

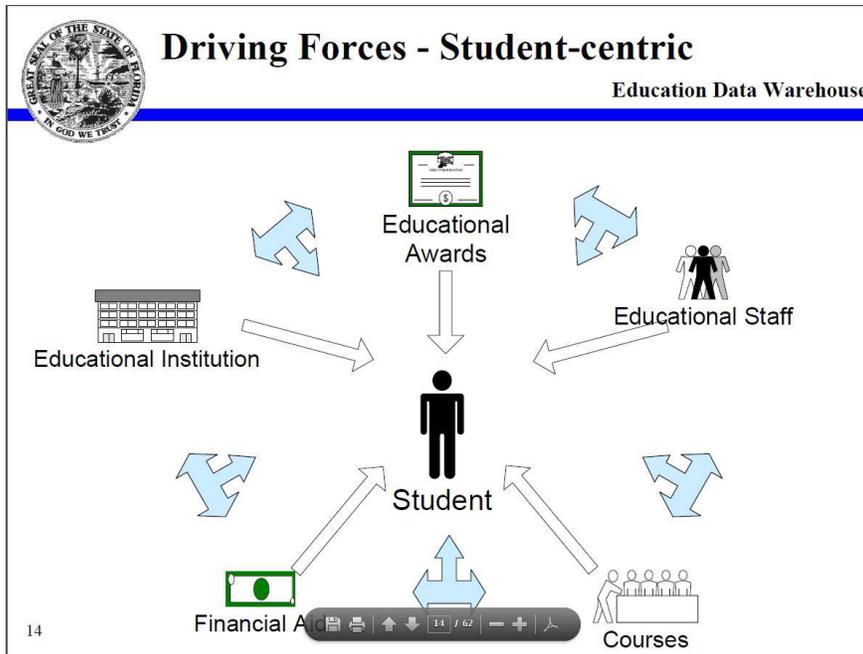
## Review of literature

### Introduction

According to the *Journal of Engineering Education*, the United States may have already lowered its status in the “global engineering and technology hierarchy”. Therefore it is imperative to assess the effectiveness regarding retention, career readiness and needs improvement of engineering and technology education programs. Other countries in the world such as China are not challenged by reduced enrollment in engineering programs. In 1995 there were approximately one-hundred thousand engineering graduates in the United States, and climbing to one-hundred and twenty thousand in 2005. The shocking comparison is that China generated one-hundred and fifty thousand graduates in 1995 and soared to five-hundred and seventy five thousand in 2005 (Davis, Yeary & Sluss, 2012).

President Barack Obama stated in a speech at the National Academy of Sciences in 2009, for educators to “think about new and creative ways to engage young people in science and engineering, like science festivals, robotics competitions, and fairs that encourage young people to create, build, and invent—to be makers of things, not just consumers of things” (Davis, Yeary & Sluss, 2012). With the current downturn of the job market, assurance is expected that students are prepared to enter the labor force highly skilled and highly qualified (Wilcox, 2006). However, in 2005 the Gates Foundation reported 81% of students who dropped out said “more real world learning may have influenced them to stay in school” (Bridgeland, 2005).

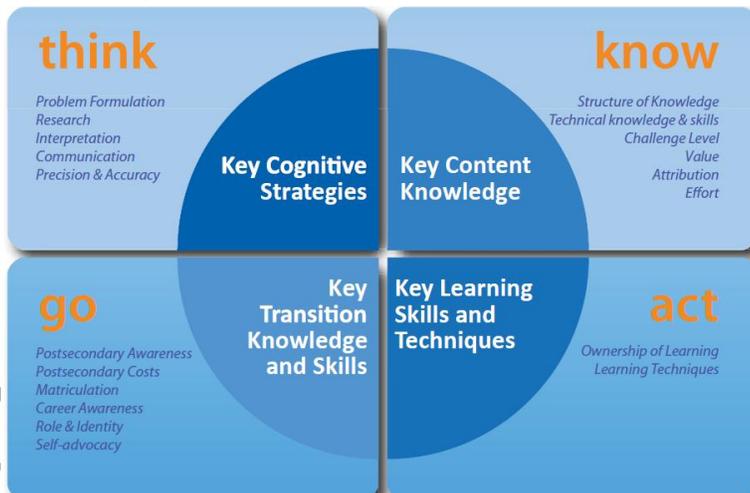
Research has acknowledged that Career and Technical Education is momentous to a young person’s education and can add value to the probability of their success. However, current daily practices in high schools across the country are still at this time liberated by *lectures, individual silent work, and recall based assessments* (Hoachlander & Yanofsky, 2011). Recent studies have revealed that Career and Technical Education students enroll in higher math, reading and science classes. Of these students enrolled in higher level courses, results of 12<sup>th</sup> grade test scores significantly increased. In regards to employment, CTE students are more likely to earn a higher wage and obtain a job after graduation. Most importantly Career and Technical Education enrollment promotes retention of secondary students (Lewis, 2005). The objective of the academies is to better prepare students for the workplace. Integrating career themes through technical courses and work based learning and career academies offer technical training in a more personalized learning environment (Estacion, D’Souza & Bozick, 2011). Educational awards, educational staff, courses, financial aide, and institution all focus on the student. According to the Education Data Warehouse Centralized student learning can be a successful driving force of a program. The 1980’s empowered the teacher to become the “central manager” of their education environment. Attention has now shifted to “school based curriculum development and research based in service education” (McNiff, 2002). This pattern of critical thinking pushes schools to put their own needs in perspective. It is a common pattern for schools not only to have curricula which is strictly content focused, rather than adding teacher’s skill sets and attitudes (McNiff, 2002).



