

Discussion Paper: 21st Century Skills

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A. INTRODUCTION

The purpose of this paper is to look at what our students need to learn to be prepared for responsible citizenship, further learning, and productive employment in our modern economy. A review of the literature has been undertaken in order to answer the following questions. Firstly, what do businesses see as the critical skills for current and future employees? Secondly, what do colleges and universities identify as critical factors in ensuring that students will be successful in their post-secondary careers?

It is clear that changes in the world and the world of work will continue to impact the skills needed by today's young people. Some of the critical factors include the following:

- OPEC oil embargo of 1973 made it clear that our nation's economic future was no longer our alone to decide; there is an increasing trend toward globalization and interdependence.
- Introduction of the personal computer has altered the speed with which work is done and its very nature – has created a new industry and has redefined the way thousands of different kinds of work are now carried out
- In the early 70's, manufacturing accounted for 27% of all nonagricultural employment in the US; services and retail trade for 32%. By 1990, manufacturing accounted for only 17% of these jobs, while services and retail trade made up 44%.
- In traditional workplaces, work was routine, repetitive and organized along hierarchical lines and emphasized mass production. In today's high performance workplaces, work is problem-oriented, flexible and organized in teams.

B. THE EVOLUTION OF THE JOB MARKET

“While businesses continue to eliminate jobs that require lower-level skills - replacing them with positions demanding stronger academic credentials and higher technical skills or displacing them entirely with either technology or competitive offshore labor – our nation's schools are turning out graduates who lack the qualifications and work ethic to succeed in a more tumultuous job market”, (Center for State Scholars, 2004).

Businesses believe that many of today's workers lack the skills they are looking for. Many employers face difficulties in finding qualified employees; 80% of businesses surveyed by the National Association of Manufacturers reported a moderate to serious shortage of qualified job candidates and 59% reported that recent hires lack basic employment skills. (See Appendix A on page 12 for more detailed results).

The following are some of the highlights of the data regarding the evolving job market:

- The US Bureau of Labor reports that 40 of the 50 fastest growing occupations in the nation now require at least some education after high school.

- By 2010, employment occupations requiring at least a Bachelor's degree are expected to grow 21.6% while jobs requiring an Associates degree are expected to grow 32%.
- The fastest growing occupation of all is projected to be computer specialists at 69% from 2000 to 2010.
- US Dept of Education says that 7 of 10 students now graduate from high school without completing the courses they will need to succeed in college or in the workplace.
- By 2010, the nation's workforce is expected to face a shortage of more than 12 million college-educated workers.
- Continuing growth in national productivity requires a continuous supply of engineers who are highly competent in mathematics and science and who are adaptable to the needs of a rapidly changing profession. The number of students who plan to major in engineering has continued to decrease. Enrollment in graduate schools that prepare students for careers in engineering, math and physical science occupations has decreased over time
- Capability in math and science is critical to pursuing science and engineering professions but international studies show that US students lose ground in science and math achievement, compared to those in other developed countries, after the 4th grade.

C. DEFINING 21ST CENTURY SKILLS

In 1990, the Secretary of Labor appointed a commission (Secretary's Commission on Achieving Necessary Skills (SCANS) <http://wdr.doleta.gov/SCANS/>) to determine the skills our young people would need to succeed in the world of work. The stated purpose was to encourage a high-performance economy characterized by high-skill, high-wage employment. The study suggested that, as of 1991, more than half of our young people were leaving school without the knowledge or foundation required to find and hold a good job. It was recognized that preparing students for the world of work is only one of many functions of education and the authors were not suggesting that schools abandon the core subjects in favor of workplace skills training. However, the success of our education system has implications for the economy as well as for the students themselves: low skills lead to low wages and to low profits. If students do not learn the necessary skills by the time they leave high school, they face bleak prospects: dead-end work, interrupted only by periods of unemployment with little chance to climb a career ladder.

The Commission developed three major conclusions:

- All American high school students must develop a new set of competencies and foundation skills if they are to enjoy a productive, full and satisfying life.
- The qualities of high performance that today characterize our most competitive companies must become the standard for the vast majority of our companies, large and small, local and global.

