Redefining College Readiness

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Introduction

The purpose of this paper is to provide an operational definition of college readiness that differs in scope from current representations of this concept. This paper suggests that, although much has been learned about this phenomenon, particularly during the past 20 years, few systematic attempts have been made to integrate the various aspects or components of college readiness that have been investigated during this period. Consequently, 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.

Recent research has shed light on several other key components of college success. Most relevant for this paper are a range of cognitive and metacognitive capabilities, often referred to as *key cognitive strategies*, which have been consistently and emphatically identified by those who teach entry-level college courses as being as of equal or greater importance than any specific content knowledge taught in high school. Examples of key cognitive strategies include analysis, interpretation, precision and accuracy, problem solving, and reasoning.

Nearly as important are specific types of content knowledge. Several studies have led to college readiness standards that identify key content knowledge associated with college success. The ability to write well is the single academic skill most closely associated with college success, but the "big ideas" of each content area are also very important elements.

Of equal importance are the attitudes and behavioral attributes that successful college students tend to possess. Among these are study skills, time management, awareness of one's performance, persistence, and the ability to utilize study groups. These are both specific skills and more general attitudes, but all of them require high levels of self-awareness and intentionality on the part of students as they enter college.

Finally, an increasing number of studies have highlighted the contextual knowledge that a student must possess to be prepared for college. These studies describe the need for students to understand how to apply to college, how to manage financial aid issues, and, perhaps most important, how to adjust to college once they arrive. The transition to college includes an element of culture shock for students, which is more severe for students from some communities than for others. Access to information about the culture of college helps students understand how to interact with professors and peers in college and how to navigate college as a social system and learning environment.

An Operational Definition of College Readiness

College readiness can be defined operationally as the level of preparation a student needs 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 with a level of understanding and proficiency that makes it possible for the student to be eligible to take the next course in the sequence or the next level course in the subject area. This conception is calibrated against what our recent research has come to define as *best practices* entry-level courses as opposed to stereotypical freshman coursework (Conley, Aspengren, Gallagher, & Nies, 2006a, 2006b; Conley, Aspengren, Stout, & Veach, 2006). If students are prepared to succeed in best practices courses, they should be able to cope with the full range of college courses they are likely to encounter.

The college-ready student envisioned by this definition is able to understand what is expected in a college course, can cope with the content knowledge that is presented, and can take away from the course the key intellectual lessons and dispositions the course was designed to

convey and develop. In addition, the student is prepared to get the most out of the college experience due to a thorough understanding of the culture and structure of postsecondary education and the ways of knowing and intellectual norms that prevail in this academic and social environment. The student has both the mindset and disposition necessary to enable this to happen.

Uses of the Expanded Conception of College Readiness

This definition of college readiness can facilitate several important actions. First and foremost, it can be used to evaluate the system currently in place to gauge college readiness. This paper asserts that, although measures exist currently or are in the process of being developed to generate high-quality information in all of the component areas of the definition, no system exists or is being developed to integrate the information and, more importantly, shape high school preparation programs so that they do a better, more intentional job of fostering student capabilities in all these areas.

The pursuit of such a goal should ultimately lead to new or refined measures and metrics to gauge college readiness with greater precision and across a wider range of variables and learning contexts. It should also provide better information to high school students about their college readiness at key points during their high school years. Ideally, the definition can also be used as a conceptual framework to design observational tools to assess the degree to which any particular high school instructional program contains all the necessary elements to prepare students for college. In short, a more robust, inclusive definition of college readiness can help shape student behaviors and high school practices in ways that result in more students entering college with the academic and social tools to succeed.

How College Differs from High School

College differs from high school in many obvious—and not so obvious—respects. College is the first setting where we expect young people to function as adults, not large children. Almost all the rules of the game that students have so carefully mastered over the preceding 13 years of schooling are either discarded or modified radically. The student-teacher relationship changes dramatically, as do expectations for engagement, independent work, motivation, and intellectual development. All this occurs while young people are also grappling with significant independence from their families and with the transition from childhood to adulthood. It is not surprising that moving from high school to college is one of the most difficult transitions that many people experience during their entire lives.

Because college is genuinely different from high school, college readiness is fundamentally different than high school competence. Detailed analyses of college courses reveal that although a college course may share the same name as a high school course, college instructors pace their courses more rapidly, emphasize different aspects of material taught, and have very different goals for their courses than do high school instructors (Conley, Aspengren, Stout, & Veach 2006). Students fresh out of high school may assume a college course will be very much like a similarly named high school class they have taken only to find that expectations are fundamentally different. College instructors are more likely to emphasize a series of key thinking skills that students typically do not develop extensively in high school. They expect students to make inferences, interpret results, analyze conflicting explanations of phenomena, support arguments with evidence, solve complex problems that have no obvious answers, draw conclusions, offer explanations, conduct research, engage in the exchange of ideas, and generally think deeply about what they are being taught (National Research Council, 2002).

Research findings describe college courses that require students to read eight to ten books in the same period that a high school class requires only one or two (Standards for Success, 2003). In these college classes, students are expected to write multiple papers in short periods of time.

These papers must be well reasoned, well organized, and documented with evidence from credible sources (National Survey of Student Engagement, 2003, 2004, 2006). By contrast, high school students may write one or two research papers, at the most, during high school, and may take weeks or months to do so. Increasingly, college courses in all subject areas require well-developed writing skills, research capabilities, and what have been commonly identified as critical thinking skills.

According to the National Survey of Student Engagement (2006), a vast majority of first-year college students are actively engaged in small groups and are expected to work on complex problems and projects with others inside and outside of class. They are then expected to make presentations and to explain what they have learned. Freshman students are expected to be independent, self-reliant learners who recognize when they are having problems and know when and how to seek help from professors, peers, or other sources.

At the same time, college faculty consistently report that freshman students need to be spending nearly twice as much time as they actually report to prepare for class (National Survey of Student Engagement, 2006). Students generally do not enter college with a work ethic that prepares them for instructor expectations or course requirements. The most successful first-year college students are those who come prepared to work at the levels faculty members expect. Those who do not arrive at college fully prepared are significantly less likely to progress beyond entry-level courses, as witnessed by the high failure rates in these courses and the high dropout rate among freshman students.

Finally, the student-teacher relationship is much different in college than in high school. A common example cited by college faculty is the first-term freshman who is failing a course and approaches the professor near the end of the term to request extra credit in order to be able to pass the course. College instructors are often perplexed by such requests, students are equally baffled by the instructor's reaction, since their high school teachers were usually amenable to such an arrangement. In other words, the cultural and social expectations about learning and performance that students encounter tend to vastly differ as well.

In short, the nature of expectations in high school and in college are significantly different. Students must be prepared to draw upon a different array of learning strategies and coping skills to be successful in college than those they developed and honed in high school. Current measures of college readiness do not necessarily do a good job of capturing these multifaceted dimensions of readiness.

Based on this assessment of the nature of college, an important question to ask is: How well do current measures gauge student readiness along these and other related important dimensions necessary for college success? The next section describes current means of determining college readiness and some of the limitations of those approaches. This is followed by a section that provides a more comprehensive notion of what it means to be college ready and then details each of its facets. Next, this paper presents some ways in which these facets might be measured and identifies how a more integrated approach to measuring college readiness might benefit students. Finally, this paper considers the changes required of high schools, colleges, and students for this new approach to be put into practice.

"The nature and quality of the courses students take are ultimately what matters, and few real measures of course quality currently exist."

Current Means to Determine College Readiness

Although it is beyond the scope of this paper to present a full critique of current conceptions and constructions of college readiness, it is worthwhile to consider briefly some of the limitations of current key measures, most notably among them course titles, grade point averages, and tests, as well as a related measure: performance in entry-level general-education courses. This brief overview is presented to accentuate the need for a more robust, comprehensive definition of college readiness, one that leads to new tools, methods, and indices that will help students understand their relative level of preparedness for college and will help high schools make systematic changes to increase the college readiness of students. The major measures and their limitations are discussed in turn.

