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Giving High School Students the Power to Know: SAS Programming and 21st Century Skills

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ABSTRACT

SAS has created a tremendous opportunity for high school students to learn skills that involve not only programming but critical thinking and problem solving skills. SAS introduces students to the world of statistics and data but also to the idea that SAS can be used in any industry or situation where analysis is needed to answer questions. This paper discusses the importance of SAS in high schools, implementation, a success story and concludes with a discussion. High school students are given the power of knowledge by applying SAS software in real-world scenarios while increasing their 21st century skills.

INTRODUCTION

Since the creation of Career and Technical Education (CTE), economic developments have had major influences on the content and direction of curriculum in the secondary schools (Rojewski, 2002). CTE was enacted to prepare students for jobs resulting from the industrial revolution. The beginning of federal legislation shaping vocational education was the Smith-Hughes Act (Lynch, 2000), which emphasized a call for a curriculum that would meet the needs of the working class (Lynch, 2000). Developments to accommodate the “working class” in school curricula have remained relatively gradual until recently, when economists declared a “new economy” (Rojewski, 2002, p.32). A new economy is one that includes manufacturing, globalization of business, information handling, business management practices, and fierce competition (Rojewski, 2002). The change in society from sole manufacturing environments to a multi-tasking, information-technology-based environment has created diverse problems in our educational system (Rojewski, 2002). The adoption of new technology in business and industry is placing additional emphasis on the need for training and education (Rucker & Reynolds, 2002, Brand, 2008). National Educational Technology Standards by the International Society of Technology Education (ISTE) (2008) states that teachers should “develop technology-enriched learning environments that enable all students to pursue their individual curiosities.” Pursuing their thoughts and ideas allows students to become active participants in their own educational goals, learning processes, and progress assessments (ISTE, 2008). Because many jobs in the future, especially those within the CTE fields, will involve technology, it is critical for students to have the education and skills to perform in the 21st century workplace (McCoy, 2001; ISTE 2008;

Brand, 2008). SAS has offered an opportunity for students to gain skills for the 21st century through the SAS in High Schools curriculum.

With the swinging pendulum of the economy, there are certain companies that have the internal strengths to weather the ups and downs. SAS is on of those corporations. Even with an uncertain economy, SAS has continued to grow and show stability. This stability has proven to be evident in of the three pillars of the SAS motto. Education initiatives have grown to now include an initiative to implement statistical collection and analysis programming in the high schools. “What we hope is that this SAS Programming course will help stimulate the desire for the students to further their careers in the STEM areas – science, technology, engineering and math,” said Jim Goodnight, CEO of SAS. “We know that graduates with these skills are poised for success in college and today’s globalized knowledge economy” (Smith, 2008).

Through the goal to educate others for success, SAS partnered with high schools in North Carolina in 2007. SAS wanted to offer their programming curriculum to high school students who were interested in gaining an advantage in their college and career aspirations. The high school pilot program started with Apex High School in Apex, North Carolina. With the success of the implementation of the program at Apex, it was subsequently offered publically to all high schools in North Carolina in August 2008. Additionally, SAS offers the high school course as a way to promote their software and awareness about statistics and data.

SAS offers the course curriculum, course materials, and support to high schools free of charge, except for a seventy five dollar fee for a one week teacher training in Cary, North Carolina. At the end of the course, students have the opportunity to become SAS certified. The high school SAS course program has now been approved as a Career and Technical Education (CTE) curriculum in North Carolina. The program is available to any teacher or school who may be interested and have the prerequisite skills to teach the course.

This paper will discuss the importance of SAS in high schools, implementation, and the success of implementing SAS in the high school Phillip O. Berry, and concludes with a discussion.

IMPORTANCE

Twenty four years ago, the National Commission on Excellence in Education gave a dire warning: *Our nation is at risk. Our once unchallenged preeminence in commerce, industry, science, and technological innovation is being overtaken by competitors throughout the world...the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. What was unimaginable a generation ago has begun to occur—others are matching and surpassing our educational attainments* (Bridgeland, Scheppach, and Stengel, 2007). In October 2008, Jim Goodnight went to North Carolina department of education to discuss the current dropout rate in North Carolina

along with the sentiment of increasing technology in education. Goodnight emphasized the need to increase student engagement, highlighting current efforts under way in the state. Three years ago, Bill Gates called America's high schools "obsolete" and testified before Congress that "every student in America should graduate from high school ready for college, career and life, every child with no exceptions. This is a goal that demands Presidential debate and attention, it is worthy of our collective best efforts to achieve, and one in which progress can be made (Bridgeland et. al., 2007). For many young people, dropping out is a gradual process of disengagement- the cumulative effect of multiple lost opportunities to tap their potential and prepare them for success in life. From the "Be the Voice" contest, which gave students an opportunity to share their challenges on graduating from high school and preparing for college, created an open forum and input from young people. Below are a few comments:

"We want to learn, we want to open our minds, and we want to expand our knowledge. Obviously we have the initiative and determination, but not given the opportunity. Expanding academic courses and social electives are vital to the essence of not just having to learn something, but wanting to learn." – Hazel, 17, Courtland CA

"For many, including myself, transitioning into college was a shock to my brain academically simply because I had never been exposed to the academic skills that I was expected to already have by the start of my college career."- Samantha, 22, Cincinnati, OH

(Bridgeland et. al., 2007)

Opportunities are abound as we become an information-rich society, said Marina Gorbis, executive director for the Institute for the Future. With a growing number of video cameras, radio-frequency identification chips (RFID) and sensors gushing data, hot jobs will spring up, creating a demand for people who can cope and build new ways to comprehend it, she said (Zappala, 2009). "We're entering an age where every object, every place, is surrounded by digital data. Massive amounts of data will be streaming in every direction," Gorbis said. "The only way we're going to be able to live in this world of massive information is to be able to access it in ways that are more sensory rich. They have to appeal to our senses" (Zappala, 2009). As Gorbis states, data will be streaming in every direction and businesses are using data to understand their consumer and competition. SAS gives students the power to learn how to take data and make it knowledge. CTE was enacted to prepare students for jobs and SAS offers students the opportunity to learn a programming language that can be used in real-world scenarios. The BASE SAS programming language stands the test of time, with user friendly programming syntax but with powerful flexibility. Once students are able to learn the syntax of the language, the possibilities are endless with data analysis.

SAS skills are in high demand by companies, governments and organizations worldwide that use SAS to analyze huge amounts of data to make better decisions (Smith, 2008). SAS careers vary from entry-level programmers to executive positions requiring data warehousing, data mining and analytical expertise (Smith, 2008). Students who graduate high school with SAS

knowledge carry a distinct advantage into post-secondary education, where SAS is used in many college courses requiring quantitative analysis, such as psychology, statistics, mathematics, business, and public health (Smith, 2008).

IMPLEMENTATION

SAS is now being taught in 10 high schools from North Carolina to Florida with the intent of more schools implementing in the coming semesters. Using the curriculum and pacing guides, provided by SAS the students were introduced to Base SAS programming. The following topics are included in the curriculum: Intro to SAS, Running SAS Data Sets, Creating SAS Data Sets, Data Step Programming, Reporting in SAS (proc report, proc gchart), Controlling Input and Output, Summarizing Data, Data Transformations, Processing Data Iteratively, and Combining SAS Data Sets. The concepts of the curriculum are programming basics and overlap with other programming languages, therefore, students who have had prior programming experience find SAS easily adaptable. This curriculum also offers critical thinking and problem solving. Administrators and teachers can find out more information on how to implement this program into their high school at <http://www.sas.com/industry/education/k12/index.html>.

SUCCESS STORY

SAS has been a great success at Phillip O. Berry Academy of Technology. Phillip O. Berry High School (POB) is a technology magnet school in Charlotte, North Carolina with three career academies: Engineering, Medical Sciences and Biotechnology, and Information Technology. These academies prepare their 1,400 students for post secondary education in competitive four-year universities, two-year community colleges, apprenticeship programs, and high-skill careers. The Academy of Information Technology (AOIT) offers course in programming, web development, computer engineering, and networking. SAS is offered in the AOIT academy as a semester based programming course. The first semester SAS was offered, August 2009, the class included 12 students with prior programming experience. The class then grew to 20 students for the spring semester, grew to 30 in the fall of 2010 and currently entails 35 students.

It is imperative for CTE professionals to stay abreast of current technologies and business practices to prepare students for the workforce. CTE empowers students by providing a range of learning opportunities that serve different learning styles (Plank, Deuce, & Estacion, 2005). Using technology within instruction often creates a learning environment that integrates a variety of learning styles and is similar to the workplace (Plank et al., 2005; Brand, 2008). Since CTE often relies on a powerful mode of teaching and learning that cognitive scientists call "contextual" or "situated" learning, both in classrooms and in workplaces (Plank et al., 2005; Anderson, Reder, & Simon, 1996), it is important for instructors to integrate this type of instruction in the classroom in order to create a contextual environment. "Contextual/situated learning

emphasizes the idea that much of what is learned is specific to the situation in which it is learned” (Anderson et al., 1996, p. 5). Applying academic and technical skills to real-world activities, using computers and other tools, and being able to see how their learning is related to the world of work make CTE classes more interesting, motivating, and educationally powerful than standard academic classes (Plank, et al., 2005). “Greater emphasis should be given to the relationship between what is learned in the classroom and what is needed outside of the classroom, and this has been a valuable contribution of the situated learning movement” (Anderson et al., 1996, p. 5). The career focus integrated with technology to prepare them for the workforce often gives students a sense of direction.