- The nation's schools must be transformed into high-performance organizations in their own right.

The SCANS group identified five competencies and a three-part foundation of skills and personal qualities that lie at the heart of current job performance and that must be an integral part of every young person's school life. (See Figures 1 and 2 on the following pages). SCANS competencies and skills were not intended for "career or vocational" education, but for all students in all disciplines. It was suggested that it is important for schools to integrate these skills and competencies throughout the curriculum to ensure that they are viewed, by students, as relevant to their lives. Although, the SCANS data was developed in 1990, it appears to continue to be in widespread use today.

The "Partnership for 21st century skills", a coalition of education, business and technology organizations, identified the following key dimensions of 21st century learning:

- 21st century content
 - Global awareness
 - Financial, economic and business literacy
 - Civic literacy
- Learning skills
 - Information and communication skills
 - Thinking and problem-solving skills
 - Interpersonal & self-directional skills
- Information & communication technology (ICT) literacy

Figure 1: Secretary's Commission on Achieving the Necessary Skills (SCANS) 1990
FIVE COMPETENCIES

Resources: Identifies, organizes, plans, and allocates resources

- A. *Time* & Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules
- B. *Money* & Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives
- C. *Material and Facilities* & Acquires, stores, allocates, and uses materials or space efficiently
- D. *Human Resources* & Assesses skills and distributes work accordingly, evaluates performance and provides feedback

Interpersonal: Works with others

- A. *Participates as a Member of a Team* & contributes to group effort
- B. *Teaches Others New Skills*
- C. *Serves Clients/Customers* & works to satisfy customers' expectations
- D. *Exercises Leadership* & communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies
- E. *Negotiates* & works toward agreements involving exchange of resources, resolves divergent interests
- F. *Works with Diversity* & works well with men and women from diverse backgrounds

Information: Acquires and uses information

- A. *Acquires and Evaluates Information*
- B. *Organizes and Maintains Information*
- C. *Interprets and Communicates Information*
- D. *Uses Computers to Process Information*

Systems: Understands complex inter-relationships

- A. *Understands Systems* & knows how social, organizational, and technological systems work and operates effectively with them
- B. *Monitors and Corrects Performance* & distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions
- C. *Improves or Designs Systems* & suggests modifications to existing systems and develops new or alternative systems to improve performance

Technology: Works with a variety of technologies

- A. *Selects Technology* & chooses procedures, tools or equipment including computers and related technologies
- B. *Applies Technology to Task* & Understands overall intent and proper procedures for setup and operation of equipment
- C. *Maintains and Troubleshoots Equipment* & Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Figure 2: Secretary's Commission on Achieving the Necessary Skills (SCANS) 1990
A THREE-PART FOUNDATION

Basic Skills: Reads, writes, performs arithmetic and mathematical operations, listens and speaks

- A. *Reading* — locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules
- B. *Writing* — communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts
- C. *Arithmetic/Mathematics* — performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques
- D. *Listening* — receives, attends to, interprets, and responds to verbal messages and other cues
- E. *Speaking* — organizes ideas and communicates orally

Thinking Skills: Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons

- A. *Creative Thinking* — generates new ideas
- B. *Decision Making* — specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative
- C. *Problem Solving* — recognizes problems and devises and implements plan of action
- D. *Seeing Things in the Mind's Eye* — organizes, and processes symbols, pictures, graphs, objects, and other information
- E. *Knowing How to Learn* — uses efficient learning techniques to acquire and apply new knowledge and skills
- F. *Reasoning* — discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem

Personal Qualities: Displays responsibility, self-esteem, sociability, self-management, and integrity and honesty

- A. *Responsibility* — exerts a high level of effort and perseveres towards goal attainment
- B. *Self-Esteem* — believes in own self-worth and maintains a positive view of self
- C. *Sociability* — demonstrates understanding, friendliness, adaptability, empathy, and politeness in group settings
- D. *Self-Management* — assesses self accurately, sets personal goals, monitors progress, and exhibits self-control
- E. *Integrity/Honesty* — chooses ethical courses of action

D. COLLEGE READINESS

Another issue of concern is the degree to which high school students are prepared for a successful experience in post-secondary education, should they choose to follow that path. The following sections provide data on various components of college readiness.

