This kind of curriculum redesign dovetails with SCL approaches that foreground authentic complex learning tasks as a means of encouraging student engagement and understanding, collaboration as a key learning strategy, and meaningful proficiency-based assessments as a way to help students progress toward deeper learning. The results should include: engaging classroom discourse; units and lessons based on open-ended explorations of complex and rigorous content; learning environments that encourage inquiry, research, innovation, and risk taking; clearly-defined, reliable assessments; and students capable of independently acquiring deeper understandings and exploring relevant real-world problems.

Proposition 2: Restructure the classroom and school day to create authentic learning opportunities that are relevant to college and career expectations, and use a range of assessment formats to measure learning, whenever and wherever it occurs.

A focus on developing the college and career readiness skill sets will require that all students engage in non-routine, problem-solving investigations and have extended learning opportunities. School systems will need to become more flexible about course design, course scheduling, learning environments, and assessments, so they can effectively promote authentic learning in real-world contexts. Meaningful system wide redesign calls for openness to restructuring classrooms, school days, and learning opportunities, as well as employing new assessment measures to capture both deeper and authentic learning (authentic learning does not necessarily require deeper or more complex thinking).

SLC approaches provide many examples of this kind of systems change, one of the boldest of which is described in *Leaving to Learn (2013)*. Authors Mojkowski and Washor have fundamentally redesigned high schools all over the world. Their Big Picture Schools have flexible schedules in which students learn outside school by participating in weekly internships, travel, community service, and independent projects that are seamlessly integrated with an in-school curriculum. While these schools offer typical high school courses, they also assign academic credit for out-of-school accomplishments. This approach connects education to the real world of life and work, creating highly engaged learners and significantly reducing dropout rates.

Other components of Big Picture Learning include:

- personalized learning plans that build on student interests and offer multiple pathways to graduation
- authentic projects and audiences generated by real-world learning
- performance assessments
- technology-based plans for each student to self-manage
- partnerships between parents and school staff
- integration of 21st-century skills with academic content
- credit for learning “24-7,” including over the summer

These SCL practices have been implemented in schools around the country, which report significantly increased graduation rates and attendance, reduced course failures, and success in providing intrapersonal supports for disengaged learners. Students appear to be learning more, which likely means they are learning more deeply (Barron & Darling-Hammond, 2008; Darling-Hammond, Alexander, & Price, 2002; Donohue, 2012; Vega, 2012).

There is no guarantee, however, that simply extending and personalizing learning in authentic, real-world contexts will ensure deeper understanding of academic content or preparation for college and careers. In other words, the value of SCL comes not just from school structure, but from learning opportunities that integrate and align academic and cross-cutting skills and provide a range of rigorous assessments.

Proposition 3: Place students at the center of learning and expand the definition of teacher.

According to Farrington et al., “Students must become new kinds of learners, not only harnessing a growing body of content knowledge across high school and college courses, but also developing and deploying key academic mindsets and learning strategies” (p. 69). Just as this sentence changes students into agents, so we must address how the roles of teachers and students need to change as we redesign curriculum, instruction, student engagement, and the learning environment to move toward college and career readiness as the endpoint of secondary education. The first step in this shift is to recognize that many students are not successful in school because schools don't meet their needs as learners. While individual students, parents, and teachers need to take responsibility for the learning process, we can also transform the educational system to place students and their needs at its center.

For students to become self-directed learners who practice the many skills associated with long-term success, the traditional roles of teachers and students must change significantly. Students are more likely to develop motivation, perseverance and self-regulatory skills when instruction is responsive to their individual needs and they play a role in determining how they learn and taking responsibility for their progress.

One way to do this is through technology. Although we do not have space here to explore the full potential of technology, including digital literacy and information systems, it is worth noting that technology can play a significant part in changing the roles of teachers and students. Delivering academic content through technology allows students to take charge of accessing and exploring content, as well as communicating about it with peers, teachers, and even experts in the field. Digital tools can also give students diverse and personalized ways to demonstrate their learning.