### Career Readiness

The primary focus of a secondary program should be for students to be given the opportunity to obtain knowledge and skills to prepare them for the workforce, with a measurement of success in the chosen occupation or postsecondary school preparation. “All schools have the ability to prepare students in a common core of foundational knowledge and skill while also acknowledging the strengths of students who have passions and interests in particular career pathway areas” (4). Students will be considered “ready” upon mastery of four key benchmarks of a) cognitive , b) content knowledge, c) skills and techniques, and d) transition of knowledge and skills (Conley, 2012).

### Implementation and Career Readiness

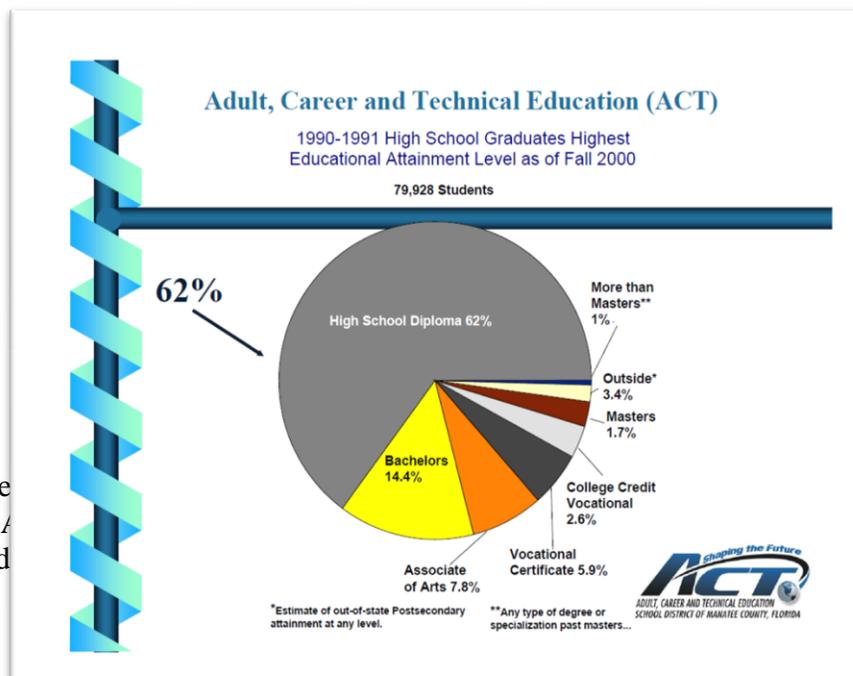


Four keys a

As p... ready, will display the ability to demonstrate key performance targets of cognitive strategies, content knowledge, skills

and techniques, and transaction of knowledge and skills. Students should be able to interpret a broad range of information and material, comprehend data and information from charts, graphs and pictures, demonstrate the ability to utilize different methods of writing, demonstrate understanding of number systems within algebra and geometry, interpret data from a broad range of sources, recognize the organization of the scientific method, understand social systems and historical trends, have explored careers and career planning, some knowledge and understanding of a second language, and experience and studies in the creative arts (Conley, 2012). The development of a program based upon a foundation of skill standards and a strong foundational comprehension of a subject can sustain multiple objectives. These teaching objectives can be met by incorporating learning which prepares students to earn industry certifications in relevant engineering careers. This detail of alignment strategy between classroom and industry will better assist students in experiencing the benefits of becoming industry certified and career ready (Wilcox, 2006).