1. Drop-out rates

Much of the literature on college readiness points to concerns about the low national rate of high school graduation which is estimated at approximately 70%, with much lower average figures for African-American (51%), Hispanic (52%) and American Indian students (54%). For more detail on this issue, see Appendix B on page 14.

2. College Preparation in High School

The second issue that arises in the literature on college readiness is the degree to which high school students are taking the necessary courses to prepare them for college entrance and success in college. For additional detail on this topic, see Appendix C, beginning on page 14.

- One study estimates that, nationwide, only 32% of students who enter 9th grade and graduate four years later have mastered basic literacy skills and have completed the coursework necessary to succeed in a 4-year college; for African Americans, the figure is 20% and for Latinos 16%.
- Only 28.8% of California's high school students met CSU admission requirements in 2003 & only 14.4% met UC admissions requirements.
- Under the 1960 California Master Plan for Higher Education, the UC system is committed to providing an education for the top 12.5% of all high school graduates; the CSU system is to serve the top 33.3%; and the community college system is to admit any student capable of benefiting from instruction.
- 49% of California graduating seniors take the SAT test at some point in their high school career; 15% take the ACT.
- Too few students are ready for college-level coursework: only 22% of the 1.2 million students who took the ACT in 2004 were considered, by ACT, to be college ready in all three academic areas: English, math and science.
- Students who complete a rigorous course of study in high school, on average, 2.6 points higher on the ACT and 102 points higher on the SAT and are better equipped to advance to higher education, complete a degree, succeed in the workplace or in military training programs or resume their education in preparation for a career change.
- A 2001 report of the Public Policy Institute of California found that the higher the level of math courses students take in high school, the greater chance those students will attend and graduate from college and find better paying jobs in the future.

- A 2005 EdSource report notes that from 2001 to 2004, the percentage of California students taking Algebra I, geometry, and Algebra II rose across all grade levels. However, about a quarter of 10th and 11th graders are taking math courses that are not part of the college-prep sequence or have quit math altogether. In addition, a smaller percentage of students are performing at proficient or above on the standardized tests associated with the higher-level math courses.

3. College attendance

- Enrollment in postsecondary institutions has increased over the past 3 decades. An analysis of 1992 high school graduates showed that 75% of US high school graduates went on to postsecondary education within 2 years of leaving high school, with 45% going to 4-year institutions; 26% to 2-year colleges; and 4% to other forms of postsecondary education.
- U.S. Census Bureau Data for 2004:
 - 43% of California's young adults aged 18-24 are enrolled in college or have completed college (10th highest rate in the US).
 - 27% of California's high school graduates age 25-29 have completed a bachelor's degree or higher (27th highest rate in US).
- A study by the California Legislative Analyst's Office (LAO) in 2002/03 found that a strong majority of high school students who are not enrolled in college-prep classes expect to go to college:
 - 71% want to enroll in college
 - 41% plan to attend a 4-year college and 30% a community college or technical school
 - 12% planned to work or enter the military upon graduation
- The University of California (UC) enrollment figures have been fairly steady over the past 4 years at approximately 200,000 full-time equivalent students. The California State University (CSU) system enrollment has dropped to approximately 320,000 in 04/05 from 330,000 in the previous two years.
- EdSource reports that about 28% of California high school graduates go to Community College and that 1/3 of UC and 2/3 of CSU graduates began at a community college.

4. Need for remediation in college

Entrance into college does not necessarily suggest that high school graduates are well prepared for success in their post-secondary careers. Many colleges report that incoming students are ill prepared to meet the challenges of college-level coursework.

- The National Center for Education Statistics reported that, in 2003, 28% of college freshmen were immediately placed into some form of remedial courses that cover material they should have learned in high school: 11% in reading; 14% in writing and 22% in math.

