Arlington Public Schools

Career, Technical, and Adult Education Program Evaluation Report

Prepared by the Office of Planning and Evaluation
Response from the CTAE Office

March 2017

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SECTION 1: BACKGROUND

The evaluation of the Career, Technical, and Adult Education (CTAE) program began in 2014-15 with the development of an evaluation design. A planning committee met regularly throughout the year to develop the evaluation questions that would guide data collection for this report. Committee members included staff from Planning and Evaluation, the CTAE Office, other central offices, and schools; as well as community members. Data collection for the evaluation occurred during the 2015-16 school year and the fall of 2016. This evaluation employed various methodologies to collect data with which to examine the success of the APS CTAE program. In particular, this report addresses the following three components outlined in Arlington Public Schools (APS) policy and procedures (45-3) for accountability and evaluation:

1. A description of the department, program, or service
2. Evaluation questions that ask:
    a. How effectively was the CTAE program implemented?
    b. What were the outcomes?
3. Recommendations

The executive summary and appendices are located online at www.apsva.us/evaluationreports.

CTAE Program Description - *Prepared by the CTAE Office*

The mission statement of the CTAE Office is "to link education and career skills for the creation of lifelong learning opportunities." The office coordinates and provides educational services along a continuum that begins with awareness-building, provides ongoing opportunities for the community to voice its needs, and provides access to educational programs that empower students to acquire the knowledge, attitudes, and skills necessary to manage change and succeed in a diverse, technological society.

Goals and Objectives

The CTAE Office operates within the Department of Instruction (DOI) to meet APS Strategic Plan goals and DOI process goals. APS develops six-year strategic plans with staff and community involvement to identify focus areas for school system improvement. Each year the School Board and the public receive reports on the progress made within each Strategic Plan goal area during the preceding year, with the opportunity for modifications to the Strategic Plan as warranted.

The CTAE Office supports each of the five strategic goals of the School Board. We provide teachers with professional learning opportunities, curriculum integration, and the latest tools to provide challenging and engaging opportunities for all students. Through professional learning opportunities, teachers analyze data and learn new strategies to eliminate the achievement gap. The office continues to support recruiting efforts to bring the best and brightest teachers to Arlington Public Schools. We continue to enhance the knowledge and abilities of our current teachers to retain them for many years to come. The CTAE office also supports the Departments of Student Services and Facilities to provide quality CTAE classrooms and learning opportunities for students with special needs.

The current Strategic Plan runs through 2016-17 and focuses on five important goal areas:

Goal 1: Ensure that Every Student is Challenged and Engaged

Goal 2: Eliminate Achievement Gaps

Goal 3: Recruit, Retain and Develop High-Quality Staff

Goal 4: Provide Optimal Learning Environments

Goal 5: Meet the Needs of the Whole Child

The CTAE Office also works toward meeting the following seven DOI process goals:

- **Communication**: Communicate curriculum and programs to constituent groups
- **Curriculum**: Develop, revise, and enhance curriculum and programs; identify and create teacher resources that support a rigorous curriculum aligned with state standards
- **Summative Assessment**: Provide analysis of summative student achievement data
- **Formative Assessment**: Identify, implement, and interpret formative assessments to monitor student progress and inform instruction
- **Instruction**: Monitor instruction and program implementation; promote high quality instruction through curriculum development, professional development, observation and feedback cycles for teachers
- **Professional Development**: Provide sustained high quality professional development for staff
- **Research:** Review current research/environmental scans for innovative approaches to teaching and learning

Progress in each of the areas of responsibility is monitored through annual supervision and evaluation within DOI as well as a cycle of program evaluation. As an integral part of the Department of Instruction, the CTAE Office supports the department in meeting their formative and summative goals. The CTAE Office develops goals that are connected to the seven DOI process goals, which in turn help students succeed. The office works with other DOI offices to support integrative learning opportunities for teachers.

CTAE Goals for Service to Elementary and Middle School Students

- Coordinate and facilitate opportunities for exposure to a wide range of careers so that they may begin to explore applications of their own interests and talents to the future world of work
- Coordinate in-school, after-school and summer student STEM[1] activities and elementary-middle teacher professional development programs for integrative teaching and learning
- Provide expanded access to robotics, computer programming/coding, and hands-on design-driven, project-based learning experiences

[1] STEM = Science, Technology, Engineering, and Math

- Coordinate and facilitate opportunities for middle school students to discover career interests and aptitudes
- Develop materials and coordinate provision of basic instruction in technical and career skills through the linkage of academic skills with experimental applications
- Facilitate the introduction of materials and academic experiences that begin to prepare middle school students for responsible citizenship through instructional methods that promote teamwork; communication skills; the ability to plan, create, develop, and implement projects; and other skills that promote future learning
- Coordinate and support the provision of a seamless transition for middle school students to high school through linked course sequences and career pathways, opportunities for participation in service learning and community service, and other career awareness building opportunities that involve both middle and high school students

Goals for Service to High School Students

- Coordinate and support instructional and authentic learning experiences for career exploration and application for all high school students
- Coordinate career decision-making services to assist students in discovering career interests and talents and in selection of secondary and post-secondary educational options
- Coordinate and facilitate the provision of curricular pathways to career choices
- Coordinate and facilitate the provision of instructional training in employability skills and provide opportunities for high school students to experience employment through work experience programs, internships and other school-to-work programs
- Create opportunities for student participation and leadership in community-focused, project-based learning with business, community, and higher education partners
- Coordinate in-school, after-school and summer student STEM activities and teacher professional development programs for integrative teaching and learning
- Provide expanded access to robotics, computer programming/coding, IT[2] and cybersecurity, engineering, and other in-demand STEM skills identified by employers
- Build linkages with local higher education institutions and with local employers to assure the most seamless transition possible to post-secondary education and to the world of work

Goals for Service to Adults

- Publicize information about the department's educational opportunities using media that are available to all adults in the county

[2] IT = Information Technology

- Provide strategies for the adult community to voice its needs and for the department to regularly assess adult needs for personal and professional programs
- Provide regular opportunities for adults to explore personal and professional interests and talents through seminars, workshops and short courses
- Provide regular programs to address adults' acquisition of English and/or basic skills required for their roles as workers, parents and community leaders
- Provide ongoing programs for adults to obtain and enhance academic and technical credentials

Attributes of Success

Success for the Career and Technical Education (CTE) Program can be defined by the extent to which programs prepare students for meeting academic and performance standards. Attributes that define success include:

- competency attainment
- certification
- student involvement in student organizations
- real-world applications involving high-level thinking skills
- achieving the state goal of 94% of the CTE students meeting 80% of the competencies
- program completers taking industry credentials and certification tests
- connection between the classroom and business partners
- updated curriculum and appropriate equipment and facilities
- Integrative STEM in all CTE courses

Success for the Adult Education Program can be demonstrated through:

- an increase in enrollments and participation
- client satisfaction through course evaluations
- GED gains on the GAIN math test or GAIN English test with the students that have been taking a pre-GED/GED course

Program Overview

The CTAE office contains the following areas:

- Agriculture
- Business and Information Technology
- Computer Science
- Family and Consumer Sciences

- Health and Medical Sciences
- Marketing Education
- Military Science
- Technology Education
- Trade and Industrial Programs
- Adult and Community Education
- GED Program

Each area will be described in more detail below.

Business and Information Technology, Computer Science, and Marketing

The Business and Information Technology, Computer Science, and Marketing programs are within the Office of Career, Technical, and Adult Education. The programs serve K-12 students in the elementary, middle, and high school programs. The programs' goals include the attainment of competencies based on industry standards and best practices, post-secondary education, technical training, and employment, and personal and professional development of life skills. Students are provided industry-based skills in business, information technology, finance, administration, entrepreneurship, economics, marketing, management, computer programming, networking, cyber security, computer applications, emerging technologies, and international business. The courses are designed to benefit students who are planning college study, a combination of college and employment, or full-time employment immediately after high school.

After completing the program, all students should be able to:

- use critical-thinking skills needed to function in students' multiple roles as citizens, consumers, workers, managers, business owners, and directors of their own economic futures
- develop an awareness of career opportunities and the lifelong learning skills that will enable them to become employable in a variety of business and information technology careers
- select and apply technology tools for problem-solving and making personal and business decisions
- communicate effectively as writers, listeners, and speakers in diverse social and business settings
- develop sensitivity to personal, societal, and governmental responsibility in the economic system
- demonstrate the interpersonal, teamwork, and leadership skills needed to function in diverse business settings
- understand how accounting procedures can be applied to decisions about planning, organizing, and allocating personnel and financial resources

- understand the principles of law as they apply to personal and business settings
- appreciate the value of the entrepreneurial spirit, both in the small business and the corporate environment

The Business and Information Technology, Computer Science, and Marketing curricula support local, state, and national standards. Business educators and business professionals review and revise the standards based on what students should know and be able to do in business.

Family and Consumer Sciences

The Family and Consumer Sciences (FACS) program focuses on the development of management skills needed across the span of life. The program is committed to a unique dual focus on work and family, empowering students to balance and fulfill individual, family, community, and work roles in a diverse global society.

The mission of the Family and Consumer Sciences program is to help students:

- develop knowledge and skills that support healthy, functioning individuals in family and work roles
- develop the knowledge, skills, and ethical behaviors needed for employment success
- develop and apply critical thinking skills
- enhance self-esteem and the appreciation of self-worth

The FACS program is open to all students as an elective that consists of semester-long and full-year courses at the five APS middle schools, the three high schools, and the Career Center. Specialized FACS courses are also taught in the Stratford Program for students with cognitive and physical disabilities. In addition, students have an opportunity to receive verified credit, college credit, and industry certification upon successful completion of selected courses and state-approved industry credentials.

Technology Education, Trade and Industrial Education

Technology Education provides all of our K-12 students a thorough understanding of technology and how it impacts their lives. Through technology education, students become comfortable with technological concepts so they can make educated consumer, business, and civic decisions that will affect their lives, the community, and the world.

The mission of the Technology Education program is to:

- develop technological literacy within students
- develop and apply critical thinking skills and the problem-solving process
- understand the connection of mathematics, science, and the study of technology education
- develop the skills necessary to function in an ever-changing technological world

The Technology Education program provides a variety of elective courses at the middle- and high-school levels. Each course provides students the opportunity to participate in authentic problem-solving

activities. Students apply their knowledge of mathematics and science as they progress through a problem-solving model to develop a solution to their problem. Students learn that there are many solutions to a problem and not just one correct answer. During a course, the students are introduced to many areas, which broaden their perspectives on technology and technological systems. In addition, students have an opportunity to receive verified credit, college credit, and industry certification upon successful completion of selected courses and state-approved industry credentials.

The Trade and Industrial Program will continue to provide a variety of elective courses at the high school levels. Students learn how to manage resources, organize and use technical information, understand complex systems, and understand the technology that is an integral part of the field. Students have an opportunity to take part in a variety of career opportunities, such as job shadowing, internships, and cooperative education. These opportunities provide the students with a glimpse into a career they may be pursuing in class. Students also have an opportunity to receive college credit in addition to industry certification or state licensure upon successful completion of the program and adequate test scores.

Adult Education

In 2014, the Adult Education program celebrated 85 years of providing personal and professional courses to the residents of Arlington County and the Northern Virginia area. The Adult Education program began as a high school continuation program in 1929 to give high school dropouts the opportunity to complete diploma requirements. In the 1950s, the program expanded to offer enrichment classes for the community and course offerings included math, English, sewing, real estate, and more. In 1999, high school continuation moved to the Office of Alternative and Extended Instruction and the Adult Education Program focused on enrichment classes, Adult Basic Education, GED, job training and certification courses for the community.

The primary purpose of Adult education, now called Arlington Community Learning, is to enrich lives by providing diverse educational, cultural and professional certification opportunities that are current, affordable and of high quality. Historically, students served by the program have been from the age of 18 to over 80, but just in the last year, new enrichment opportunities have been offered to younger students in middle and high school. Nine hundred courses are offered annually, and catalogs describing course offering are sent to most households in the county. Arlington Community Learning produces four catalogs per year, to include the winter, spring, summer and fall semester. The winter, spring and fall semesters runs for 12 weeks, while the summer semester is condensed to eight weeks. Scholarship money is available for students who need assistance paying for classes from the Janice Gentry Memorial Scholarship fund.

Industry-standard certifications currently offered through the Arlington Community Learning program include Certified Nurse Aide, Cosmetology and Pharmacy Technician.

The General Educational Development (GED) Program

Within the Adult Education program, the GED Program is designed to provide educational opportunities to adults 18 years or older who were once enrolled in school, but for various reasons, did not complete the requirements for high school graduation. Test preparation is offered through the GED Program.

Options available for students include teacher-led classes and computer-based instruction. Teacher-led classes are offered in both English and Spanish at various locations within Arlington County.

English GED prep courses are divided into four levels according to reading and math skills. Students take the General Assessment of Instructional Needs (GAIN) to help determine the appropriate class level. The GAIN is a national assessment tool used to measure academic skills in English and mathematics. The assessment measures and reports the instructional needs, Educational Functioning Levels (EFLs), and progress of students. The Wonderlic General Assessment of Instructional Needs (GAIN) ® basic skills test was specifically developed to measure EFLs as defined by the National Reporting System. In addition, it provides a scale score and grade level equivalency. Test scores are also a predictor of the likelihood that students are prepared to pass the GED test, or if they need more instruction and practice.

Arlington Adult Basic Math classes are for students whose reading and math skills are at a third-grade level or possibly lower. Level 2 classes are for students whose skills fall between a fourth- and sixth-grade level in reading and math. Level 3 classes are for students who are at a seventh- or eighth-grade level in reading and math. Level 4 is for students whose math and reading skills are at a ninth-grade level or higher. Tuition costs for classes range between $49 and $129 depending on the frequency of class meetings. Most classes run 14 weeks. Saturday morning classes are also available.

Computer-based instruction and distance learning is also available for students who may not need instruction in all four areas of the GED exam or who have schedule conflicts. Students are required to take the pre-GAIN assessment to be placed in the distance learning program.

Funding for the GED preparation classes comes from tuition, state, and federal grants and the Janice Gentry Scholarship. The state and federal grants also enable APS to offer some free pre-GED preparation classes to students. These free classes are held at the APS Transportation office, Wakefield High School, and the Syphax Education Center. The APS Transportation classes are mainly for the APS Transportation and Facilities employees. The tuition-free Wakefield class is a math only class for students who need additional work in math skills. The tuition-free Syphax Education Center language arts class is an additional help class for lower level students, which meets two afternoons per week. Prior to January 2005, all ABE, pre-GED, and GED classes were funded primarily by tuition and the Janice Gentry Scholarship fund.

Program Services

In addition to the program areas described above, the CTAE office provides services for students of all ages, from prenatal through adult.

Services for Infants to Elementary School

CTAE provides a variety of support services to educate infants, pre-school children, and elementary students which include:

- early childhood education for children ages two weeks to school-age in the Teenage Parenting Programs and in the Even Start Family Literacy program;
- early education for pre-school children through the Child Development programs at the high schools and Career Center; and

- parenting education, in collaboration with the Arlington County Department of Human Services, for meeting health needs and accessing community resources, and daily transportation in Teen Parenting.

Services to Elementary School Students

CTAE provides services to elementary school children:

- materials development and coordination of provision of basic instruction in technical and career skills through the linkage of academic skills with experimental applications;
- support for school-based teacher and student STEM initiatives, teacher professional learning, and access to relevant resources, and experiences with robotics, coding, and STEM activities;
- Children's Engineering at some elementary schools is a program that enables teachers to introduce children to the technological world around them, and to promote critical thinking and problem-solving abilities as they build upon a child's capability to retain content described in the SOL's; and
- provision of computer keyboarding skills in the third grade, which allows students to increase their technology literacy skills while meeting the state technology standards as well.

Services to Middle School Students

CTAE provides educational opportunities to all middle school children:

- coordination and facilitation of opportunities for students to discover potential career interests and aptitudes;
- support for school-based STEM initiatives, student STEM clubs and robotics teams, teacher professional learning, and access to relevant resources and teacher/mentor training; instruction that promotes teamwork, communication skills, the ability to plan, execute, and complete a project, and other skills that promote technologically literate learners; and
- support a seamless transition for middle school students to high school through linked curricular sequences, opportunities for participation in service learning and community service, and other career awareness-building opportunities that involve middle school students.

Services to High School Students

CTAE provides services to all high school students enrolled in Career and Technical Education (CTE) courses and assists teens who may be trying to complete their education while juggling the responsibilities of parenthood.

Examples are:

- instructional and experiential opportunities for specific career exploration and application for all high school students through hands-on classroom activities, guest speakers, and field trips to assist students in discovering career interests and talents and to make better career decisions in preparation for post-secondary education;

- support for school-based STEM initiatives, student STEM clubs and robotics teams, STEM panels, STEM expos, local and regional competitions, higher education exposures, dual enrollment coursework, teacher professional development, and access to relevant resources and teacher/mentor training;
- coordination of instruction to integrate core academic principles and employability skills for high school students to experience employment through cooperative education programs, internships, and other school-to-work programs;
- provide ISAEP (Individual Student Alternative Education Plan) students with opportunities to be work-ready through part-time jobs and/or vocational training while preparing to pass their GED exam;
- instruction in prenatal development, labor, delivery, breastfeeding, and the early stages of parenting through the Family and Consumer Sciences and Teenage Parenting Program; and
- building partnerships with local higher education institutions and with local employers to facilitate the most seamless transition possible to postsecondary education and/or the world of work.

Services for Adult Learners

CTAE makes services available to all adults in Arlington:

- information about the educational opportunities through a catalog mailed to Arlington homes, and through the program's website
- opportunities for adults to suggest new courses or course revisions
- regular programs to address adults' acquisition of English or basic skills required for their roles as workers, parents, and community leaders
- ongoing programs for adults to obtain and enhance academic and technical credentials
- opportunities for adults who have not obtained their high school diploma to obtain the GED certificate

Curriculum and Instruction

CTAE classes have an inherent potential to add relevance to academic learning and to enhance the relationships that contribute to an effective learning environment. CTAE courses in Arlington are taught by skilled instructors and are characterized by the following attributes:

- competency-based and process-oriented curriculum content, as defined by state competencies and national standards, and that address technical knowledge and skills, employability skills, and career exploration
- integrative STEM-focused, curriculum mapping and integrative teaching and learning strategies embedded throughout the curriculum

- hands-on, real-world applications that integrate math, science, social studies, language arts, and technology with career and technical education
- collaborative lab experiences, problem-based learning, and design-based activities that help them define problems, locate and synthesize information, and work to create solutions both in and outside the classroom
- opportunities for student leadership organizations, such as DECA, Family, Career, and Community Leaders of America (FCCLA), Skills USA, Technology Students Association (TSA), and Future Business Leaders of America (FBLA), serving as an integral part of the instructional program
- career training opportunities for students with industry partners, including cooperative education, internships, mentor ships, job shadowing, and field experience
- support for business and community partnerships and resources to facilitate special STEM project-based experiences
- industry certifications or licensure for students in many of the CTE courses
- college credit for students while still in high school via articulation agreements and dual enrollment with post-secondary institutions

The Arlington Community Learning attributes include:

- providing educational enrichment opportunities to adult learners in the community
- vocational certification programs to improve employability

The GED program attributes include:

- instruction to adult learners in the community who need basic literacy and numeracy skills
- GED preparatory courses in English and Spanish for adults who wish to obtain their GED credential
- assessment opportunities to adults for proper course placement
- GED preparatory classes and GED testing opportunities to inmates in the Arlington Detention Facility

Best and Current Practices

In this section, we discuss the best practices found in career and technical education research. We will discuss the evolution and current focus of CTE, developing a work ethic among CTE students, service needs for teachers and their LEP students in CTE, and including industry-based certifications in CTE. We will also discuss current research on GED programs.

Evolution and Current Focus of CTE Programs

The need for CTE programs is very apparent in current education. In a compelling article that strongly supports the role of CTE in high schools, Hyslop (2014) points out that almost every high school student

takes at least one CTE course and that CTE programs are thriving in our nation's secondary schools. Additionally, there is a strong link between CTE programs, student engagement and high school graduation. CTE courses engage students by providing real world experiences that align with students' college and career goals. Current national data indicates that students' enrolled in CTE programs "graduate at much higher rates than students who do not invest in CTE programs" (Hyslop, p. 16). Additionally, CTE-focused associate degrees and certificates can help students earn higher wages. In Virginia, research from College Measures indicates that individuals who hold an occupational/technical associates degree earn approximately $6000 more a year than individuals who earn a non-occupational associates degree (Hyslop, 2014).

CTE has evolved over the last two decades (Gray, 2004). Starting in the late 1980s, the focus shifted away from transition to work, to include both transition to work and to college. Today, CTE programs integrate technical and academic skills and have wonderful results. Over half of the students in an integrated CTE/academic program go to college after graduation, and many of the others enroll in technical programs. Students still in high school are earning industry credentials, including certifications and licenses, helping them to prepare for their future. During the 2011-12 school year in Florida, more than 28,000 students enrolled in CTE career academies earned 32,004 industry-recognized credentials (Hyslop, 2014). In Virginia, students can earn two verified credits by passing a certification or licensure exam. Students are also earning college credit through CTE dual-enrolled courses. Nearly 30% of dual enrolled credits earned by students in high school are in CTE courses (Kreamer, 2014).

Lastly, research shows that CTE can reduce dropout rates and increase academic performance (Hyslop, 2013). This can be attributed to the instructional methods used in CTE classrooms, including project-based learning, inquiry-based learning and hands-on projects and assignments (Hyslop, 2013). In a research article published in 2013 by the American Institutes for Research, it is said that "High-quality CTE addresses the goals of college and career readiness and provides learning options that are appealing for students who might otherwise be at risk of leaving high school" (pg. 2).

Developing "Work Ethic"

Work ethic is one of several skill sets that are currently being required in career and technical education. In addition to other traditional competencies, "workplace-readiness skills" are now a required component of Virginia high school CTE courses. Some of these skills include demonstrating math, writing, and speaking skills on a level for the student's chosen career field. However, there are also non-academic requirements, including strong work ethic, positive attitude, self-presentation, and independence.

How do you teach students about work ethic? According to an article by Predmore (2005), several programs in Georgia have been very successful at encouraging, teaching, and assessing work ethic. The Georgia Department of Education highlights 10 work ethic traits: attendance, character, teamwork, appearance, attitude, productivity, organizational skills, communication, cooperation, and respect. Several of these traits overlap with the Virginia workplace-readiness skills. At East Central Technical College, one of Georgia's successful technical schools, students receive a grade based solely on their work ethic. Students work hard to prove their work ethic because the school has encouraged potential employers to look at those grades on their transcripts.

However, even if grades are not implemented to motivate students to demonstrate work ethic, there are several ways to encourage these traits among students in the program. Predmore (2005) emphasizes the importance of teacher modeling of work ethic. He says that all employees and teachers in the program should be in discussion about work ethic in order to encourage commitment to the idea. In addition, teachers should model a strong work ethic for their students by being dependable and displaying positive work habits. Finally, teachers should teach students about what work ethic is and why it is so important.

Service Needs in CTE for Teachers and Their Limited English Proficient (LEP) Students

"For English learners it is critical that teachers provide interesting, relevant lessons that are presented in a way that allows students to participate fully in lessons and will ensure that they will be successful in school" (Echevarria & Vogt, 2010). CTE teachers have been learning how to better serve their LEP students through professional development focused on the Sheltered Instruction Observation Protocol (SIOP) model. The SIOP teaching model was created as a method that teachers can use to integrate content and language instruction for students learning to speak English. The SIOP model is composed of 30 features that are grouped into eight components which include lesson preparation, building background, comprehensible input, strategies, interaction, practice and application, lesson delivery and review and assessment. During the 2013-14 school year, CTE teachers completed 15 hours of professional development. The SIOP coach from the ESOL/HILT Office has been working with CTE teachers since 2015-16. In addition, SIOP workshops are conducted by representatives from the Center for Applied Linguistics in Washington, DC. These workshops have focused on practices and strategies of the SIOP Model to effectively integrate language and content instruction for students in CTE classes. Additionally, teachers have had the opportunity to work in teams to develop SIOP lesson plans.

Including Industry-Based Certifications in Career and Technical Education

Industry-based certifications (IBCs) are a type of certification that students can obtain through CTE. IBCs are based on the proficiency needs within a specific occupation. Therefore, students who pursue an IBC learn the performance requirements and skills sought after by employers in particular industries. Wilcox (2006) argues for the importance of industry-based certifications in CTE programs. While one goal of CTE is to prepare students for entry into post-secondary education, another role is to prepare those students who wish to enter the workforce immediately following high school graduation. IBCs provide employers with "a standard that is useful in evaluating and benchmarking a candidate who has no substantial work experience." In addition, IBCs meet the CTE needs for program relevancy, accountability, and consistency of results. IBCs assure that students are prepared for success in the current labor market.

IBCs can be used as either alternatives or supplements to the credentialing systems already in place, such as post-secondary degrees, state licenses, and more (Wilcox, 2006). In Virginia high schools, CTE students can earn verified credit by completing two or more CTE classes in a sequence and taking the associated IBC test or licensure. Additionally, Virginia provides a program called "Path to Industry Certification" for junior and senior students who have no immediate plans for entering postsecondary education. In this program, students simultaneously work towards their diploma while additionally pursuing technical training in preparation for an IBC.

In order to properly incorporate IBCs into a CTE program, several issues need to be recognized and accounted for. In particular, while IBCs are very specific to their industry, the primary role of CTE is to teach the student a wide range of skills (Wilcox, 2006). Although specific certification can be beneficial, it is also important to prepare the student for a broad career where systems and technology are constantly changing. One way to compromise is to start with a foundation of broad knowledge while incorporating specific IBC requirements along the way. However, it takes a lot of effort on the part of the CTE program to choose particular IBC candidates. For additional information, the American National Standards Institute and the National Organization for Competency Assurance are currently qualifying IBCs.

College Credit while still in High School

Students in some CTE classes are able to gain college credit within the high school class. This is called dual enrollment and helps high school students get a jump on their post-secondary education. Some CTE classes have been cross walked with similar courses at the local college or community college. If the high school course has similar course objectives and competencies, an agreement can be put in place to give college credit and high school credit for the same class. Additional college level work is integrated into the class for the college credit. To teach the dual enrolled course, the high school teacher needs to meet the college criteria to become an adjunct instructor. Students earn a grade that is on the high school transcript and also on the participating college's transcript as well. Most of the college credit is transferable to other colleges and universities and gives the student an opportunity to experience college level courses while still in high school. This also is a way for the student to save some money on their college education.

Professional Development

Professional development continues to be an important component of the CTAE office. Over the past six years the office has provided the following professional development:

- Math-in-CTE training
- Sheltered Instruction Observation Protocol (SIOP) in collaboration with the HILT office
- STEM Integration in CTE
- AP Computer Science
- Industry Certification Training
- Keyboarding Methodologies
- Exemplary Program Evaluation
- Mobile Apps Development
- Virtual Classes
- WISE Training for CTE and Social Studies
- Microsoft Academy

- Cybersecurity Training
- Project Lead the Way
- Teachers for Tomorrow
- Technology in Family and Consumer Science
- Early Childhood STEAM[3] Cohort in conjunction with the Early Childhood office

Resources

Staffing

Within the CTAE Office, there is a director, one K-12 curriculum supervisor, two STEM teacher specialists, an adult education coordinator, and a GED coordinator. Additional staff includes the supervisor of the Arlington Education and Employment Program (REEP), two administrative assistants, one full-time registration clerk, and the part-time Project Y.E.S. coordinator.

The primary responsibilities of the central CTAE Office employees are described in **Table 1**:

Table 1: CTAE Office Staff and Responsibilities

Employee	Primary Responsibilities
CTAE Director (1.0)	• monitor CTAE programs at the schools and provide leadership to the programs by coordinating budgets, overseeing curriculum, making school visits, and communicating with administrators • direct and supervise the activities and duties of supervisors and other office staff • collaborate with other instructional supervisors, principals, teachers, higher education officials, and business and community organizations to develop and coordinate STEM initiatives • provide for administration of the GED and ABE programs • serve as liaison to several community and state agencies and higher education institutions • coordinate the activities of the CTAE advisory committee • develop and coordinate Technology Education, Trade, and Industrial programs for K-12 • act as a staff liaison to AYES Business and Education Council and the local Technology Preparatory Steering Committee • provide leadership for the Y.E.S. coordinator to run a fourth- and fifth-grade

[3] STEAM = Science, Technology, Engineering, Arts, Mathematics

	mentoring and drop-out prevention program
CTAE Supervisor (1.0) *Overall duties*	• recommend appropriate changes in CTE curriculum to reflect industry trends • manage and administer local, state, and federal funds designated for the CTAE program • design and implement curriculum-related projects integrating core content subject matter with CTAE goals • interview and recommend potential teaching applicants to Human Resources • conduct CTAE teacher observations • evaluate programs and make recommendations for program improvements • act as staff liaison for various committees, such as the CTAE advisory committee, Department of Instruction meetings, etc. • ensure classroom equipment is in good working order and is reflective of what is being used in industry • provide leadership in the review of instructional materials • provide support to teachers and staff through workshops, equipment, curriculum updates, and ongoing process and outcome evaluations • provide guidance on facility renovations to ensure adequate space for CTE instructional needs as well as safety requirements • review and test program-specific equipment and software applications, and assisting with configuration and installation • provide leadership in instruction within their respective CTE program areas • provide leadership for student organizations • provide leadership for countywide meetings • work with the Adult Education Coordinator to maintain and implement curriculum area programs for adults • coordinate and facilitate countywide CTE credentialing and certification testing
Adult Education Coordinator (1.0)	• supervise and provide leadership for the Adult Education Program • assist with the Individual Student Alternative Education Program (ISAEP), with the acceptance and removal of students in the program • assist with writing state grants for operational funds and for GED and ABE instruction • supervise the International Housekeeping Program and consultants • ensure quality instruction for community enrichment, certification programs, adult basic education programs, and the youth programs

	• develop and design the Arlington Community Learning catalog, which is distributed four times each year and is delivered to most households in Arlington • prepare the master schedule and coordinates facility use for classes • interview and hire Arlington Community Learning instructors and staff • oversee the registration office • responsible for the fiscal integrity of the program
GED Coordinator (1.0)	• administer and oversee all pre and post GAIN assessments and makes sure that students are placed in the correct class level • counsel students on classes and testing • report GAIN scores to National Reporting System (NRS) and the state level • complete end of year state reports for RACE to GED grant and the ISAEP program • write, monitor, and report all GED grant money • oversee all GED instructors and other staff working under the GED grants • oversee GED Instructor/Educational Coordinator at the Arlington County Detention Facility • interview and hire GED admin staff and teachers • manage day to day operation of the ISAEP program • attend and participate in the monthly Region 8 Adult Education Regional meetings
GED Instructor/ Educational Coordinator (1.0)	• teach and facilitate all ABE/Pre-GED/GED classes • oversee inmate and volunteer tutors • oversee aspects of GED testing at the Arlington County Detention Facility, Pearson VUE Testing Center • manage day to day operation of ABE/Pre-GED/GED program at the ACDF
STEM Specialists (1.5)	• support STEM and CTE curriculum integration K-12 • support and coordinate data collection and reporting and grant programs • promote and facilitate professional development in integrative teaching and learning • expand awareness of CTE/STEM-focused teaching and learning opportunities • provide extra-curricular and complementary summer/weekend STEM programs • coordinate higher education partnerships • support elementary STEM initiatives and connections to secondary CTE • support parent, business and community involvement
Project Y.E.S. Coordinator (0.5)	• organize, maintain, and allocate the Y.E.S. budget • communicate program criteria and available resources to school principals, aiding in the selection of mentors and building coordinators at each school with a Y.E.S.

	program • plan and facilitate countywide meetings with teachers including program training to ensure the program's implementation at all schools • conduct site visits • maintain regular, consistent communication with Project Y.E.S. mentors and coordinators • maintain the Project Y.E.S. website • writes and disseminates the Y.E.S. monthly newsletter • regularly update program materials • work with Payroll to ensure the payment of tri-annual stipend payments • review and record Project Y.E.S. school data
Administrative Specialist (1.0)	• support the CTAE Director with clerical, financial, grant, state reporting, room management, and other matters
Administrative Assistant (1.0)	• support the CTE Supervisor with clerical, financial, and grant work

In addition to these central positions, the following school-based positions contribute to the implementation of the CTAE program.

CTE Teachers

Courses are available in six CTE program areas, including Business & Information Technology, Computer Science, Family & Consumer Sciences, Marketing, Technology Education and Trade & Industrial Education. The programs provide students instruction in 13 out of 16 of the National Career Cluster areas. CTE's motto is Learning by Doing—Learning that Works for Arlington. Students are engaged in exploration and authentic problem-based and project-based learning experiences. There are 17 middle school CTE teachers teaching in Business & Information Technology, Computer Science, Family and Consumer Science, and Technology Education. In the high school there are 43 CTE teachers teaching in Business & Information Technology, Computer Science, Family & Consumer Sciences, Marketing, Technology Education and Trade & Industrial Education.

Funding

The budget for the Department of Instruction includes funds for approved curriculum and professional learning. The FY 2017 budget includes $932,365 that is shared among **all** instructional programs to pay for:

- salaries for curriculum work done by teachers

- salaries and costs for in-service professionals, including outside consultants, contract courses, and staff participating in professional learning outside of their contract hours
- conference registration fees for both presenters and attendees

Additional expenditures and sources of funding for the CTAE program are included in **Table 2**.