New York’s Manpower Demonstration Research Corporation (MDRC) developed the most comprehensive research of career academies in March of 2000. The covered more than 1,700 students currently enrolled in career academies. The study revealed many negative aspects involving career academies. The group noted in regard to course content and teacher strategies, that academies had little influence over these central decisions. Standardized test scores showed no creditable effect on students enrolled in academies, and also added no cause in connection to future employment (Black, 2004). However, in 2000 and 2001, Katherine Hughes and Melinda Karp of Columbia University Institute on Education and Economy completed a study with 199 graduating career academy seniors. This sample of students felt their involvement in career academies brought forth engagement in learning, development in career plans, while enrolled in smaller classes with supportive teachers. Most importantly students rate their coursework as rigorous and relevant, giving the feeling that they are academically prepared for today’s workforce (Black, 2004). Figure 1 illustrates a study of the attainment levels of graduates from 1990-1991 in the year 2000. Figure 2 is a comparison in 2005 of graduates from 1995-1996.



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## Florida 1995-96 High School Graduates: Highest Educational Credential Attainment as of 2005

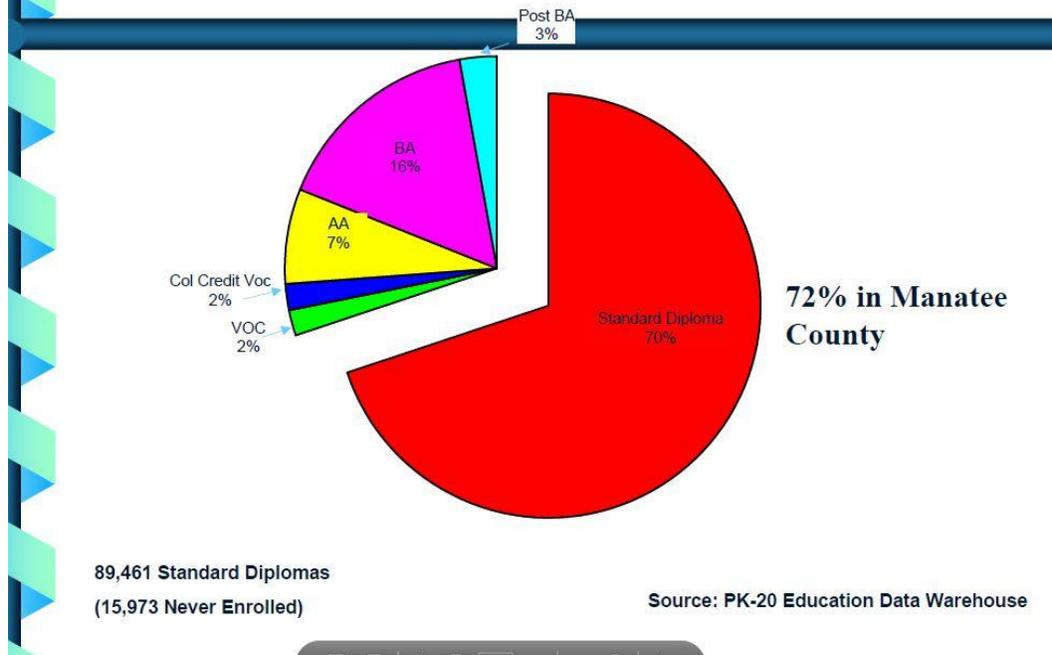
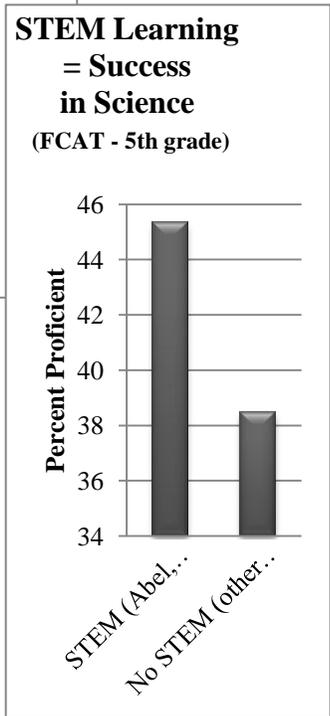
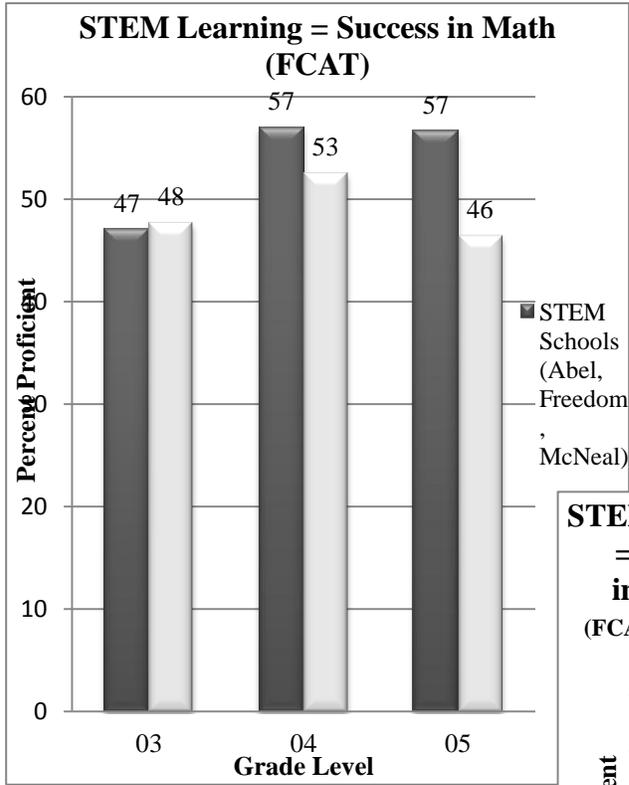
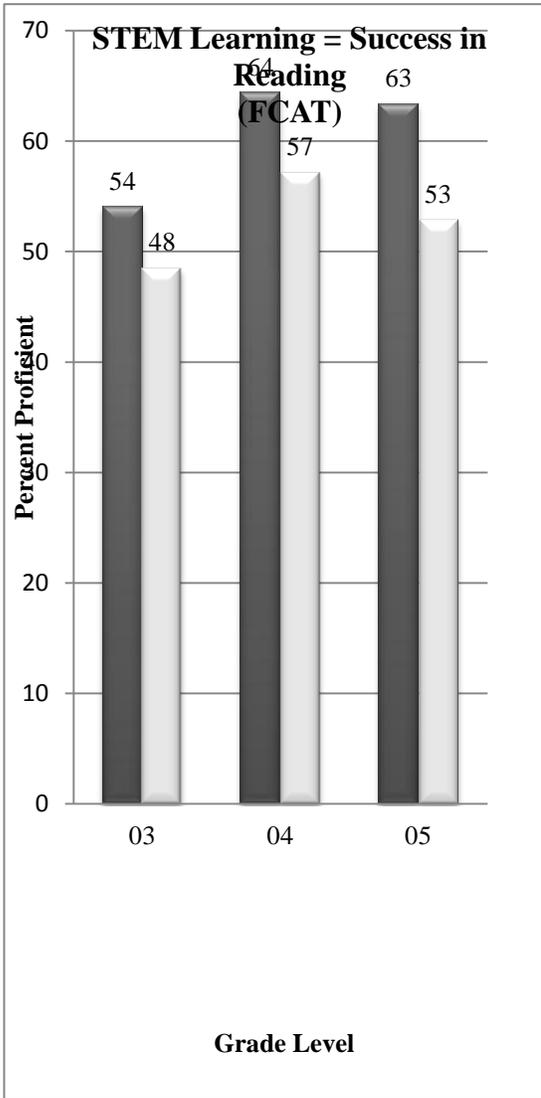