- Over the course of their college careers, over 40% of postsecondary students will take at least one remedial course.
- 76% of students who require remediation in reading and 63% of students who require one or two remedial math courses fail to earn degrees. However, 65% of students who do not require remediation complete associate or bachelor degrees
- At CSU campuses, freshmen must take proficiency exams in English and math. In the fall of 2003 only 63% were deemed to be proficient in math and 52% in English. The remaining students were placed in some form of remediation course.
- The UC system claims to not offer remedial instruction, however if students fail the university's writing test, they must enroll in a "Subject A" class – in 2004, about 1/3 of the entering freshmen were in a "Subject A" class.
- A 2005 national survey by the Higher Education Research Institute reported that only 36% of postsecondary faculty members felt that most students are well prepared academically for college; 41% said that most students they taught lacked the basic skills needed for college-level coursework.

5. College completion rates

Finally, in assessing how well prepared our students are for postsecondary education, it is useful to consider how many students actually complete a 2-year or 4-year degree in a timely fashion.

- Nationally, 1 in 4 freshmen at 4-year colleges and 1 in 2 freshmen at 2-year schools fail to return for sophomore year.
- A national study published in 2004, suggested that for every 10 high school students who start high school in California:
 - 7 will graduate from high school
 - 3.7 will go to college
 - 2.5 will still be enrolled in college in their sophomore year
 - 1.9 will complete a degree within 150% of time (e.g. completing an associate's degree within 3 years or a bachelor's degree within 6 years).

E. CIVIC RESPONSIBILITY

In discussing high school reform, the Gates Foundation discusses the importance of civic responsibility. Democratic institutions require a citizenry that is knowledgeable, reflective and committed to these institutions. Challenges that the future will bring will require all students, not just an elite minority, to leave school with an informed point of view, knowledge of the world, an ability to grapple with complex problems and a willingness to engage with people different from themselves. At the same time, trends in the civic awareness and competence of young people are on the decline:

- Young people are less engaged in collective civic institutions than their parents or grandparents

- Voter turnout has been steadily declining since 1960 and has been especially acute among young people; in the 1996 and 2000 presidential elections, turnout among 18-25 year olds was below 40%
- Young people have the highest score on record on the Political Apathy Index as they are considerably less interested and knowledgeable about public affairs.

F. TRANSFORMING HIGH SCHOOLS FOR 21ST CENTURY SKILLS

The 1990 SCANS report noted that despite changes in the workplace, most high schools have not changed fast enough or moved far enough. Many high school students see little connection between what they do in school and how they expect to make a living. Students involved in SCANS focus groups understood clearly that a high school diploma by itself did not guarantee a job in today's economy. However, students were not clear on where they would learn the necessary job skills. It was noted that it is important for students to associate schoolwork with "real work" and understand that the task of learning is the real work of today, whether at school, in university or on the job. There is a need for clearer communication between the business community and educators about the expectations for high school graduates.

Education systems must set clear-cut standards and ensure that students, teachers, parents and business leaders understand the value of achieving competency in these standards. The SCANS report suggested three principles to guide contextual learning in schools:

- Students do not need to learn basic skills before they learn problem-solving skills; they are not sequential but mutually reinforcing.
- Learning should be oriented away from mere mastery of information and toward encouraging students to recognize and solve problems.
- Real know-how, namely foundation and competencies, cannot be taught in isolation; students need practice in the application of these skills.

G. Career and Technical Education in High Schools

It has been suggested that more attention must be given to the issue of career and technical education in our high schools. This is typically defined as:

“A program of study that involves a multi-year sequence of courses that integrates core academic knowledge with technical and occupational knowledge to provide students with a pathway to postsecondary education and careers”.

- In 03/04, 42% of California high school students were identified as career/technical concentrators as they were taking courses beyond the introductory level.
- In 03/04, 74 Regional Occupational Centers and Programs (ROCPs) served approximately 336,000 students or about 37% of California's high school students aged 16 and older (45% female and 55% male).
- In 04/05 California provided a total of \$23 million to support 269 Career Academies in the state's high schools.

- Tech Prep programs combining 2 or more years of high school education with 2 years of post-secondary education – 80 consortia operating in California funded by \$11.5 million in Perkins Act funding in 04/05.
- Federal School-to-Work Act funds, which had previously supported California school programs such as internships, co-ops, and school enterprises, have now been virtually discontinued.