Table 2: CTAE Funding Categories

EXPENDITURES	
Supplies/Business & Marketing	$1,041.00
Supplies/Technology Education	$20,551.00
Supplies/Office	$3,396.00
INCOME	
Perkins Grant (CTE)	$259,620.41
Race to the GED Grant	$27,327.00
Adult Education Tuition	$460,159.65
Adult Education Family Literacy Act (AEFLA) Grant	$172,317*
ISAEP Grant	$31,434.00

*This funding supports Adult Education as well as the Arlington Education and Employment Program (REEP) and Even Start.

Costs not accounted for in the above table include:

- Expenses related to the construction and infrastructure of CTAE classrooms and labs. The cost per square foot for is higher because of safety considerations and equipment.
- Computer hardware that is replaced by the county (every three years for desktop computers and every 4 years for laptop computers).
- Professional learning (i.e. teacher pursuing advanced degrees or certifications).
- Various grants including Teen Parenting, the Governor's Career and Technical Academy, grants for green construction, and grants obtained by teachers for projects.

Status of Recommendations Made in Previous Evaluations

The CTAE Program was last evaluated in 2000. **Table 3** lists the recommendations made in the prior report as well as the current status of each recommendation.

Table 3: Status of Recommendations Made in Previous Evaluation

Recommendation	Status
Recommendations to be implemented by CTAE:	
1. Revise the Exemplary Program Review Process	The Exemplary Program Review Process has been modified and implemented. The teachers were part of the modification process and workshops were provided to train the teachers in the use of Taskstream.

2. Prioritize Professional Development Opportunities. The CTAE program should prioritize professional development opportunities that focus on the best instructional practices that are expected in CTE programs.	The professional development opportunities were prioritized to provide best instructional practices over the past six years. The offerings were done over multiple years for sustained teacher growth.
3. Continue to Gather Information on Course Enrollments. CTAE staff should continue to gather information on CTAE course enrollments to begin addressing any future needs in the program's offerings:	The CTE enrollment has been tracked over the past five years and the information is used to evaluate the program of studies CTE offerings.
Recommendations requiring work with other programs, departments, and/or schools:	
4. Work with CTE teachers to fully implement CanDo competency tracking by every CTE program. Fully implement the CanDo competency tracking system.	Work has been done to modify the CanDo system to make it more user friendly. It has not been fully embraced by all CTE teachers.
5. Work with information services to ensure that CTE data is being compiled accurately and on a consistent basis so that it is easily accessible.	Work has been ongoing with Information Services to incorporate CTE data needs into Synergy.
Recommendations to be Implemented by GED Program	
6. Primarily, we recommend restructuring the GED program design in an effort to increase student grade-level equivalencies.	The GED Program restructured its design in an effort to increase student grade-level equivalences by extending the Fall and Winter classes to be 14. The program now offers free specialized classes for Math and Language Arts, as well as, two volunteers for tutoring. GED practice test vouchers are provided for students interested in taking a practice test through a grant program.

Methodology

Evaluation Design and Questions

Table 4 displays the CTAE evaluation design.

Table 4: CTAE Evaluation Design

Program/Service Objective	Program/Service Question	Data Source(s)
Evaluation Question 1: Implementation – How effectively was the CTAE Program implemented?		
Objective 1: Best instructional practices for emotional support, classroom organization, instructional support, and student engagement are evident across instruction in CTE classrooms.	1a To what extent are best instructional practices evident in CTE classrooms?	• Classroom Assessment Scoring System (**CLASS**)
Objective 2: The APS CTE program follows best practices in career and technical education.	2a To what extent do APS CTE course designs demonstrate quality implementation in the following categories? • SOL integrated lessons • Career pathways • Employability skills • Instructional technologies • Industry trends and practices • Competencies • Partnership involvement	• Taskstream
	2b To what extent are best instructional practices in CTE instruction evident in CTE classrooms?	• CTE Observation Tool
Objective 3: APS CTE programs are accessible to all students.	3a Who participates in APS CTE programs? 3b To what extent are introductory CTE courses available to HILT students? To SPED students?	• Enrollment data
	3c To what extent do the following factors affect participation in APS CTE programs? • awareness and perceptions of	• Surveys of students, teachers, counselors, parents

Program/Service Objective	Program/Service Question	Data Source(s)
	CTE programs • Logistical factors (e.g. scheduling) • High school credit requirements • Other	• Hanover Research: interviews with Virginia university admissions offices
	3d What accommodations are available to HILT and SPED students who take CTE courses?	• Taskstream • Staff and student survey
Objective 4: The ISAEP[4] program is accessible to all students who are at risk of dropping out and/or would benefit from participating.	4a What factors affect participation in the ISAEP program?	• Counselor focus groups
	4b How do counselors refer at-risk students to alternative options?	• Interviews with students who have dropped out
Objective 5: CTE programs effectively utilize community and business partnerships.	5a How and to what extent are community and business partners used in CTE courses?	• Taskstream • Survey of teachers and students • Business partner interviews
	5b To what extent are students involved in CTE student organizations?	• Data collection from CTE teachers
Objective 6: The CTE program facilitates opportunities for students at all grade levels to explore career interests and aptitudes.	6a To what extent do students at all grade levels have opportunities to explore career interests and aptitudes?	• Surveys of teachers, counselors, and students
	6b What is the alignment among CTE offerings and local workforce requirements?	• Taskstream • Local workforce data

[4] Individual Student Alternative Education Plan

Program/Service Objective	Program/Service Question	Data Source(s)
Objective 7: APS manages CTE resources effectively.	7a To what extent is student data available and easily accessible to CTE teachers? 7b What is the impact of equipment on the CTE program's ability to offer an optimum program? What is the process for updating equipment?	• Teacher survey

Program Service/Objective	Program/Service Question	Data Source(s)
Evaluation Question 2: Outcomes – What were the outcomes for the targeted population?		
Objective 8: All APS students experience career and college advancement while in high school.	8a To what extent do APS high school students earn credentials towards a career?	• Competency attainment (CanDo) • Industry certifications • State report card
	8b To what extent do APS high school students earn credentials towards college advancement?	• Dual enrollment college credits • AP and IB pass rates
	8c To what extent do CTE students successfully transition into further education or training, the workforce, or military service?	• State alumni/completer survey • Locally developed alumni/completer survey • Senior survey
	8d To what extent do CTE program completers graduate with an Advanced Studies diploma?	• Graduation data
	8e What proportion of CTE program participants move from level 1 to level 2?	• Enrollment data

Program Service/Objective	Program/Service Question	Data Source(s)
	8f To what extent do CTE completer alumni report that their experience with APS CTE courses helped them to be college and career-ready?	• Locally developed alumni/completer survey
Objective 9: ISAEP and adult education GED students are able to obtain a high school equivalency (GED) certificate.	9a To what extent do adult GED students make gains in reading and math skill levels while participating in the Pre-GED/GED Programs?	• National Reporting System
	9b How long does it take adult GED students to attain the GED?	• Adult education GED enrollment • GED pass rates
	9c To what extent do ISAEP and adult education GED students successfully obtain a high school equivalency certificate?	• GED pass rates • National Reporting System

Study Measures

Data sources used to inform this evaluation are described in detail below.

Classroom Assessment Scoring System (CLASS)

The Classroom Assessment Scoring System (CLASS) is an observation tool developed at the University of Virginia's Curry School of Education to analyze the interactions among adults, students, and content. CLASS observations were conducted in the fall of 2015 at both the middle school and high school level, where CTE courses were offered.

The domains and dimensions of the CLASS tool are described in detail in **Appendix B1**. **Appendix B2** describes the alignment between CLASS dimensions and APS best instructional practices. A summary of CLASS observations conducted for this evaluation is available in **Appendix B3.**

APS-Developed CTE Observation Tool

In order to assess the implementation of best practices specific to CTE instruction, a CTE observation tool was developed by the Office of Planning and Evaluation in conjunction with the CTAE Office and the evaluation planning committee. Observations were conducted at the same time as CLASS observations, and were carried out by retired CTE teachers and administrators who participated in inter-rater reliability training. The observation tool can be found in **Appendix B4**, and results of the observations are summarized in **Appendix B5**.

Internal Program Evaluation Portfolios

The CTAE program conducts an internal program evaluation on a six-year cycle for each of its instructional areas. The internal evaluation requires teachers to submit evidence to be rated against a rubric, and portfolios are scored by volunteers with a background in CTE. The CTAE Office provided the Office of Planning and Evaluation with portfolio scores, and an analysis of select items that address quality of instruction are included in this evaluation. The full summary is available in **Appendix C1**. The full list of required documentation is available in **Appendix C2**, and the scoring rubric is available in **Appendix C3**.

Enrollment

This evaluation includes CTE enrollment data from Synergy, the student information system. Full enrollment information is available in **Appendix C4**.

CTE Finishers

Students who take CTE courses may **finish a sequence**, which is defined as taking two sequential CTE courses in the same program area (for example, Auto I and Auto II). Data on CTE finishers was extracted from the data warehouse for this evaluation. The full report is available in **Appendix C5**.

Student Organization Participation

In the spring of 2016, the Office of Planning and Evaluation collected information from CTE teachers on which of their current students were participating in CTE student organizations at the classroom, regional, state, and national levels. This information is provided in **Appendix C6**.

Workforce Opportunities and CTE Offerings

The Alexandria/Arlington Regional Workforce Council[5] provided the Office of Planning and Evaluation with information about local job openings between July 1, 2015 and June 30, 2016. This information was pulled from the Wanted Analytics website[6], a subscription-based service that provides data on workforce trends. The CTE Office then reviewed the data and indicated areas of alignment with current CTE offerings as well as potential areas for revision to CTE offerings. Complete workforce data is available in **Appendix C7.**

Surveys

Multiple surveys were administered in the spring and fall of 2016. In addition, questions were added to some already-existing surveys such as the annual senior survey and the biannual Community Satisfaction Survey. A summary of survey responses from students, parents, and staff can be found in **Appendix D1**. Alumni survey responses for CTE completers who graduated one year ago are summarized in **Appendix D2**, and alumni survey responses for CTE completers who graduated three or four years ago are summarized in **Appendix D3**.

[5] https://workforcecouncil.arlingtonva.us
[6] https://www.wantedanalytics.com

University Admissions Interviews

To address the concern that there may be a perception among APS stakeholders that participation in CTE courses could negatively impact a student's college admissions experience, APS contracted with Hanover Research (Hanover) to conduct a series of interviews with admissions staff in five colleges located in Virginia (4) or the southeastern United States (1). The full report is available in **Appendix D4**.

Focus Groups and Interviews: High School Dropouts

In the spring of 2016, the Office of Planning and Evaluation contracted with an external facilitator, who conducted two 90-minute focus groups: one with a group of high school counselors, and one with all high school Directors of Counseling (DOCs). Both focus groups addressed multiple topics covering questions for the evaluations of both CTAE and Gifted Services. Each focus group dedicated some time to questions about how counselors identify students who are at risk of dropping out, and if and how they refer them to alternative options.

In addition to these focus groups, the facilitator conducted a series of telephone interviews with APS students who had dropped out of high school within the last few years. These were students who had dropped out without ever having had contact with the ISAEP program. The primary goal was to understand their reasons for dropping out, and what alternative options were presented to them.

The full report is available in **Appendix D5**.

Interviews: Business Partners

The same external facilitator conducted a series of telephone interviews during the summer of 2016, with CTE business partners who provide work-based opportunities to APS students. The purpose of the interviews was to learn what has made current business partnerships successful and what could strengthen future partnerships. This report is available in **Appendix D6**.

Competency Attainment

Information about competency attainment among CTE completers is available in the latest annual state report, in **Appendix E1**.

Industry Certifications

The CTAE Office provided the Office of Planning and Evaluation with six years of industry certification assessment results. A summary of these results is available in **Appendix E2**.

Dual Enrollment and College Credits

Information on opportunities for students to obtain college credit in CTE courses was extracted from the data warehouse. This includes enrollment in CTE dual enrollment courses, dual enrollment grades, IB exam results, and AP exam results. This data is summarized in **Appendix E3**.

Graduation and Diploma Type

Diploma type for CTE completers (graduates who "finished" a CTE sequence) was extracted from the data warehouse. This data is available in **Appendix E4**.

ISAEP and GED

The CTAE Office provided the Office of Planning and Evaluation with data on participation, progress, and GED attainment for ISAEP and adult education students. This information is summarized in **Appendix F1**.

SECTION 2: FINDINGS

Evaluation Question #1: How effectively was the CTAE program implemented?

To address this question, the evaluation focused on several areas: access and participation, career exploration, quality of instruction, and effective use of resources.

Access and Participation

Enrollment in CTE Courses

The percentage of secondary students enrolling in CTE courses has fluctuated during the five years included in this evaluation. Over two-thirds of high school students, and about half of middle school students, were enrolled in a CTE course in 2015-16. There has been a large increase in enrollment in high school business and IT courses, primarily due to the addition of Economics and Personal Finance as a graduation requirement in 2012-13, as well as the addition of a Cybersecurity course in 2015-16.

Female students are underrepresented in business and IT, technology education, computer science, military science, and trade and industrial courses. They are overrepresented in FACS and Health Medical Science classes.

The number of students finishing a CTE sequence has decreased sharply from since 2012-13, and as the overall number of completers has decreased, the gap between males and females has increased.

CTE courses are available in multiple CTE program areas in all comprehensive middle and high schools. At the middle school level, CTE courses are available in the following program areas:

- **Technology Education** (For example: Exploring Technology, Technological Systems, Inventions and Innovations)
- **Family and Consumer Sciences** (For example: Exploring Family and Consumer Science, Teen Living, Life Management Skills, Taking Charge)
- **Business and Information Technology** (For example: Digital Input Technologies, Exploring Computer Keyboarding Applications, Multimedia Technology, Investigating Computer Science)

At the high school level, the CTAE program offers courses in six program areas:

- **Trade and Industrial Programs** (For example: Air Force JROTC, Automotive Technology, Cosmetology, Culinary Arts and Sciences, Electricity, Physical Therapy/Sports Medicine Technology, Television Production)
- **Technology Education** (For example: Engineering, Project Lead the Way, Computer Assisted Drawing/Architectural Drawing, IB Design Technology)
- **Military Science** (JROTC courses)
- **Health and Medical Sciences** (For example: Physical Therapy/Sports Medicine, EMT, Pharmacy Tech, Animal Science)

- **Family and Consumer Sciences** (For example: Child Development and Parenting, Early Childhood Education, Interior and Fashion Design, Food and Fitness)
- **Computer Science** (For example: Computer Science, AP Computer Science, Computer Information Systems)
- **Business and Information Technology and Marketing** (For example: Introduction to Business and Marketing, Cybersecurity, Advanced Topics in Businesses and Marketing, Entrepreneurship)

At the high school level, a CTE course may fulfill a specific graduation requirement, or may be taken as an elective, depending on the course and the individual student's other coursework:

- Any CTE course may be used to fulfill the fine/practical arts requirement.
- The Economics and Personal Finance course, in addition to fulfilling the graduation requirement that all students take Economics and Personal Finance, may also be used to fulfill two additional graduation requirements: virtual/online class, and – for students pursuing a standard diploma – CTE industry certification, if the student passes the WISE Finance certification.
- Some CTE courses can be used to fulfill a graduation requirement in another content area (for example: Animal Science can be used as a science credit).
- CTE courses that follow a sequence can be used to earn a student-selected verified credit if the student also passes the related state-approved industry certification test.

The percentage of secondary students enrolling in CTE courses has fluctuated during the five years included in this evaluation. Around 50% of both middle and high school students were enrolled in at least one CTE course in 2011-12. These percentages dipped to a low of 24% of middle school students, and 38% of high school students, in 2013-14. Both levels have seen an increase since then, with high school CTE enrollment surpassing 2011-12 levels to reach 68% in 2015-16, and middle school CTE enrollment returning to 2011-12 levels, reaching 47% in 2015-16.

Figure 1 shows the number of middle school CTE enrollments over the past five school years, as well as the percentage of middle school students who enrolled in at least one CTE course. Both measures show a dip in enrollment during the middle of this time period followed by a subsequent increase. As the APS student population has grown, the number of enrollments has increased across CTE program areas over the past two years. In terms of percentage of students enrolled, growth is less pronounced. The percentage has increased since the lowest point and appears to be on an upward trend, but still shows slight decreases since 2011-12.

Figure 1: Number of MS CTE Enrollments and Percentage of MS Students Enrolled in at Least One CTE Course, 2011-12 through 2015-16

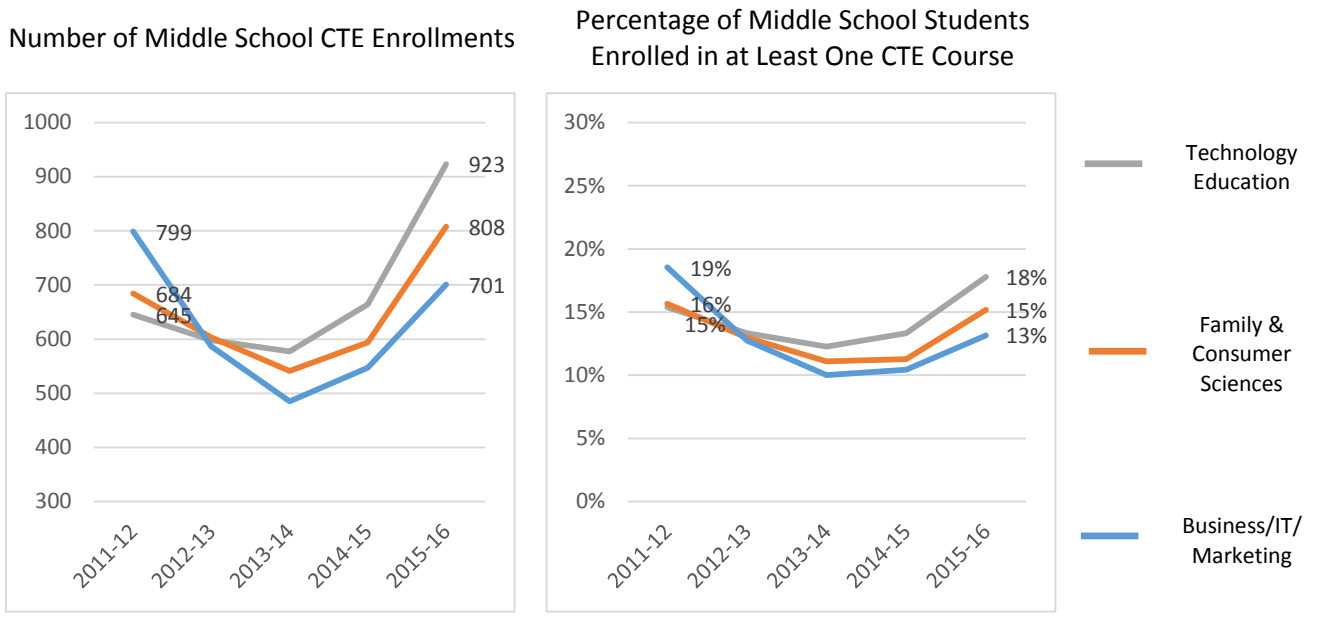


Figure 2 shows the number of high school CTE enrollments over the past five school years, as well as the percentage of high school students who enrolled in at least one CTE course. By either measure, there has been a large increase in enrollment in the area of business/IT/marketing. This is primarily due to the addition of Economics and Personal Finance as a graduation requirement in 2012-13. In addition, a new course, Cybersecurity, was added in 2015-16. Other CTE program areas have seen less change. There has been a small increase in the percentage of students enrolled in a computer science course, from three percent in 2011-12 to six percent in 2015-16.

Figure 2: Number of HS CTE Enrollments and Percentage of HS Students Enrolled in at Least One CTE Course, 2011-12 through 2015-16

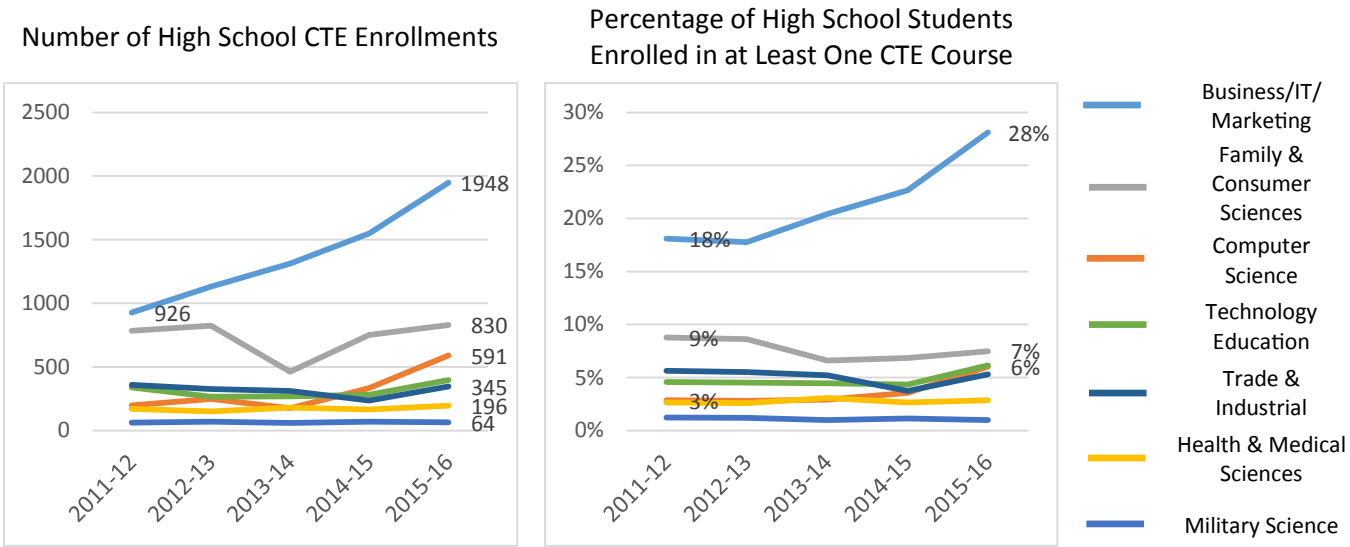


Table 5 shows 2015-16 middle school CTE enrollment disaggregated by demographic variables. Female students are underrepresented in business/IT/marketing and technology education, and overrepresented in FACS classes. LEP and economically disadvantaged students, and students with disabilities, are slightly underrepresented in technology education; and students with disabilities are also slightly underrepresented in FACS classes. Economically disadvantaged students are overrepresented in FACS classes, and white students are overrepresented in technology education classes.

Table 5: Middle School CTE Enrollment by Student Groups, 2015-16

Student Group	APS MS	*Business/IT/ Marketing*	*FACS*	*Technology Education*
Total Number	5,197	701	808	923
Female	50%	32%	65%	27%
Male	50%	68%	35%	73%
LEP	17%	18%	16%	12%
Non-LEP	83%	82%	84%	88%
Disadvantaged	30%	34%	40%	24%
Non Disadvantaged	70%	66%	60%	76%
SWD	16%	18%	14%	13%
Non-SWD	84%	82%	86%	87%
Asian	8%	10%	9%	9%
Black	11%	15%	16%	10%
Hispanic	27%	24%	33%	22%
White	48%	45%	39%	54%
Other	6%	5%	4%	6%

Table 6 shows 2015-16 high school CTE enrollment disaggregated by demographic variables. Female students are considerably underrepresented in computer science and technology education classes, with just 16% of high school girls enrolled in a class in one of these areas. Just 38% and 32% of high school girls are enrolled in military science and trade and industrial courses, respectively. Girls are overrepresented in FACS and Health & Medical Sciences courses. LEP and economically disadvantaged students are underrepresented in computer science, and overrepresented in military science and trade and industrial courses. White students are overrepresented in computer science courses, while Hispanic students are overrepresented in military science and trade and industrial courses.

Table 6: High School CTE Enrollment by Student Groups, 2015-16

Student Group	*APS HS*	*Business/IT/ Marketing*	*Computer Science*	*FACS*	*Health & Medical Sciences*	*Military Science*	*Technology Education*	*Trade & Industrial*
Total Number	6,535	1,948	591	830	196	64	396	345
Female	47%	43%	16%	57%	69%	38%	16%	32%
Male	53%	57%	84%	43%	31%	63%	84%	68%
LEP	22%	27%	7%	31%	15%	31%	19%	45%
Non-LEP	78%	73%	93%	69%	85%	69%	81%	55%
Disadvantaged	33%	39%	15%	48%	35%	58%	32%	50%
Non Disadvantaged	67%	61%	85%	52%	65%	42%	68%	50%
SWD	15%	15%	11%	23%	13%	20%	14%	25%
Non-SWD	85%	85%	89%	77%	87%	80%	86%	75%
Asian	10%	10%	15%	13%	11%	3%	12%	3%
Black	12%	14%	8%	17%	13%	20%	10%	15%
Hispanic	31%	36%	13%	37%	40%	58%	32%	61%
White	43%	34%	56%	30%	30%	17%	41%	17%
Other	5%	5%	7%	3%	6%	2%	5%	3%

Full enrollment data is available in **Appendix C4**.

CTE Finishers

Students who take CTE courses may **finish a sequence**, which is defined as taking two sequential CTE courses in the same program area (for example, Auto I and Auto II). Through 2012-13, students were also considered a "finisher" if they took just one class in EMT, physical therapy/sports medicine, and forensics. Students are considered to be **finishers** until they graduate. Upon graduation, they are considered **completers**. **Figure 3** shows the number of students who were CTE finishers from 2011-12 through 2015-16. This number has decreased sharply from the peak in 2012-13 (986) to a low in 2015-16 (527).

Figure 3: Number of APS Graduates who Were CTE Completers, 2011-12 through 2015-16

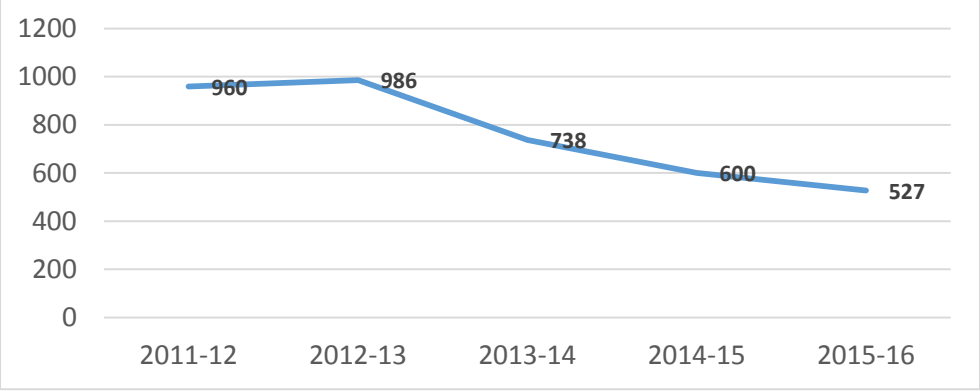
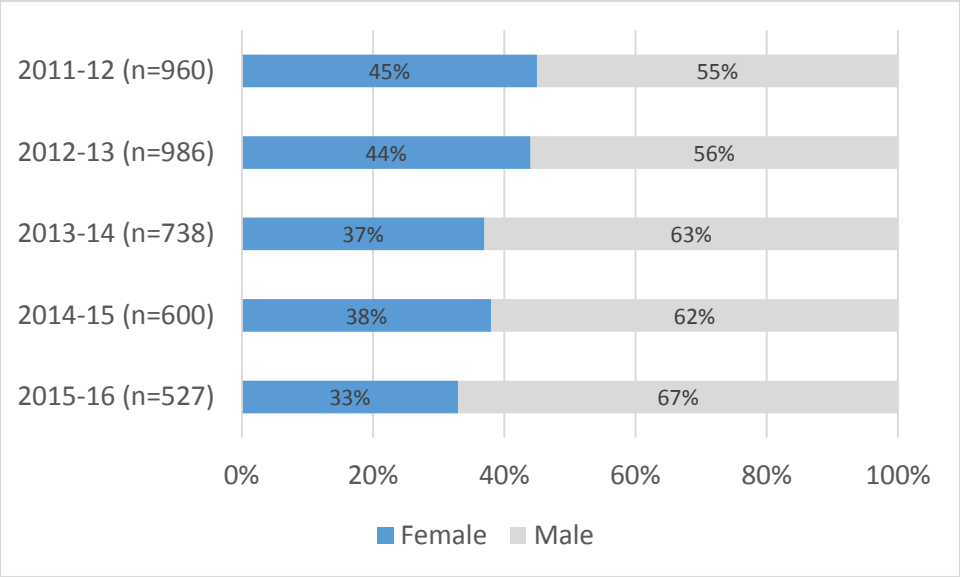


Figure 4 shows the percentage of CTE completers who were male and female over the past five years. As the overall number of completers has decreased, the gap between males and females has increased. In 2015-16, about a third of CTE completers were female. Both the overall decline in CTE finishers and the increased gender gap may be at least partly attributable to the change in 2013-14 eliminating single courses in EMT, physical therapy/sports medicine, and forensics as qualification for being counted as a finisher, as many of these courses tend to have higher proportions of female students.

Figure 4: CTE Completers by Gender



Other demographic groups have seen less change over this five-year period. Complete demographic information is available in **Appendix C5**.

Accommodations for English Language Learners and Students with Special Needs

Around two-thirds of all HILT/HILTEX students and high school students with disabilities indicated that their CTE teacher was very or somewhat helpful in helping them understand the lesson. For middle school students with disabilities, this was just 46%. Common accommodations listed by CTE teachers that they use with their students were SIOP techniques for HILT/HILTEX students; and following IEPs and 504 plans and allowing additional time for students with disabilities.

As part of the CTAE evaluation, multiple surveys were administered in the spring and fall of 2016. In addition, questions were added to some already-existing surveys such as the annual senior survey and the biannual Community Satisfaction Survey. All student and parent surveys were available in Spanish as well as English.

Table 7 shows the response rates and margin of error for each survey administered. When the margin of error is greater than 5, the results should be interpreted with caution.

Table 7: Response Rates for CTE Surveys

Response Group	*Date Administered*	*Population Size*	*Number of Responses*	*% of Population*	*Margin of Error*
High school seniors – general questions	spring 2016	1,329	1,329	100%	n/a
*High school seniors – CTE-specific questions**			1,026	77%	1.46
CTE students (grades 7-8)	spring 2016	1,445	820	57%	2.25
CTE students (high school)	spring 2016	2,100	1206	57%	1.84
Parents (Community Satisfaction Survey)	spring 2016	14,832	603	4%	3.9
All students (grades 5-11) (CSS)	spring 2016	12,120	1,286	11%	2.6
Teacher (non-CTE)	fall 2016	2,225	511	23%	3.8
Counselors	fall 2016	92	42	46%	11.2
Principals and APs	fall 2016	92	51	55%	9.2
CTE Teachers	fall 2016	63	49	78%	6.7

*Not all seniors responded to the questions included in the senior survey that specifically address the CTE program. Since questions of both types – general and CTE-specific – are included in this evaluation, response rates and margin of error are provided for both types of questions.

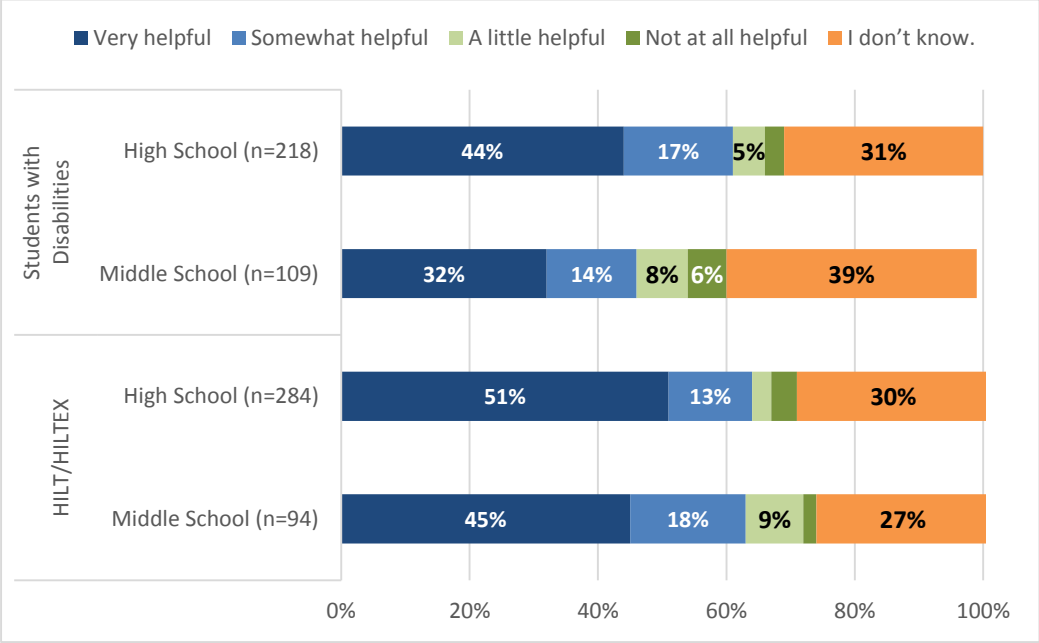
The CTE student survey included a series of questions gauging the perceptions of students with disabilities and students in the HILT/HILTEX program about the effectiveness of accommodations available to them in their CTE classes.

Nineteen percent of respondents indicated that they either were currently or had been in the HILT/HILTEX program, and 17% of students indicated that they either currently had an IEP or 504 plan, or had had one in the past. Students who replied yes to these questions were then asked one or both of the following questions, depending on which program they had indicated:

- Does your CTE teacher for this class help **HILT/HILTEX students** understand the lesson if they need help?
- Does your CTE teacher for this class help **students with disabilities** understand the lesson if they need help?