Course Titles and Grade Point Averages

The most common approach is to define college readiness in terms of high school course-taking patterns, including the titles, perceived challenge level, and the number of units required for graduation, combined with the grades students receive in those courses. What this widely held definition assumes or presumes is that the number of courses that high school students take, and the units and names assigned to them, are accurate, comprehensive predictors of college-level success (Callan, Finney, Kirst, Usdan, & Venezia, 2006). Generally, these course titles must be approved by college admissions offices, in an uneasy but highly choreographed interplay between high schools and colleges. The end result is course titles that appear standardized on transcripts, but that reflect a lack of "alignment between what is required to get into college versus what's needed to stay in college and succeed as an adult." (Wagner, 2006)

Adelman (2006) employed transcript analysis to reach the conclusion that completing a challenging high school curriculum is the greatest pre-collegiate indicator of bachelor's degree completion, and the impact is even greater for African American and Hispanic/Latino students than for Caucasian students. This, however, leads toward a course title-based definition of college readiness. Simply increasing the prescribed courses students take may not be sufficient, particularly for students who attend high schools with low academic standards and expectations. The nature and quality of the courses students take are ultimately what matters (ACT, 2005b), and few real measures of course quality currently exist. A key necessary component that could address issues of course quality would be a set of criteria that specify the performances necessary to receive a high school diploma. Since the 1980s, states have concentrated their reform efforts on the development of statewide standards and assessments. Yet most of these standards-setting activities end at the 10th grade. Few states have undertaken to define 12th grade high school standards and the curriculum necessary to attain those standards.

Although course requirements for a high school diploma have increased in a number of states, they have yet to produce significant improvements in student performance in college (Achieve, 2004). For instance, since 1987 many states have increased their mathematics and science requirements (National Science Board, 2004), but measures of college graduation have not shown increases (ACT, 2002, 2005a; Callan et al., 2006), nor have National Assessment of Educational Progress (NAEP) scores improved significantly (National Center for Educational Statistics, 2007). The absence of improved college success rates, even in the face of increasingly demanding high school graduation requirements, demonstrates how challenging it will be to achieve greater college success by simply having students take more prescribed courses without understanding exactly what is being learned in those courses.

In fact, the mean grade point average of high school students has steadily increased

even as measures of college success have fluctuated or worsened (Woodruff, 2004). A study of high school transcripts undertaken by ACT researchers (Ziomek & Svec, 1995) found compelling evidence of grade inflation. More recently, data from transcript analyses performed as a component of NAEP determined that high school graduates in 2005 had an overall grade point average of 2.98. This represented a .30 GPA increase from 1990 (Ziomek & Svec, 1995). In other words, a *B* average in high school today may reflect knowledge and skills equivalent to something more like a *C* average thirty years ago. This is particularly problematic because many colleges have raised their GPA requirements over the same period (Breland et al., 2000).

Rather than leading to an improvement in student readiness for college, this appears simply to have resulted in the compression of grades at the upper end of the scale. This has led to any number of attempts to compensate for the compression, primarily through the weighting of particular courses. The University of California (UC) system, for example, weights Advanced Placement® (AP®) and honors courses, so that many UC applicants now demonstrate GPAs that exceed 4.0. Individual high schools adopt their own weighting criteria, leading to myriad ways to compute grade point averages. According to Hawkins & Clinedinst (2006) many colleges are weighting high school GPAs to combat this problem. It's not just the UC system that gives higher weight to college prep courses; 49 percent of U.S. colleges and universities are as well. Many less-selective colleges and universities are opting to use this weighting strategy rather than increasing GPA requirements. Breland et al. (2000) found that GPA requirements have increased more in private than in public colleges over the last 10 years, which accounts for most of the effect they saw in increased GPA requirements in higher education institutions.

Tests

Beyond using high school course titles to define college readiness, a more direct approach is to test students on a set of knowledge that they are presumed to need to know to succeed in entry-level college courses. Admissions tests define college readiness by establishing benchmarks empirically or through "cut scores." For example, ACT has defined college readiness by establishing College Readiness Benchmarks representing the minimum ACT test scores required for students to have a high probability of success in corresponding credit-bearing first year college courses. The Benchmarks reflect the ACT scores students need to earn to have at least a 75 percent or greater chance of obtaining a course grade of *C* or better (ACT, 2005a). This is not a direct measure of necessary content knowledge and thinking skills, but a gauge of probability.

All states have adopted some form of high school examination in English, mathematics and science for a variety of reasons, including requirements in the federal *No Child Left Behind Act* (NCLB). Research conducted by Standards for Success, published in the 2003 report *Mixed Messages* (Conley, 2003), found that most state standards-based high school tests were not well aligned with postsecondary learning. These tests may be good measures of basic academic skills, but not necessarily of the knowledge and capabilities needed for college success.

The scores students receive on state tests may not be good indicators of college readiness, but students may believe that passage of the state test is just such an indicator. Recent data from the NAEP suggest a fundamental disconnect between trends and scores on state tests and on NAEP tests, which has prompted a federal study of state definitions of "proficiency" (Cavanagh, 2006). When performance on state tests is compared to NAEP performance, significant differences exist from state to state, and students can show improvement on state tests and not corresponding improvement on NAEP. In other words, it is very difficult to know what successful performance on a state test really means.

Serious problems are created when high schools place undue emphasis on getting students to pass state tests. When students finally pass state exams, their programs of study may be hopelessly out of sync with what it takes to be implementing college eligible. One possible means to help address this disconnect would be implementing second-generation assessment systems that connect high school tests with outcomes beyond high school (Conley, 2006) and, in the process, provide students with realiable information on how ready they are and what they need to do to be college-ready

based on their state high school exam scores.

Colleges also rely on AP test scores as a potential measure of college readiness because these courses are one of the few places in which some assumptions might be made about what has actually been learned by students in a particular AP class. This is because each AP course has a set of curricular and resource requirements and, often more important, because many students take the corresponding AP exams after they take the course. This creates a situation in which teachers tend to align course content with the curricular and exam specifications.

However, even AP courses are being called into question by some colleges and universities. Although the reasons for this are complex, one contributing issue is that some high schools have adopted the practice of offering an AP course in which none of the students take the AP exam, while others have taken to posting AP courses on student transcripts in subject areas for which no AP exam exists, and therefore, no true AP course exists. These issues demonstrate how even an externally-referenced program such as AP can be co-opted to serve the purpose of inflating the academic credentials of students without necessarily contributing to students' college readiness.

Performance in College Courses

An obvious but frequently overlooked fact is that the final arbiter of college readiness is a student's college performance. Students who must enroll in remedial courses or who fail entry-level courses find it much more difficult, as well as more costly, to graduate from college.

Remedial Education

The high proportion of students identified as needing remedial or developmental education is frequently cited as evidence of the limitations of current admissions measures. Although the precise number of students requiring remediation is difficult to ascertain, federal statistics indicate that 40 percent of admitted and enrolled students take at least one remedial course (National Center for Education Statistics, 2004), reducing dramatically their probability of graduating and costing up to an estimated $1 billion per year (ACT, 2005b). The California State University system, which draws its students from the top third of high school graduates in the state and which tracks remediation rates more precisely, finds that 46 percent of all first-year students require remedial education in both English and mathematics (Ali & Jenkins, 2002). Rates at community colleges are probably considerably higher, leading to multi-tier remediation programs at some institutions, where student skill levels are so low that more than one remedial course in a subject area must be taken before students reach a credit-bearing course.

Having to enroll in remedial courses increases the time it takes students to complete their degrees and is associated with a decreased graduation rate (Adelman, 1999; National Center for Education Statistics, 2004). Nationally, only 17 percent of those students who must take a remedial reading class receive a bachelor's degree or higher; of those taking two remedial classes (other than reading), only 20 percent receive a bachelor's or higher (National Center for Education Statistics, 2004).