With the flexibility and power of SAS, teachers have the ability to teach the SAS curriculum but use relevant data to teach concepts. Several projects used at Phillip O. Berry allowed for students to have the opportunity to see past the four walls of the classroom and implement SAS in relevant real world situation. The success of SAS at POB steamed from the practicality of SAS and the ability to apply it to outside the classroom. To illustrate the practicality several projects were completed including field trips and school projects. One of the first projects that successful was a field trip to the NBA Charlotte Bobcats game. The SAS class attended the Charlotte Bobcats game to show them a real world experience of statistics. The students later ran statistical data using SAS and presented their Bobcats data at the job shadowing career day at SAS in Cary. On another field trip, the students attended and gathered data at the semi-professional Charlotte Checkers hockey game. After attending the game, students used the data collected to run statistics about the game attended.

Students also completed several “in-school” projects including a project that evaluated a new lunch schedule, where students created a survey and collected student responses on their opinions of the new lunch schedule. To evaluate the effectiveness of Homecoming at POB, students created and executed a survey to ask the student body their opinions of the week. Conclusions were drawn of which spirit days the students enjoyed the most to which class (freshman, sophomore, etc) participated the most. This data was then presented to administration as well as a SAS representative.

Students at Phillip O. Berry used SAS to solve practical problems requiring advanced data analysis. Using SAS, students had an opportunity to collect and analyze data for the school Parent Teacher and Student Association (PTSA) on student transportation. They analyzed transportation data and presented their findings to the school board to show how proposed changes in bus routes would affect their school. The Transportation Survey gave students the opportunity to see how SAS can be used to research and analyze information in a real life scenario. The SAS programming class allowed them to go beyond the school walls and students felt as though they were making a difference in a community problem.

To showcase the first annual World Statistics Day, a cross curricular project was created

and lead by the SAS students. A taste test was conducted between Coke and Pepsi to analyze which soda students in AOIT liked better. SAS students assisted with the development of the survey and with the execution of the survey. From the data collected, the raw data was analyzed using SAS and then displayed in student webpages. The purpose of the project was to show how statistics can fall across multiple curriculums and is used in everyday situations. For more information on these projects please visit <http://sjonespob.webs.com/classdocuments>.

Students left the class with a new understanding of the relevance between the learning in school and application after the class ended. According to Autumn Brehon, a senior student at POB, "I have gained a different perspective at looking at other things in my life". Because of the nature of learning how to program SAS, she said that she looks at grammar, sentence composition, trends, among other subjects differently. Consequently, she is "not so frustrated when figuring things out in a structured fashion." Mya Hough, SAS student at POB, said that she thoroughly enjoys her class experience because they can relate the material to real life topics. For instance, she was able to use the program to analyze the latest fashion trends at POB.

Phillip O. Berry is highlighted in the following article showcased on the SAS website, <http://www.sas.com/success/phillipoberry.html>. This and other articles on the success of SAS in the K-12 sector can be found at the SAS website under Customer Success, Education, K-12: <http://www.sas.com/success/indexByIndustry.html#0200.1600.0000>.

DISCUSSION

"Education is a social process ... Education is growth.... Education is, not a preparation for life; education is life itself." --John Dewey

SAS has created a tremendous opportunity for high school students to learn skills that involve not only programming but critical thinking and problem solving skills. SAS introduces students to the world of statistics and data but also to the idea that SAS can be used in any industry or situation where analysis is needed to answer questions. Raw data comes from every industry and can be manipulated into formative knowledge. Twenty first century skills are not only the technology skills but the soft skills of communication, working with others, and problem solving. Through the SAS curriculum students have the chance to learn and apply these skills. A sense of value is established as students can see where data analysis can be used in their own daily activities and enhance their lives.

Society thrives on the ability to obtain and retain information. Human learning is the combination of processes whereby the whole person- body (genetic, physical, and biological) and mind (skills, attitudes, values)-experiences a social situation, the perceived content of which is then transformed cognitively, emotionally or practically and integrated into the person's individual biography resulting in a changed (or more experienced) person (Jarvis, 2006). Learners learn knowledge, skill, attitudes, emotions, beliefs, values, and senses in every learning experience,

even though they are not all specified nor assessed as outcomes of learning (Jarvis, 2006). As a result, learners are experiencing new knowledge although not always aware. Experience lies at the intersection of objective reality and the self and we learn from our experience-our own construction of that reality (Jarvis, 2006). We turn data and information into knowledge, beliefs, values and emotions (Jarvis, 2006). Every situation has potential as a learning experience, which gives educators the ability to create an environment that encourages growth of knowledge and interpretations of that knowledge.

Twenty first century skills have become an imperative part of a student's education. Students must be prepared for a workforce that is technology driven, global, and innovative. SAS programming gives students in high schools an opportunity to learn a well versed programming language along with real world application. As their brochure states, "SAS programmers are in high demand in the marketplace. SAS knowledge can help students enter careers in the technology, marketing, financial services, health care, and pharmaceutical" (Smith, 2008). SAS may produce software but also feel a responsibility to educate students to become the best they can be using analytics as a tool. High school student Amber Brehon summed it up by saying "I love that class!"

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