Students responded by indicating that their teacher is *very, somewhat, a little, or not at all helpful*; or by selecting *I don't know*. Reponses are displayed in **Figure 5**. Around two-thirds of all HILT/HILTEX students and high school students with disabilities indicated that their teacher was *very* or *somewhat helpful*, compared to just 46% of middle school students with disabilities. While few indicated that their teacher was either *a little helpful* or *not at all helpful*, many students across programs and levels selected *I don't know* (27-39%).

Figure 5: Does your CTE teacher for this class help HILT/HILTEX students/students with disabilities understand the lesson if they need help? (CTE students indicating they are/have been in the HILT/HILTEX program or have/have had an IEP or 504)



CTE teachers also responded to open-ended questions asking them what **accommodations** they make for the HILT/HILTEX students and students with disabilities in their classes. Both middle and high school teachers said that they offer the following accommodations for **HILT/HILTEX** students:

- Using Sheltered Instruction Observation Protocol (SIOP) techniques (2 middle school, 16 high school)
- Peer support/paired with another student (6 middle school, 3 high school)
- Multiple modes of instruction provided (5 middle school, 4 high school)
- Vocabulary support (4 middle school, 4 high school)
- Additional time (4 middle school, 6 high school)
- Additional support/help from teacher (4 middle school, 5 high school)

Additional accommodations offered at the middle school level included preferential seating (3), modeling/demonstrating (3), and group work (3). At the high school level, additional accommodations included differentiated instruction/assignments (2), language assistance (2), and making teacher presentations available online (2).

Regarding accommodations for **students with disabilities**, both middle and high school teachers were highly likely to note that they **adhere to the students' IEP and 504 plans** (15 middle school teachers, 11 high school teachers). In addition, teachers at both levels noted the following specific accommodations:

- Additional time (21 middle school, 18 high school)
- Additional support/help from teacher (10 middle school, 5 high school)
- Preferential seating (10 middle school, 7 high school)
- Modified assignments/tests (10 middle school, 7 high school)

- Copies of notes (2 middle school, 2 high school)
- Calculation devices (2 middle school, 2 high school)

Additional accommodations offered at the middle school level include peer support (3), group work (3), and google classroom (2). Two high school teachers also mentioned hands on work (2).

Complete survey responses from staff and CTE students are available in **Appendix D1**.

Familiarity and Perceptions

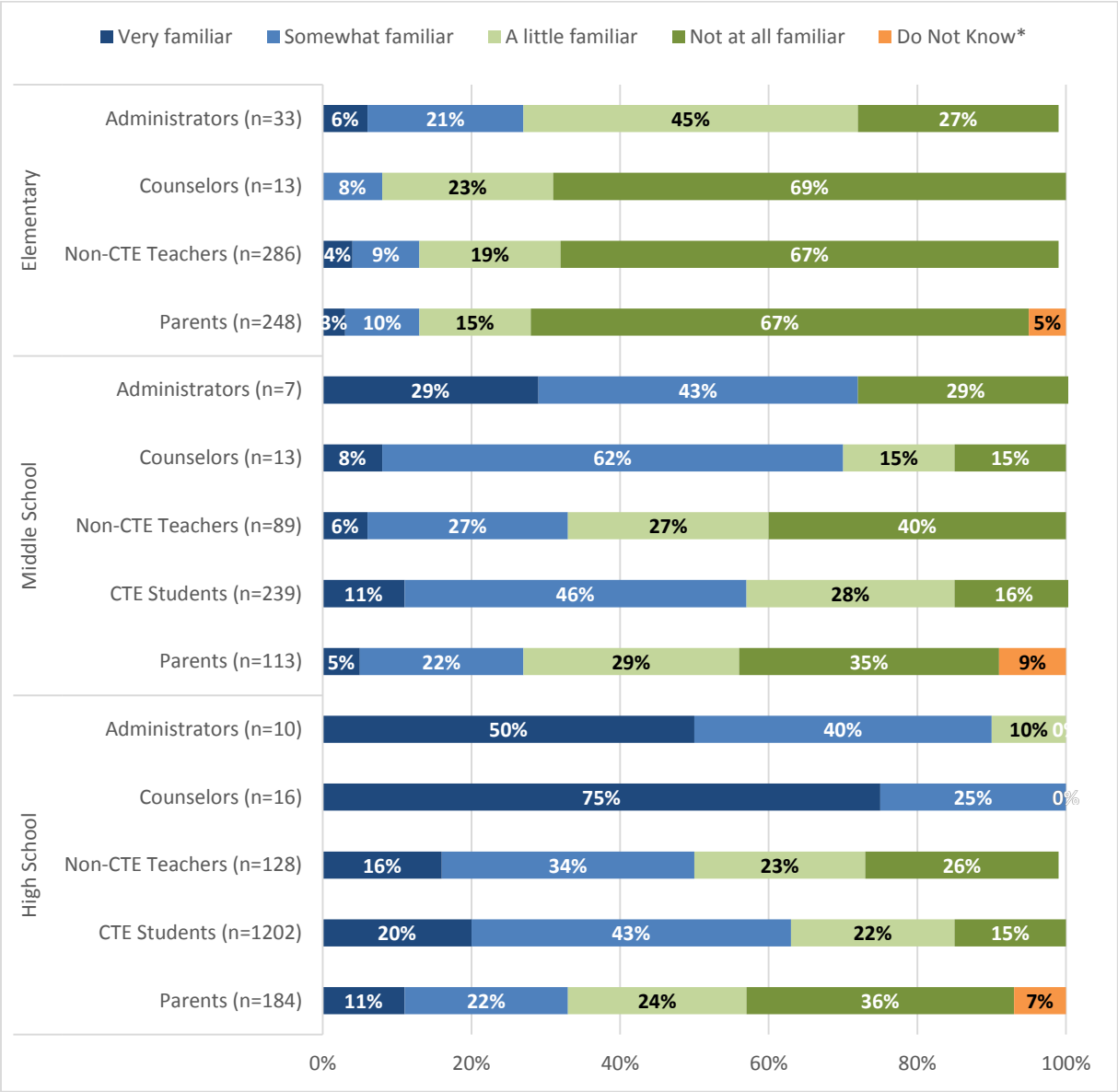
Elementary stakeholders are less familiar with the CTE program than secondary stakeholders. While most respondents across stakeholder groups felt that the CTE program benefits both college-bound students and students who are not on a path to college equally, high school seniors who planned to attend a four-year college were the least likely to report that they were familiar with the CTE program. This group was also least likely to report that they had taken a CTE course, and most likely to report that they did not know that a CTE course could be used as a fine or practical arts credit. Among high school seniors, the most popular reasons for not having taken a CTE class were schedule conflicts, lack of familiarity, and lack of interest. Feedback from college admissions staff indicates that CTE coursework on a student's transcript does not positively or negatively affect their chances of acceptance, as long as students meet their general requirements for academic rigor and accomplishment.

One aim of the surveys administered for this evaluation was to gauge the level of familiarity with the CTE program among APS stakeholders, as well as the perceptions stakeholders have of the program. These questions were designed, in part, to address a concern that some students, parents, and school staff may have the impression that CTE courses are not appropriate for students who intend to attend college.

Figure 6 shows staff, parent, and CTE student responses to the question, "**How familiar are you with courses/opportunities offered through the Career and Technical Education program?**"

Unsurprisingly, elementary respondents were the least likely to report that they were familiar with the CTE program. High school respondents were more likely than middle school respondents to report that they were familiar. At both of these levels, administrators and counselors had the highest rates of familiarity, followed by CTE students and then non-CTE teachers (CTE teachers were not included in this question). Among secondary stakeholders, parents were the least likely to report familiarity with the program, and about a third of middle and high school parents reported that they were *not at all familiar* with the program.

Figure 6: How familiar are you with courses/opportunities offered through the Career and Technical Education program? (Parents, Students, and Staff by Level)

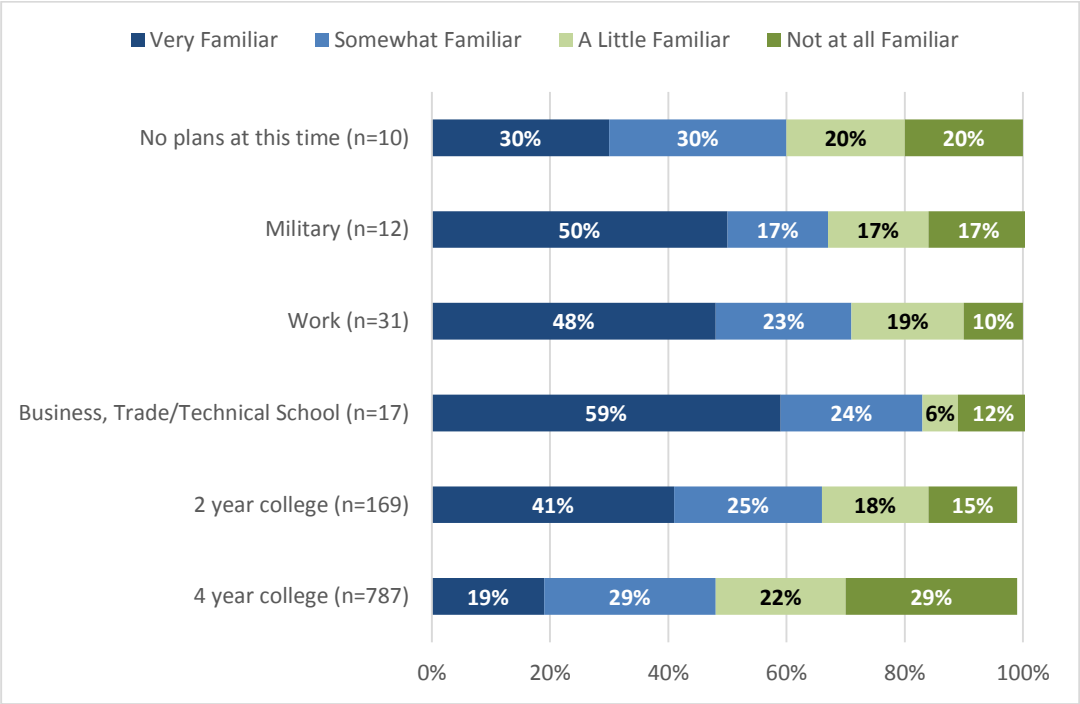


**included in parent survey only*

This question was also included in the 2015-16 senior survey, which is primarily designed to collect information about twelfth grade students' post-high school plans. This survey was administered to all seniors and therefore included both students who had taken CTE courses and those who had not.

Responses are presented in **Figure 7**, disaggregated by post-high school plans. Students who planned to attend a **four-year college** were the least likely to report that they were familiar with the CTE program (48%), and those planning to attend a **business or trade/technical school** were the most likely (83%). Among other groups, between 60-71% reported that they were *very* or *somewhat familiar* with the program.

Figure 7: How familiar are you with courses/opportunities offered through the Career and Technical Education program? (High School Seniors by Post-HS Plans)



All surveys included the question, "**Which of these descriptions of the CTE program best matches your understanding of the program?**" **Figure 8** displays responses among staff, parents, and CTE students, by level. In all but two cases, respondents were most likely to indicate that the CTE program primarily benefits **both college-bound students and students who are not on a path to college equally**. This response was particularly popular among secondary staff (90-94% of high school counselors and administrators and 62-71% of middle school counselors and administrators; 94% of middle school CTE teachers; 88% of high school CTE teachers).

Two groups were most likely to select **I don't know**: elementary teachers (all of whom are non-CTE teachers) and elementary counselors. Typically, the second-most popular response was that the program primarily benefits **students who are not on a path to college, but college-bound students may benefit as well**. Very few respondents indicated that they believe the CTE program primarily benefits **students who are not on a path to college**.

Figure 8: Which of these descriptions of the CTE program best matches your understanding of the program? (Parents, Students, and Staff by Level)

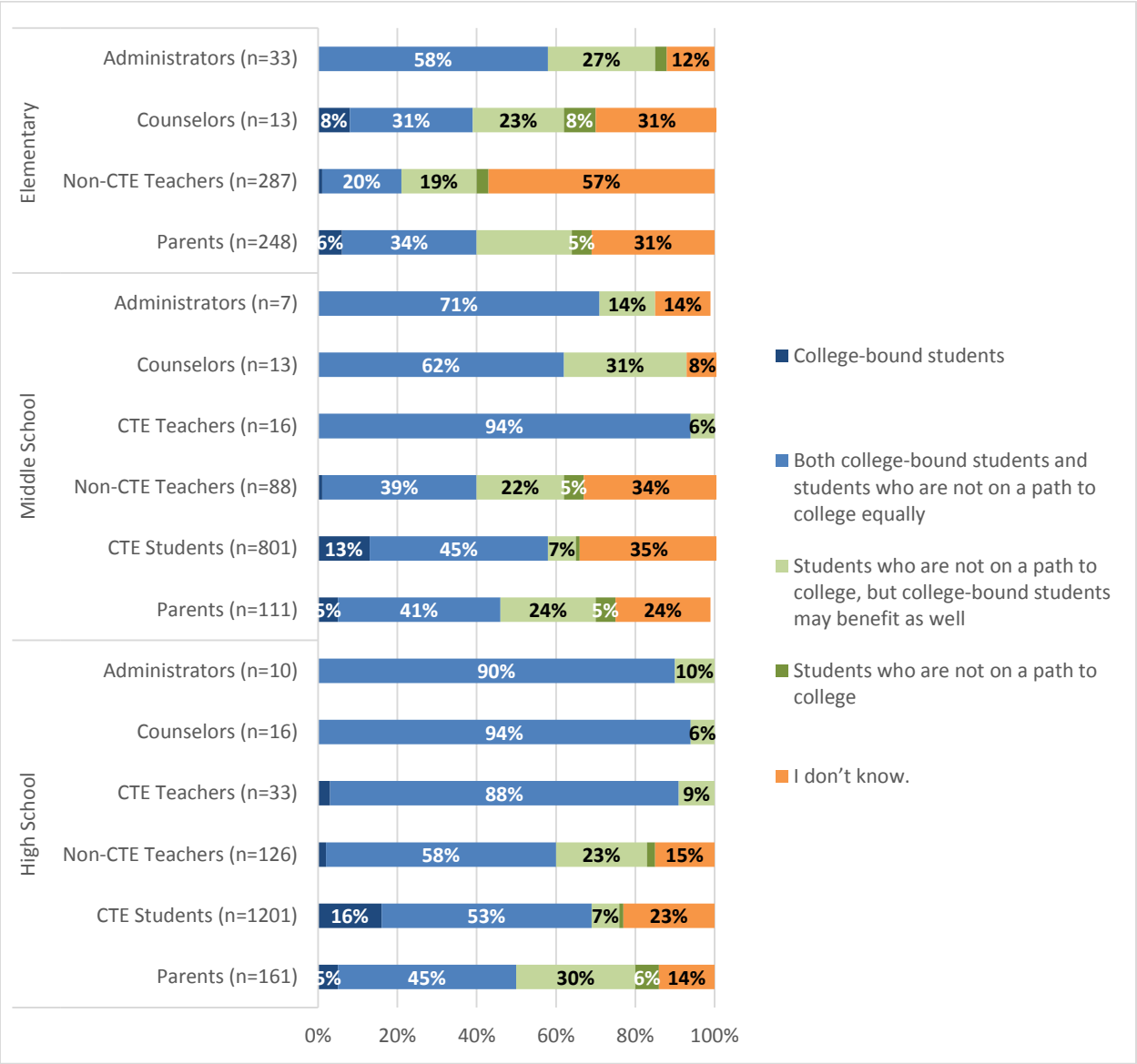


Figure 9 shows high school seniors' responses to this question, disaggregated by their participation in CTE coursework. Students who hadn't taken a CTE course in their high school career were most likely to select **I don't know** (45%), while students who had taken a CTE course were most likely to indicate that the CTE program primarily benefits **both college-bound students and students who are not on a path to college equally** (54%).

Figure 9: Which of these descriptions of the CTE program best matches your understanding of the program? (High School Seniors by CTE Participation)

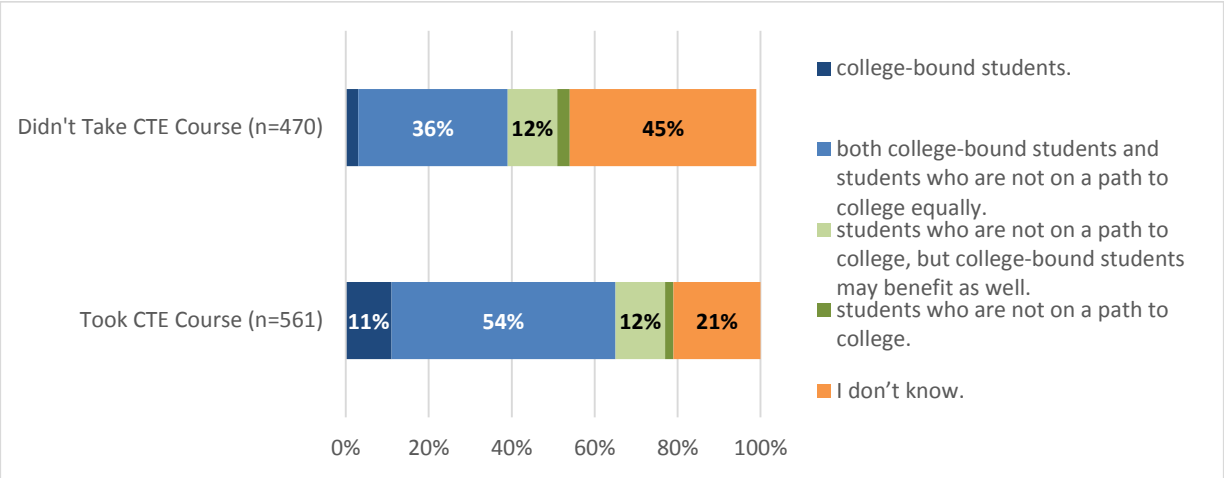
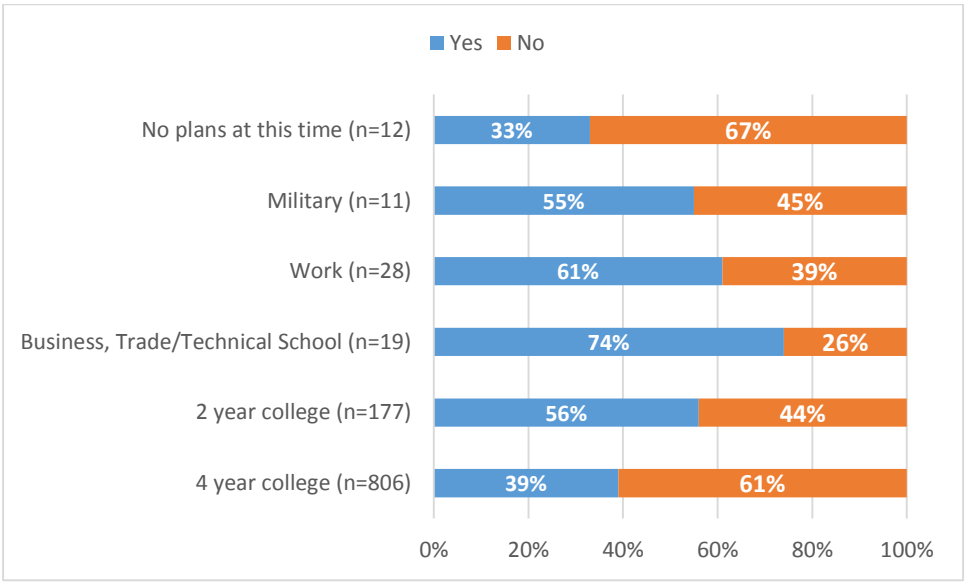


Figure 10 shows high school seniors' response to the question, "**Did you know that a CTE course could be used as a fine or practical arts credit?**" Most students planning to attend a four-year college (61%) indicated that they did *not* know this. Students most likely to select *yes* were those planning to attend a business or trade/technical school (74%).

Figure 10: Did you know that a CTE course could be used as a fine or practical arts credit? (High School Seniors by Post-HS Plans)



Secondary staff were asked how likely they were to encourage the following types of students to enroll in a CTE course:

- Students with disabilities
- English language learners
- Students pursuing a standard diploma (high school only)
- Students pursuing an advanced diploma (high school only)

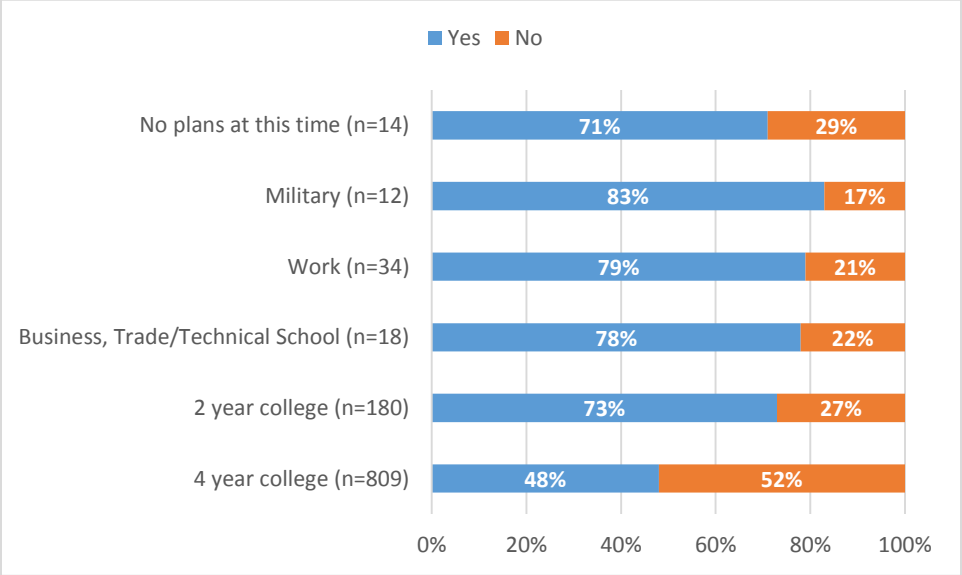
Generally, all staff groups were highly likely to select either *very likely* or *somewhat likely* for all of the above groups, ranging from 83-100%, with just one exception: of the five middle school administrators who responded, just three indicated they were *very* or *somewhat likely* to encourage English language learners to take a CTE course. Among high school staff, there were minimal differences in responses about standard versus advanced diplomas.

Similarly, parents were asked how likely they were to encourage their child to enroll in a CTE course. Around half of all parents indicated that they were *very* or *somewhat likely* to do so, though this percentage decreased slightly from elementary (56%) to middle school (54%) high school (50%).

Non-Participation

Seniors were asked, "**While you were a student in APS, did you ever take a CTE course?**" Responses are displayed in **Figure 11**. Students planning to attend a four-year college were the least likely to respond *yes* at just 48%. Other groups selected this response between 71-83% of the time.

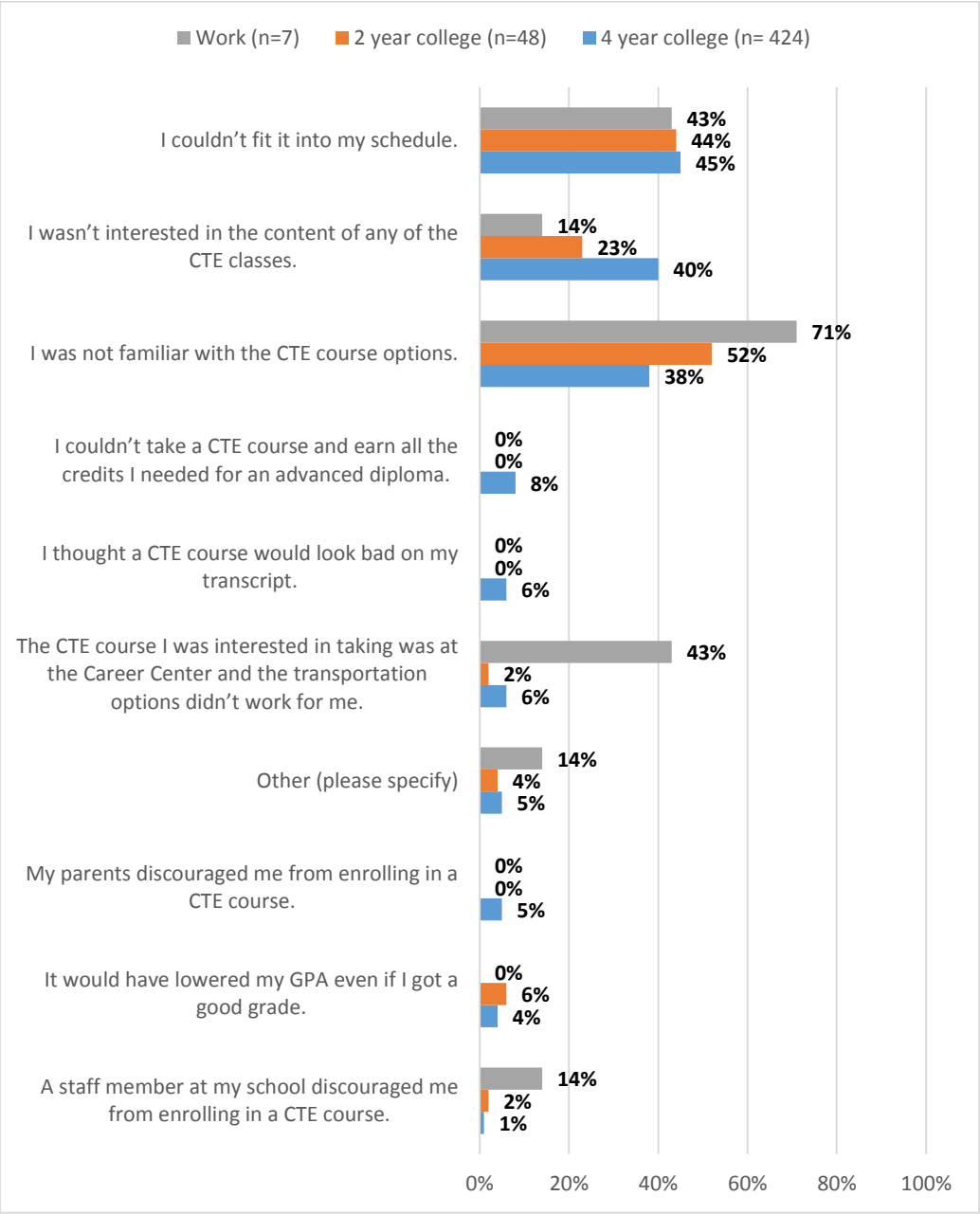
Figure 11: While you were a student in APS, did you ever take a CTE course? (High School Seniors by Post-HS Plans)



Students who selected *no* were asked to indicate their reasons for not taking a CTE course. Responses are displayed in **Figure 12**. By far, the most popular reasons were:

- I couldn't fit it into my schedule. (43%, 44%, and 45% of students planning to work, attend a two-year college, or attend a four-year college, respectively)
- I was not familiar with the CTE course options. (71%, 52%, 38%)
- I wasn't interested in the content of an of the CTE classes. (14%, 23%, 40%)

Figure 12: Which of the following factors impacted your decision not to enroll in a CTE course? (Select all that apply) (High School Seniors who did not take a CTE course, by Post-HS Plans)*



**Military, Business, Trade/Technical School, and No Plans at this Time are not included as fewer than five respondents reported not having taken a CTE course.*

The full survey report is available in **Appendix D1**.

Perceptions of CTE among College Admissions Offices

To address the concern that there may be a perception among APS stakeholders that participation in CTE courses could negatively impact a student's college admissions experience, APS contracted with Hanover Research (Hanover) to conduct a series of interviews with admissions staff in five colleges

located in Virginia (4) or the southeastern United States (1). Hanover reached out to colleges to solicit their participation based on information provided by APS about the colleges most frequently attended by APS graduates. **Table 8** lists attributes of the participating colleges, most of which chose to remain anonymous.

Table 8: Attributes of Participating Colleges in Hanover Research Interviews

Name/ Designation	Title	Institution/ designation	State	Governance	Under-graduate population	Percent admitted
Respondent A	Dean of Admission	Institution A – R1 University	--	Public	20,000-25,000	71-80%
Michael Walsh	Dean of Admission	James Madison University	VA	Public	19,144	66%
Respondent B	Regional Senior Assistant Director	Institution B – Large Master's College or University	--	Public	8,000-10,000	61-70%
Respondent C	Anonymous Admissions Staff	Institution C – R2 University	--	Public	6,000-8,000	31-40%
Respondent D	Dean of Admission	Institution D – Small Master's College or University	--	Public	4,000-6,000	51-60%

Interviews found that:

- **Admissions officials at public, southeastern universities seldom see applicants with substantial CTE courses, which they define as classes that prepare students for technical careers or teach specific vocationally-applicable skills.** This perspective accords with the U.S. Department of Education's 2012 blueprint for technical and vocational education, which mentions the relationship between CTE and postsecondary education as one of several key growth areas but still prioritizes industry partnerships and vocational training. There is no clear consensus about whether these courses are becoming more common on students' applications at competitive institutions.
- **Most college and university admissions committees prioritize students' test scores, grades, and participation in rigorous coursework when assessing applicants.** Admissions personnel typically check applicants' schedules against the most rigorous courses offered at their schools and seldom consider courses outside of core academic disciplines in their initial review of an

application. As long as students meet their general requirements for academic rigor and accomplishment, it does not matter whether or not they participated in substantial CTE courses in addition to meeting those performance benchmarks.

- **CTE participation can be much more influential in cases where a student's academic credentials do not clearly warrant acceptance or rejection, or at institutions that prize students whose passions extend beyond traditional academic achievement.** In these cases, students and their high school recommenders can cite their extensive CTE experience as evidence of their wide-ranging interests, institutional "fit," or commitment to a major or program. The interviews suggest that even very selective institutions value experiences like CTE coursework that help students to stand out relative to other academically qualified students.
- **Almost all of the interviewees cited in this report state that students should use their essays or supplemental application materials to show how their CTE courses have prepared them for college**. Students should not make excuses for focusing on CTE at the expense of traditional academic disciplines, but rather be able to account for their interests. Similarly, recommendation letters and school reports appended to applications should explain why a student took substantial CTE coursework rather than additional AP or honors courses. Commonly accepted reasons for CTE participation include career exploration, general interest in the field, and a school culture that prizes CTE and provides challenging courses to advanced students.
- **Most colleges and universities do not consider CTE participation as preparation for a major, and there are rarely clear policies defining credit transfer for technical courses in fields like computer science, health, or business**. The major reason admissions staffers do not pay significant attention to CTE coursework is that 75-80% of students in four-year institutions change their major at least once, so planning admissions around students' proposed majors is difficult. Some interview respondents expressed hope that increased CTE participation could help high school students choose their majors more wisely, but it is unclear whether this is the case.
- **Respondents were divided about whether or not schools should prioritize additional CTE for their college-bound students or focus on academic fundamentals.** Their perspectives may have been influenced by the types of institution they represent. For instance, one respondent at a large, moderately selective university emphasized ensuring that students complete key courses like Algebra II to improve their chances of postsecondary success. Representatives of more selective schools, whose applicant pools may be more academically qualified, were more likely to favor additional CTE options for students to explore their interests.

The full Hanover report is available in **Appendix D4**.

Career Exploration

Career Exploration for All Students

Teachers at the secondary level were more likely than elementary teachers to report that they cover career exploration frequently, whereas elementary students were more likely than secondary

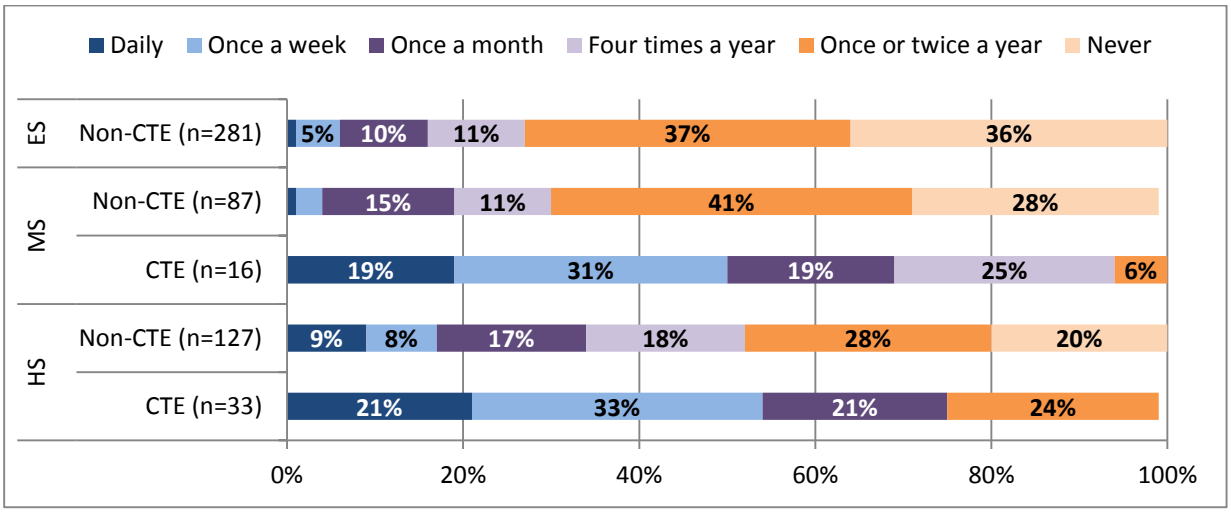
students to report that they learn about careers frequently. Across levels, the least commonly cited career exploration activities were role-play activities or practice applying for jobs. High school seniors who had taken a CTE course were more likely than those who hadn't to report that they had been encouraged to explore career opportunities during their time as an APS student.