Children from low-income families are particularly vulnerable to a system that does not send clear signals to students concerning their readiness for college. These students are the most dependent on the schools to prepare them properly for college success because they are often the first in their families to attend college. Families of these students can only gauge how well-prepared their children are for college using the measures adopted by the schools their children attend. Unfortunately, these students are among the most likely to find themselves in remedial education.

Only six in ten children from low-income families can expect to graduate from high school, only one in three will enroll in college, and only one in seven will earn a bachelor's degree (Bedsworth, Colby, & Doctor, 2006; Conley, 2005). Those students who do succeed in earning a college degree today are taking longer to do so compared with students 20 years ago (ACT, 2002). These figures suggest a circuitous path to attaining a degree. It also suggests that many—perhaps most—of those who go on to college are not fully prepared for what will be expected of them, particularly when it comes to how colleges operate (Adelman, 1999; Horn, 2004; Venezia, Kirst, & Antonio, 2004). Equally important, this suggests

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that the high school program of preparation is not adequately geared toward expecting these students to be prepared for college admission or success. Considerably lower expectations and demands are held for students in courses with titles that satisfy the needs of college admissions offices but which are not closely aligned with the actual content knowledge and intellectual skill levels freshman college students need to survive in the general education courses that they normally take during their initial year in college (Achieve, 2004; Adelman, 1999).

Remediation statistics only reveal the tip of the iceberg. Many institutions allow students to choose not to take remedial courses even if the student is identified as needing such a course. Placement methods vary tremendously from institution to institution and are often rudimentary in nature, identifying only those students with the most serious deficiencies. In combination, these factors result in many students, particularly students from low-income families and first-generation college attendees, struggling during the first year of college. In turn, this may result in an increase in time-to-degree-completion for many students. According to national statistics, among students who began seeking bachelor's degrees at an institution in 1995–96, only slightly more than half had attained their degree from the institution six years later (National Center for Education Statistics, 2003).

General Education

Student performance in general education courses has long been an issue in postsecondary education, where these courses serve as the real arbiter of admission. These "gateway" courses restrict access to majors and also tend to weed out students who are incapable of succeeding in them. When students struggle in entry-level courses, it extends the time required to complete a degree, a hidden cost of inadequate or inappropriate preparation. Failure rates in some entry-level courses approach 50 percent, and while some argue this is largely due to the poor quality of college instruction, others argue that the high failure rate can be explained primarily by poor student study habits, a lack of student understanding of the expectations of college instructors, and deficiencies in student content knowledge and thinking skills.

Defining what it takes to succeed in these entry-level courses is a key component in determining what it means to be college-ready. *College readiness standards* should send clearer messages to high schools regarding course content and to states about their high school level standards and assessments. These standards are not geared to what should or does occur in high schools as much as to what will be expected of students in college.

No less than a half-dozen such sets of standards exist at the national and state levels. They largely agree on what students need to know and be able to do to be ready for college. All are focused expectations related to entry-level college courses.

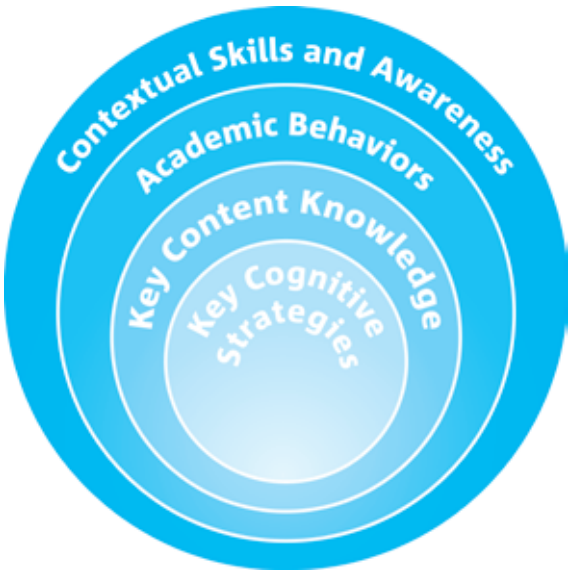
The Standards for Success project, sponsored by the Association of American Universities, developed a comprehensive set of readiness standards in six subject areas (Conley, 2003a). These statements outline the knowledge, skills, and key cognitive strategies necessary for success in research universities. Washington, D.C.-based Achieve, Inc., sponsored by state governors, organized the American Diploma Project. Its goal was to develop standards that reflected both college readiness and work readiness in mathematics and English (Achieve, The Education Trust, & Thomas B. Fordham Foundation 2004). Both the College Board and ACT have published their own versions of college readiness standards and criteria. In addition, several states, and most notably the State of Washington, have already published, or are in the process of developing, sets of college readiness standards or "definitions" that relate to state high school academic standards (Transition Math Project, 2005).

Components in a Comprehensive Definition of College Readiness

College readiness is a multifaceted concept comprising numerous variables that include factors both internal and external to the school environment. To provide a functional representation of the key facets of college readiness, the model presented below organizes the key areas necessary for college readiness into four concentric levels. These four areas of college readiness knowledge and skills emerge from a review of the literature and are those that can be most directly influenced by schools.

In reality, these various facets are neither mutually exclusive nor perfectly nested as they appear to be in the model. They interact with and affect one another extensively. For example, a lack of college knowledge often influences students' decisions regarding the specific content knowledge they choose to study and master. And a lack of attention to academic behaviors causes problems for many first-year students, regardless of whether they possess the requisite content knowledge and key cognitive strategies.

Figure 1: *Facets of College Readiness*



The model argues that what is needed is a more comprehensive look at what it means to be college-ready, a perspective that emphasizes the interconnectedness of all the facets contained in the model. The key point of this definition is that all facets of college readiness must be identified and eventually measured if more students are to be made college-ready.

Key Cognitive Strategies

The success of a well-prepared college student is built upon a foundation of key cognitive strategies that enable students to learn content from a range of disciplines. Unfortunately, the development of key cognitive strategies in high school is often overshadowed by an instructional focus on decontextualized content and the imparting of facts necessary to pass exit examinations, or even simply a desire to keep students busy and classrooms quiet.

For the most part, state high-stakes standardized tests require students to recall or recognize fragmented and isolated bits of information. Those that do contain performance tasks are severely limited in the time the tasks can take and their breadth or depth. The tests rarely require students to apply their learning and almost never require students to exhibit proficiency in higher forms of cognition (Marzano, Pickering, & McTighe, 1993).

Several studies of college faculty members nationwide, regardless of the university, expressed near universal agreement that most students arrive unprepared for the intellectual demands and expectations of postsecondary education (Conley, 2003a). For example, in one study faculty identified critical thinking and problem solving as the primary areas in which first-year students needed further development (Lundell, Higbee, Hipp, & Copeland, 2004).

The term key cognitive strategies was selected for this model to describe the intelligent

behaviors necessary for college readiness and to emphasize that these behaviors need to be developed over time so that they become ingrained ways of thinking, automatic habits related to how intellectual activities are pursued. In other words, key cognitive strategies are patterns of intellectual behavior that lead to the development of mental processes and capabilities necessary for college-level work. This term invokes a more disciplined approach to thinking than terms such as "dispositions" or "thinking skills." The term indicates intentional and practiced behaviors that become a habitual way of working toward more thoughtful and intelligent action (Costa & Kallick, 2000).

The specific key cognitive strategies referenced in this paper are those shown to be closely related to college success. The following

Analysis: The student identifies and evaluates data, material, and sources for quality of content, validity, credibility, and relevance. The student compares and contrasts sources and findings and generates summaries and explanations of source materials.

Reasoning, argumentation, proof: The student constructs well-reasoned arguments or proofs to explain phenomena or issues; utilizes recognized forms of reasoning to construct an argument and defend a point of view or conclusion; accepts critiques of or challenges to assertions; and addresses critiques and challenges by providing a logical explanation or refutation, or by acknowledging the accuracy of the critique or challenge.