The California Chamber of Commerce is supporting reforms to the career technical education system in the firm belief that an educated workforce is a key factor for improving the state's economy. They suggest that our schools must:

- Expand students' exposure to career technical education in middle school.
- Meet the demand for middle and high school teachers with current knowledge of industry-relevant workforce skills.
- Greater coordination of community colleges with K-12 schools in career technical courses.
- Build on the effective Tech Prep Model 2+2.

H. Measuring success in the development of 21st century skills

The literature notes that there are relatively few assessments, which focus on measuring students' competency in 21st century skills. However, in considering the degree to which our schools are succeeding in preparing students for success in postsecondary education, careers and citizenship, certain indicators may be of value. For example, the Ohio task force on high quality high schools suggests that valuable indicators of success might include:

- Increase in % of high school students (in all subgroups) meeting or exceeding academic content standards
- Higher graduation rates for all students
- Increase in % of students who take AP and college-credit classes
- Increase in % of students taking SAT/ACT tests and in the mean scores on these tests
- Increase in college enrollment rates
- Decrease in college remediation rates for recent high school graduates
- Increase in college attainment and completion rate
- Decrease in unemployment rates among young adults
- Increase in employers' perceptions that young adult employees are well prepared for employment
- Decrease in % of young adults in correctional facilities
- Increase in % of young adults who vote
- Increase in % of students who volunteer or participate in service learning

At this time, it is difficult for high schools to gain data on the experiences of their graduates in their postsecondary, career and life experiences. The CSU system does provide reports to California high schools regarding incoming students' GPAs, SAT or ACT scores as well as results of math and English proficiency tests. The UC system reports aggregate data of this type but does not break it down by high school.

Schools may choose to survey their senior students before they graduate; soon after graduation, or up to 1-5 years after graduation and beyond. For existing seniors, the benefit is that they are readily available as the survey can be conducted at school. Questions might include:

- Current plans for postsecondary enrollment, work or military service.
- Degree to which high school offered classes they needed to fulfill their goals.
- Support they received from counselors, teachers or administrators in determining their pathways, choosing classes, etc.
- Quality of instruction offered? Challenging? Interesting/engaging?
- Availability of support services when needed? Academic/personal.
- Perceived safety of campus/environment.
- Sufficient information provided on progress to student/parents.
- Overall experience.

Once students have graduated, the issue of contacting them becomes more difficult but it is useful to have data on their experiences in post-secondary or work. It is important to build the database of contact information in senior year and to keep it updated over time. One option is to use an outside source. For example, LifeTrack is a private company that provides graduate tracking services including:

- Senior Exit Survey
- Initial Graduate Survey (6-18 months after graduation)
- Advanced Graduate Survey (5 years after graduation)

H. CONCLUSIONS

It is clear that trends toward increasing globalization and the growing importance of technology will continue to impact the skills that our students will need to develop to be prepared for responsible citizenship, further learning and productive employment.

The education system must consider the degree to which their students are achieving the competencies and foundations identified by the SCANS reports and other sources. These must be infused throughout the curriculum, rather than be seen as separate career or vocational education initiatives. There is a definite need for clearer communication between the business community and educators about the expectations for high school graduates. It has been suggested that it will be increasingly necessary to ensure that students associate schoolwork with “real work” and understand that the task of learning is the real work of today.

High schools, in particular must address the issues relating to college readiness including developing means of improving graduation rates; ensuring that all students have access to a rigorous, college preparatory curriculum; and that all students achieve proficiency in the core curriculum to reduce the need for remediation in college; and improve the chance for success in postsecondary education. There is a growing need, as well, to examine the availability of career and technical education options for today’s high school students and to prepare students to uphold their civic responsibilities.

Finally, K-12 systems will need to collect and analyze data on student success beyond high school graduation to determine the degree to which current programs and reforms are achieving the goals of preparing students for success in the 21st century.

APPENDIX A: EMPLOYERS' PERCEPTIONS OF SKILL DEFICIENCIES

The National Association of Manufacturers 2001 members' survey asked employers about the most serious skill deficiencies of current hourly production employees. They found that:

- 59.1% of employers stated poor basic employability skills (attendance, timeliness, work ethic);
- 32.4% poor reading/writing skills;
- 26.2% inadequate math skills;
- 25.0% an inability to communicate;
- 23.7% poor English language skills;
- 22.1% an inability to read and translate drawings/diagrams/flow charts;
- 22.0% an inability to work in a team environment; and
- 12.3% poor computer/technical skills.