One of the goals of the CTAE program is to coordinate and facilitate opportunities for students at all levels to learn about a wide range of careers so that they may begin to explore their own interests and talents. Students are required to identify a career cluster that interests them when they are in 7th grade for their six-year academic plan, which is then expected to be reevaluated as they move through high school.

CTE teachers in middle and high school provide opportunities for students to explore careers within their curriculum areas. Students learn about the many career options within a career cluster and the education and skills needed to pursue that career field. CTE coursework provides students an opportunity to try out a career cluster while still in high school.

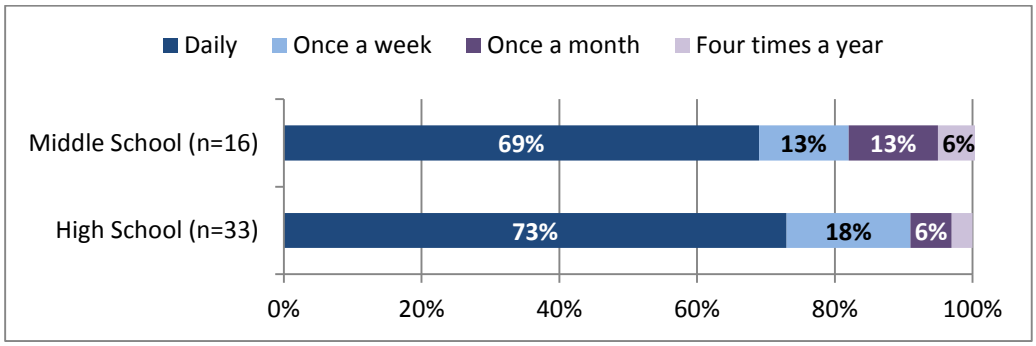
Both CTE and non-CTE teachers were asked how frequently they cover career exploration in their instruction. Responses are displayed in **Figure 13**. Unsurprisingly, **CTE teachers** were generally more likely to indicate that they cover career exploration frequently, with 50-54% selecting *daily* or *once a week*. Among **non-CTE teachers**, high school teachers were more likely to select *daily* or *once a week* (17%) than middle school (4%) or elementary teachers (6%). The two most common responses among non-CTE teachers were *once or twice a year* and *never*, and this was highest at the elementary (73%) and middle school levels (69%). Notably, a quarter of high school CTE teachers indicated that they cover career exploration just *once or twice a year*.

Figure 13: How frequently do you cover career exploration in your instruction? (Teachers)



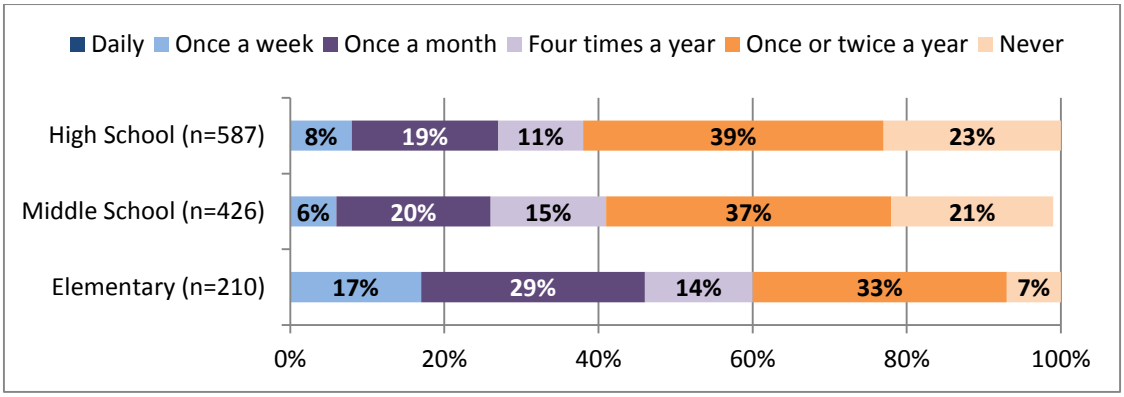
In addition to career exploration, CTE teachers were asked how frequently their instruction **replicates or simulates practices and situations found in business and industry**. These responses are displayed in **Figure 14**. No teachers selected the least frequent options of *once or twice a year* or *never*, and over two-thirds at each level selected *daily*.

Figure 14: How frequently does your instruction replicate or simulate practices and situations found in business and industry? (CTE Teachers)



The 2016 Community Satisfaction Survey, which was administered to a sample of students in grades 5-11, included a series of questions to gauge how frequently and in what ways students explore careers in school. This survey was distinct from the CTE student survey administered that year, and the secondary students who responded may or may not have had experience with CTE coursework. **Figure 15** shows responses to the question, "**How frequently do you learn about different careers at school**?" Unlike teachers, no students indicated that they learn about careers *daily*. Across levels, the most common response was *once or twice a year*, followed by *once a month*. Middle and high school students were far more likely to indicate that they *never* learn about careers (21-23%) than elementary students (7%).

Figure 15: How frequently do you learn about different careers at school? (All Students)



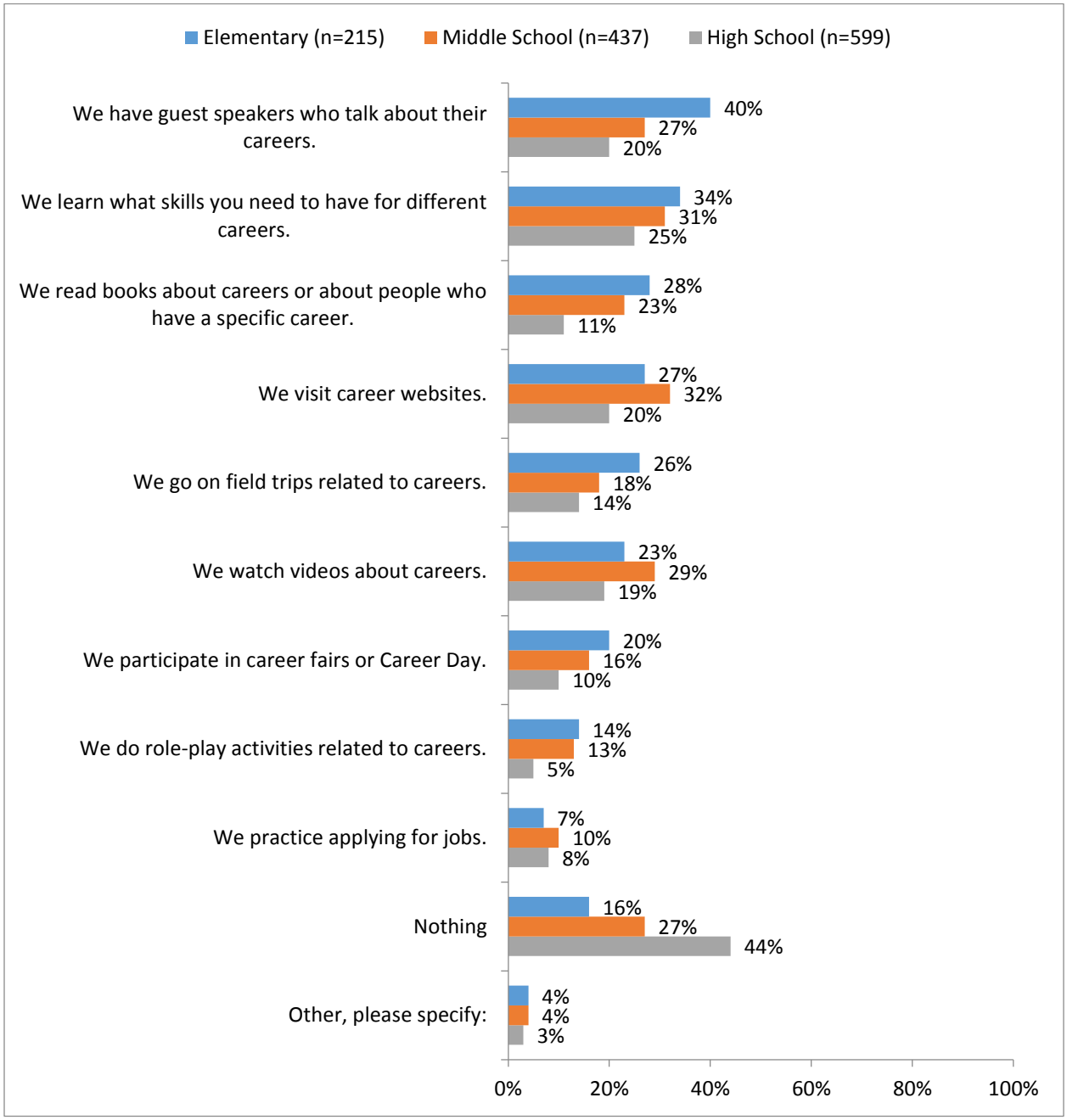
Students also responded to two questions per level about the ways that they learn about careers: "Thinking about this school year…"

- **All levels**: …what do you do **in your classes** to learn about careers?
- **Elementary and middle school**: …what does **your counselor** do to help you learn about careers?
- **High school**: …what do **your counselor and your college and career specialist** do to help you learn about careers?

Responses to the first question are displayed in **Figure 16**. The most common classroom activity cited among elementary students was **We have guest speakers who talk about their careers** (40%). Among middle school students, it was **We visit career websites** (32%), and among high school students, it was **We learn what skills you need to have for different careers** (25%). Students across levels were least

likely to indicate that they do **role-play activities** related to careers, or that they **practice applying for jobs**. The percentage of students indicating that they do **nothing** to learn about careers increased by level, with 16% at the elementary level, 27% at the middle school level, and 44% at the high school level (the most common response overall for high school).

Figure 16: Thinking about this school year, what do you do in your classes to learn about careers? You may choose more than once response. (All Students)

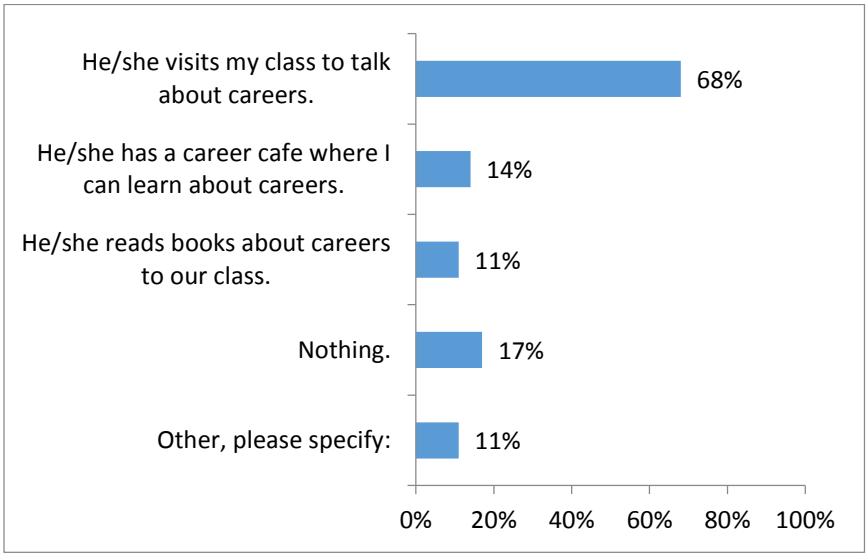


Responses about counselors (elementary and middle school) and counselors and college and career specialists (high school) are displayed in **Figure 17** (elementary) and **Figure 18** (secondary). Response

options were different for elementary and secondary students given the nature of the counselor's (or college and career specialist's) job at each level.

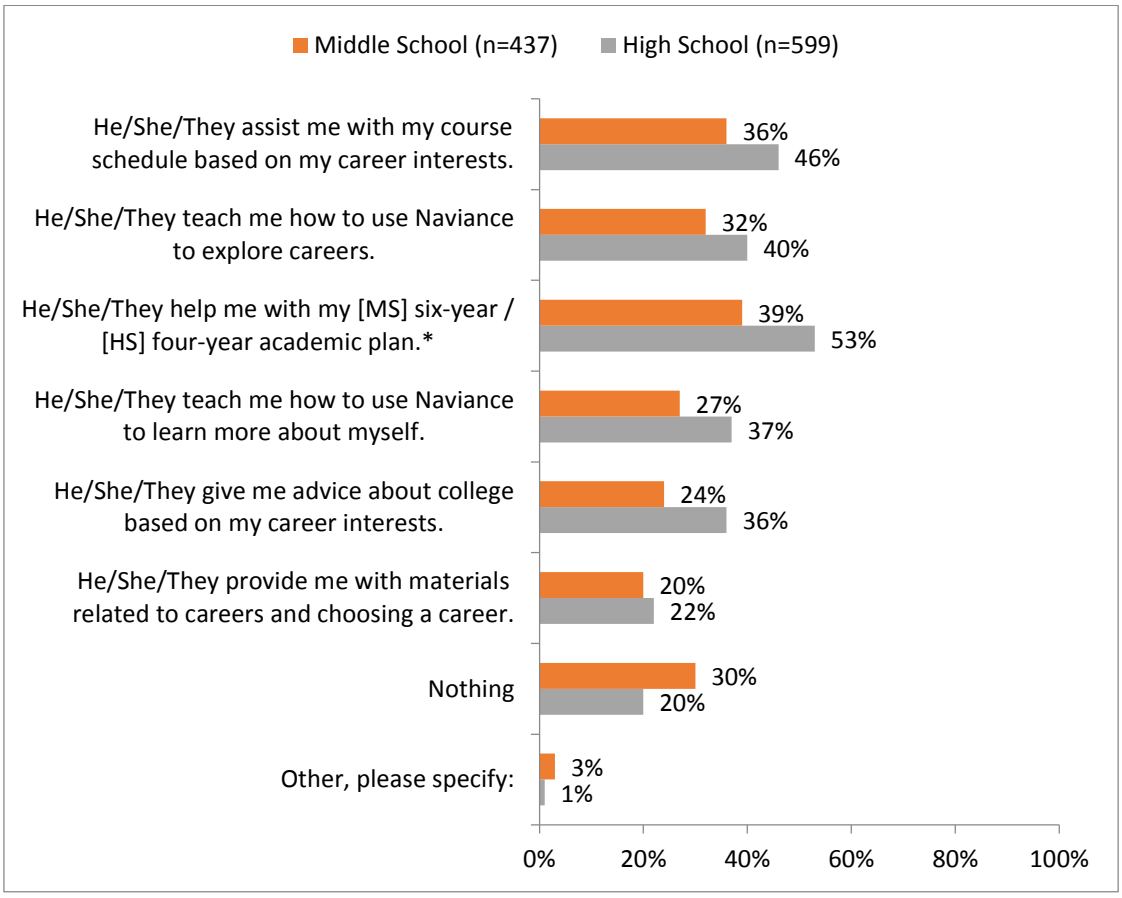
By far, elementary students were most likely to report that their counselor **visits their class to talk about careers** (68%). Just 17% of elementary students said that their counselor does **nothing**.

Figure 17: Thinking about this school year, what does your counselor do to help you learn about careers? You may choose more than one response. (Elementary Students, n=215)



Among secondary students, high school students were more likely than middle school students to select any response other than **nothing** (30% of middle school responses and 20% of high school responses). Notably, just 39% of 7th and 8th graders, and 53% of high school students indicated that their counselor or college and career specialist help them with their six-year or four-year **academic plan**. The expectation is that all students will collaborate with their counselors on their academic plan.

Figure 18: Middle School: Thinking about this school year, what does your counselor do to help you learn about careers? You may choose more than one response./High School: Thinking about this school year, what do your counselor and your college and career specialist do to help you learn about careers? You may choose more than one response.



*MS n = 220. For this question, responses from 6th graders were omitted.

On the senior survey, students were asked the following questions:

- During my time as an APS student, I was encouraged to explore career opportunities.
- My high school helped me select courses that aligned with my college and career goals.

Responses are displayed in **Table 9** and **Table 10**, disaggregated by CTE participation and by post-high school plans. For both questions, students who **took a CTE course** were more likely to indicate that they *strongly* or *somewhat agreed*, and this difference was greater (14 percentage points) on the question of whether they were encouraged to explore career opportunities. There is also a similar pattern across questions when disaggregating by post-high school plans: for each question, the students who were least likely to indicate agreement were those planning to attend a **four-year college**, to **work**, or those who had **no plans**.

Table 9: During my time as an APS student, I was encouraged to explore career opportunities. (High School Seniors by CTE Participation and by Post-HS Plans)

Category	*Group*	*% Strongly/ Somewhat Agree*
CTE Participation	Took CTE Course (n=567)	79%
	Didn't Take CTE Course (n=479)	65%
Post-HS Plans	4 year college (n=848)	70%
	2 year college (n=201)	85%
	Business, Trade/ Technical School (n=20)	95%
	Work (n=37)	76%
	Military (n=15)	93%
	No plans at this time (n=13)	54%

Table 10: My high school helped me select courses that aligned with my college and career goals. (High School Seniors by CTE Participation and by Post-HS Plans)

Category	*Group*	*% Strongly/ Somewhat Agree*
CTE Participation	*Took CTE Course (n=558)*	69%
	Didn't Take CTE Course (n=478)	63%
Post-HS Plans	*4 year college (n=845)*	65%
	2 year college (n=198)	72%
	Business, Trade/ Technical School (n=19)	84%
	Work (n=34)	62%
	Military (n=14)	86%
	No plans at this time (n=12)	50%

The full survey report is available in **Appendix D1**.

Career Exploration Opportunities for CTE Students

Most CTE teachers work with community and business partners to some extent, and high school teachers were positive about the value of community and business partnerships to the APS CTE program (middle school teachers did not answer this question). While the proportion of high school CTE students who had participated in a work-based learning opportunity was relatively low, those who had participated were almost universally positive about the experience. Of those who hadn't participated, around half attributed their lack of participation to a lack of awareness, and just 15% attributed their lack of participation to their own lack of interest. Business partners who provide work-based learning opportunities to APS CTE students indicated that they both provide and receive benefits from the relationship. They offered a variety of suggestions to strengthen the program, such as publicizing the program more, identifying areas for growth and taking steps to increase partnerships, and instituting processes such as a standard job application to ensure student interest and commitment.

The Virginia Department of Education (VDOE) CTE Work-Based Learning Guide[7] defines work-based learning (WBL) as "a school-coordinated, coherent sequence of on-the-job experiences that are related to students' career goals and/or interests, are based on instructional preparation, and are performed in partnership with local businesses, industries, or other organizations in the community. Work-based learning enables students to apply classroom instruction in a real-world business or service-oriented work environment."

The CTE program encourages local businesses to participate in various WBL activities, which may be organized by a CTE teacher or by central office staff. **Figure 19** shows answers to a question on the CTE teacher survey, "**How frequently do you work with community and/or business partners in your CTE courses?**" Most CTE teachers work with partners to some extent, as just 6-9% indicated that they *never* do. High school teachers were more likely to indicate that they frequently work with partners, with about a third reporting that they do so *daily* or *once a week*, compared to about a quarter of middle school teachers.

Figure 19: How frequently do you work with community and/or business partners in your CTE courses? (CTE Teachers)

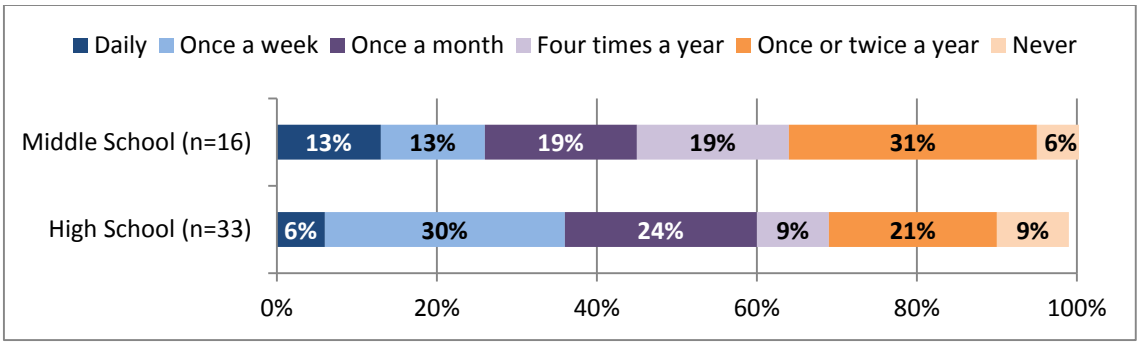
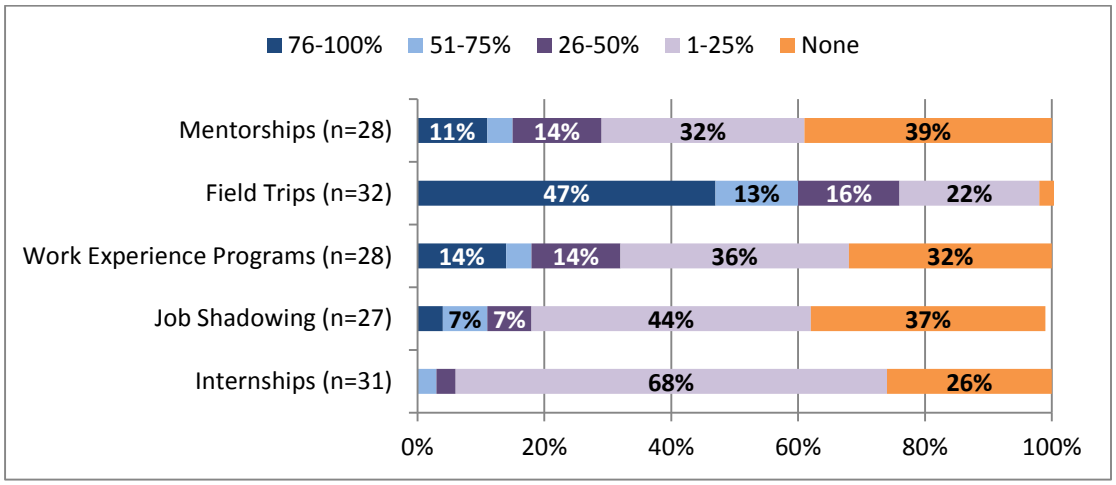


Figure 20 shows high school CTE teachers' responses to the question, "**Approximately how many of your students participate in the following opportunities through the CTE program (for your CTE program area)?**" By far, the opportunity with the highest participation rate was **field trips**, with almost half of teachers reporting that between 76-100% of their students participate, and only three percent reporting that *none* of their students participate. **Internships** had the lowest participation rate, with 68% of teachers reporting that between *1-25%* of their students participate, and 26% reporting that *none* of their students do.

[7] http://www.doe.virginia.gov/instruction/career_technical/work-based_learning/wbl_learning_guide.pdf

Figure 20: Approximately how many of your students participate in the following opportunities through the CTE program (for your CTE program area)? (High School CTE Teachers)



High school CTE students were asked a corresponding set of questions about their participation in CTE opportunities outside the classroom. Responses are displayed in **Table 11**. Most students (61%) said that they had not participated in any of the opportunities, followed by 26% who said they had participated in **field trips**. The participation rate for all other opportunities ranged from 4-9%.

Table 11: Have you ever participated in any of the following work-based opportunities through a CTE course? (Select all that apply) (High School CTE Students, n=1206)

Opportunity	*Percent*
Field trips	26%
Job shadowing	9%
Work experience programs	9%
Internships	7%
Mentorships	5%
Cooperative education (“Co-op”)	4%
None of the above	61%

Those students who indicated they had not participated in any of the above opportunities were then asked why not. Responses are displayed in **Table 12**. Around half attributed their lack of participation to a **lack of awareness** of available opportunities. Just 15% attributed their lack of participation to their own **lack of interest**.

Table 12: Why haven't you participated in any of the above opportunities? (High School CTE Students, n=731)

Response	*Percent*
I am not aware of what opportunities are available.	52%
I am interested, but I can’t fit something like this into my schedule.	22%
I am aware of the opportunities, but I am not interested.	15%
Other	11%

High school CTE teachers were **positive about the value of community and business partnerships to the APS CTE program**, with 93% indicating the partnerships were either *very* or *somewhat beneficial*. The remaining 7% selected *I don't know* rather than indicating the partnerships were not beneficial. Likewise, most (90%) indicated that the work/effort required of staff to set up community and business partnerships is *completely* or *somewhat worth it*.

High school students who had participated in a work-based opportunity were also overwhelmingly positive, with between 90% (mentorships) and 98% (Co-op) indicating that the opportunity they had participated in had been *very* or *somewhat valuable*. Similarly, almost all indicated that they *strongly* or *somewhat agreed* with the following statements:

Overall, the work-based learning opportunity or opportunities…

- …provided me with work-related skills. (96%)
- …helped prepare me for a career. (92%)
- …helped me determine a career path. (83%)

And 79% indicated agreement with the statement, "**I am still interested in this career path.**"

In an effort to learn what has made current business partnerships successful and what could strengthen future partnerships, APS contracted with an external evaluator in the summer of 2016 to conduct telephone interviews with CTE business partners who provide work-based opportunities to APS students. Five in-depth telephone interviews were conducted, lasting between 30 to 60 minutes. Interviewees included representatives of both automotive and other types of partners such as civic associations.

The external evaluator found that:

- **Business partners said they got involved to develop future employees (primarily auto industry), because of their altruism and sense of community (partners from all sectors), and to fill a specific need (partners from all sectors).**
- **In partners' view, they both provide *and* accrue benefits.** They very much view the partnership program as a win-win. In terms of providing benefits, they all see themselves as providing education. Automotive partners also provide a productive, professional alternative for students who will not attend college. Benefits that partners accrue include: being able to grow their own talented, trained staff; getting the aid of helpful students; offering opportunities for staff to be mentors; and, enjoying the feeling of giving back to the community that supports the business.
- **Partners who host students as staff (e.g., internships) say that their challenges center on making sure they sign on committed students who really want to experience working in the partners' field.** They have had souring experiences in which students "no show" or quit in a very short time period.
- **Sometimes students show a lack of understanding about the workplace.** For example, they may not display a strong work ethic, may need better workplace communication skills (e.g., working with customers, accepting criticism), or may need to show more responsibility.

- **Partners had high praise for the strong one-on-one connections APS staff members maintain with them.** They regarded these connections as the central strength of the program. They said they know exactly who to contact with questions, ideas, or difficulties. They described communication as clear and open. One specifically noted that because APS adults clearly value what partners offer, the students follow their lead and value it, too.
- P**artners' suggestions to strengthen the program include:**
    - Working with partners to identify how they can invest further in the program—by learning APS's needs and exploring whether they can contribute manpower or funding.
    - Publicizing the program more. Specific suggestions include: noting well-known businesses that participate, which may suggest a "stamp of approval" to other businesses; providing print materials to help introduce the partnership to businesses; using social media; and reaching out to trade groups.
    - Identifying areas for growth such as technology and coding and taking steps to increase partnerships (e.g., offer more classes, pique interest among younger students). In choosing areas for growth, one suggested focusing on "tight-knit" local business sectors where word-of-mouth will help draw in more partners.
    - Tasking a department or committee with identifying key needs at each school and seeking partners to fill it.
    - Maintaining processes for internship-type partnerships, such as job application procedures, that help ensure students who participate have genuine interest and feel committed.

The full survey report is available in **Appendix D1**. The summary of partner interviews is available in **Appendix D6**.

Participation in National Student Organizations

Career and Technical Student Organizations (CTSOs) are national organizations that provide students with leadership and workplace experiences and offer competitions at the regional, state, and national levels. APS CTE students are encouraged to participate in the following CTSOs:

- **Future Business Leaders of America (FBLA)**[8]: aims to help prepare students for careers in business through leadership development, competitions, and community service
- **Technology Student Association (TSA)**[9]: offers co-curricular activities, competitive events, and related programs to foster leadership in technology, innovation, design, and engineering
- **SkillsUSA**[10]: aims to improve the quality of the skilled workforce through employability, technical, and professional skills training.

[8] http://www.fbla-pbl.org
[9] http://www.tsaweb.org
[10] http://www.skillsusa.org

- **Family Career and Community Leaders of America (FCCLA)**[11]: aims to promote personal growth and leadership through family and consumer sciences education, focusing on multiple roles of family members, wage earners, and community leaders
- **DECA**[12]: aims to prepare leaders and entrepreneurs for careers in marketing, hospitality, and management

In the spring of 2016, the Office of Planning and Evaluation collected data from each CTE teacher on the number of their current students who participated in a given student organization at the class, regional, state, or national level. Results are displayed in **Table 13**.

Table 13: Number of Students Participating in Student Organizations, 2015-16*

Organization	*In-Class Only*	*Regional*	*State*	*National*
Future Business Leaders of America	286	53	0	0
Technology Student Association	143	48	38	6
SkillsUSA	86	44	34	16
Family Career and Community Leaders of America	137	0	5	0
DECA	50	30	16	4

*Note that numbers are presented cumulatively; that is, students included in the "Regional" column are also included in the "In-Class Only" column. There are exceptions for organizations where participation at the state level does not require participation at the regional level.

This data is available in **Appendix C6**.

Alignment between APS CTE Offerings and Local Workforce Requirements

APS CTE courses are most likely to align with job openings requiring either a high school diploma or a bachelor's degree, and are most likely to align with required certifications for jobs requiring a high school diploma.

The most popular job openings requiring a high school diploma were retail salespersons and first-line supervisors of retail sales workers, which align with Intro to Business and Marketing, and first-line supervisors of food preparation and serving workers, which aligns with Culinary Arts and Science. The most popular job openings requiring a bachelor's degree were software developers and computer systems analysts, aligned with Computer Science; network and computer systems administrators, aligned with Intro to Information Technology; and information security analysts, aligned with Cyber Security.

Commonly required hard and soft skills include oral and written communication skills, Microsoft Office, detail-oriented, marketing, creativity, and problem solving, all of which are aligned with CTE offerings. Several job openings, required skills, and required certifications were not aligned with current CTE offerings but represent areas to be taken into consideration for revisions to the CTE curriculum.

[11] http://www.fcclainc.org
[12] https://www.deca.org

For purposes of this evaluation, the Alexandria/Arlington Regional Workforce Council[13] provided the Office of Planning and Evaluation with information about local job openings between July 1, 2015 and June 30, 2016. This information was pulled from the Wanted Analytics website[14], a subscription-based service that provides data on workforce trends.

Complete workforce data is available in **Appendix C7**. It includes a summary of the total number of advertised jobs requiring a high school diploma, associate's degree, bachelor's degree, or graduate/professional degree.

Available jobs are further broken down by the following categories:

- **Specific job** (e.g. retail salesperson, customer service representative)
- **Hard and soft skills** required (e.g. oral and written communication skills, Microsoft Office)
- **Certifications** required (e.g. commercial driver's license, first aid certification)

In order to assess the alignment between APS CTE course offerings and current local workforce requirements, the CTAE Office reviewed the provided data and indicated:

- Alignment between existing CTE courses and current job openings, required skills, and required certifications
- Jobs, skills, or certifications not aligned with current CTE courses that merit further exploration as possible areas for expansion in the CTE program

Job Openings

Table 14 shows the number and percentage of job openings during this one-year period that were aligned with APS CTE offerings, by degree type. The total number of job openings does not include jobs categorized as "other" as it was not possible to determine CTE alignment for those jobs. CTE courses were most likely to align with jobs requiring either a **high school diploma** (82%) or a **bachelor's degree** (62%).

Table 14: Number and Percentage of Job Openings Aligned with CTE Course Offerings by Degree Type

Degree	Available Job Openings	Aligned with Available CTE Courses	% Aligned with Available CTE Courses
High School Diploma	99,761	81,527	82%
Associate's	42,999	7,025	16%
Bachelor's	245,083	151,370	62%
Graduate	22,158	6,964	31%

The top ten job openings requiring a **high school diploma** are shown in **Table 15**.

[13] https://workforcecouncil.arlingtonva.us
[14] https://www.wantedanalytics.com

Table 15: Top Ten Local Job Openings Requiring a High School Diploma, Aligned with APS CTE Courses

Job	Number of Openings	CTE Alignment
Retail Salespersons	9,098	Intro. to Business and Marketing
First-Line Supervisors of Retail Sales Workers	6,861	Intro. to Business and Marketing
First-Line Supervisors of Food Preparation and Serving Workers	5,664	Culinary Arts and Science
Customer Service Representatives	3,790	Intro. to Business and Marketing
First-Line Supervisors of Office and Administrative Support Workers	3,655	Technology Computer Applications
Executive Secretaries and Executive Administrative Assistants	3,082	Technology Computer Applications
Cashiers	2,294	Entrepreneurship
Maintenance and Repair Workers, General	2,178	Automotive Technician/ Construction Technology
Combined Food Preparation and Serving Workers, Including Fast Food	2,155	Culinary Arts and Science

The top ten job openings requiring a **bachelor's degree** are shown in **Table 16**.