"Understanding and mastering key content knowledge is achieved through the exercise of broader cognitive skills embodied within the key cognitive strategies."

are the most important manifestations of this way of thinking:

Intellectual openness: The student possesses curiosity and a thirst for deeper understanding, questions the views of others when those views are not logically supported, accepts constructive criticism, and changes personal views if warranted by the evidence. Such open-mindedness helps students understand the ways in which knowledge is constructed, broadens personal perspectives, and helps students deal with the novelty and ambiguity often encountered in the study of new subjects and novel materials.

Inquisitiveness: The student engages in active inquiry and dialogue about subject matter and research questions and seeks evidence to defend arguments, explanations, or lines of reasoning. The student does not simply accept any assertion that is made or conclusion that is reached, but rather asks why things are so.

Interpretation: The student analyzes competing and conflicting descriptions of an event or issue to determine the strengths and flaws in each portrayal and any commonalities among or distinctions between them; synthesizes the results of an analysis of competing or conflicting descriptions of an event or issue or phenomenon into a coherent explanation; states the interpretation that is most likely correct or most reasonable, based on the available evidence; and presents orally or in writing an extended description, summary, and evaluation of varied perspectives and conflicting points of view on a topic or issue.

Precision and accuracy: The student knows what type of precision is most appropriate for the task and the subject area, is able to increase precision and accuracy through successive approximations generated from a task or process that is repeated, and uses precision appropriately to reach correct conclusions in the context of the task or the subject at hand.

Problem solving: The student develops and applies multiple strategies to solve routine problems, generate strategies to solve non-routine problems, and applies methods of problem solving to complex problems requiring method-based problem solving. These key cognitive strategies are broadly representative of the foundational elements that underlie various "ways of knowing."

These key cognitive strategies are at the heart of intellectual pursuits at the university level. They are necessary to discern truth and meaning as well as to strive for them. They are at the heart of how postsecondary faculty members think, and how they think about their subject areas. Without the ability to think in these ways, a student who enters college either struggles mightily until these habits begin to develop and take shape or misses out on a central lesson of college, which is to hone the ability to think about the world in complex ways.

Academic Knowledge and Skills

Successful academic preparation for college is grounded in two important dimensions—key cognitive strategies and content knowledge. Understanding and mastering key content knowledge is achieved through the exercise of broader cognitive skills embodied within the key cognitive strategies. With this relationship in mind, it is entirely reasonable to consider some general areas in which students need strong grounding in content that is foundational to the understanding of academic disciplines. A case for the importance of challenging content as the framework for developing thinking skills and key cognitive strategies has been made elsewhere and will not be reviewed in depth here (Bransford, Brown, & Cocking, 2000).

To illustrate the academic knowledge and skills that are necessary for college success, a brief discussion of the key structures, concepts, and knowledge of core academic disciplines is presented below. This presentation is not a substitute for a comprehensive listing of essential academic knowledge and skills. A more complete exposition is contained in *Understanding University Success*, produced by Standards for Success through a three-year study in which more than 400 faculty and staff members from 20 research universities participated in extensive meetings and reviews to identify what students must do to succeed in entry-level courses at their institutions (Conley, 2003a). These findings have been confirmed in subsequent studies.

This overview begins with two academic skill areas that have repeatedly been identified as being centrally important to college success: writing and research. This is followed by brief narrative descriptions of content from several core academic areas.

Overarching Academic Skills

Writing: Writing is the means by which students are evaluated at least to some extent in nearly every postsecondary course. Expository, descriptive, and persuasive writing are particularly important types of writing in college. Students are expected to write extensively in college and to do so within short timeframes. Students need to know how to pre-write, edit, and rewrite a piece before it is submitted. Once a piece of writing has been submitted and feedback has subsequently been provided, they often must repeat this process. College writing requires students to present arguments clearly, substantiate each point, and use a style manual when constructing a research paper. In addition, college-level writing is expected to be largely free of grammatical, spelling, and usage errors.

Research: College courses increasingly require students to be able to identify and use appropriate strategies and methodologies to explore and answer problems and to conduct research to explore a wide range of questions. To do so effectively, students must be able to evaluate the appropriateness of a variety of source material and then synthesize and incorporate the material into a coherent paper or report. They must also be able to access a variety of types of information from a range of locations, formats, and source environments.

Core Academic Subjects Knowledge and Skills

English: The knowledge and skills developed in entry-level English courses enable students to engage texts critically and create well

written, organized, and supported work products in both oral and written formats. The foundations of English include reading comprehension and literature, writing and editing, information gathering, and analysis, critiques, and connections. To be ready to succeed in such courses, students need to build vocabulary and word analysis skills, including roots and derivations. These are the building blocks of advanced literacy. Similarly, students need to utilize techniques such as strategic reading that will help them read and understand a wide range of non-fiction and technical texts. Knowing how to slow down to understand key points, when to re-read a passage, and how to readily identify key terms and concepts so that only the most important points are highlighted are examples of strategies that aid comprehension and retention of key content.

Math: Most important for success in college-level mathematics is a thorough understanding of the basic concepts, principles, and techniques of algebra, since a great deal of mathematics that students will encounter later on will draw upon or utilize these principles. This entails more than simply exposure to such ideas. When students have learned and applied these elements of mathematical thinking at a deep level, they comprehend what it means to grasp complex mathematical concepts and are more likely to engage in similar thinking in subsequent areas of mathematical study. College-ready students possess more than a formulaic understanding of mathematics. They are able to apply conceptual understandings in order to extract a problem from a context, use mathematics to solve the problem, and then interpret the solution back into the context. They know when and how to estimate to determine the reasonableness of answers and they use a calculator as a tool, not a crutch.

Science: College science courses emphasize many aspects of scientific thinking. In addition to utilizing all the steps in the scientific method, students learn what it means to think like a scientist. This includes practicing the communication conventions followed by scientists, the way empirica l evidence is used to draw conclusions, and how such conclusions are then subject to scrutiny, alternate interpretations, and challenge. Students come to appreciate that scientific knowledge is both constant and dynamic at any given moment, and that the evolution of scientific knowledge does not necessarily mean that prior knowledge was "wrong." Students grasp that scientists think in terms of models and systems as ways to comprehend complex phenomena. This helps them make sense out of the flow of ideas and concepts they encounter in entry-level college courses and the overall structure of the scientific discipline they are studying. In their science courses, students master core concepts, principles, laws, and vocabulary of the scientific discipline being studied. Laboratory settings are the environments where content knowledge and scientific key cognitive strategies converge to help students think scientifically and integrate learned content knowledge.

Social Sciences: The social sciences entail a range of subject areas, each with its own content base and analytic techniques and conventions. The courses entry-level college students typically take include geography, political science, economics, psychology, sociology, history, and the humanities. The scientific methods shared across the social sciences emphasize interpreting sources, evaluating evidence and competing claims, and understanding themes and the overall flow of events within larger frameworks or organizing structures. Being aware that the social sciences consist of certain "big ideas" (theories and concepts) that are used to order and structure all of the detail that often overwhelms them can help students to construct mental scaffolds that will assist them in thinking like social scientists.

World Languages: The goal of second language study is to communicate effectively with and receive communication from speakers of another language in authentic cultural contexts through the skills of listening, speaking, reading, and writing. Learning another language involves much more than memorizing a system of grammatical rules. It requires the learner to understand the cultural context from which the language

arose and in which it resides, to use the language to communicate accurately, and to use the learner's first language and culture as a model with which to compare the new language and culture. Second language proficiency can improve learning in other disciplines, such as English, history and art, and expand professional, personal, and social opportunities. Language learners need to understand the structure and conventions of a language, but not primarily through word-for-word translation or memorization of de-contextualized grammatical rules. Instead, students of a language need to master meaning in more holistic ways and in context.