The "Voices from Main Street: Assessing the State of Small Business Workforce Skills" 2000 survey found that:

- 34% of small business owners were extremely or very satisfied with the skills and education of employees and prospective employees.
 - 65% said that improving the quality of workforce skills and education was very important.
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- As reported in a **2002** study, over 60% of employers reported that recent graduates had poor math skills, while nearly 75% pointed to a deficiency in grammar and writing skills.

APPENDIX B: HIGH SCHOOL GRADUATION RATES

- “The continuing failure of US public schools to keep so many of their students in school – particularly their black and Hispanic students, who fail to graduate at much higher rates than whites and Asians – must be considered one of the most urgent problems in education policy.” (Greene and Forster, 2003).
- National figures suggest that close to one in three students **drop out** of high school (i.e. Graduation rate of approx. 71%)
 - Approx. 60% of 16-19 year-old dropouts are unemployed and more than 40% of 20-24 year-old high school dropouts are unemployed
 - Earnings for male dropouts fell 35% between 1971 and 2002
 - Estimated that high school dropouts will earn \$270,000 less than high school graduates over their working lives
 - California does not have an accurate method of measuring graduation rates due to lack of system of tracking individual students over time
 - It is estimated that California’s graduation rate is 68.8-71.3% by researchers although California reported, under NCLB, that the figure was 86.9% in 01/02
- On average, only 70% of U.S. students graduate from high school:
 - 51% of black students
 - 52% of Hispanic students
 - 72% for White students
 - 79% for Asian students
 - 54% for American Indian students

APPENDIX C: ADDRESSING COLLEGE READINESS

Many suggest that there is a need to align academic standards with the knowledge and skills required for college and workplace success. It has also been suggested that schools should track achievement of students from K-12 through postsecondary education and use the results to improve the rigor of the course offerings and instruction in high school. Earning a high school diploma should signify that students are ready for college or work. Some findings from the literature regarding the degree to which high schools are preparing students for success in college:

- Minority students are significantly less likely to take rigorous, college prep courses than are Asian and white students; Of the graduating class of 2000, the following % took a math course beyond Algebra II:
 - American Indian 29%
 - Latino 31%
 - African American 32%
 - White 47%
 - Asian 69%
- The ACT organization, which administers college entrance exams, notes that despite the long-recommended benefits of taking a core curriculum, not enough students take a core curriculum or are required to take it – since 1994, the % of students taking a core curriculum has stayed relatively stable at approximately 55%.
- Even if students take the minimum number of courses as defined the core curriculum, it will not guarantee they will be ready for college – ACT points out that greater benefits are accrued by students who take more than the core curriculum. They suggest that every high school student should take one or more advanced math classes beyond Algebra II as well as Biology, Chemistry and Physics to be ready for college & work.
- San Jose Unified School District has shown dramatic results after it required all students to take the A-G requirements of the UC system: between 1998 and 2002, test scores of African American 11th grade students increased nearly 7 times as much as those of African American students across the state; this occurred without an increase in dropout rates that some had predicted.
- In the Texas Scholars program, employers took a lead role in describing the opportunities that await young people who work hard and complete rigorous courses in high school, making it clear that coursework matters to future academic and career success
 - Many students enrolled in tougher courses
 - When students successfully completed challenging courses it bred higher expectations among peers
 - Generated greater demand for high-level courses
 - Program challenged adults' assumptions about who is “college material”
 - Included requirements for 3 credits math through at least Algebra II; 3 credits of lab science, including physics; 4 credits of English; 3.5 credits of Social Studies; and 2 credits of a language other than English.
 - Benefits of strong background in each of these core areas discussed in-depth (#11, p. 6-8)
 - Many other states now using this State Scholar model to implement more rigorous core curriculum requirements.