Table 16: Top Ten Local Job Openings Requiring a Bachelor's Degree, Aligned with APS CTE Courses

Job	Number of Openings	CTE Alignment
Software Developers, Applications	15,996	Computer Science
Network and Computer Systems Administrators	15,469	Intro to Information Technology
Computer Systems Analysts	12,336	Computer Science
Information Security Analysts	12,171	Cyber Security
Management Analysts	10,693	n/a
Computer Systems Engineers/Architects	10,112	Computer Science
Information Technology Project Managers	8,310	Intro to Information Technology
Marketing Managers	8,215	Intro to Business and Marketing
Registered Nurses	6,067	Intro to Medical Science
Web Developers	5,880	Design, Multimedia and Web Technologies

Table 17 shows the local job openings that are not aligned with current CTE offerings but may present areas for possible CTE expansion.

Table 17: Local Job Openings Indicating Areas for Possible CTE Expansion

Occupation	Degree Required	Number of Openings
Management Analysts	Bachelors	10,693
Registered Nurses	HS Diploma, Associates, Graduate	5128
Public Relations Specialists	Associates, Bachelors, Graduate	5005
Computer User Support Specialists	Associates	4,861
Web Developers	Associates	4,309
Financial Managers, Branch or Department	Associates, Bachelors, Graduate	3561
Operations Research Analysts	Associates, Bachelors, Graduate	2315
Lawyers	Associates. Graduate	2155
Financial Analysts	Bachelors, Graduate	2,144
Intelligence Analysts	Bachelors, Graduate	1,997
Technical Writers	Bachelors, Graduate	1,743
Sales Representatives, Services, All Other	Bachelors	1,704
Purchasing Agents, Except Wholesale, Retail, and Farm Products	Bachelors	1,314
Medical Scientists, Except Epidemiologists	Bachelors	1,162
Environmental Science and Protection Technicians, Including Health	Associates, Bachelors, Graduate	1046
Nursing Assistants	HS Diploma, Associates	1041
Property, Real Estate, and Community Association Managers	Associates, Bachelors	948
Paralegals and Legal Assistants	Associates, Bachelors, Graduate	803
Executive Secretaries and Executive Administrative Assistants	Associates	743
Bookkeeping, Accounting, and Auditing Clerks	Bachelors	694
Educational, Guidance, School, and Vocational Counselors	Bachelors, Graduate	654
Information Security Analysts	Associates, Graduate	640
Meeting, Convention, and Event Planners	Bachelors	637
Maintenance and Repair Workers, General	Associates, Graduate	624
Interpreters and Translators	HS Diploma, Bachelors	619
Compensation, Benefits, and Job Analysis Specialists	Bachelors	571
Medical Records and Health Information Technicians	Associates	560
Reporters and Correspondents	Bachelors	552
Medical Assistants	Associates	551
Budget Analysts	Bachelors, Graduate	549

Occupation	Degree Required	Number of Openings
Computer and Information Research Scientists	Graduate	533
Environmental Engineers	Bachelors	493
Personal Financial Advisors	Bachelors	463
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	Bachelors	412
Radiologic Technologists	Associates	408
Biological Technicians	Bachelors	397
Physician Assistants	Graduate	362
Nurse Practitioners	Graduate	361
Home Health Aides	HS Diploma, Associates	352
Accountants	Associates, Graduate	300
Marketing Managers	Graduate	295
Electronics Engineering Technicians	Associates	281
Community and Social Service Specialists, All Other	Graduate	275
Training and Development Specialists	Associates, Graduate	250
Heating and Air Conditioning Mechanics and Installers	Associates	245
Personal Care Aides	HS Diploma	240
Medical Secretaries	Associates	231
Auditors	Associates, Graduate	207
Instructional Coordinators	Graduate	187
Economists	Graduate	178
Physicians and Surgeons, All Other	Graduate	154
Dentists, General	Graduate	127
Surgeons	Graduate	127
Surgical Technologists	Associates	121
Respiratory Therapists	Associates	119
Cardiovascular Technologists and Technicians	Associates	112
Clinical Research Coordinators	Graduate	98
Speech-Language Pathologists	Associates	97
Optometrists	Graduate	92
Medical Equipment Repairers	Associates	90
Urban and Regional Planners	Graduate	88
Human Resources Managers	Associates	81
Audiologists	Graduate	80
Treasurers and Controllers	Graduate	75
Emergency Management Directors	Graduate	73

Occupation	Degree Required	Number of Openings
Pediatricians, General	Graduate	67
First-Line Supervisors of Construction Trades and Extraction Workers	Associates	63
School Psychologists	Graduate	63
Database Administrators	Graduate	49
Critical Care Nurses	Graduate	46

Hard and Soft Skills

Table 18 shows the most frequently required hard and soft skills by degree type, number of openings, alignment with current CTE offerings, and by whether the skill may indicate a possible area for CTE expansion. This table represents the top ten most frequently required skills for each degree type, totaling 17 skills overall given the overlap in required skills across degree types.

Table 18: Most Frequently Required Hard and Soft Skills by Degree Type

Required Skill	Degree Type	Number of Openings	CTE Alignment	Possible CTE Expansion
Oral and written communication skills	High School Diploma	26,623	All CTE	n/a
	Associates	8,812		
	Bachelors	92,820		
	Graduate	6,649		
Microsoft Office	High School Diploma	9,078	Computer Information Systems	n/a
	Associates	4,177		
	Bachelors	44,243		
	Graduate	1,597		
Detail oriented	High School Diploma	9,813	All CTE	n/a
	Associates	3,744		
	Bachelors	33,138		
	Graduate	1,636		
Project Management	Bachelors	32,888	n/a	Yes
	Graduate	1,784		
Marketing	High School Diploma	9,002	Intro to Business and Marketing	n/a
	Bachelors	31,763		
	Graduate	1,834		
Creativity	Bachelors	31,086	All CTE	n/a
	Graduate	2,231		
Problem solving	Associates	3,275	All CTE	n/a
	Bachelors	28,498		
	Graduate	1,560		
Microsoft PowerPoint	Bachelors	28,042	Computer	n/a

Required Skill	Degree Type	Number of Openings	CTE Alignment	Possible CTE Expansion
			Information Systems	
Work independently	High School Diploma	6,825	All CTE	n/a
	Associates	2,538		
	Bachelors	24,976		
Integrity	High School Diploma	11,576	All CTE	n/a
	Associates	3,024		
	Bachelors	24,921		
	Graduate	2,455		
Customer service oriented	High School Diploma	12,626	All CTE	n/a
	Associates	3,438		
Team-oriented, teamwork	High School Diploma	10,011	All CTE	n/a
	Associates	2,529		
	Graduate	1,607		
Sales experience/ability	High School Diploma	6,727	Entrepreneurship	n/a
Organizational skills	High School Diploma	5,678	All CTE	n/a
Troubleshooting	Associates	3,675	All CTE	n/a
Java	Associates	2,409	Computer Science	n/a
Management skills	Graduate	1,497	n/a	Yes

Certifications

Table 19 shows the number of job openings during this one-year period that required some type of certification, as well as the number and percentage of the certifications that were aligned with current APS CTE offerings, by degree type. CTE courses were most likely to align with required certifications for jobs requiring a **high school diploma** (36%).

Table 19: Number and Percentage of Job Openings Requiring a Certification that Are Aligned with CTE Course Offerings, by Degree Type

Degree	Number of Job Openings Requiring Certification	Number Aligned with Available CTE Courses	% Aligned with Available CTE Courses
High School Diploma	49,798	17,980	36%
Associate's	46,293	12,278	27%
Bachelor's	193,171	27,745	14%
Graduate	18,180	4,719	26%

The top ten required certifications for jobs requiring a high school diploma are shown in **Table 20**.

Table 20: Top Ten Required Certifications for Jobs Requiring a High School Diploma, Aligned with APS CTE Courses

Required Certification	Number of Openings	CTE Alignment
Driver's License	14,130	n/a
Food safety programs	3,039	Culinary Arts and FACS
Commercial Driver's License	1,850	n/a
Occupational Safety & Health Administration Certification	1,787	Trade and Industrial
Secret Clearance	1,737	n/a
Certification in Cardiopulmonary Resuscitation	1,678	Health and Medical Science
Top Secret Sensitive Compartmented Information	1,532	n/a
HAZMAT	1,530	Trade and Industrial
First Aid certification	1,487	Health and Medical Science
Basic Life Support	1,119	EMT

Table 21 shows the required certifications that are not aligned with current CTE offerings but may present areas for possible CTE expansion.

Table 21: Required Certifications for Local Job Openings Indicating Areas for Possible CTE Expansion

Certification	Degree Required	Job Openings
Certified Registered Nurse	High School Diploma, Associates, Bachelors, Graduate	14,013
Commercial Driver's License	High School Diploma, Associates	9,285
Certified Information Systems Security Professional	High School Diploma, Associates, Bachelors	8455
Continuing Education	Bachelors	2,803
Certified Information Security Manager	Bachelors, Graduate	2,147
Certified Ethical Hacker	Bachelors	2,045
Licensed Practical Nurse	High School Diploma, Associates, Bachelors	1958
Certification in Ethics	High School Diploma, Associates, Bachelors	1877
Oracle Database 11g Administrator Certified Professional	Bachelors, Graduate	1,856
HAZMAT	Associates, Graduate	1,466
Certified in Nursing Administration	High School Diploma, Associates	1293
Certified Practical Nurse, Long-term care	High School Diploma, Associates, Bachelors, Graduate	1290
Security certification	Bachelors	1,262

Certification	Degree Required	Job Openings
Systems Security Certified Practitioner	High School Diploma, Associates, Bachelors	1033
Cisco Certified Internetwork Expert	Bachelors	987
Board Certified	Graduate	977
Certified Nursing Assistant	High School Diploma, Associates	922
GIAC Security Essentials Certification	High School Diploma, Bachelors	914
Nationwide Mortgage Licensing System	Bachelors	907
Engineer-In-Training	Bachelors	874
Certified Purchasing Manager	Associates	846
Accreditation Board for Engineering and Technology	Bachelors	755
Child Development Associate	Associates, Bachelors	707
EPA certification	High School Diploma, Associates, Graduate	658
Associate of Casualty Actuarial Society	Bachelors	612
VMware Certified Professional	Bachelors	608
GIAC Security Leadership Certification	Bachelors	552
Red Hat Certified Engineer	Bachelors	543
Cisco Intrusion Prevention System Specialist	Bachelors	529
Project Management Professional	High School Diploma, Graduate	494
American Registry of Radiologic Technologists	High School Diploma, Associates	485
Class B Commercial Driver's License	High School Diploma	449
Certified in Long Term Care	High School Diploma, Associates	444
Certified Public Accountant	Associates, Graduate	443
National Security Agency	Bachelors	416
Certified Financial Planner	Bachelors	362
Certified Family Nurse Practitioner	Graduate	311
Phlebotomist	High School Diploma	287
Doctor of Medicine	Graduate	274
American Nurses Credentialing Center	Graduate	265
Material Handling Equipment	High School Diploma	265
HVAC Certification	High School Diploma	250
Speech and Language Pathologist	Graduate	239
Radiography	Associates	225

Certification	Degree Required	Job Openings
Family Physician / Internal Medicine (FP/IM)	Graduate	218
Business Process Management Programming Languages	Associates, Graduate	183
Radiation Therapy	Associates	180
Advanced Practice Nurse	Graduate	178
Microsoft Certified Systems Engineer	Associates	167
Medical License	Graduate	159
Certified Medical Assistant	High School Diploma	154
Registered Health Information Technician	Associates	152
Family Medicine	Graduate	150
Patient Care Technician	Associates	150
Orthopedic Certified Specialist	Graduate	149
Registered Health Information Administrator	Associates	148
Registered Medical Assistant	High School Diploma, Associates	145
Certification in General Surgery	Associates, Graduate	137
Real estate license	High School Diploma	132
Basic Cardiac Life Support	Associates	126
Registered Respiratory Therapist	Associates	126
Registered Veterinary Technician	Associates	117
Pediatric Advanced Life Support	Graduate	102
Project Management Institute	Graduate	91
Certified Internal Auditor	Graduate	89
American Health Information Management Association	Associates	88
Law Enforcement Officer	High School Diploma	86
Doctor of Dental Surgery	Graduate	84
Telecommunications	Associates	82
Qualified Environmental Professional	High School Diploma	80
Medical-Surgical Nurse	Associates	77
Certified Coding Specialist	High School Diploma	76
Doctor of Dental Medicine	Graduate	75
System Administrator	Associates	75
National Commission on Certification of Physician Assistants	Graduate	71

Certification	Degree Required	Job Openings
American Speech-Language Hearing Association	Associates	70
Emergency Medical System	High School Diploma	68
Chartered Financial Analyst	Graduate	66
Pediatrics certification	Graduate	65
Medical Laboratory Technician	Associates	64
Special Education	Graduate	59
Adult Nurse Practitioner	Graduate	57
I-CAR Certified	High School Diploma	55
A+ certification	High School Diploma	53
Advanced Certification Administrator	Graduate	53
National Academy of Sports Medicine clinical certification	High School Diploma	52
Clinical Nurse Specialist	Graduate	49
Advanced Practice Registered Nurse	Graduate	45
Neonatal Resuscitation Program	Graduate	45
Association for Clinical Pastoral Education	Graduate	38
Information Assurance Technicians	Graduate	38
Dermatology	Graduate	37
Occupational Therapist Registered	Graduate	36

The full list of workforce opportunities is available in **Appendix C7**.

Quality of Instruction

CLASS Observations

CLASS observations show a high level of classroom organization across levels, with student engagement falling into the high end of the middle range. Emotional support and instructional support were stronger at the middle school level, with instructional support falling into the middle range for both levels. Analysis and inquiry was the lowest rated dimension for either level. This refers to students' engagement in higher-level thinking skills.

Arlington Public Schools uses the Classroom Assessment Scoring System (CLASS) observation tool to assess the quality of interactions between teachers and students for all program evaluation areas. It was developed by the University of Virginia's Curry School of Education as an early childhood observation tool, and later expanded to include other grade levels. CLASS is now managed by Teachstone, a company in Charlottesville, Virginia.

The CLASS tool is grounded in developmental theory and research that suggest that interactions between students and adults are the primary mechanism for student learning. Multiple research studies have found that students who attend classrooms that rate highly on the CLASS have improved social and academic outcomes (Howes et al., 2008).

The secondary CLASS is organized into four broad domains: Emotional Support, Classroom Organization, Instructional Support, and Student Engagement. The first three domains contain specific observable dimensions that are appropriate to each grade level. **Table 22** outlines the dimensions included in each domain of the secondary CLASS tool. Dimensions are scored on a 7-point scale consisting of Low (1, 2), Mid (3, 4, 5), and High (6, 7) ranges.

Table 22: Secondary CLASS Domains and Dimensions

Domain	Dimension	Measures
Emotional Support	*Positive Climate*	Emotional connection among teachers and students, verbal and non-verbal
	Teacher Sensitivity	Teacher awareness and responsiveness to students' academic and developmental needs
	Regard for Adolescent Perspectives	Degree to which lessons value students' ideas and opinions and promote autonomy
Classroom Organization	*Behavior Management*	Teachers' use of clear behavioral expectations and effectiveness at redirecting misbehavior
	Productivity	How well the teacher manages time and routines so instructional time is maximized
	Negative Climate	Expressed negativity among teachers and students, verbal and non-verbal
Instructional Support	*Content Understanding*	Depth of lesson and approaches used to support comprehension
	Analysis and Inquiry	Degree of higher-level thinking skills, such as metacognition (i.e., thinking about thinking)
	Instructional Learning Formats	Teachers' employment of lessons and materials to support different learning styles
	Quality of Feedback	Degree to which feedback expands learning and understanding
	Instructional Dialogue	Use of purposeful dialogue distributed among students and with teacher
Student Engagement	*n/a*	Degree to which all students are focused and participating

CLASS domains and dimensions are described in detail in **Appendix B1**. The alignment between CLASS dimensions and APS best instructional practices can be found in **Appendix B2**.

CLASS observations of CTE classrooms were conducted in the fall of 2015. Prior to conducting the observations, observers attended a CTE-specific training led jointly by the Offices of CTAE and Planning

and Evaluation. In this training, the CTAE supervisor explained how CTE courses differ from core content classes, and what to look for in the area of Instructional Support. As part of this training, observers group-rated videos of CTE instruction.

Observers conducted two 30-minute cycles (observations) for each teacher, which were then averaged to one overall score. **Table 23** shows the number and percentage of teachers observed at each level.

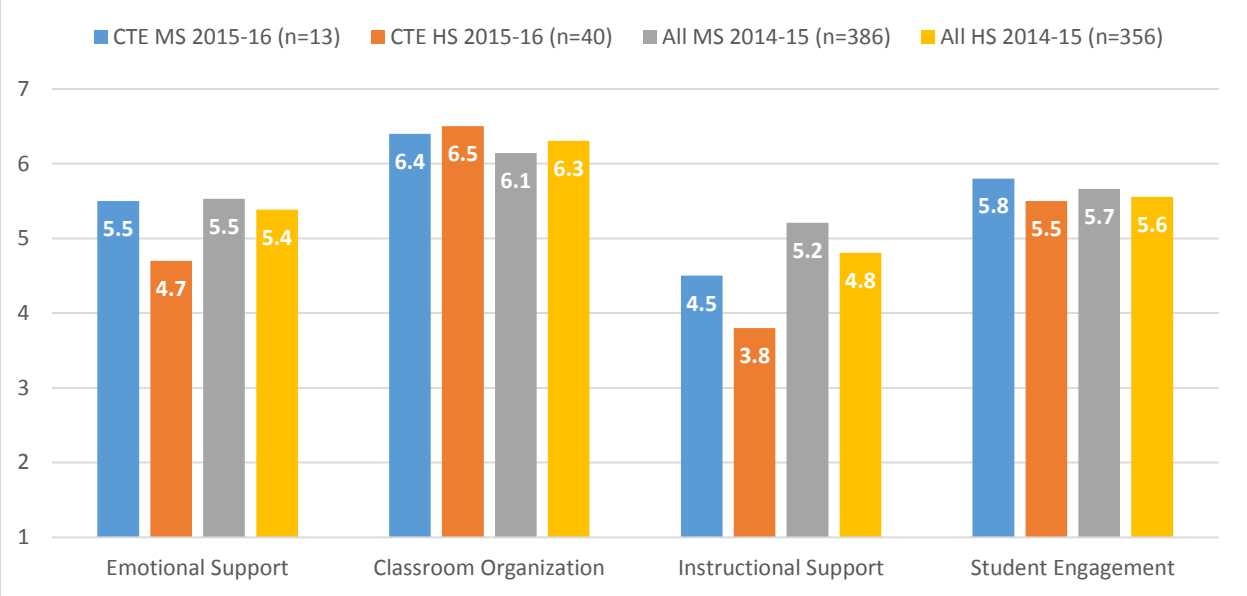
Table 23: Sample Size of CTE CLASS Observations, Fall 2015

Response Group	Number of Teachers	Number of Observations	Percent Observed	Margin of Error (95% Confidence Level)[15]
Middle School	15	13	87%	10.3
High School	41	40	98%	2.5

Figure 21 shows the average CLASS scores for each domain by level. Average CLASS scores from 2014-15 are included for context. The 2014-15 data was collected in classrooms covering all content areas, including CTE, as part of the evaluations of the Professional Development and Minority Achievement programs.

When interpreting CLASS results, Teachstone advises that typically, half a point to a point difference is considered to be **educationally significant**; in other words, a difference that would impact outcomes for students[16]. Mean scores in this analysis show educationally significant differences among domains as well as between CTE levels and within levels across content areas.

Figure 21: Average CTE CLASS Doman Scores by Level



[15] Generally, a margin of error of five or lower indicates that results can be interpreted as representative of the entire population. In the case of middle school teachers, while all but two teachers were observed, the margin of error is higher than five due to the small overall population.

[16] Teachstone, personal communication, June 13, 2014 and January 5, 2016

Average scores for middle school and high school CTE classes fell into the high range for **Classroom Organization**, and high-mid range for **Student Engagement**. **Emotional Support** was stronger at the middle school level, with an average score of 5.5 compared to 4.7 at the high school level.

The average **Instructional Support** scores were relatively lower and fell into the middle range. This domain also saw an educationally significant difference between middle school and high school, with an average score of 4.5 at the middle school level, compared to 3.8 at the high school level. This is also generally the area with the largest gaps between CTE observations and observations of all content areas, with a 0.7-point gap between middle school observations and a 1-point gap between high school observations.

Within Instructional Support, **Analysis and Inquiry** was the lowest rated dimension for either level (3.6 for middle school and 2.7 for high school). Analysis and Inquiry refers to students' engagement in higher-level thinking skills. At the secondary level, observers look for behavioral markers associated with a series of indicators as displayed in **Table 24**.[17]

Table 24: Indicators and Behavioral Markers Associated with Analysis and Inquiry

	Facilitation of higher-order thinking	Opportunities for novel application	Metacognition
Behavioral Markers	• Students identify and investigate problems/questions • Students examine, analyze, and/or interpret data, information, approaches, etc. • Students construct alternatives, predict, hypothesize, or brainstorm • Students develop arguments, provide explanations	• Open-ended tasks • Presents cognitive challenges • Students apply previous knowledge/skills	• Students explain their own cognitive processes • Students self-evaluate • Students reflect • Students plan • Teacher models thinking about thinking

The full report on CLASS observation results can be found in **Appendix B3**.

CTE Observation Tool

A CTE-specific observation tool was developed for this evaluation. Findings show a high occurrence of safety procedures being modeled and followed, instruction that authentically models the world of

[17] Pre-K CLASS Dimensions Guide (2014). Teachstone Training, LLC.

work, and project/problem-based learning. Occurring less frequently were high-level questioning, teacher modeling with student practice, and lecture. High-level questioning was also an element more likely to be rated "developing/needs improvement," particularly at the middle school level. Observed lessons at both levels were more likely to include multidisciplinary connections to reading and writing than science or social studies. Technology/equipment was more likely to be used by teachers than students at both levels, and more likely to be used in general at the high school level.

In order to assess the implementation of best practices specific to CTE instruction, a CTE observation tool was developed by the Office of Planning and Evaluation in conjunction with the CTAE Office and the evaluation planning committee. Observations were conducted at the same time as CLASS observations, and were carried out by retired CTE teachers and administrators who participated in inter-rater reliability training. Observers conducted one 30-minute observation for each teacher. **Table 25** shows the number and percentage of teachers observed at each level.

Table 25: Sample Size of Observations with CTE Observation Tool, Fall 2015

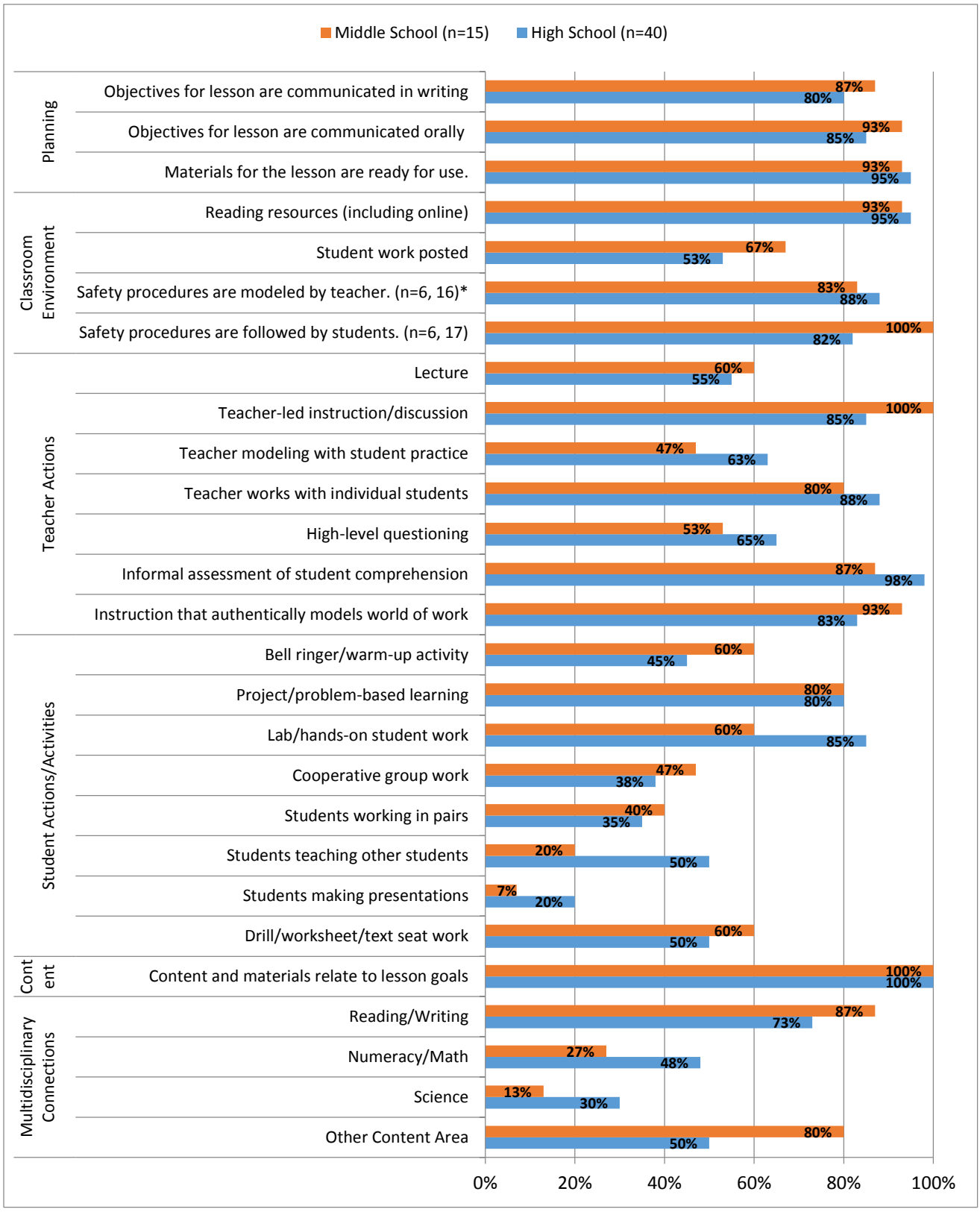
Response Group	Number of Teachers	Number of Observations	Percent Observed	Margin of Error (95% Confidence Level)
Middle School	15	15	100%	n/a
High School	41	40	98%	2.5

Observers indicated first whether a specified element was observed (yes/no), and then, in most cases, the level of effectiveness of each observed element (on a scale of effectiveness). **Figure 22** shows the percentage of observations in which each element was observed. Key findings include:

- **Planning**: All elements observed between 80-95% of the time.
- **Classroom Environment**: Safety procedures were modeled by the teacher between 83-88% of time, and followed by students in 100% of middle school observations but just 82% of high school observations. Student work was posted in only 67% of middle school classrooms and 53% of high school classrooms.
- **Teacher Actions**: Between 83-100% of observed lessons included instruction that authentically models the world of work, informal assessment of student comprehension, the teacher working with individual students, and teacher-led instruction/discussion. Elements observed at a lower rate were high-level questioning, teacher modeling with student practice, and lecture (47-65% of observations). High-level questioning and teacher modeling occurred more frequently at the high school level.
- **Student Actions/Activities**: The most frequently observed elements were project/problem-based learning, which occurred in 80% of observations at both levels, and lab/hands-on student work, which occurred in 85% of high school observations but just 60% of middle school observations. High school observations were also far more likely to include students teaching other students (50% vs 20%).
- **Content**: All observations noted that the lesson content and materials related to lesson goals and objectives.

- **Multidisciplinary Connections:** Observed lessons at both levels were most likely to include connections to reading and writing. This occurred in 87% of middle school observations and 73% of high school observations. High school lessons were more likely than middle school lessons to include connections to science (30% vs 13%) and math (48% vs 27%).

Figure 22: Percentage of Observations in which Specified Elements Were Observed



*These numbers and percentages omit observations where safety procedures were observed to be not applicable.

Figure 23 shows the level of effectiveness observed for given elements in the middle school observations. Observers rated these elements only if they had already noted that the element had been observed (as displayed in **Figure 20**). Most elements were rated either *highly effective* or *effective* in 80% or more of observations. Those that received a higher percentage of ratings of *developing/needs improvement* were:

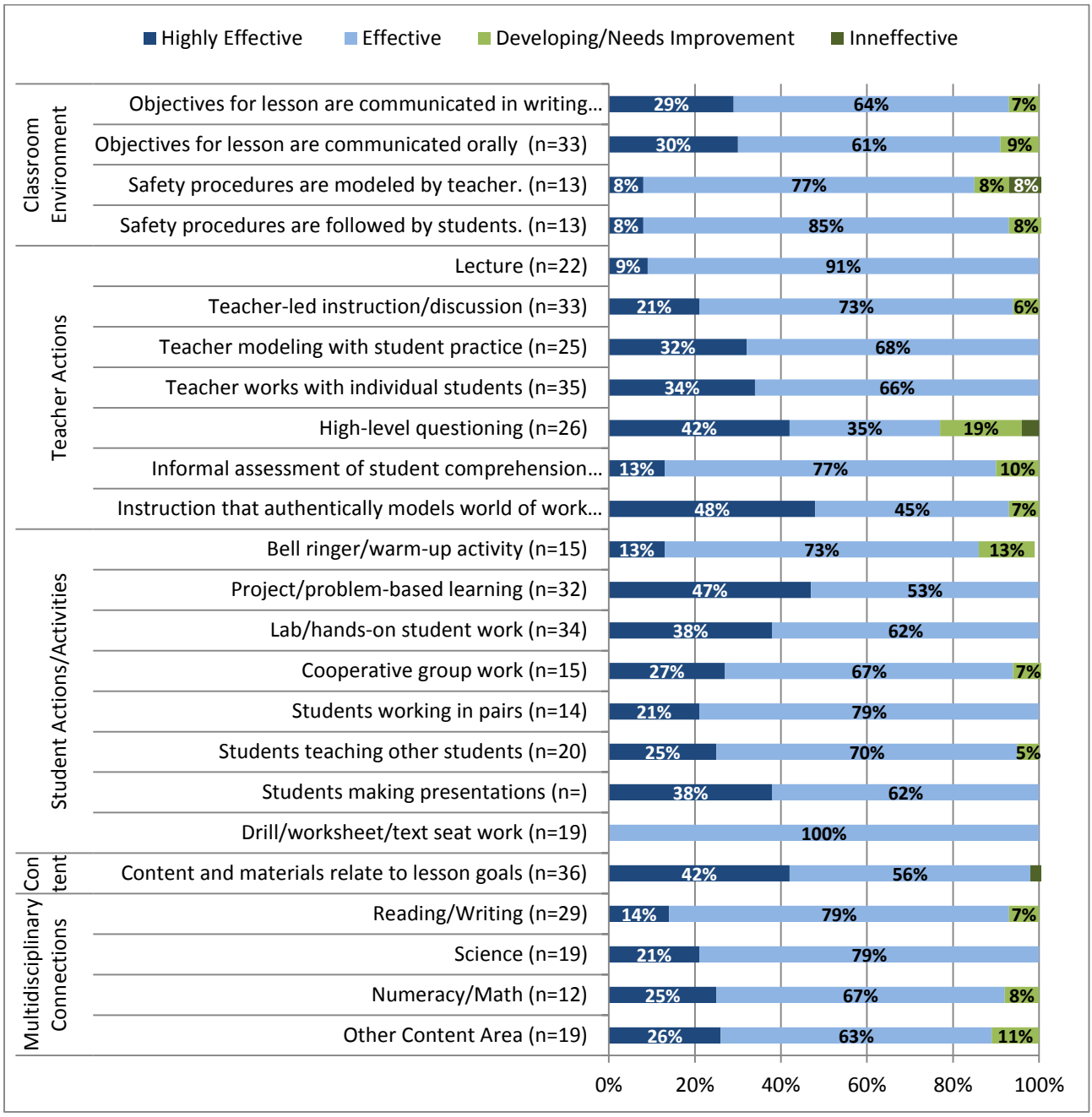
- Instruction that authentically models world of work (28% developing/needs improvement)
- High-level questioning (38%)
- Objectives for lesson are communicated in writing (39%)

Figure 23: Level of Effectiveness for Specified Elements in Middle School Observations

*"Students teaching other students" and "Students making presentations" are not included as n is less than 5.
** "Numeracy/Math" and "Science" are not included as n is less than 5.

Figure 24 shows the level of effectiveness observed for given elements in the high school observations. As with the middle school observations, observers rated these elements only if they had already noted that the element had been observed. All but one element were rated either *highly effective* or *effective* in 85% or more of observations. The exception was **high-level questioning**, which was rated *developing/needs improvement* in 19% of observations, and *ineffective* in 4% of observations.

Figure 24: Level of Effectiveness for Specified Elements in High School Observations



The CTE observation tool also included a section on use of technology and equipment. **Figure 25** shows the percentage of observations that noted that technology and/or equipment were in use by either

teachers or students. Technology/equipment was more likely to be used by teachers than students at both levels, and more likely to be used in general at the high school level.