The Arts: The arts refer to college subject areas including art history, dance, music, theater, and visual arts. Students ready for college-level work in the arts possess an understanding of and appreciation for the contributions made by the most innovative creators in the field. Students come to perceive of themselves as instruments of communication and expression who demonstrate mastery of basic oral and physical expression through sound, movement, and visual representations. They understand the role of the arts as a vehicle of social and political expression and even change. They pose and and give voice to difficult questions through their personal artistic visions. They are able to justify their aesthetic decisions when creating or performing a piece of work and know how to make decisions regarding the proper venue for performing or exhibiting any creative product.

Academic Behaviors

This facet of college readiness encompasses a range of behaviors that reflect greater self-awareness, self-monitoring, and self-control on the part of students in relation to a series of processes and behaviors necessary for academic success. These are distinguished from key cognitive strategies by the fact that they tend to be independent of a particular content area, whereas the key cognitive strategies are always developed within the ways of knowing that are dominant within a specific content area. The key academic behaviors consist largely of self-monitoring skills and study skills.

Self-monitoring is a form of metacognition, the ability to think about how one is thinking. Examples of metacognitive skills include: awareness of one's current level of mastery and understanding of a subject, including key misunderstandings and blind spots; the ability to reflect on what worked and what needed improvement in any particular academic task; the tendency to persist when presented with a novel, difficult, or ambiguous task; the tendency to identify and systematically select among and employ a range of learning strategies; and the capability to transfer learning and strategies from familiar settings and situations to new ones (Bransford et al., 2000). Research on the thinking of effective learners has shown that these individuals tend to consciously monitor, regulate, evaluate, and direct their own thinking (Ritchhart, 2002).

Another important area of college readiness is student mastery of the study skills necessary for college success. The underlying premise is simple: academic success requires the mastery of key skills necessary to comprehend material and complete academic tasks successfully, and

Key academic behaviors consist largely of self-monitoring and study skills.

the nature of college learning in particular requires that significant amounts of time be devoted to learning outside of class for success to be achieved in class. Study skills encompass a range of active learning strategies that extend far beyond reading the text and answering the homework questions. Typical study-skill behaviors include time management, preparing for and taking examinations, using

information resources, taking class notes, and communicating with teachers and advisors (Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004). An additional critical set of study skills is the ability to participate successfully in a study group and recognize the paramount importance of study groups to success in specific subjects. Examples of specific time-management techniques and habits include the following: accurately estimating how much time it will take to complete all outstanding and anticipated tasks and allocating sufficient time to complete those tasks; using calendars and creating "to do" lists to organize studying into productive chunks of time; locating and utilizing settings conducive to proper study; and balancing study time with competing demands, such as work and socializing.

Contextual Skills and Awareness

The importance of this broad category has only recently been highlighted as an ever-wider range of students apply to college. Contextual factors encompass primarily the privileged information necessary to understand how college operates as a system and culture. This lack of understanding of the context of college causes many students to become alienated, frustrated, and even humiliated during their freshman year and decide that college is not the place for them. Examples of key context skills and awareness include a systemic understanding of the postsecondary educational system combined with specific knowledge of the norms, values, and conventions of interactions in the college context, and the human relations skills necessary to cope with and adapt to this system, even if it is radically different from the community in which a particular student was raised.

This does not necessarily mean that students need to disown their cultural backgrounds, heritage, and traditions—merely that they need to understand the relationship between their cultural assumptions and the assumptions and expectations that are operating within the college environment. The likelihood for success in college is higher among students who possess interpersonal and social skills that enable them to interact with a diverse cross-section of academicians and peers. These skills include the ability to collaborate and work as part of a team; understand the norms of the "academic" culture and protocol for interacting with professors and others in that environment; a facility for interacting with people from different backgrounds and cultures; an ability to communicate informally; and an ability to demonstrate leadership skills in a variety of settings.

Another important area of contextual awareness is known as *college knowledge*. This is information, formal and informal, stated and unstated, necessary for gaining admission to, and navigating within, the postsecondary system. College knowledge includes an understanding of the following processes: college admissions, including curricular, testing, and application requirements; college options and choices, including the tiered nature of postsecondary education; tuition costs and the financial aid system; placement requirements, testing, and standards; the culture of college; and the challenge level of college courses, including increasing expectations of higher education (Lundell et al., 2004).

Admissions requirements, and timelines in particular, are extremely complicated, and students often do not recognize the importance of either until it is too late. Specific institutions have additional special requirements and exceptions that are not readily evident. Financial aid options are largely unknown or substantially misunderstood by many students most in need of such support. The economically well-off are more likely to have this knowledge than are the working-class families or families whose children are the first generation to attend college (Conley, 2005; Robbins et al., 2004; Venezia et al., 2004).

The next section provides an operational definition of college readiness that the conceptual model helps to delineate. Specific statements across all the dimensions of college readiness are included in the section. These statements are presented in a form that allows them to be measured or gauged. The net result is a profile of college readiness that will help students know with greater certainty the degree to which they are college-ready, and may eventually help high school administrators gauge how well their programs of study are preparing students for college success.

A Definition of College Readiness

It is possible to compile lengthy and detailed lists of the content knowledge students must possess and the key cognitive strategies they must master to be college-ready. In fact, a variety of such compilations already exist (Achieve, The Education Trust, & Thomas B. Fordham Foundation, 2004; Conley, 2003, 2003a, 2004). In addition, others have identified the academic behaviors and context knowledge that increase the likelihood students will succeed in college.

Rather than review these lists in detail, it may be more practical to consider a highly representative list of knowledge, skills, and attributes a student should possess to be ready to succeed in entry-level college courses across a range of subjects and disciplines. Such a list attempts to capture keystone skills that can only be demonstrated if a set of subordinate and prerequisite knowledge and skills are in place. The list is not intended to be all-inclusive, but to suggest to the informed reader the types of indicators that would be necessary to gauge the more comprehensive notion of college readiness presented in this paper.

General Characteristics

Students who possess sufficient mastery of key cognitive strategies, key content knowledge, academic behaviors, and contextual knowledge would be defined as being college-ready based on the degree to which they could demonstrate the following:

- Consistent intellectual growth and development over four years of high school resulting from the study of increasingly challenging, engaging, coherent academic content.
- Deep understanding of key foundational ideas and concepts from the core academic subjects, as well as the ability to apply them.
- A strong grounding in the knowledge base that underlies the key concepts of the core academic disciplines as evidenced by the ability to use the knowledge to solve novel problems within a subject area, and to demonstrate an understanding of how experts in the subject area think.
- Facility with a range of key intellectual and cognitive skills and abilities that can be broadly generalized as the capacity to think.
- Reading and writing skills and strategies sufficient to comprehend the full range of textual materials commonly encountered in entry-level college courses, and to successfully complete written assignments commonly required in such courses.
- Mastery of key concepts and ways of thinking found in one or more scientific disciplines sufficient to succeed in at least one introductory-level college course that could conceivably lead to a major that requires additional scientific knowledge and expertise.
- Comfort with a range of numeric concepts and principles sufficient to complete at least one introductory level college course that could conceivably lead to a major that requires additional proficiency in mathematics.
- Ability to accept constructive critical feedback including critiques of written work submitted or weaknesses in an argument presented in class.
- Ability to assess objectively one's level of competence in a subject and to devise plans to complete course requirements in a timely fashion and with a high degree of competence.
- Ability to study independently and with a study group on a complex assignment requiring considerable out-of-class preparation over a reasonably long period of time.
- Ability to interact successfully with a wide range of faculty, staff, and students, including those who come from different backgrounds and hold points of view that differ from those of the student.
- Understanding of the values and norms of colleges, and of disciplinary subjects that serve as the organizing structures for intellectual communities that pursue common understandings and fundamental explanations of natural phenomena and core

aspects of the human condition.

Example Performances

The general characteristics listed above are suggestive or descriptive of tasks that students have to be able to complete in college courses. The following examples, while far from all-inclusive, illustrate what a student who has sufficient competence in the general areas listed above would be able to do in a college course. Any student who can do the following with proficiency will likely be ready for a range of postsecondary learning experiences.