SCL approaches can further support new roles for teachers and students by fostering interpersonal skills such as leadership and collaboration. Many SCL practices are designed to encourage engagement through student choice and voice (Toshalis & Nakkula, 2012). Students can set their own learning goals. Sometimes they can choose what content they will learn; at other times (or even the same time), they may choose how to learn it. Collaborative learning is an effective means for delving into complex topics that might be too challenging for individuals to address on their own (NRC, 2001). The SCL practice of peer assessment (Andrade, Huff, & Brooke, 2012) also calls on interpersonal skills.

Educational systems that put students at the center of learning still require teachers, but their roles also change. The primary role of the teacher is no longer to deliver appropriate content, but to frame knowledge as something to be constructed, investigated, and disputed. Teachers model open-ended inquiry, evidence-based reasoning, and processes for solving non-routine problems. They also design instruction so that students learn to collaborate and lead peers in shared learning.

School Self-Assessment Questions

As schools move toward implementing student-centered learning approaches to promote deeper learning and foster college and career readiness, their first step will be to assess their current programs. The questions below are designed to support that self-assessment.

Evaluating curriculum and instruction:

- Do our curriculum, instruction, and assessments integrate the academic and cross-cutting knowledge, skills and attributes necessary for college and career readiness, from K-12?
- Do we use mastery-based strategies that allow for pacing based on proficiency as determined by ongoing assessments designed to promote learning and inform instruction?
- Does our assessment system include a range of technically sound assessment approaches that monitor the acquisition of both academic content and cross-cutting college and career readiness skills?
- Do we position K-12 students to develop independence and confidence as learners?
- Do we target community assets to engage learners and deepen learning?
- Do we use time flexibly and provide a variety of supports and learning opportunities outside the school day and year?

Examining the role of teachers:

- Do teachers see content knowledge as information to be transmitted to students, or do they frame knowledge as something to be constructed, investigated, and even disputed?
- Do teachers regularly model open-ended inquiry, evidence-based reasoning, and problem solving?
- Are teachers and administrators willing to let students set learning goals in the context of authentic intellectual work?
- Do teachers have the deep content knowledge they need to help students build expertise and provide them with appropriate scaffolding?
- Do teachers have the resources and expertise to develop and use a variety of assessments, such as performance assessments and digital portfolios?

- Do teachers have opportunities to collaborate on teaching and learning, including establishing a shared vision and expectations for deep learning, developing engaging tasks, and analyzing student work samples and assessment data?
- Are teachers willing to put students at the center of their own learning and act as coaches or mentors, where appropriate?
- Do teachers design instruction so that students learn to collaborate with and lead peers in productive ways?

Looking at student attitudes and preparation:

- Are students willing and prepared to take responsibility for guiding and evaluating their own learning?
- Are students willing and prepared to think deeply about each discipline's content, issues, and problems, through extended investigations in school, as well as authentic learning opportunities outside the school building?
- Are students willing and prepared to engage in meaningful discipline-specific discourse with adults and peers, using each discipline's precise language, materials and tools?
- Are students open to solving new kinds of problems and constructing knowledge, not simply memorizing information?

Conclusion

This paper has argued that although the new academic content standards are a significant step forward, they will not be sufficient to prepare American students for college and careers. We have offered three evidence-based sets of cross-cutting college and career readiness skills that, when integrated with rigorous academic content and implemented via student-centered learning approaches, have the potential to transform American education. We recognize that there is still much to be learned about college and career readiness, and we hope our recommendations can provide a foundation for future research, policy, and practice, as the educational community strives for more meaningful information about how to best support our students, in school and for their futures.

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Nellie Mae Education Foundation
1250 Hancock Street, Suite 205N, Quincy, MA 02169
877-635-5436 | nmefoundation.org