Figure 25: Percentage of CTE Observations that Noted Use of Technology and/or Equipment

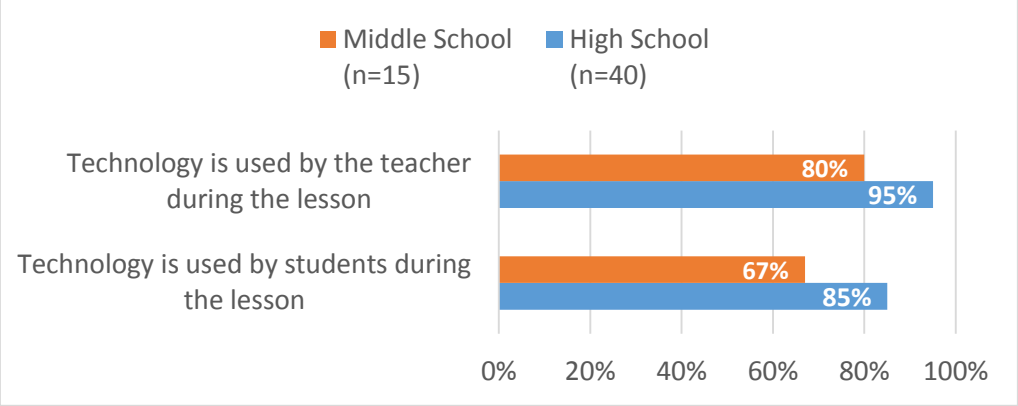


Table 26 shows the percentage of observations in which technology/equipment use was observed to align with listed best practices. Use of technology/equipment was most likely to be observed as **enhancing instruction and fostering understanding** (100%), and **engaging students in learning tasks** (90-100%).

Table 26: Percentage of CTE Observations Aligned with Specified Best Practices in Technology/Equipment Use*

Use of technology and/or equipment is…	Middle School (n=13)	High School (n=39)
…interactive	69%	74%
…enhancing instruction and fostering understanding	100%	100%
…engaging students in learning tasks	100%	90%
…engaging students in creating a product/service	62%	77%
…none of the above	0%	0%

*Two middle school and one high school observation included the answer choice, "Not applicable – use of technology is not evident."

The CTE observation tool is available in **Appendix B4**. Full observation results are available in **Appendix B5**.

CTE Internal Program Evaluation Portfolios

Almost all portfolios assembled by CTE teachers received an exemplary score for the focus areas of instructional technologies, industry trends and practices, and competencies. Remaining focus areas saw more mixed results. Generally, portfolio scores indicate a high level of variation from school to school, with large gaps between one school's low score and another's high score.

The CTAE program conducts an internal program evaluation on a six-year cycle for each of its instructional areas. Two cycles of this evaluation process were completed in 2002 and 2009, and a third cycle will be completed in spring 2017.

The internal evaluation requires teachers to submit evidence to be rated against a rubric based on *Ohio's Quality Program Standards for Career-Technical Education Programs* , which were developed by the National Dissemination Center for Career and Technical Education at Ohio State University, and are housed at the Ohio Department of Education[18]. In prior years, hard copies of evidence were collected in crates. In 2010-11, the CTAE Office transitioned to Taskstream, a digital portfolio system that allows teachers to upload evidence electronically.

The CTAE Office recruits volunteer external reviewers annually to score submitted evidence. The external review team consists of CTE supervisors and teachers from other school systems, APS CTE retirees, college and university representatives, citizens' advisory committee members, and business professionals. Evaluators rate each portfolio subsection on a scale of 0 (no evidence of implementation) to 3 (exemplary), and provide open-ended feedback indicating program's strengths, challenges, and areas needing improvement. Results are shared with school staff. Taskstream scores are also used for federal monitoring reports.

An additional goal of these portfolio assessments is to serve as a resource for districtwide professional development, curriculum updates, and infrastructure development; and to facilitate collaboration among teachers within a CTE program area. CTE program areas that receive an Exemplary Program Evaluation status are eligible to be nominated for the Virginia Department of Education's Creating Excellence Awards.

The CTAE Office provided the Office of Planning and Evaluation with score reports generated by Taskstream. Average scores for select sections of the portfolios that address quality of instruction are included in this evaluation. **Table 27** shows the selected sections along with a description of the required documentation for each focus area.

Table 27: Portfolio Sections and Required Documentation

Portfolio Category	Focus Area	Description	Indicator Number	Required Documentation
Curriculum and Pathways	SOL integrated lessons	All CTE courses have the core content Standards of Learning (SOL) aligned to the CTE course competencies. When practical, CTE teachers incorporate the related SOLs within their lesson plans.	A3.3a.21	Provide two lesson plans that support core Virginia Standards of Learning (SOL).
	Career pathways	Within each of 16 career clusters, there are multiple career pathways that represent a	A.3.3b.23	Evidence of career pathway for this program that aligns CTE

[18] http://education.ohio.gov/Topics/Career-Tech/CTE-Program-Review

Portfolio Category	Focus Area	Description	Indicator Number	Required Documentation
		common set of skills and knowledge, both academic and technical, necessary to pursue a full range of career opportunities within that pathway, ranging from entry level to management and including technical and professional career specialties.		curriculum offerings at middle school, high school, and postsecondary programs (from local plan)
	Employability skills	Employability skills are general skills that are necessary for success in the labor market at all employment levels and in all sectors.	A3.3b.22 a	Explain how employability skills are addressed in this program.
Technology Use in Instruction	Instructional technologies	The use of current technology in instruction to provide students the technical knowledge and skills needed to prepare for industry careers.	A.2.2a.13	Provide three examples of how technology is used in the classroom, and explain how students are using state-of-the-art technology to prepare for industry.
Goals and Objectives	Industry trends and practices	Current research and implementation practices that enhance and supplement program development, teacher professional development, teaching, and learning.	A1.1b.5	Evidence of current and future industry trends and practices in program area and evidence of teachers' research in program area
	Competencies	A prescribed set of knowledge and skilled-based tasks that are taught within all CTE courses.	A1.1a.4	Provide an electronic link(s) to the current curriculum frameworks, and an electronic link(s) to the current curriculum competency lists and Can Do
Partnership and Collaboration	Partnership involvement	Program collaborations with internal and external community and business partners	A5.5a.31	Program collaborates with business, industry, labor and community agencies.

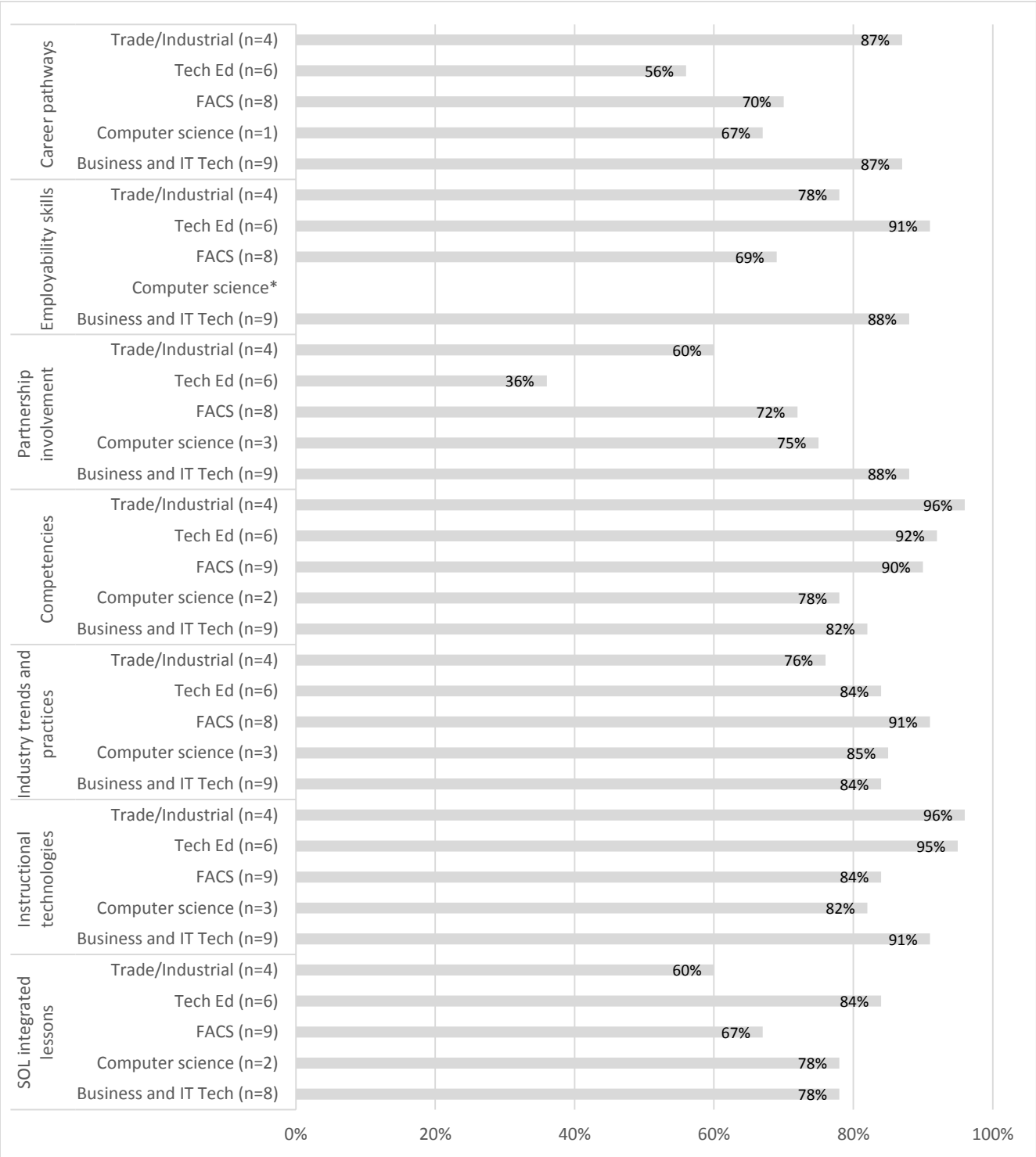
The full list of required documentation is available in **Appendix C2**. The rubric is available in **Appendix C3**.

Taskstream data included in this evaluation represents all evidence collected from 2012-13 through 2015-16. **Figure 26** shows average scores for each Taskstream focus area, by CTE program area. Percentage scores are calculated by dividing the average rubric score by three (the highest possible score). A score of 80% or higher is considered exemplary. Almost all CTE program areas received an exemplary score for the focus areas of **instructional technologies**, **industry trends and practices**, and

competencies, and those not falling into this range were close (76-78%). The remaining focus areas saw more mixed results. The following Taskstream focus areas were scored lower than 70% for listed CTE program areas:

- SOL integrated lessons: Trade/Industrial (60%) and FACS (67%)
- Partnership involvement: Trade/Industrial (60%) and Tech Ed (36%)
- Employability skills: FACS (69%)
- Career pathways: Computer science (67%), Tech Ed (56%)

Figure 26: Average Taskstream Focus Area Scores by CTE Program Area



*Employability skills was not completed by this program area

In order to assess the extent of variation across schools, this evaluation includes an analysis of average scores by program area for each individual school. Complete, deidentified, school-based data can be found in **Appendix C1**. **Table 28** shows the minimum and maximum focus area scores for each school-

based CTE program area. Generally, scores indicate a high level of variation from school to school, with large gaps between one school's low score and another's high score. It is unclear if this variation is due primarily to variation in quality or variation in data entry.

Table 28: Minimum and Maximum Taskstream Focus Area Scores by School-Based CTE Program Area

Focus Area	Business/IT		Computer Science		FACS		Technical Education		Trade & Industrial	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
SOL integrated lessons	33%	100%	78%	78%	0%	100%	61%	100%	33%	100%
Instructional technologies	56%	100%	78%	89%	50%	100%	89%	100%	89%	100%
Industry trends and practices	50%	100%	78%	89%	44%	100%	69%	100%	56%	100%
Competencies	33%	100%	78%	78%	56%	100%	78%	100%	89%	100%
Partnership involvement	40%	100%	57%	100%	11%	100%	0%	89%	33%	100%
Employability skills	25%	100%	0%	0%	0%	100%	67%	100%	44%	100%
Career pathways	44%	100%	67%	67%	0%	100%	22%	100%	44%	100%

Effective Use of Resources

Availability and Accessibility of Student Data

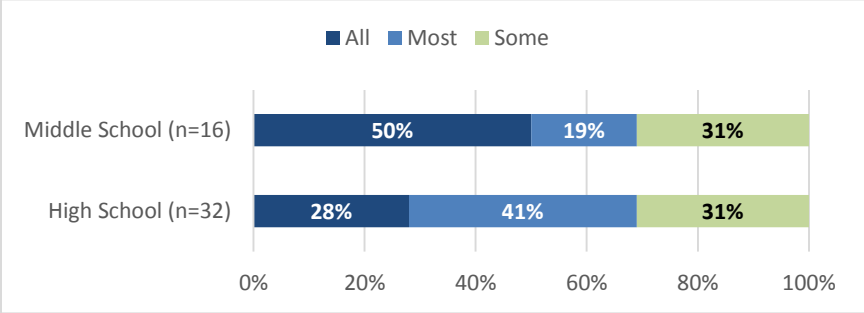
Almost a third of CTE teachers at both levels reported that they only have access to some of the data they need. Middle school teachers were far more likely to report that data is easily accessible, while high school teachers were more likely to report that data is accessible but cumbersome sometimes. Teachers at both levels had high rates of satisfaction with support from the CTAE Office in the areas of communication (78-88%) and professional development (87-88%). High school teachers also had a high rate of satisfaction with support for technology (78%), while this was the area of highest dissatisfaction for middle school teachers, along with funding for supplies (both 32%).

CTE teachers are expected to regularly access and use two types of data:

- **State-approved industry credential**: Teachers are able to access their students' industry credential assessment participation and results in Synergy. This information is uploaded approximately four times per year.
- **Competency attainment**: Teachers are expected to assess and record their students' attainment of competencies as a course progresses using CanDo, a teacher-developed database.

Figure 27 shows responses to the question, "**Do you have access to the student data you need to effectively do your job as a CTE teacher?**" No CTE teachers selected *none* as a response. Middle school teachers were more likely to report that they have access to *all* the data they need (50%), while high school teachers were more likely to report they have access to *most* of the data they need (28%). Almost a third of teachers at both levels reported that they only have access to *some* of the data they need.

Figure 27: Do you have access to the student data you need to effectively do your job as a CTE teacher? (CTE Teachers)



The CTE teacher survey also included the question, "**How would you rate the ease of accessing the student data you need?**" This question included the following answer choices:

- Student data is easily accessible.
- Student data is accessible but it can be cumbersome sometimes.
- Student data is so cumbersome to access it frequently hinders my ability to access it.
- Student data is virtually impossible to access.

Responses are displayed in **Figure 28**. Middle school teachers were far more likely to report that data is *easily accessible* (47% vs 21%), while high school teachers were more likely to report that data is accessible but *cumbersome sometimes* (52% vs 27%).

Figure 28: How would you rate the ease of accessing the student data you need? (CTE Teachers)

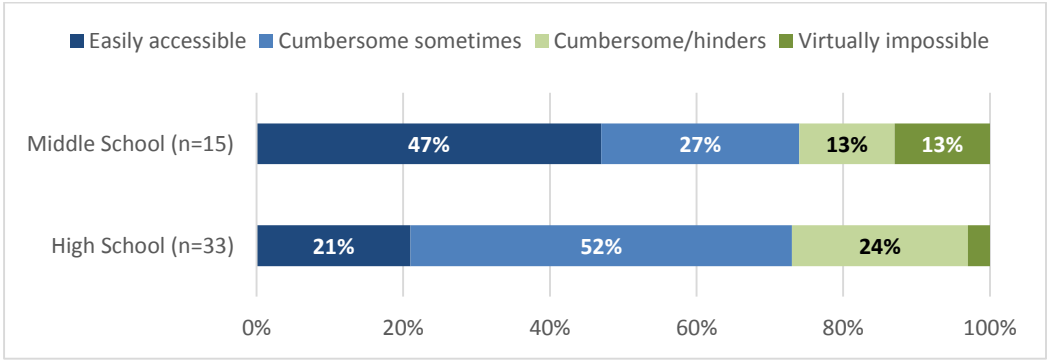
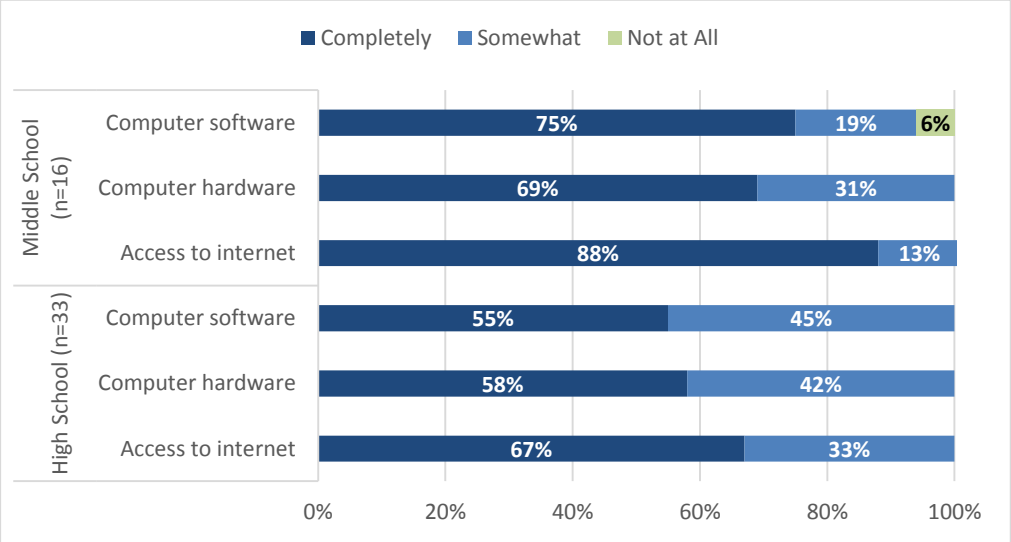


Figure 29 shows responses to the question, "**To what extent do the following resources meet your needs?**" Almost no teachers selected *not at all*. This was selected by just six percent of middle school teachers referencing **computer software**. Teachers at both levels were most likely to report that **access to the internet** *completely* meets their needs, although this was higher at the middle school level (88%) than at the high school level (67%).

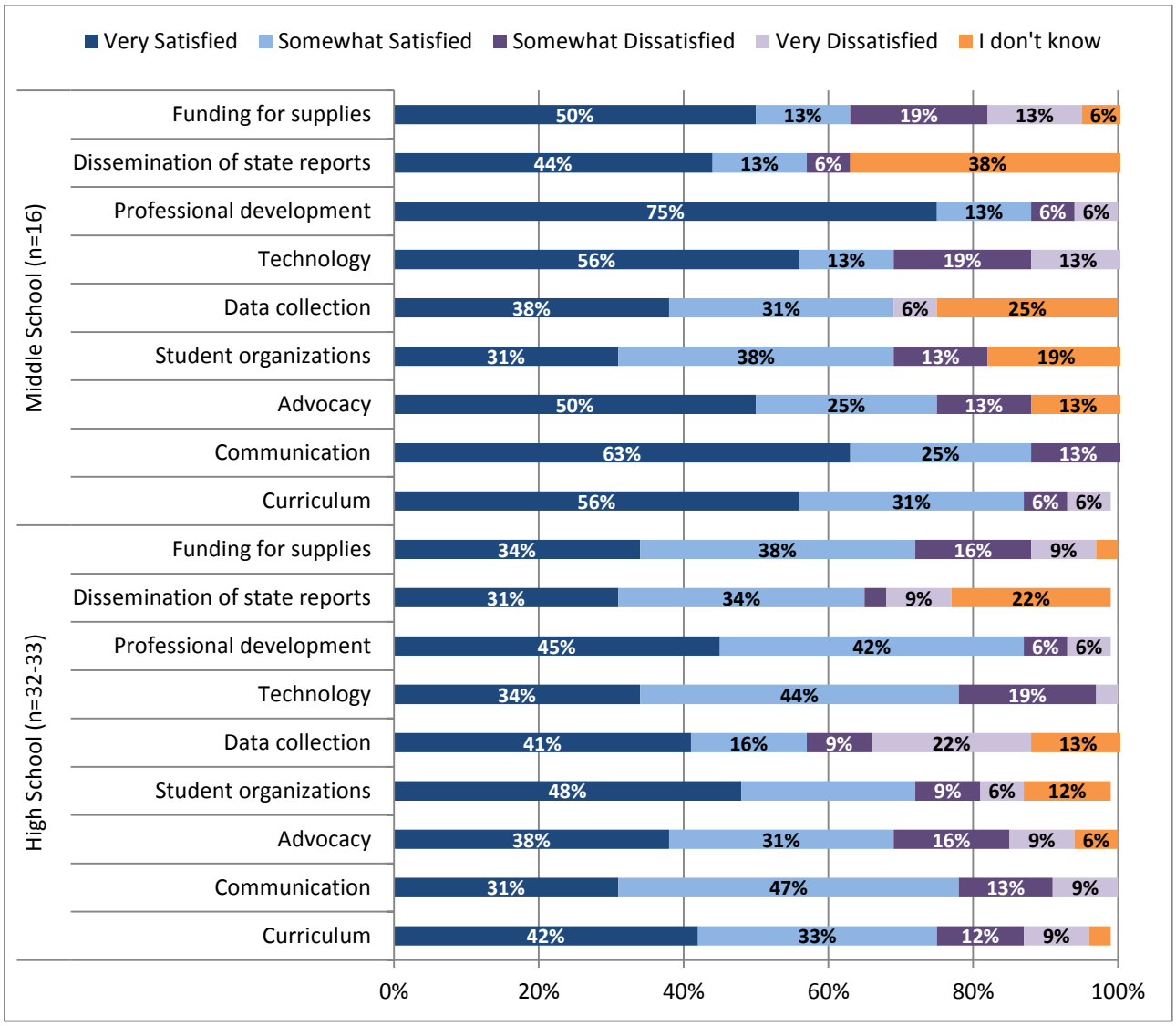
Figure 29: To what extent do the following resources meet your needs? (CTE Teachers)



CTE teachers were asked to rate their satisfaction with division-level support from the CTAE Office in a number of areas. Responses are displayed in **Figure 30**. Teachers at both levels had high rates of satisfaction with **communication** (78-88%) and **professional development** (87-88%). High school teachers also had a high rate of satisfaction with support for **technology** (78%), while this was the area of highest dissatisfaction for middle school teachers, along with **funding for supplies** (both 32%).

High school teachers were most likely to express dissatisfaction with support for **data collection** (31%), while this category was more likely to receive a response of *I don't know* from middle school teachers (25%). Teachers at both levels were more likely to select *I don't know* than *very* or *somewhat dissatisfied* for the area of **dissemination of state reports** (38% of middle school teachers, 22% of high school teachers).

Figure 30: Please rate your level of satisfaction with division-level support for the following from the CTAE Office. (CTE Teachers)



The full survey report is available in **Appendix D1**.

Maintenance of Equipment

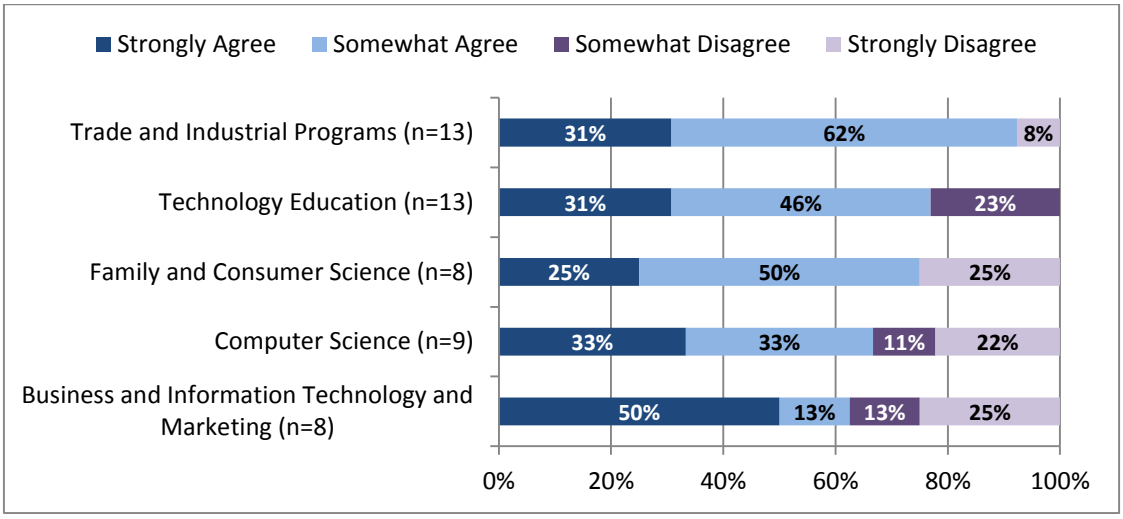
Teachers of trade and industrial courses were the most likely to report that the tools, equipment, and supplies in their classroom met industry standards, while computer science and FACS teachers were most likely to report that their equipment is up-to-date. Teachers of business and IT and trade and industrial courses were most likely to report that the process for updating computers and laboratory machinery equipment was efficient.

CTE courses rely on equipment that provides students with an authentic business or industry experience, which helps prepare them for future careers in their related field.

- **Business and information Technology** courses have desktop and laptop computers, along with other personal devices and software to simulate business and marketing. Students use networking equipment such as routers and switches as they design and build virtual and authentic networks.
- **Family and Consumer Sciences** students work with equipment that would be used in a residential and a commercial kitchen. Students also use sewing machines and computerized embroidery machines in the apparel portion of their class. To have an authentic view of parenting, computerized babies are used to simulate an infant's wants and needs over a 24-hour period. The babies also capture necessary data to show the care they received from the student over that time.
- In the **Technology Education** program, students learn the engineering design model as they design on the latest Computer Aided Design (CAD) software. The students build their models using 3D printers and laser engravers along with traditional woodworking equipment and hand tools.
- In **Trade and Industrial** classes, students use the equipment of an automotive technician and a collision repair technician, or cameras and editing equipment to develop public service announcements and live broadcasts. Students in the health and medical classes use the equipment they would see in the hospitals and labs along with manikins that simulate various health related conditions.

Figure 31 shows CTE teachers' level of agreement with the statement, "**The tools, equipment, and supplies in my classroom/lab meet the standards of those used in industry,**" disaggregated by CTE program area. Teachers in the trade/industrial area were the most likely to respond positively, with 92% selecting *strongly* or *somewhat agree.* In contrast, just two-thirds of teachers in the business/IT/marketing and computer science programs indicated agreement.

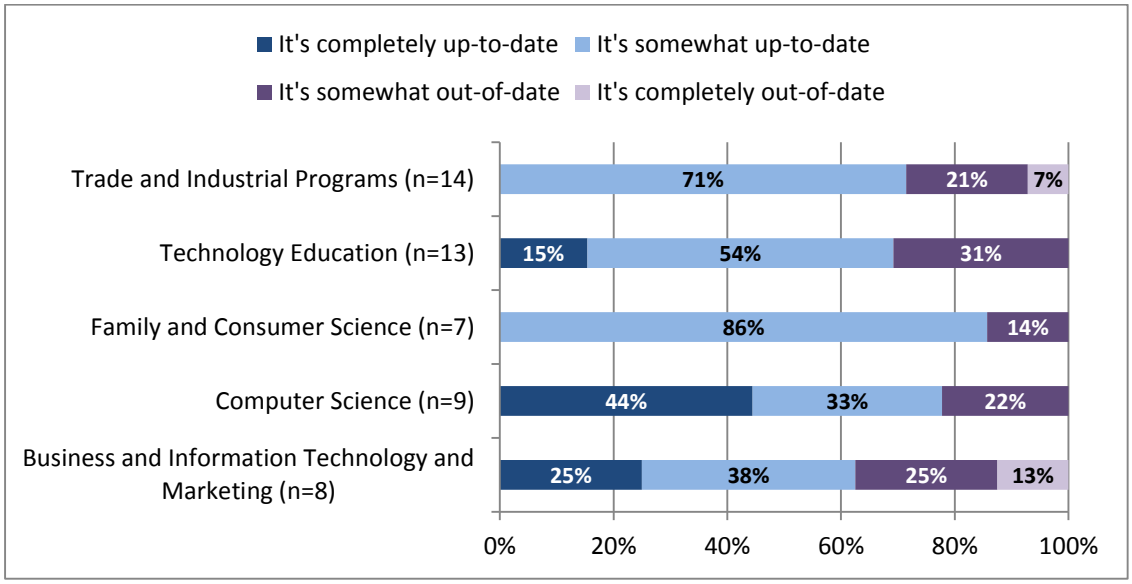
Figure 31: The tools, equipment, and supplies in my classroom/lab meet the standards of those used in industry. (CTE Teachers)*



*If a teacher indicated that they teach in more than one CTE program area, their response has been included in each area.

Figure 32 shows responses to the question, "**How current is the equipment that you have in your classroom?**" Teachers in the computer science and family and consumer science (FACS) programs were most likely to report that their equipment is either *completely* or *somewhat up-to-date* (78% computer science, 86% FACS). This percentage ranged from 63-71% for other groups.

Figure 32: How current is the equipment that you have in your classroom? (CTE Teachers)*



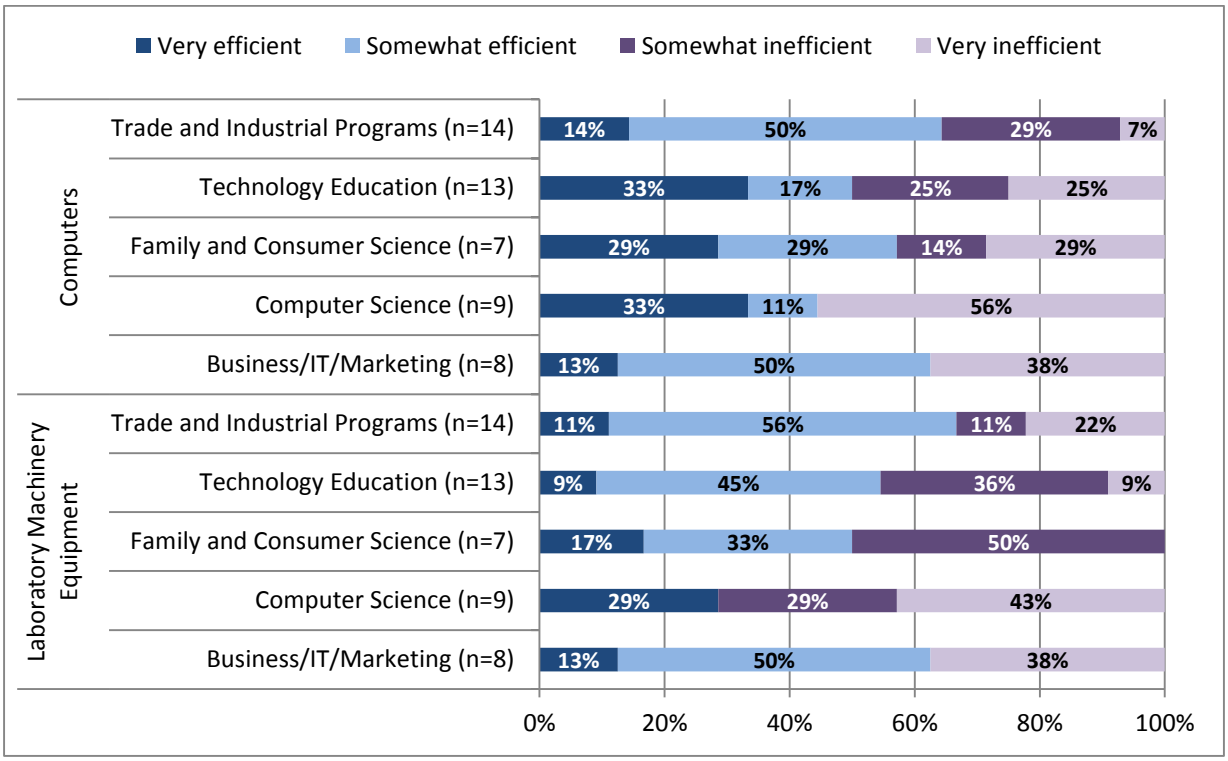
*If a teacher indicated that they teach in more than one CTE program area, their response has been included in each area.

Figure 33 shows responses to two questions:

- How would you rate the efficiency of the process for updating **computers**?
- How would you rate the efficiency of the process for updating **laboratory machinery equipment**?

For both categories of equipment, teachers in the business/IT/marketing and trade/industrial programs were most likely to report that the process for updating was either *very* or *somewhat efficient*, with around two-thirds of each group selecting these responses. Teachers in the remaining programs rated the updating process inefficient between 43-71% of the time.

Figure 33: How would you rate the efficiency of the process for updating… (CTE Teachers)*



*These questions included an N/A response option for teachers who do not use laboratory machinery or computer equipment in their instruction. N/A responses were removed in order to calculate these percentages. Total N/A responses were 2 computer science teachers, 1 FACS teacher, 2 technology education teachers, and 5 trade/industrial teachers for laboratory machinery equipment, and 1 technology education teacher for computer equipment.

The full survey report is available in **Appendix D1**.

Evaluation Question #2: What were the outcomes?

Career Credentials

Survey responses indicate that use of CanDo among teachers is inconsistent. In lieu of competency attainment data from CanDo, this evaluation includes the competency rate included in the 2015-16 CTE Annual Performance Report produced by VDOE. That rate is reported for CTE completers only, and is based on grades rather than individual competencies. The competency rate increased to 93% in 2015-16.

As the number of students taking industry certification tests has increased due to new requirements, the pass rate has increased as well, from 65% in 2013-14 to 74% in 2015-16. During the same time period, the gap in pass rates has decreased for most student groups.

Attainment of Competencies

The Virginia Department of Education (VDOE) requires school districts to track and report student competency attainment for all CTE courses. Competencies are the skills necessary for a given career and technical course of study.