- Write a three- to five-page research paper that is structured around a cogent, coherent line of reasoning, incorporates references from several credible and appropriate sources; is relatively free from spelling, grammatical, and usage errors; and is clearly written and easily understood by the reader.

- Read with understanding a range of non-fiction publications and technical materials, using appropriate decoding and comprehension strategies to identify key points; note areas of question or confusion, remember key terminology, and understand the basic conclusions and points of view.

- Employ fundamentals of algebra to solve multi-step problems, including problems without a single, obvious solution and problems requiring mathematics beyond algebra; do so with a high degree of accuracy, precision, and attention to detail; and be able to explain the rationale for the strategies pursued and the methods employed.

- Conduct basic scientific experiments or analyses that require the following: use of the scientific method; an inquisitive perspective on the process; interpretation of data or observations in relation to an initial hypothesis; possible or plausible explanation of unanticipated results; and presentation of findings to a critical audience using the language of science, including models, systems, and theories.

- Conduct research on a topic and be able to identify successfully a series of key source materials that could be accessed to shed light on the question being researched; organize and summarize the results from the search, and synthesize the findings in a manner that makes most sense given the nature of the question being investigated.

- Interpret two conflicting explanations of the same event or phenomenon, taking into account each author's perspective, the cultural context of each source, the quality of the argument, its underlying value positions, and any potential conflict of interest an author might have in adopting a particular point of view.

- Communicate in a second language, using the language in a culturally appropriate fashion for common daily tasks and interactions, without resorting to literal translation except in specific, isolated cases.

- Participate in a study group outside of class with students who represent a continuum of academic abilities and cultural backgrounds, incorporating the strengths of group members to complete the assignment or project at hand or prepare successfully for the exam or presentation in question.

- Complete successfully a problem or assignment that requires approximately two weeks of independent work and extensive research, seeking periodic feedback from teachers and other pertinent resources along the way and using the feedback to revise and strengthen the final product.

- Create and maintain a personal schedule that includes a to-do list with prioritized tasks and appointments.

- Utilize key technological tools, including appropriate computer software, to perform academic tasks such as conducting research, analyzing data sets, writing papers, preparing presentations, and recording data.

- Locate websites that contain information on colleges, the admissions process, and financial aid, and navigate such websites successfully, comparing the programs and entrance requirements of several colleges and assessing the cost and overall feasibility of attending each institution.

- Present an accurate self-assessment of readiness for college by analyzing and citing evidence from classroom work and assignments, grades, courses completed, national and state exams taken; demonstrate insight into one's own level of maturity and self-discipline.

Possible Ways to Measure the Dimensions of this Definition

Each of the four major components of college readiness needs to be measured in a somewhat different but complementary fashion. While a technical discussion of these potential methods is beyond the scope of this paper, a brief description of how each might be measured is offered.

Key Cognitive Strategies Measurement

The key cognitive strategies are demonstrated primarily through learning activities and tasks that are deeply embedded in a course or courses. These strategies should be expected to develop over time, implying a continuous measurement system that is sensitive to increasing sophistication and elaboration of capabilities and not just counting the presence or absence of particular elements.

The best means currently available to accomplish this goal is probably the collection of classroom evidence. This approach has been used in a number of settings with some success, including a range of relatively high-stakes decisions. While the measurement of key cognitive strategies envisioned in this paper is primarily for formative purposes, it is possibile that these measurements might someday contribute to higher stakes decisions.

A collection of evidence is, as its name implies, student work collected over a period of time to demonstrate some specific set of abilities or skills. The collection is different from the more familiar "portfolio" in that it is focused on a particular set of criteria and its contents must meet both sufficiency and proficiency requirements. Collections of evidence are more structured than portfolios and are scored using more rigorous methods and instruments.

Collections of evidence have been employed in a variety of settings in the U.S. and abroad for college-readiness purposes. Several states in Australia use variations on a collection of evidence to judge student work produced intentionally for an external review process (Gipps, 1994; Masters & McBryde, 1994; Sadler, 1992). In the U.S., the Proficiency-based Admission Standards System (PASS) has utilized collections of evidence as an optional basis on which to make college admissions decisions concerning students who have applied to the Oregon University System during the past seven years (Conley, 2004). More recently, in Washington state the Office of the Superintendent of Public Instruction adopted a collection-of-evidence-based method as an alternative means of evaluating students who had not passed the state high school exit exam, which is a necessary condition for graduating (Conley, O'Shaughnessy, & Langan, 2006d). Currently, the Educational Policy Improvement Center (EPIC) is developing a formative assessment system for grades 6 through 12 that will gauge the development of key cognitive strategies along five key dimensions: reasoning, argumentation, and proof; interpretation; precision and accuracy; problem solving; and research (Conley, McGaughy, O'Shaughnessy, & Rivinus, 2007).

Key Content Knowledge Measurement

Although admissions tests have been a longstanding, and reasonably effective, method of identifying students who are potentially college-ready based only on a short test of general reading and mathematics abilities, advances in the understanding of the key knowledge necessary to succeed in college courses suggest a potentially different, or at least supplementary, measure of content knowledge. That measure is the end-of-course exam.

The advantage of these tests is that they can be carefully geared to identified standards and expectations for what will be taught in a college course. This increases alignment between the high school and college programs

of study. If the tests are carefully designed to cover key concepts that are foundational to the subject area, they can provide very useful information to students, as well as potentially to postsecondary institutions concerning an individual's level of readiness.

End-of-course exams have gained popularity during the past 10 years, particularly, although not exclusively, in southern states. Texas is considering replacing its current state high school examination system, the Texas Assessment of Knowledge and Skills, with specific end-of-course exams. California has also added end-of-course exams to their standardized state exam.

High schools are not unfamiliar with end-of-course exams for college preparation purposes. Most notably, AP and International Baccalaureate® (IB®) exams have been given at the end of a wide range of specific high school courses for many years (although the AP course is designed to be a college course taught in high school). The results from these exams, however, are rarely combined with other measures of college readiness while students are in high school. Instead, the results from these tests are considered by admissions offices as one element among many others in the complex calculus of admissions decisions.

A college readiness assessment system that consisted of a series of end-of-course exams would yield much more detailed, fine-grained information regarding student knowledge and skills relative to college readiness standards. Although clearly more expensive to construct and maintain than current admissions tests, the exams have the potential to eventually become an integral component of the courses associated with them and serve as something for which teachers can prepare students without the stigma associated with "teaching to the test." These exams can also contain complex problems and writing components that are not currently available to admissions tests.

Academic Behaviors Measurement

Academic behaviors can be measured in relatively straightforward ways if the means to measure them is defined largely in terms of their presence and the degree of fidelity between student behavior and identified successful strategies in a series of areas. Most of these imply some sort of student survey and inventory where students list their methods, tools, and strategies in areas such as study skills, time management, and self management. Other possible measures relate to self assessment of competence relative to a range of academic skills, which would be facilitated if measures were in place as described for key cognitive strategies and key content knowledge. Academic behavior management is an area that would also lend itself to discussions between teachers (or advisors) and students professed versus actual behavior. Such discussions could also take the form of advising on how to improve. However, progress could be gauged in relation to a scale or other set of objective measures of competence.

Considerable work is underway in this area, on the topics of study skills and time management in particular, and student self management in general. It is likely that a number of major tools will be available to students and schools in the near future that will be designed to gauge student competence in these areas with greater precision. The only potential issue is that these systems are not necessarily designed to connect with information about intellectual development and content knowledge mastery. Although a relationship can be assumed to exist among the three, a measurement system that had the capacity to connect all measures would be preferable to one that reported each separately.

Contextual Skills and Awareness Measurement

Student contextual knowledge about, and understanding of, the entire process of college admissions, financial aid, and successful functioning in college can be determined relatively readily through questionnaires. However, the larger issue is how this information is used. The most important use for the information is as a more general indicator of the quality of the preparation program itself. While information on individual students is quite useful from a diagnostic perspective to identify areas where additional information is needed, the overall profile of student contextual skill and awareness suggests very clearly specific changes that high school

programs need to make to improve student competence and confidence in this area.