Figure 2

Manatee County School District continues to better develop the implementation of K-12 engineering program. Studies revealed that scores in math, reading and science in STEM (Science, Technology, Engineering and Math) themed elementary classrooms across the District of Manatee County are increased compared to schools with non STEM focused programs. The objectives of STEM learning in the elementary school are to introduce students to content and skills, which will be required for college and career readiness. This model supports a “bottom up” approach involving schools, teachers, students, and community (Wagner, 2012). This approach accelerates learning, and increases anticipation of elementary students enrolling into middle school STEM programs. Data shows FCAT scores increasing at schools with STEM programs.



**Conclusion**

In 2011, Estacion, D'Souza & Bozick conducted research of twelve Districts in the state of Florida. Of the twelve districts surveyed (332,010 students), 15 percent (49,795) were participating in career academies (Estacion, D'Souza & Bozick, 2011). Haile Middle School Career and Technical Academy (CAT) began in 2012. The need for the academy was to be in conjunction with Florida House Bill 1255, which states that by 2011-2012 school years, each district shall include plans to implement at least one career and professional academy in the district. According to the bill, academies must provide instruction in courses targeted at careers in high growth areas. Integrating content from core subject areas along with aligning course

work with approved industry certification training is a necessity (Florida House Bill 1255). Research findings indicated there is a need to continually assess and improve engineering technology programs in order to maintain effectiveness and clearly support the proposed research project of discovering program retention, career readiness effectiveness and needs improvement of the career academy.