The bulk of required competencies are specific to each course. Each course has between 48-163 competencies, arranged by skills within skillsets. For example, for **Automotive Technology I**, the following skills are required under the skillset of **Shop and Personal Safety**:

- Identify general shop safety rules and procedures.
- Utilize safe procedures for handling of tools and equipment.
- Identify and use proper placement of floor jacks and jack stands.
- Identify and use proper procedures for safe lift operation.
- Utilize proper ventilation procedures for working within the lab/shop area.
- Identify marked safety areas.
- Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
- Identify the location and use of eyewash stations.
- Identify the location of the posted evacuation routes.
- Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
- Identify and wear appropriate clothing for lab/shop activities.
- Secure hair and jewelry for lab/shop activities.

Teachers rate their students for each competency using the following levels:

1. Uninformed
2. Beginning
3. Practicing
4. Competent
5. Expert

In each course, students are expected to attain 80% or more of competencies at the Practicing level or higher.

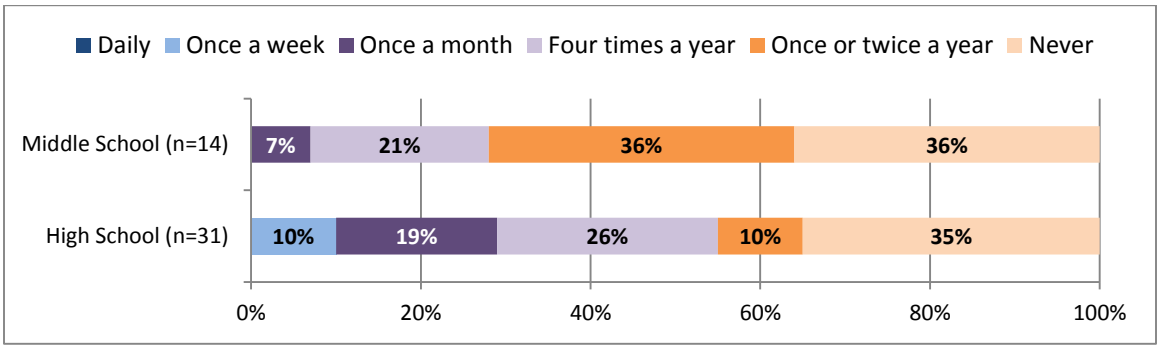
Prior to 2006, teachers kept track of student competencies through their own methods; e.g., folders, spreadsheets, etc. In 2006, staff at the Career Center developed an online tool, CanDo, to allow teachers to more easily enter and track student competency attainment. For purposes of this evaluation, the Office of Planning and Evaluation completed an analysis of competency attainment rates using data obtained through CanDo. Ultimately, due to inconsistent student numbers, the decision was made to not include this data in the evaluation.

A recommendation from the prior evaluation was for the CTE Office to work with CTE teachers to fully implement CanDo. While work has been done to enhance the CanDo system and encourage teachers to

use it, survey responses from the current evaluation indicate that use of CanDo among teachers remains inconsistent.

Figure 34 shows responses to a survey question about how frequently teachers use CanDo. About a third of teachers at each level reported that they *never* use CanDo, and around a third of middle school teachers reported that they use it just *once or twice a year*. This variation in the use of CanDo may help to explain the inconsistency of the CanDo competency attainment data available for this evaluation.

Figure 34: How frequently do you use CanDo to collect data to inform your CTE instruction? (CTE Teachers)



CanDo is not connected to Synergy, the APS student information system, essentially creating an additional gradebook for teachers to use. To alleviate this problem, the CTAE Office has been working with Information Services to input competencies into Synergy and to give teachers the ability to connect the competencies to assignments. Once this work is completed, a teacher will be able to see how his/her students perform on a specific competency and adjust his/her instruction as needed. This work will be piloted with a small group of CTE teachers in spring 2017.

In lieu of complete competency attainment data, APS has fulfilled its requirement to report competency attainment rates to the state by inferring competency attainment based on a student's course grade. A grade of C or higher is considered equivalent to attaining 80% or more of required competencies at the Practicing level. Data that is reported to the state is then summarized in the CTE Annual Performance Report produced by the Virginia Department of Education (VDOE).

Table 29 shows the student competency rate from the 2015-16 CTE Annual Performance Report. The competency rate is based on the performance of **CTE completers only**, not all CTE students. Over a three-year period, the student competency rate was highest in the most recent year at 93%.

Table 29: Student Competency Rate for CTE Completers

2013-14		2014-15		2015-16	
n	%	n	%	n	%
471	85%	313	89%	254	93%

Survey responses are summarized in **Appendix D1**. The CTE Annual Performance Report is available in **Appendix E1**.

Attainment of Industry Credentials

State-approved credentials are industry-specific tests that measure the skills necessary to be competent in the field related to the test. These assessments include state and national licenses, industry credentials, or occupational competency tests developed for a specific industry. Students learn the skills within the appropriate CTE class and at the end of the class sit for the related test. If a student passes the test, they are awarded a certificate that could lead to employment and/or a higher starting salary. The certification may also be used for a student-selected verified credit towards graduation.

Table 30 shows industry certification tests available to APS CTE students along with the year each test was available. There has been an increase in available industry certification tests due to several changes in requirements and instructional offerings:

- Starting with 2016-17 graduating class, students getting a standard diploma are required to pass an industry certification test.
- Economics and Personal Finance was added as a graduation requirement in 2012-13. The WISE Financial Literacy test is available to students in this course, and was purposely made available to allow students to fulfill two graduation requirements through one course (the class itself and the industry certification test).
- The new cybersecurity program at Career Center, first implemented in 2015-16, has led to the addition of many industry certification tests.

Of the 24 tests, 13 were first available in 2015-16, and three have been discontinued:

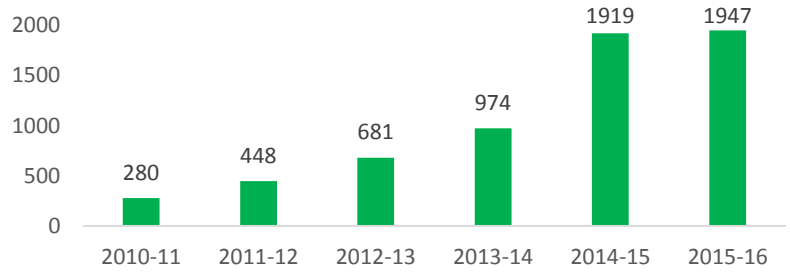
- ACA Adobe Dreamweaver CS5
- MOS Microsoft Office Word 2010
- MTA Web Development Fundamentals (C#)

Table 30: Industry Certification Tests Available to CTE Students

Certification Test Name	*CTE Program Area*	*2013-14*	*2014-15*	*2015-16*
ACA Adobe Dreamweaver CS5	Business & IT	Y	Y	
ACA Photoshop CS6	Business & IT/Tech Ed		Y	Y
ASE Maintenance & Light Repair	Trade & Industrial			Y
Brainbench Internet Security	Business & IT			Y
Brainbench JAVA 1	Computer Science	Y	Y	Y
Brainbench Network Authentication	Business & IT			Y
Brainbench Network Security	Business & IT			Y
Brainbench Networking Concepts	Business & IT			Y
ETS ParaPro	FACS			Y
Intuit Quickbooks Certified User 2015	Business & IT			Y
MOS Microsoft Office Excel 2013	Business & IT			Y
MOS Microsoft Office Powerpoint 2010	Business & IT	Y	Y	Y
MOS Microsoft Office Word 2010	Business & IT	Y	Y	
MOS Microsoft Office Word 2013	Business & IT			Y
MTA Web Development Fundamentals (C#)	Business & IT	Y		
NOCTI ASK Entrepreneurship Management	Business & IT			Y
NOCTI ASK Fundamental Business Concepts	Business & IT			Y
NOCTI Electrical Occupations	Trade & Industrial			Y
NOCTI Television Production	Trade & Industrial		Y	Y
PLTW Intro to Engineering Design	Technology Education	Y	Y	Y
PLTW Principals of Engineering Design	Technology Education		Y	Y
TCP/IP Administration	Business & IT			Y
WISE Financial Literacy	Business & IT	Y	Y	Y
Workplace Readiness Skills for Commonwealth	ALL CTE	Y	Y	Y

Figure 35 shows the number of industry credentials achieved from 2010-11 through 2015-16. The number of achieved industry credentials has increased during this time and was around 1,900 during the last two years.

Figure 35: Number of Industry Credentials Achieved, 2010-11 through 2015-16



The full report on industry certifications is available in **Appendix E2**.

College Advancement

As the number of students taking dual enrollment CTE courses has increased, the gender gap has decreased considerably and girls were underrepresented by just three points in 2015-16. Between 96-100% of students enrolled in CTE dual enrollment course in the last three years earned college credit through the course.

The number of students taking the AP Computer Science exam has increased as well. Several student groups are substantially underrepresented, including girls, LEP students, economically disadvantaged students, and Hispanic students. Black students and students with disabilities are underrepresented at lower rates, between 6-9 percentage points. The percentage of students passing the exam has increased over the last three years and was 44% in 2015-16.

There has been a small drop in the number of students taking IB CTE exams. During the last three years, girls, LEP students, and economically disadvantaged students have been underrepresented, as well as students with disabilities and Hispanic students. Black students were underrepresented at a lower rate, by just two to four percentage points. The pass rate has increased during this period, to 48% in 2015-16.

Students enrolled in select CTE courses have the opportunity to earn college credit in a number of ways:

Dual enrollment is an enrichment opportunity that allows APS high school students to earn college credits for courses taken through a number of colleges while still being enrolled in the high school class. As a dual enrolled student, a student takes a course at their high school and is enrolled in both high school and college.

The following CTE dual enrollment classes are available to students: Advanced Topics in IT, Advanced Topics, Automotive Technology I, Automotive Technology II, Automotive Technology III, Computer Assisted Tech/Architectural Drawing, Computer Assisted Tech/Engineering Drawing, Computer Programming, Early Childhood Education II, EMT/Human Anatomy & Physiology, Geospatial Tools & Techniques, Medical Terminology, Teachers for Tomorrow and Television and Multimedia Production.

Students may also earn college credit while in high school through the AP or IB programs. These programs both have national assessments which colleges may choose to accept for college credit. Colleges set individual policies on accepting scores on the assessments as credits for their classes.

The **Advanced Placement** (**AP) program** is an intensive program developed by the College Board that offers students an opportunity to develop their academic strengths through rigorous college-level curricula and challenging national exams. AP classes are available at all APS comprehensive high schools. AP exams are scored on a scale of 1 to 5, with 3 or above considered a passing score. In the area of CTE, APS students may take AP Computer Science.

International Baccalaureate (IB) is an academic program licensed by the International Baccalaureate Organization (IBO) that, upon successful completion, results in the awarding of a high school degree. The curriculum emphasizes the importance of international awareness and responsible citizenship. At the completion of certain courses, students take a test scored on a scale of 1 to 7; a score of 4 or above

is considered passing. The following IB courses are available in the area of CTE: Computer Science, Business Management, and Design Technology.

Dual Enrollment Credits

Over the past three years, there has been a concerted, countywide effort to increase enrollment in dual enrollment courses in APS. **Table 31** shows the demographics of students enrolled in CTE dual enrolled courses from 2013-14 through 2015-16. The number of students enrolled in these courses has increased from 98 to 201 over that time period.

As the number of total students has increased, the gender gap has decreased considerably and girls were underrepresented by just three points in 2015-16. Students with disabilities, LEP students, and economically disadvantaged students have all been overrepresented in dual enrollment classes during this period. The rate of overrepresentation has decreased for all groups as overall enrollment has increased in dual enrolled courses, and students with disabilities were underrepresented by six points in 2015-16. Similarly, Hispanic students have been overrepresented and the rate of overrepresentation has decreased during this period.

Table 31: Student Demographics for Students in CTE Dual Enrolled Classes

Student Group	*2013-14*		*2014-15*		*2015-16*	
	CTE Dual Enrolled	APS HS	CTE Dual Enrolled	APS HS	CTE Dual Enrolled	APS HS
Total Number	98	6,014	154	6,232	201	6,535
Female	22%	47%	37%	47%	44%	47%
Male	78%	53%	63%	53%	56%	53%
LEP	31%	23%	25%	23%	25%	22%
Non-LEP	69%	77%	75%	77%	75%	78%
Disadvantaged	51%	33%	42%	33%	37%	33%
Non Disadvantaged	49%	67%	58%	67%	63%	67%
SWD	27%	15%	19%	15%	9%	15%
Non-SWD	73%	85%	81%	85%	91%	85%
Asian	7%	9%	6%	9%	12%	10%
Black	12%	12%	9%	12%	10%	12%
Hispanic	47%	31%	53%	32%	43%	31%
White	29%	42%	29%	42%	32%	43%
Other	5%	5%	3%	5%	3%	5%

Students obtain college credit through dual enrolled courses at a very high rate. In the past three years, between 96-100% of students enrolled in CTE dual enrolled courses obtained college credit by passing the class. This was true across CTE program areas.

AP and IB Pass Rates

Table 32 shows the demographics of students who took the AP Computer Science exam from 2013-14 through 2015-16. The number of students taking this test has increased during this time period, from 26 to 80. During the same period, the gender gap has fluctuated but has remained lower than the peak in 2013-14. Girls were underrepresented by 37 percentage points in 2015-16. 2015-16 saw an increase in

the gap for LEP and economically disadvantaged students, who were underrepresented by 21-22 points that year. Black and Hispanic students have been underrepresented at a fairly consistent rate, ranging from 7 to 9 percentage points for black students and 16 to 19 percentage points for Hispanic students.

Students with disabilities have been underrepresented during this period as well, although with a relatively smaller gap. Students with disabilities were underrepresented by just three points in 2013-14. This has increased in more recent years and was six points in 2015-16.

Table 32: Student Demographics for Students who Took AP Computer Science Exam

Student Group	*2013-14*		*2014-15*		*2015-16*	
	AP Computer Science	APS HS	AP Computer Science	APS HS	AP Computer Science	APS HS
Total Number	26	6,014	39	6,232	80	6,535
Female	4%	47%	15%	47%	10%	47%
Male	96%	53%	85%	53%	90%	53%
LEP	8%	23%	8%	23%	1%	22%
Non-LEP	92%	77%	92%	77%	99%	78%
Disadvantaged	19%	33%	21%	33%	11%	33%
Non Disadvantaged	81%	67%	79%	67%	89%	67%
SWD	12%	15%	8%	15%	9%	15%
Non-SWD	88%	85%	92%	85%	91%	85%
Asian	27%	9%	20%	9%	12%	10%
Black	4%	12%	5%	12%	3%	12%
Hispanic	15%	31%	13%	32%	13%	31%
White	50%	42%	56%	42%	66%	43%
Other	4%	5%	5%	5%	6%	5%

Table 33 shows the percentage of students who obtained a score of three or higher on the AP Computer Science exam. As the number of students taking the test has increased, so has the percentage of students passing the exam. The pass rate of 44% in 2015-16 still lags behind the state (60%) and national (65%) pass rates.

Table 33: Percentage of Students Obtaining Score of 3 or Higher on AP Computer Science Exam

School Year	*Number of APS Students who Took AP Computer Science Exam*	*Percentage of Students who Obtained 3 or Higher*		
		APS	Virginia	National
2013-14	26	23%	66%	61%
2014-15	39	46%	62%	64%
2015-16	80	44%	60%	65%

Table 34 shows the demographics of students who took CTE IB exams from 2013-14 through 2015-16. There has been a small drop in the number of students taking these exams, from 96 in 2013-14 to 83 in 2015-16. During that period, girls, LEP students, and economically disadvantaged students have been underrepresented, as well as students with disabilities and Hispanic students. Black students were underrepresented at a lower rate, by just two to four percentage points.

Table 34: Student Demographics for Students who Took CTE IB Exam

Student Group	*2013-14*		*2014-15*		*2015-16*	
	IB CTE Course	APS HS	IB CTE Course	APS HS	IB CTE Course	APS HS
Total Number	96	6014	83	6232	83	6535
Female	20%	47%	23%	47%	18%	47%
Male	80%	53%	77%	53%	82%	53%
LEP	3%	23%	5%	23%	2%	22%
Non-LEP	97%	77%	95%	77%	98%	78%
Disadvantaged	17%	33%	24%	33%	21%	33%
Non Disadvantaged	83%	67%	76%	67%	79%	67%
SWD	4%	15%	5%	15%	7%	15%
Non-SWD	96%	85%	95%	85%	93%	85%
Asian	11%	9%	16%	9%	14%	10%
Black	8%	12%	10%	12%	8%	12%
Hispanic	16%	31%	19%	32%	16%	31%
White	55%	42%	51%	42%	55%	43%
Other	9%	5%	5%	5%	6%	5%

Table 35 shows the percentage of students who obtained a score of four or higher on CTE IB exams. The pass rate has increased over the three-year period, from 31% in 2013-14 to 48% in 2015-16.

Table 35: Percentage of Students Obtaining Score of 4 or Higher on IB Exam

School Year	*Number of Students who Took IB Exam*	*Percentage of Students who Obtained 4 or Higher*
2013-14	96	31%
2014-15	83	36%
2015-16	83	48%

*No IB exams in the area of Business/Information Technology/marketing were taken in 2013-14.

The full report on dual enrollment, AP, and IB participation and results is available in **Appendix E3**.

Graduation Rate and Type for CTE Completers

The percentage of CTE completers earning an advanced studies diploma has increased from 48% in 2011-12 to 56% in 2015-16. In the most recent two years, a gap has developed between male and female students, with a 12-point difference in the percentage of males (60-61%) and females (48-49%) receiving an advanced studies diploma. In addition, there are substantial gaps for LEP students, economically disadvantaged students, students with disabilities, black students, and Hispanic students.

This evaluation includes an analysis of the graduation rate and diploma type for CTE completers; i.e., students who completed a CTE sequence (such as Auto I and Auto II) while at APS. A student is considered to be a completer once they graduate.

Figure 36 shows the diploma type for CTE completers from 2011-12 through 2015-16. The percentage of CTE completers earning an advanced studies diploma has increased from 48% in 2011-12 to 56% in

2015-16, and there has been a corresponding decline in the percentage earning a standard diploma. The percentage of CTE completers dropping out has ranged from two to four percent during this time period.

Figure 36: Diploma Type for CTE Completers

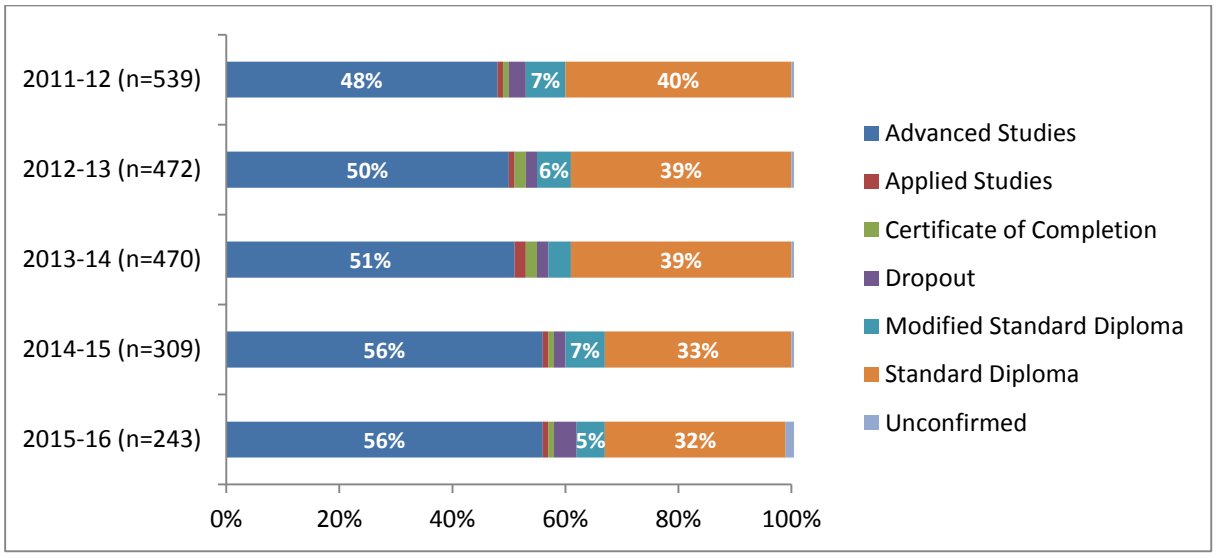
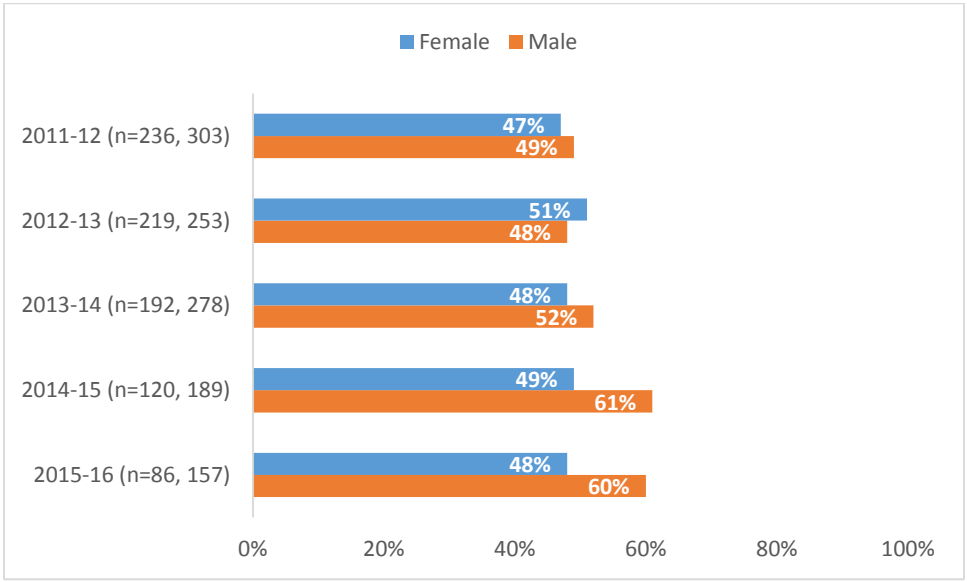


Figure 37 shows the percentage of CTE completers who received an advanced studies diploma, by gender. In the most recent two years, a gap has developed between male and female students, with a 12-point difference in the percentage of males (60-61%) and females (48-49%) receiving an advanced studies diploma.

Figure 37: Percentage of CTE Completers Receiving an Advanced Studies Diploma, by Gender[19]



[19] For Figures 37-41, n represents number of each group, in the same order as listed in the legend. For example, in Figure 37, in 2011-12, there were 236 female CTE completers and 303 male CTE completers.

Figure 38 shows the percentage of CTE completers who received an advanced studies diploma, by limited English proficient (LEP) status. LEP students are far less likely than non-LEP students to receive an advanced studies diploma. In 2015-16, there was a 40-point gap between LEP and non-LEP students.

Figure 38: Percentage of CTE Completers Receiving an Advanced Studies Diploma, by LEP Status

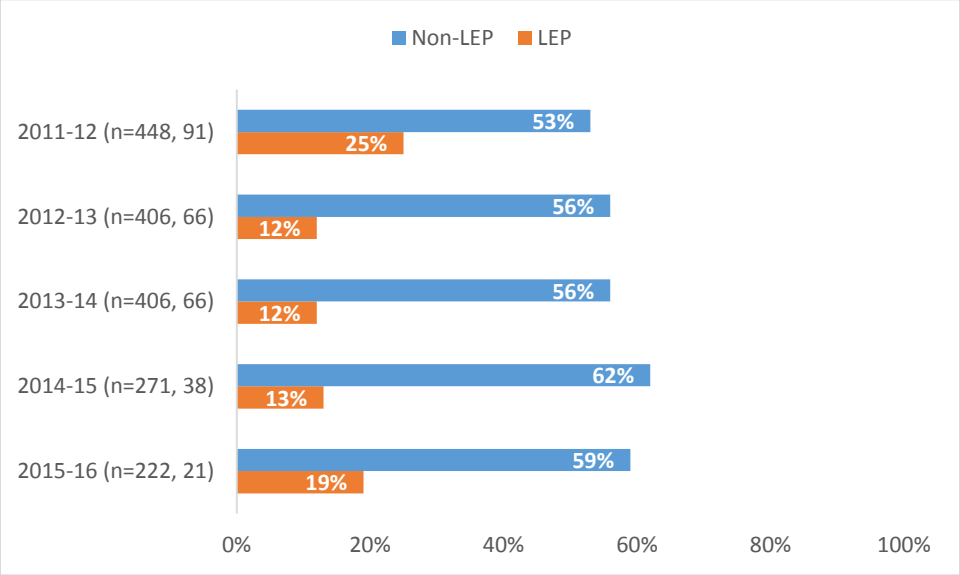


Figure 39 shows the percentage of CTE completers who received an advanced studies diploma, by economic status. This gap decreased in the most recent year, from 28 points in 2014-15 to 18 points in 2015-16.

Figure 39: Percentage of CTE Completers Receiving an Advanced Studies Diploma, by Economic Status

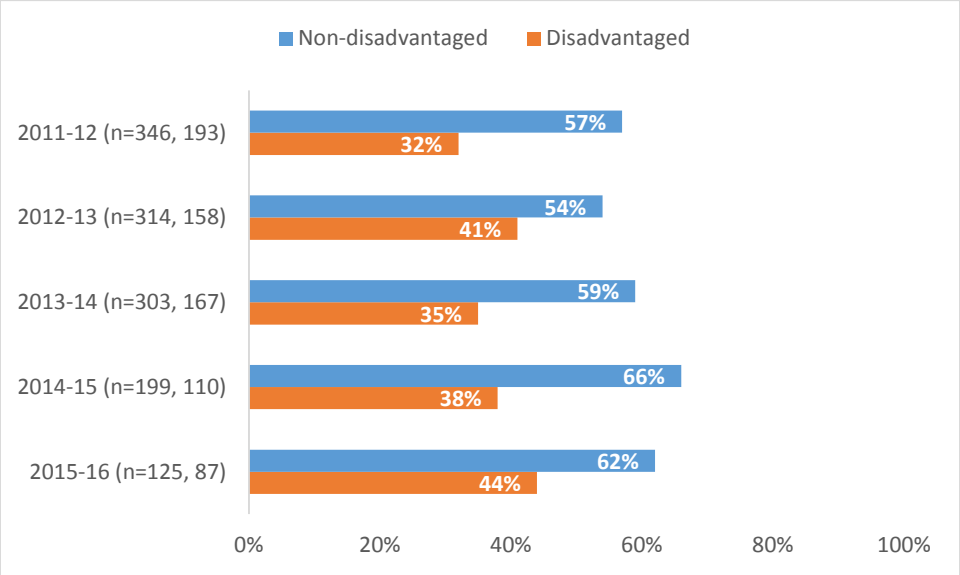


Figure 40 shows the percentage of CTE completers who received an advanced studies diploma, by disability status. The gap between students with disabilities and those with no disabilities has ranged from 40-48% over the last five years.

Figure 40: Percentage of CTE Completers Receiving an Advanced Studies Diploma, by Disability Status

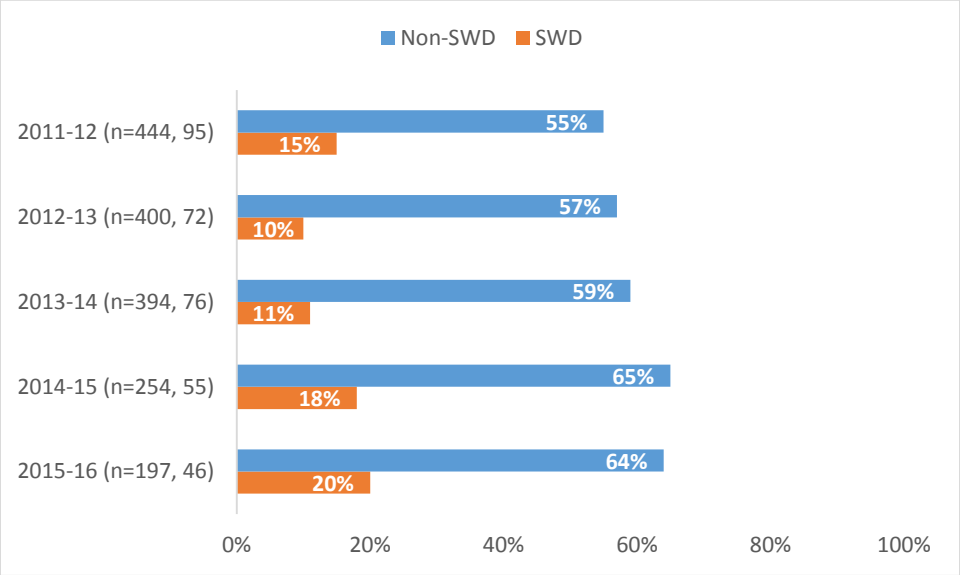
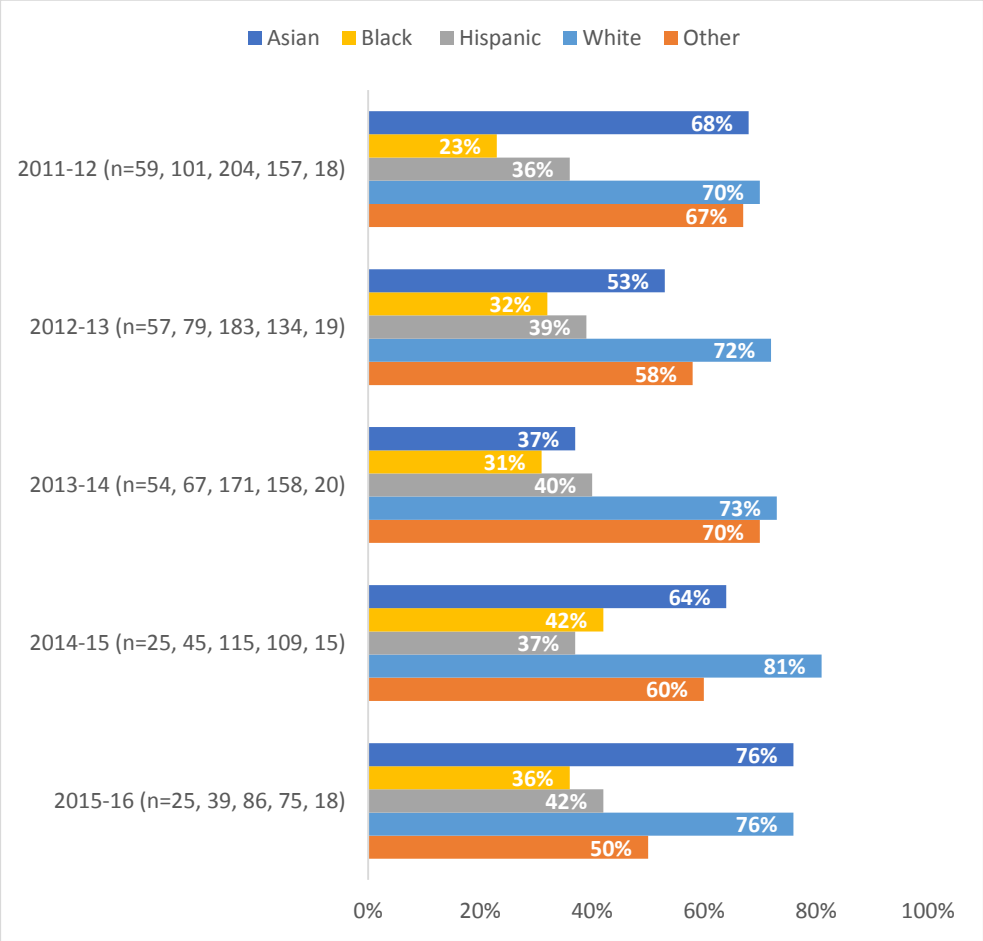


Figure 41 shows the percentage of CTE completers who received an advanced studies diploma, by race and ethnicity. Over five years, there have been large gaps between white students and black and Hispanic students, ranging from 33 to 47 percentage points. There has also been a gap between white and Asian students; this has been less consistent. The number of Asian students has decreased during this time period. In 2015-16, there were 25 Asian CTE completers and they received an advanced studies diploma at the same rate as white students (76%).

Figure 41: Percentage of CTE Completers Receiving an Advanced Studies Diploma, by Race/Ethnicity



The full report on graduation and diploma type is available in **Appendix E4**.

Post-High School Transitions for CTE Students

Most seniors indicated that they planned to attend a four-year college regardless of their CTE participation; this rate was higher among those who had not taken a CTE course. Those who had taken a CTE course were more likely than those who had not to indicate they planned to attend a two-year college (23% vs 10%) or work (5% vs 1%).

Among alumni who had graduated the previous year and completed a CTE sequence while at APS, most reported that they were currently a full-time student, and this increased to 94% in 2015. Likewise, there was an increase in the percentage of students reporting that their education type was a four-year university (62% in 2015).

Among alumni who had graduated three or four years previously and completed a CTE sequence while at APS, most indicated that they were currently enrolled in a four-year college. About a third indicated that they are working full time and a quarter indicated that they are working part time.

Table 36 shows the percentage of APS seniors reporting various post-high school plans, disaggregated by whether or not they had taken a CTE course while in high school. Most seniors indicated that they planned to attend a four-year college regardless of their CTE participation, although this rate was higher among those who had not taken a CTE course (87% vs 67%). Those who had taken a CTE course were more likely than those who had not to indicate they planned to attend a two-year college (23% vs 10%) or work (5% vs 1%).