Integrating the Four Sources

As noted, much of this information is currently collected in one fashion or another, but rarely, if ever, is the information combined into a comprehensive profile for the student to gauge personal college readiness and for the preparing institution to gauge the adequacy of its preparation program. The holy grail of college readiness would be an integrated system that provides all this information to students in a progressive, developmentally appropriate fashion so that they have a continuous sense of how well they are being prepared—and are preparing themselves—for college.

As mentioned throughout this section, much if not all the basic instrumentation necessary to create an integrated college readiness data system probably exists already or is under development. Numerous organizations vie to provide these services and tools to schools and students. However, few schools utilize these services and tools in ways that result in a comprehensive system being in place at the school level, a system that addresses all facets of college readiness. This more comprehensive and inclusive definition of college readiness is a conceptual framework within which some of the most important measurements of the ability of students to undertake, and succeed in, postsecondary coursework can be included and combined. The ultimate result would be one set of scores or indicators across multiple dimensions and measures that could be tracked over time from perhaps sixth grade through high school that would allow everyone involved to be aware of where a student stood relative to the various dimensions of college readiness at any given point in time.

Implications of the Definition

The definition of college readiness has a series of implications and issues associated with it that will be touched upon briefly in this paper. Clearly, if this sort of definition were adopted at a policy level, the effects would be significant because it would make more evident the disparity that exists between those who are admitted and those who actually have the capabilities necessary to succeed in postsecondary education. Its purpose at this point is not to suggest that numerous students should be denied admission to college, but to highlight the gaps between the current implied or *de facto* definitions of college readiness and a more comprehensive, systematic approach to the issue. In this context, the definition is offered more as a statement of probability: the more of the elements of the definition the student has mastered, the greater the likelihood the student will succeed in entry-level general education courses. Given this more generous interpretation, the task of implementing such an expanded definition seems more manageable and incremental.

Gauging College Preparatory Programs

A reasonable initial goal might be not to use a more comprehensive measure to determine college admissions, but rather to ascertain how well each high school is preparing students for college. Entry-level college programs could also be assessed to ascertain the types of readiness they demand of students. Such information could be a useful starting point for program redesign to improve alignment by providing information on the specific areas in which changes are needed to enhance student readiness for, and ultimate success in, college.

High schools in particular need to be organized to develop more systematically each of the elements contained in the definition. Students should be exposed to the definition and provided with tools to assess for themselves what they are going to need to do to make become college-ready. Admissions offices need to emphasize in their communications with prospective applicants the importance of achieving all the components of the definition. Entry-level college courses can be designed to build upon the elements of the definition and to avoid reproducing high school-level expectations that lead college freshmen to believe college is just like high school, a perception that often causes them to adopt work habits that are counterproductive in the new learning environment. Admissions and placement testing methods need to evolve to capture more information about student proficiency on all the aspects of the definition.

Gauging Effects in College

A student who meets all aspects of the college readiness definition would benefit in several ways. First, the student would be comfortable in nearly any entry-level general education course. This is significant, since failure to succeed in one or more general education course during the first year is strongly correlated with failure to remain enrolled in college (Choy, 2001; Choy, Horn, Nunez, & Chen, 2000).

Second, the student would be more realistically able to select among a wide variety of majors, including those requiring mathematics or science. Currently, many students who complete mathematics and science requirements for college admission are not really prepared to take college-level courses in these areas, and they assiduously avoid them. These students essentially eliminate from the realm of possibility any major that requires mathematics or science.

Given the increasing relevance of mathematics and science to many majors that previously did not rely heavily on them, deficiencies in these subject areas have an even greater effect on narrowing the choice of majors available to students. Mathematics is found in a range of majors from business to the social sciences. Scientific knowledge is necessary for access to entire fields such as human physiology, physical therapy, nursing, and other healthcare-related fields for which

rapid job growth is predicted. Of course, lack of skill or confidence in mathematics or science completely rules out all forms of engineering, an area of critical concern in terms of national economic priorities as well as another area of rapid job growth and economic opportunity.

Third, and often overlooked, students who lack facility in the areas outlined in the definition will simply not get as much out of college, particularly if they fail to develop the key cognitive strategies. On one level, the intrinsic value and sense of accomplishment the student derives from college will be lessened if the student has to devote considerable energy simply to survive, which is what often occurs when students feel overwhelmed because what they encounter during their freshman year is unfamiliar and disorienting. Ultimately, college just won't be as stimulating and interesting for students who don't really understand what it is supposed to be about.

For a student from an under-represented group the problem is more serious and pronounced. These students enter college with far less awareness of what it takes to fit in and to cope with the system. When this is compounded by a lack of content knowledge or learning skills, there is little about the experience that is positive for them. As a result, many exit during the freshman year. If these students were to understand more fully all of what college has to offer and how one behaves in college in order to gain the most benefit from the experience, they would be more likely to persevere.

On another level, this is a problem for the institution because an increasing number of states and organizations are calling on colleges to be accountable for the value added that the college experience imparts to students in exchange for the ever-increasing tuition expenses incurred. Unfortunately, students who enter poorly prepared and not thinking in ways consistent with the culture and structure of postsecondary education often are able to navigate through the system without really derving a lot from the experience. For example, evidence suggests that some students can complete a bachelor's degree and be less proficient at writing than when they entered college (Bok, 2006).

A more comprehensive conception of college readiness can create expectations that students understand the purposes of college and, as a result, work to take full advantage of all options and opportunities available to them. They would be prepared to add value to their education instead of merely navigating the system. This would set the stage for postsecondary institutions to assess the value added element of a baccalaureate degree in more comprehensive and consistent ways.

What Schools and Students Can Do to Foster College Readiness

If schools and students understand college readiness in a more expansive and comprehensive way, they can do more to develop and hone the full range of capabilities and skills required for college success. Indeed, at the heart of this definition is the notion that those most interested in college success will change their behaviors based on the greater guidance the definition offers regarding how to become college-ready. The following section discusses some of the changes that could occur in high schools and on the part of students to attain better and more comprehensive readiness for college.

Create a Culture Focused on Intellectual Development

Using these criteria, the most important thing a high school can do is create a culture focused on fostering and promoting intellectual development among all students. Intellectual development is comprised of several elements.

The first element involves students interacting with appropriately important and appropriately challenging academic content. For students to do so requires schools to create an intellectually coherent program of study that is systematically designed to focus on what Wiggins and McTeague (1998) describe as the "big ideas" of each subject area taught. Students learn about these big ideas through exposure to a series of "enduring" and "supporting understandings" that create an overall intellectual and cognitive structure for the content, a structure that can span multiple courses and grade levels but that is revisited by students each time a new course within that area is taught.

Second, key cognitive strategies should be developed over a sequentially more challenging progression throughout four years of high school. If the content of the program of study is carefully organized around the kinds of key organizing and supporting concepts and information described previously, this structure of challenging and appropriate content can be used as a framework for developing key thinking and reasoning skills and other supporting cognitive habits that will affect success in college as much as, or perhaps even more than, any specific content knowledge students acquire.

Third, the academic program should be structured so that students are required to assume more control and responsibility for their learning as they move through high school. This does not necessarily mean that students should have more choices over what they learn, but rather that they are expected to work independently and semi-independently outside class on progressively larger, more complex projects. For example, over time students should be expected to assume more responsibility for critiquing their own work and rewriting or modifying that work before it is ever submitted, rather than only after they receive feedback from teachers.

The reason the intellectual climate of the school is a central element in college readiness is because the school can control this variable directly and relatively completely if its teachers and administrators choose to do so. Furthermore, this is an area that teachers and administrators often fail to address consciously. Instead, they often allow students to set the intellectual tone and tenor of the school. In such environments, little thought is given to how students are developing intellectually from course to course or year to year, or what is happening in any given course to cause such development to occur.