- A 1999 study suggested that the higher the level of math students take in high school, the more likely they are to earn bachelor's degrees and the threshold is a substantive course beyond Algebra II (Adelman)
 - Looked at records of 30,000 students from 10th grade in 1980 to age 30 in 1993, and found that the academic intensity and quality of one's high school curriculum was a more accurate predictor of bachelor degree completion than grades, national standardized test scores, or class rank, particularly among minority students using regression analysis techniques
 - Correlation of high school curriculum with bachelor's degree attainment (.54) is higher than test scores (.48) or class rank/GPA (.44) – impact of high academic intensity and quality of degree completion is far more positively pronounced for African-American and Latino students
 - Strongest predictor is highest level of math studied: finishing a course beyond the level of Algebra II more than doubles the odds that the student who enters postsecondary education will complete a bachelor's degree

- A 2004 report by ACT reported that students taking Algebra I, Geometry, Algebra II and one additional higher level math course are much more likely to succeed in college than those with a less rigorous sequence of math courses (i.e. 75% chance of earning a C or better & a 50% chance of earning a B or better in credit-bearing college courses).

- Students who complete Algebra II in high school earn a bachelor's degree nearly 40% of the time whereas students who stop at Geometry earn a bachelor's degree only 23% of the time.

- Particularly important for bridging the achievement gap: taking a rigorous high school curriculum that includes math through Algebra II or beyond cuts the gap in college completion rates between white students and African American and Latino students in half.

- A 2004 study by Achieve, Inc., a bipartisan organization, non-profit organization created by the nation's governors and business leaders, suggested, that “No state requires its graduates to take the courses that reflect the real-world demands of work and postsecondary education.” They make the following observations:
 - High school course taking in math and English is an indication of students' opportunity for success in the high-performance workplace
 - 84% of those who hold highly paid professional jobs had taken Algebra II or higher as their last high school math course
 - 67% of those holding well-paid, white-collar, skilled jobs had taken Algebra II or a higher level math course while 84% had taken at least Geometry
 - In English, the vast majority of workers in good jobs had taken 4 years of English

Achieve, Inc. 2004 suggests, “No state requires its graduates to take the courses that reflect the real-world demands of work and postsecondary education.” They believe that every high school student should take a college preparatory curriculum including 4 years of rigorous math and 4 years of English (only Arkansas, Indiana & Texas have or will soon make a college-prep curriculum the norm). The

report also discusses the importance of social studies, science and foreign language courses. Suggest that the college and workplace readiness benchmarks for English are divided into 8 strands:

- Language
- Communication
- Writing
- Research
- Logic
- Informational text
- Media
- Literature

○ College & workplace readiness benchmarks for math are organized into 4 domains:

- Number sense and numerical operations
- Algebra
- Geometry
- Data interpretation, statistics and probability

The Ohio Task Force on High Quality High Schools (2004) made the following recommendations to improve high schools to fulfill the mission of preparing students to be successful in the 21st century:

- Implement smaller learning communities to personalize the educational experiences of students.
- Ensure all students follow a challenging curriculum that prepares them for success.
- Provide applied learning opportunities outside the classroom through internships, mentorships, apprenticeships, and service learning projects through partnerships with the community.
- Fund expanded professional development to allow teachers to build their skills in providing applied, hands-on learning opportunities for their students.
- Engage members of the community to build stronger school-community connections to provide mutual support and improvement.
- Urge post-secondary institutions to provide additional opportunities for training of teachers in critical shortage areas of technology, career-technical fields, math and science.
- Prevent dropouts and reconnect with students who have left without graduating.
- Bridge the gap between high school and postsecondary institutions through increased collaboration:
 - Eliminate gaps in expectations between K-12 system and college system.
 - Offer low-stakes, online assessments that students can take to know whether they are ready for college.
 - Consider funding students to take SAT or ACT during 7th, 8th, 9th or 10th grades to allow students to take necessary additional coursework in areas of identified weaknesses.
 - Offer dual-enrollment opportunities in partnership with colleges & universities.
 - Develop data system that includes K-16 performance measures and is shared between K-12 and post-secondary systems.

RESOURCE LIST: 21ST CENTURY SKILLS

- Achieve Inc. “The Expectations Gap: a 50-state review of high school graduation requirements”. 2004. <http://www.achieve.org/>
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