The result is that students often begin their senior year of high school believing they are ready for college because they have completed required courses. This, in turn, often leads to the development of particularly poor study habits and skills during the final year of high school (Conley, 2001; Kirst, 2000; National

Commission on the High School Senior Year, 2001). In this fashion, the lack of a coherent, developmentally sequenced program of study also contributes to deficiencies in other key areas, including study skills and time management. In fact, it is difficult to imagine a preparation program that emphasizes time management and study skills but does not sequence challenge levels that develop these skills progressively from year to year.

Specify Core Knowledge and Skills

As noted above, the school must organize its curriculum in each subject area around a set of core concepts and supporting information. The goal is to have students develop an understanding of the structure of the discipline and to retain specific content knowledge within this structure. To facilitate this organization of knowledge, the school must be prepared to adopt a formal set of exit standards that specify what students are expected to know and be able to do in each of the core academic areas. These standards need not be so specific that they try to capture each and every piece of knowledge that a student should master, but they should be comprehensive enough to identify the big ideas and supporting knowledge necessary to comprehend each big idea fully and completely. These standards can be considered keystone expectations that clearly infer the mastery of significant subordinate skills and knowledge necessary to achieve them.

This sort of a structure facilitates a more logical progression and development of knowledge mastery over four years of high school instead of the isolated course-based model that currently exists. At the same time, the exit standards do not necessarily mandate or require any particular organizational structure or instructional strategy. Schools remain free to organize the instructional program in the way they see fit to ensure student mastery of the keystone knowledge.

Provide Necessary Supports to Students

In addition to key cognitive strategies and important content knowledge, students need specialized information in order to access the college admission system. Given the decentralized nature of U.S. postsecondary education, high schools are the only place where all students have the opportunity to come into contact with information pertaining to the complexities of preparing for, and applying to, college. High schools are responsible for make this information available to all students, not just those who seek it out. This means incorporating college readiness activities into the routines and requirements of the school.

For example, students need to know about college requirements and financial aid options. They need to understand the application process. In fact, an increasing number of high schools that serve high proportions of students who would be the first generation in their family to attend college are requiring all students to apply to at least one college during the fall semester of their senior year. Students need experience creating a resume or other summary document that highlights and profiles their activities and accomplishments. They need knowledge of the financial aid system and its attendant timelines and documentation requirements. They need to understand the tiered nature of postsecondary education in the U.S. and recognize that some institutions are very demanding and selective in their admissions processes while others are more open and accept essentially all applicants. They need to understand that certain colleges may be a better fit for students with particular types of learning styles and interests and recognize that the majors offered by a college are an important factor to weigh when deciding which college to attend. They need to know when all the application-related deadlines occur and have a plan for submitting required paperwork, such as letters of recommendation and transcripts, within those deadlines. Finally, they need to understand the role of admissions tests, such as the SAT® and ACT®, as well as AP, IB, and others, along with any dual enrollment options the state or school may offer.

All this information is necessary for students to make good decisions about college preparation and to demystify the process. Many students fail to apply to college simply because the process seems so daunting, and

they feel intimidated or overwhelmed by all of the requirements and activities associated with the application process. Others may lack the developmental maturity necessary to think as far into the future as the college preparation and application process requires. Activities to break this process down into manageable pieces that students master automatically as they move through high school will help increase the number of applicants and their subsequent success getting admitted to, and succeeding in, college.

Although these activities are not very effective if conducted in isolation from the academic program, they are an important component of an overall environment in which students develop the full set of knowledge and skills necessary for college success, including intellectual capabilities and thinking skills, complex and appropriate content, and knowledge of the system of college preparation, application, and admission.

Provide Necessary Supports to Teachers

To teach an intellectually challenging class, teachers must be properly prepared and equipped with the understandings of their subject area necessary to evoke in students the desired responses to material, responses designed to deepen their engagement with, and understanding of, key course concepts and to expand their repertoire of thinking skills and strategies. Teachers must have a reference point for college readiness that extends beyond their own previous experiences in college or self-reports from the few students who return to share their experiences in college.

The necessary support ideally takes the form of professional-development activities in which teachers learn to focus their curricula on key ideas and supporting concepts and to teach these through techniques, activities, and assignments that require students to develop the key cognitive strategies necessary for college success. Such activities are often most effective when undertaken in partnership with colleagues from postsecondary institutions. They can include seminars on recent developments in the academic field, debate and discussions of controversial ideas in the subject area, critiques of potential student assignments, and reviews of student writing and a consideration of strategies to improve writing.

These activities need not be didactic in nature, with the postsecondary faculty being viewed as possessing all the answers and the high school faculty perceived as being in need of enlightenment. Instead, these sessions can be collaborative and collegial in nature. Although such sessions should ideally begin with face-to-face interactions, they can be sustained and continued through online discussion boards and other electronic means that help faculty build and maintain connections across the system boundaries.

Even though every high school teacher may not participate in such activities, a critical mass will have a transformative effect on the academic culture and norms of the high school. Expectations for what constitutes current teacher knowledge of a subject will be transformed, along with the degree of challenge and rigor that is embedded in courses. In the past, the Advanced Placement® program attempted to achieve this goal through sessions that did very much what was described previously. This worked well when the AP community was small and close knit. The recent rapid expansion of AP has stretched the fabric of this community and made it more difficult to sustain the type of intellectual interaction that is needed.

In addition, AP teachers often did not share their experiences with other high school faculty members, which resulted in AP courses having a different tenor to them than the rest of the curriculum. This needs to change so that the new and expanded AP offerings at many schools can serve as a reference point for an infusion of ideas and techniques that better prepare all students for college, regardless of whether they take any AP courses.

What Students Can Do to Develop Their College Readiness

A definition of college readiness must also address the issue of how students combine and integrate various facets of college readiness. For students, this process is complex because it includes elements that are under the schools' control as well as elements that are not.

In particular, students need to understand what it really means to be college-ready. They need to understand what they must do as well as what the system requires or expects of them. First and foremost, they must understand that college admission is a reasonable and realistic goal that can be attained through careful planning and diligent attention to necessary tasks.

Because colleges judge students based on the sum total of their performance in high school (although many omit the freshman year and some functionally ignore the second semester of senior year), it is critical that students begin their journey toward college readiness before they arrive in high school. Although this paper does not explore the role middle schools play in moving students toward a college-ready state, it is worth noting that, at the least, the connection between middle school and high school mathematics and English programs deserves careful scrutiny. For their part, students need to be making careful decisions as they plan their very first high school course schedule as incoming ninth graders. A wrong decision at this point can have ramifications that reverberate throughout high school and beyond.

Similarly, students need to construct an overall plan for college preparation that ensures they will develop the necessary skills in a progressively more complex fashion over four years. Ideally, the school's program of study should be designed so that students cannot make bad decisions. The element of individual student planning is important in the U.S. educational system, where high school and college are not closely or directly connected.

A number of states have instituted what they refer to as "default" high school programs of study into which all students are enrolled unless their parents specifically exempt them from the program. The programs of study are designed to meet the entrance requirements of the state university system. This is a first step toward ensuring that students do not make decisions in high school they will quickly come to regret when they are faced with the prospect of life after high school.

Students need to take the responsibility to utilize the information presented to them on college academic and financial requirements and to discuss this information with adults in their lives who may be able to help them. Unfortunately, not all students have supportive family environments, but support can come from other quarters as well, and students need to be encouraged to reach out to, and interact with, adults who can help them navigate the college readiness gauntlet, whether these adults are relatives, community service staff, or adults at the school who may be paid staff or volunteers. Young people need individual guidance and personal role models to initially believe they are capable of becoming college-ready and then to recognize the steps necessary to make college-readiness a reality in their lives.

Given the knowledge-intensive system of college readiness, admission, and financial aid that the U.S. has adopted, this component of personal support and student initiative should not be overlooked in the college readiness equation.

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