Table 36: Please select the one response that best describes your plans after you graduate (High School Seniors by CTE Participation)

Post-HS Plan	*Took CTE Course (n=578)*	*Did Not Take CTE Course (n=489)*
4 year college	67%	87%
2 year college	23%	10%
Business, Trade/Technical School	2%	1%
Work	5%	1%
Military	2%	0%
No plans at this time	2%	1%

In addition to feedback from current APS students, this evaluation includes two sources of feedback from alumni who completed a CTE sequence while at APS:

- A follow-up survey required by VDOE and administered annually
- An APS-developed survey sent to alumni in the fall of 2016

The Virginia Department of Education (VDOE) requires school divisions to administer a follow-up survey to all CTE completers within 9-12 months of graduation. The goal of the survey is to gauge completer transition to further education or employment, as well as satisfaction with how well the CTE program prepared them for that transition. Divisions are tasked with achieving a response rate of 75% or higher. Each year, the CTAE Office reaches out to alumni via US mail and phone calls to invite them to participate in the online survey, until the survey reaches the required response rate. The CTAE Office provided the Office of Planning and Evaluation with responses to this survey from the past four complete administrations.

While many of the questions on the APS-developed survey were aligned with the state follow-up survey, the APS survey differed in that the respondents had graduated three or four years prior to receiving the survey, rather than just one.

For the APS-developed survey, the CTAE Office provided the Office of Planning and Evaluation with lists of CTE completers who had graduated in 2011-12 and 2012-13. Planning and Evaluation invited alumni to participate in the survey by 1) mailing a letter to the last known mailing address of the student, and 2) sending an email invitation to those students who had provided one in their senior survey when they graduated. The survey was available online.

Table 37 shows the response rates and margin of error for the survey. In total, 93 people responded to the survey. Of those, 31 responses were filtered out based on responses to one of two questions:

- What year did you graduate from Arlington Public Schools?
- Did you complete a CTE sequence while in APS? "Completing a sequence" is defined as taking two sequential CTE courses in the same program area (for example, Auto I and Auto II). This also includes EMT, physical therapy/sports medicine, and forensics, even if you only took one class.

If a respondent selected "N/A – I did not attend Arlington Public Schools" or indicated that they had not completed a CTE sequence while at APS, the survey ended and the respondent received the following message: "Your response indicates that you are not part of the intended audience of this survey. Thank you for your participation." The margin of error of 12 is calculated based on the total number of valid responses. Given the relatively low response rate/ high margin of error, results should not be taken to represent the experiences of all APS CTE completers.

Table 37: Alumni Survey Response Rate

Letters Sent	*Returned letters*	*Emails Sent*	*Invalid Emails*	*Responses*	*Response Rate*	*Margin of Error*
937	175	757	56	62	7%	12

Table 38 shows the current status of alumni who had completed a CTE sequence while in APS, according to the state follow-up survey. Years included represent the year after graduation. Alumni were able to select multiple responses. Most alumni reported that they were currently a full-time student, and this increased to 94% in 2015. The percentage reporting that they work full-time has decreased from 22% to 15% over four years, while the percentage working part-time has increased from 41% to 54%.

Table 38: Current Status of CTE Completers, One Year after Graduation (multiple responses allowed)

Current Status	*2012 (n=368)*	*2013 (n=406)*	*2014 (n=154)*	*2015 (n=358)*
Student: Full-time	86%	84%	84%	94%
Student: Part-time	14%	16%	16%	6%
Work: Full-time	22%	22%	18%	15%
Work: Part-time	41%	41%	42%	54%
Military	2%	2%	2%	2%

Table 39 shows the types of education alumni had participated in since graduating from high school the previous year. Just as there was an overall increase in the percentage of alumni completers reporting they were full-time students, there was also an increase in the percentage of students reporting that their education type was a four-year university (62% in 2015). There was a corresponding drop in the percentage of students reporting that their education type was a community college (37% in 2015). Other types of education were far less common, between 0-4%.

Table 39: Types of education you have participated in since high school (CTE Completers One Year after Graduation)*

Education Type	*2012 (n=317)*	*2013 (n=315)*	*2014 (n=114)*	*2015 (n=244)*
Four-year university	55%	56%	55%	62%
Community college	43%	42%	38%	37%
Technical School/college	1%	1%	3%	1%
Business/Industry training through your employer	0%	Less than 1%	4%	0%
Other	Less than 1%	0%	2%	0%

*Response options omitted from this table are "registered apprenticeship" and "occupational/technical training through a local school system." No alumni selected these responses in any year.

Table 40 shows the current employment and/or education status of alumni who responded to the APS-developed survey. For these respondents, more time had passed between their graduation and taking the survey: three to four years. Most respondents indicated that they were currently enrolled in a four-year college. About a third indicated that they are working full time and a quarter indicated that they are working part time.

Table 40: Which of the following describes your current employment and/or education status? (Select all that apply) (n=62)

Post-High School Plans	*Percent*
Enrolled in a four-year college	55%
Have a full-time job	32%
Have a part-time job	26%
Enrolled in a two-year college	19%
Enrolled in another postsecondary institution (for example, a trade school)	2%
Military	0%
Other	8%

Survey responses for seniors are available in **Appendix D1**. Survey responses for alumni who took the state follow-up survey are available in **Appendix D2**, and survey responses for alumni who took the APS-developed survey are available in **Appendix D3**.

CTE Completer Alumni Feedback

Most respondents to the APS-developed alumni survey reported that the CTE program had a strong impact on their level of preparation for their current work or education status, and an additional third indicated that it had a moderate impact. Similarly, almost all respondents to the state alumni survey indicated that they were satisfied with the preparation they received in their CTE coursework for their further education or employment.

Alumni who reported that they were currently working gave positive feedback about the relevance of their CTE sequence to their job, and those who reported that they were currently a student were positive about the relevance of their CTE sequence to their area of study.

Echoing current CTE students, the alumni who had participated in a work-based opportunity were positive about the experience, with almost all indicating that the opportunity they had participated in had been valuable; and that the experience had provided them with work-related skills, helped prepare them for a career, and helped them determine a career path.

Both the state follow-up survey and the APS-developed alumni survey included questions about the impact of the CTE program on their current work or education status. **Table 41** shows responses on the **state follow-up survey** to the question, "**Overall, how satisfied are you with the preparation you received in your high school Career and Technical Education program for further education or employment?**" In each of the last four years, almost all respondents indicated that they were either *satisfied* or *very satisfied*.

Table 41: Overall, how satisfied are you with the preparation you received in your high school Career and Technical Education program for further education or employment? (Alumni CTE Completers, One Year after Graduation)

	2012 (n=368)	*2013 (n=404)*	*2014 (n=154)*	*2015 (n=358)*
Very satisfied	52%	47%	59%	42%
Satisfied	46%	51%	38%	55%
Dissatisfied	1%	2%	3%	3%
Very dissatisfied	Less than 1%	Less than 1%	0%	Less than 1%

Table 42 shows responses to the **APS survey** question, "**How much of an impact did the APS CTE program have on your level of preparation for your current work or education status?**" Most respondents reported that the CTE program had a *strong impact*, and around a third indicated that it had a *moderate impact*.

Table 42: How much of an impact did the APS CTE program have on your level of preparation for your current work or education status? (Alumni CTE Completers, 3-4 Years after Graduation, n=62)

Response	*Percent*
It had a strong impact.	53%
It had a moderate impact.	34%
It had no impact.	10%
I don't know.	3%

In open-ended responses, alumni shared how the CTE program helped prepare them for their current work or education status. Answers fell into three overarching themes:

- The CTE program helped prepare them for college coursework or gave them skills in their field of interest. (21 responses)

  I took the Physical Therapy class at the Career Center and am now on a track to complete a Bachelors of Science in Nursing. The foundation in human anatomy has greatly helped with my college courses.

- The CTE program guided students to select a career or college major. (19 responses)

It helped me delve into the world of criminal justice, which led me to my college majors, which led me to my current job in the federal court system.

- The CTE program helped them obtain employment (4 responses)

  After successfully completing the auto tech classes offered at the Career Center I was able to obtain a well-paying job at a dealership. Being that I wasn't planning on immediately leaving to a four year institution, working as a technician gave me the opportunity to even be able to afford the tuition for my bachelor's degree. Now I am studying at a four-year institution working on my Mechanical Engineering degree.

On the **APS-developed survey**, the 34 alumni who indicated that they were **currently working part- or full-time** were asked a series of questions about the relevance of their CTE coursework to their job. Responses were positive overall. For example:

- Two-thirds reported that their job is *closely* or *somewhat related* to the CTE sequence they completed in high school.
- Seventy percent indicated that they are using *most* or *some* of what they learned in their CTE courses for their current job.
- Twelve respondents who were currently working indicated that they received an industry or professional certification or license as a result of completing their CTE sequence. Of these 12, half reported that their current job was in a field related to this certification/license.

The **state follow-up survey** shows an increase in positive responses over time. The percentage of respondents reporting that their **current job is in a field related to any of their past CTE courses** has increased from 20% in 2012 to 42% in 2015. Likewise, the percentage reporting that they are using most or some of what they learned in their CTE courses for their current job has increased from 28% in 2012 to 44% in 2015.

On the **APS-developed survey**, the 47 alumni who indicated that they were **currently a student** were also positive about the relevance of their CTE sequence to their current area of study. Half reported that their CTE sequence was *closely related* to their field of study, and around a third indicated that it was *somewhat related*. On the **state follow-up survey**, around a third selected *closely related* and around a quarter selected *somewhat related*.

The **APS-developed survey** included a series of questions about work experience opportunities offered through the CTE program. **Table 43** shows responses to the question, "**Did you ever participate in any of the following work-based opportunities through a CTE course?**" Most respondents indicated that they had not participated in any work experience programs. Around a quarter had participated in **internships** or **job shadowing**.

Table 43: Did you ever participate in any of the following work-based opportunities through a CTE course? (Select all that apply) (n=62)

Opportunity	*Percent*
Internships	23%
Cooperative education ("Co-op")	2%
Job shadowing	27%
Work experience programs	16%
Mentorships	15%
None of the above	58%

Similar to current CTE students (see page 51) , the 25 alumni who had participated in a work-based opportunity were positive about the experience, with between 89% (mentorship) and 100% (internship and work experience) indicating that the opportunity they had participated in had been *very* or *somewhat valuable*. Similarly, almost all indicated that they *strongly* or *somewhat agreed* with the following statements:

Overall, the work-based learning opportunity or opportunities…

- …provided me with work-related skills. (92%)
- …helped prepare me for a career. (92%)
- …helped me determine a career path. (84%)

Alumni were generally positive about the relevance of their work-based learning opportunities to their current job or area of study:

- Two-thirds of the 14 students who had participated in a work-based learning opportunity and were **currently working** reported that their job was in the same field as the work-based learning opportunity.
- Just over half of the 17 students who had participated in a work-based learning opportunity and were **currently a student** reported that their current area of study was in the same field as the work-based learning opportunity.

On the **APS-developed survey**, alumni who indicated that they were currently working were asked to provide their annual income. Responses are included in **Table 44**.

Table 44: Annual Income for CTE Completers who Graduated Three to Four Years Ago

Job Status	*Response*	*Percent*
Part-Time Job (n=14)	$0 to $24,000	71%
	$24,001 to $51,000	14%
	$51,001 to $72,000	0%
	$72,001 to $86,000	0%
	$86,001 to $110,000	7%
	$110,001 to $150,000	0%
	$200,001 or higher	7%
*Full-Time Job (n=20)**	$0 to $24,000	20%
	$24,001 to $51,000	40%
	$51,001 to $72,000	20%
	$72,001 to $86,000	5%
	$86,001 to $110,000	5%
	$110,001 to $150,000	10%
	$200,001 or higher	0%

*includes two respondents who reported they have both a full-time and a part-time job

The state follow-up survey is summarized in **Appendix D2**. The APS-developed alumni survey is available **in Appendix D3**.

ISAEP and Adult Education GED

Arlington Public Schools offers several alternative pathways to earning a high school diploma. One of these alternatives is the General Educational Development (GED) assessment. GED prep classes are managed by the CTAE Office and are available through two different programs: one for APS high school students and one for adults.

Individual Student Alternative Education Plan (ISAEP)

Counselors and DOCs are familiar with and value the ISAEP program and see it as best-suited not for struggling students but instead for successful students who wish to finish high school and move on. GED pass rates can only be reported for two of the last five years due to the low number of participating students. In 2011-12, four out of six students attained the GED, and in 2014-15, all five students who took the test attained the GED.

Virginia law requires that all residents attend school until they receive a high school diploma or reach 18 years of age. Students between the ages of 16 and 18 may choose an alternative school plan to satisfy the legal requirement. Several options in APS - including Langston High School Continuation, New Directions, and Arlington Community High School - offer alternative approaches to the traditional curriculum that allow students to earn a traditional high school diploma. Another option, managed by the CTAE program, is the Individual Student Alternative Education Plan (ISAEP), which prepares students for the GED and provides career training and counseling. In order to participate in the APS ISAEP program, students must meet several requirements, including:

- Demonstrate a minimum reading level of 7.5 (roughly equivalent to halfway through 7th grade on the General Assessment of Instructional Needs or GAIN)
- Score at least 125 on practice tests in all four GED subject areas
- Be at least one full year behind in credits. Exceptions to this requirement may be made for students who are credit deficient and who are at risk of leaving school before completion.

Understanding of ISAEP among APS Stakeholders

The CTAE program is interested in ensuring that all students who would benefit from participating in ISAEP and who might otherwise drop out of high school receive adequate information about the ISAEP option. For purposes of this evaluation, the Office of Planning and Evaluation contracted with an external facilitator to conduct focus groups with counselors and telephone interviews with students who had dropped out of high school. The overarching questions explored during these conversations were:

- How familiar are high school counselors with the ISAEP program?
- Under what circumstances do counselors refer students to ISAEP?
- What alternative options were presented to students who dropped out?

Counselors and Directors of Counseling: Familiarity with and Perceptions of ISAEP

In the spring of 2016, the external facilitator conducted two 90-minute focus groups: one with a group of high school counselors, and one with all high school Directors of Counseling (DOCs). Both focus groups addressed multiple topics covering questions for the evaluations of both CTAE and Gifted Services. Each focus group dedicated some time to questions about how counselors identify students who are at risk of dropping out, and if and how they refer them to alternative options. Though the conversations covered a broad array of questions related to the issue of students dropping out of high school, the primary goal for the purpose of this evaluation was to gauge when and how counselors might refer students to the ISAEP program. The full report is available in **Appendix D4**.

Findings from the focus groups include:

- **Counselors and DOCs think of the available alternative options as a set of possible solutions and, among them, one should be a good match for a particular student.** In other words, they do not conceive of the alternative options as a set of layers with a final, last-resort endpoint. For example, one student may need flexible scheduling in order to work and contribute money to his or her family. Another student may wish to earn a GED diploma in order to move on from high school sooner.
- **They feel very knowledgeable about the options they can offer students.** One benefit to the small size of the Arlington school system, they said, is that staff members know one another well and always know who to call.
- **They value the ISAEP program.** All of the high school counselors and DOCs knew, top-of-mind, the APS staff member to turn to for help with students' GED needs. The counselors saw the GED program as best-suited not for struggling students but instead for successful students who simply wish to finish high school and move on. Some said that, despite the independent nature of GED study and completion, it is not ideal for students with issues such as anxiety and school avoidance

because these students typically wish to have a diploma and not a GED. It is also not well-suited to students who struggle academically because GED completion requires good reading skills and a great deal of study.

Feedback from Students who Dropped out of High School

In addition to these focus groups, the same facilitator conducted a series of telephone interviews with APS students who had dropped out of high school within the last few years. These were students who had dropped out without ever having had contact with the ISAEP program. The primary goal was to understand their reasons for dropping out, and what alternative options were presented to them.

These interviews proved difficult to complete, and while the hope was to interview around ten students, intensive recruiting by mail and telephone among 45 potential interviewees yielded only six students who agreed to be interviewed and only three who ultimately participated. Students had the option of conducting the interview in English, Spanish, or another preferred language. While interpretation of the student feedback gathered must necessarily be limited due to low numbers, the following themes emerged:

- Information about options that might make it possible or easier to graduate had clearly been shared with all three students. All three were identified and routed to one or more APS support in their high school careers.
- When students were asked which adults tried to help or to persuade them to stay in school, all three mentioned high school counselors, and one mentioned a teacher who was very helpful to him.

The full report on student interviews is available in **Appendix D4**.

ISAEP Participation and GED Attainment

Table 45 provides information reported to the Virginia Department of Education (VDOE) annually. This information includes the total number of students who:

- Take placement tests for ISAEP (**served**)
- Enroll in ISAEP (**enrolled**)
- Take the GED test
- Pass the GED test

Participation rates are low in each of the five years included in the data. Across years, not all students who enroll in ISAEP take the GED, although the proportion varies considerably. Due to low numbers, pass rates can only be reported for two of the last five years. In 2011-12, four out of six students attained the GED, and in 2014-15, all five students who took the test attained the GED.

Table 45: ISAEP Enrollment, GED Participation, and GED Pass Rates, 2011-12 through 2015-16

Measure	*Category*	*2011-12*	*2012-13*	*2013-14*	*2014-15*	*2015-16*
Total number of students served; i.e., who expressed an interest in ISAEP and took placement tests	African-American	5	5	5	7	3
	Hispanic	6	5	5	5	7
	White	6	12	4	8	6
	Other	2	0	1	1	2
	Total	19	22	15	21	18
Number of students enrolled in ISAEP program, by entry reason	Academic Challenges	2	1	5	2	0
	Disciplinary Issues	2	2	1	2	0
	Age Imbalance	3	1	0	1	0
	Other	0	0	1	5	3
	Total	7	4	7	10	3
Total number of students who took the GED test		6	1	4	5	2
Total number of students who passed the GED tests		4	*	*	5	*

*omitted; n less than 5

Adult GED Program

While the total number of students registered in adult education GED prep classes has decreased since 2011-12, the percentage of registered students remaining for 12 seat hours or more has increased from 31% in 2012-13 to 48% in 2015-16.

Of the 39 students who took the GED over the last two years and who also shared results with APS, 23 attained the GED. Among the students who attained the GED, it took an average 0.6 years from the APS start date to the final GED test date.

The APS Adult Education GED Program is designed for adults who do not have a high school diploma. Classes are available for people who wish to develop or refresh the skills necessary for successful completion of the GED test. Students are encouraged to take the GED test when their progress indicates their readiness. New students are required to take an English and math assessment to ensure proper course placement. Available courses include:

- Basic math classes (formerly Pre-GED classes level 1)
- Skill builder prep classes (formerly Pre-GED prep classes level 1/2)
- GED en español curso preparatorio (formerly GED en español)
- GED math only
- GED en español (solamente matemáticas)
- GED preparation classes level 2
- GED preparation classes level 3
- GED preparation classes level 4

Registration

Figure 42 shows the number of students who registered for adult GED courses from 2011-12 through 2015-16. The data includes:

- **Initial registrations**: All students who registered. These students took a placement exam and received counseling about the GED and available courses.
- **Remained registered**: The number of students who remained registered and took the class. This represents the initial registrations minus the number of students who canceled their registration after taking the placement exam and receiving counseling about course options.

The number of students registering and remaining registered for adult GED classes has decreased since 2011-12, with a peak in 2013-14 at 309. In the most recent year, the number of students remaining registered was 242. The number of cancellations ranged from 16-19 in the four first years, and decreased to six in 2015-16.

Figure 42: Adult GED Course Registrations, 2011-12 through 2015-16

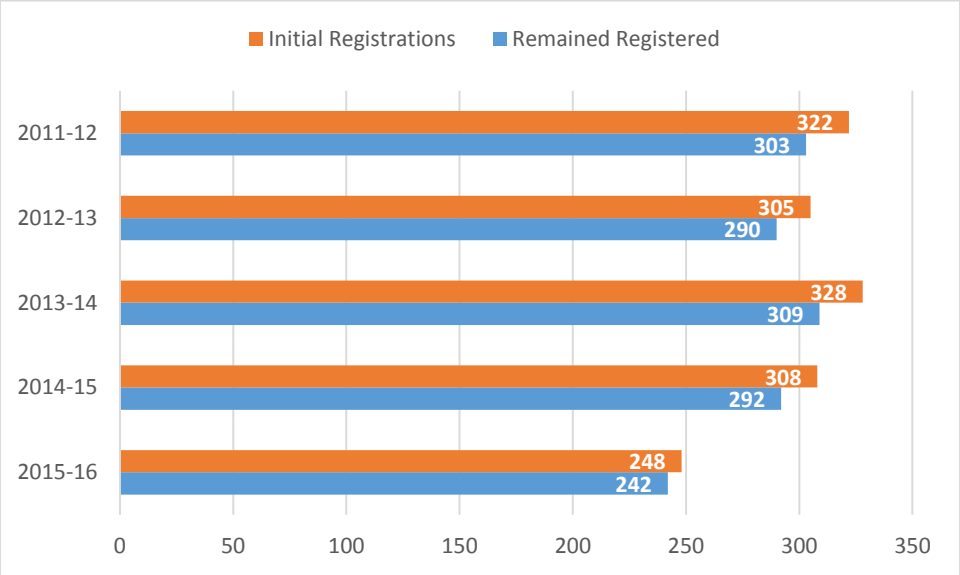
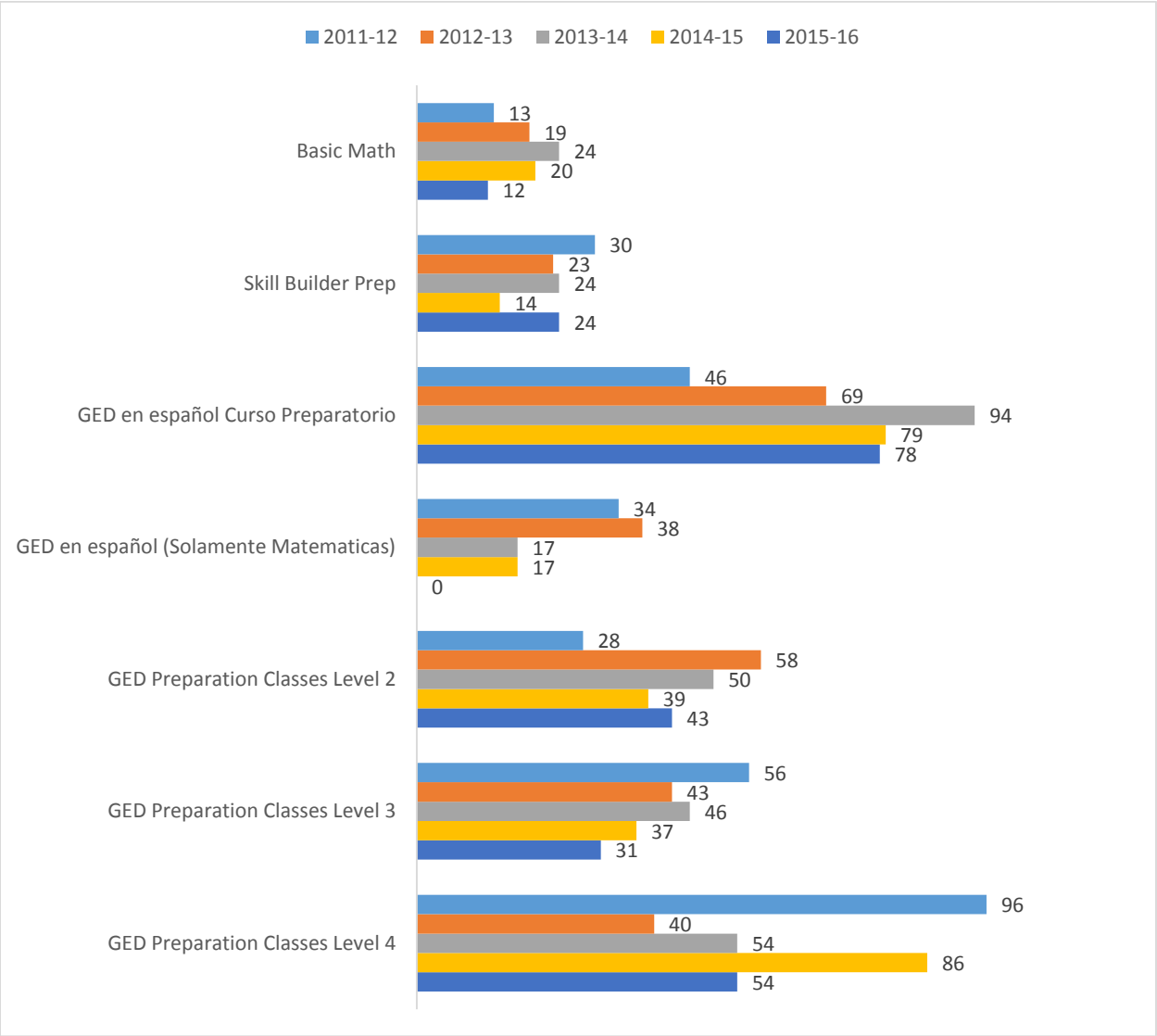


Figure 43 shows the number of students who registered (and remained registered) for an adult GED class, by specific class.

Figure 43: Adult GED Course Registrations, 2011-12 through 2015-16, by Specific Class



Gains over Time

Students in the adult GED program take placement tests to assess their educational functioning level (EFL) and gains in reading and math. The EFLs are:

1. Adult Basic Education (ABE) Beginning Literacy
2. ABE Beginning Basic Education
3. ABE Intermediate Low
4. ABE Intermediate High
5. Adult Secondary Education (ASE) Low
6. ASE High

Performance on placement assessments is entered into the National Reporting System (NRS) database, which produces a report for each school year on gains made by students in the program. Students are included in the NRS reports if they attend class for 12 seat hours or more. **Table 46** shows the total

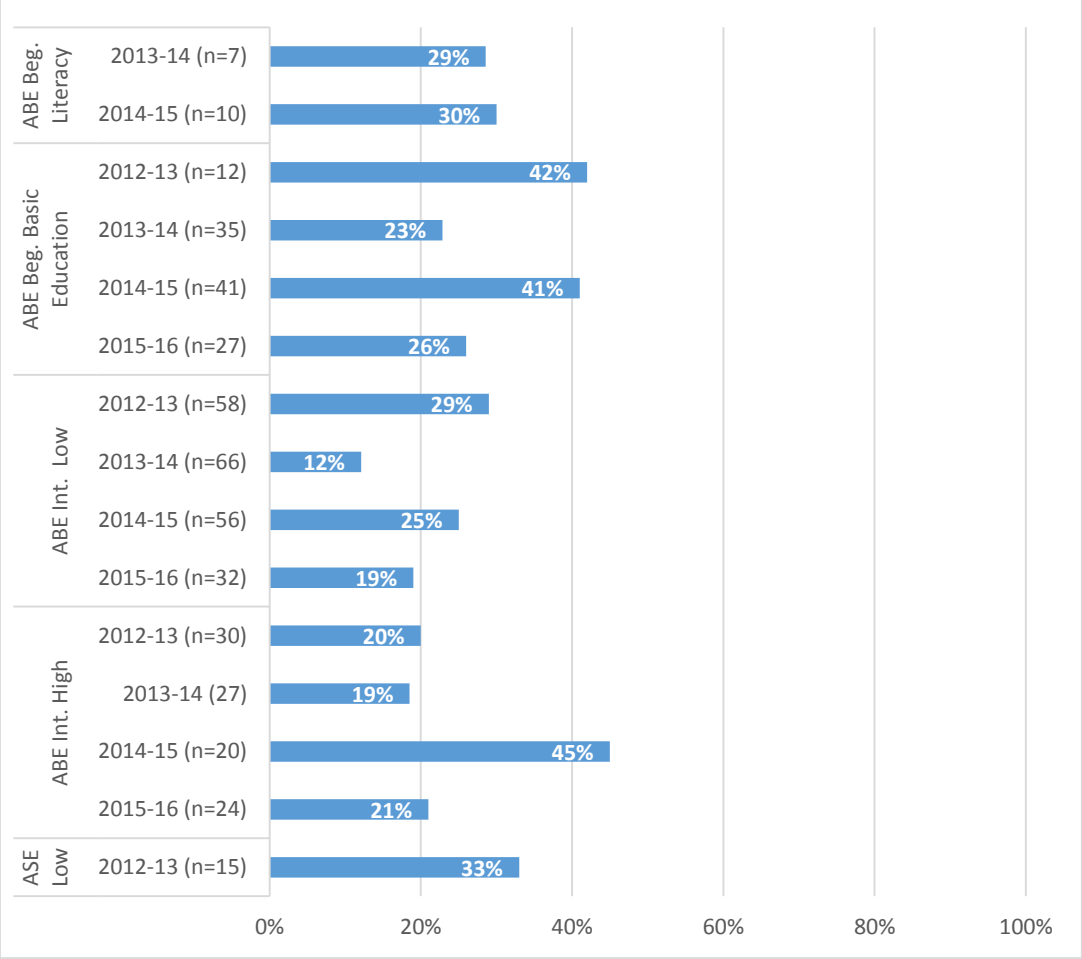
number of students included in the NRS reports as a percentage of the total number of non-canceled registrations for each of the last four school years. While the total number of registered students has decreased, the percentage of registered students remaining for 12 seat hours or more has increased from 31% in 2012-13 to 48% in 2015-16.

Table 46: Percentage of Registered Students who Remained 12 Seat Hours or More

School Year	Total Non-Canceled Registrations	Remained 12 Seat Hours or More (NRS)	%
2012-13	290	90	31%
2013-14	309	132	43%
2014-15	292	139	48%
2015-16	242	115	48%

Figure 44 show gains made by EFL in 2012-13 through 2015-16. The report includes data for both reading and math; if a student made a gain in one of these areas, it is counted as a gain.

Figure 44: Percentage of Adult Education Students Completing A Level by Educational Functioning Level and School Year*



*ABE Beg. Literacy and ASE Low omitted for certain years as n is less than 5. ASE High not included as only one student at that level took practice tests during this time period.

Adult Education GED Attainment

Students must take the GED test at a Pearson VUE Testing Center. They have the option to proactively share their GED scores with APS within the ged.com website at the time of registering for the test or after taking the test. Since not all students share their scores, APS does not have test results for all adult education GED students who take the test.

The CTAE Office provided Planning and Evaluation with GED results for 39 adult education students who took the GED between December 2014 and December 2016. These are students whose GED results were accessible to CTAE staff on ged.com because the student had shared scores with APS.

Of the 39 students:

- 23 attained the GED (59%).

Of the remaining 16 who haven't yet attained the GED:

- None has taken all four subtests.
- 11 have passed at least one subtest (four have passed one subtest, three have passed two subtests, and four have passed three subtests).
- Six have failed at least one subtest (five have failed one subtest and one has failed two subtests).

Of the students who attained the GED, it took an average 0.6 years from the APS start date to the final GED test date. This ranged from 0.2 years for four students and 1.8 years for one student. **Table 47** shows the time (in years) it took all 23 students to attain the GED. Due to low numbers, it is not possible to disaggregate the data by entry level.

Table 47: Years to Attain GED

Years to Attain GED	Number of Students
0.2	4
0.3	3
0.4	3
0.6	2
0.7	2
0.9	1
1.0	1
1.1	1
1.2	1
1.3	1
1.8	1

Full data on the ISAP program and the Adult Education GED program are available in **Appendix F1**.

SECTION 3: RECOMMENDATIONS AND NEXT STEPS

Connections with Systemic APS Processes and Initiatives

In addition to the specific recommendations described below, APS should carefully consider this report's findings and recommendations in light of the following overarching processes, initiatives, and resources. Fundamental and systematic coordination is needed so that we can share, learn from, and build upon both our challenges and successes in a concerted manner.

- *Strategic Planning, 2017-18.* This major endeavor presents an excellent opportunity to ensure APS charts a path to better prepare students for careers.
- *The Whole Child framework.* We will build the next Strategic Plan around this framework, which calls for students to be actively engaged in learning and connected to the school and broader community.
- *Profile of a Graduate.* These new state diploma requirements call for Virginia graduates to have acquired knowledge, skills, behaviors and capabilities that qualify as attributes of a career-ready student. As the standards become effective with first-time ninth graders in fall 2018, now is the time to correlate this study's findings with the Profile.
- *A2E (Aspire2Excellence).* Counselors, teachers, and students should consistently and effectively utilize this academic planning tool—from the early elementary grades through high school—to enhance students' awareness of the meaning and value of career exploration and the availability of CTE courses.
- *Arlington Tech.* Explore ways to promote this new Career Center program among students and their families and make it more readily accessible district wide. Emphasize the potential for earning college credits by dual enrolling in academic and CTE courses
- *Personalized learning.* Personalized learning empowers students to leverage technology and support learning through flexibility and choice while ensuring instruction and outcomes are connected to each student's unique talents, skills, and interests. The approach is pertinent to career exploration and readiness.

Career Exploration and Awareness of CTE Opportunities

RECOMMENDATION #1.

Explore and utilize opportunities within APS to increase awareness of and participation in CTE courses. Work with schools and departments to encourage career exploration opportunities for students in the classroom.

Address the finding that students reported varying degrees of familiarity with CTE courses and the ways the courses can fulfill credit requirements:

- Target communication about the CTE courses to school staff, counselors, students, and parents so that all stakeholders are aware of the opportunities and benefits.

- Work with the Student Services Office and school counselors to ensure that the academic plan process is fully implemented and incorporates discussion of students' career interests and opportunities.
- Explore ways to increase access to CTE options for all high school students, including online course options.
- Make student and counselor information resources, such as Naviance, accessible to CTAE.
- For both students and teachers, clearly connect related course planning events such as Transition Saturday and high school counselors' visits to middle schools.

Identify ways in which career exploration can be more regularly and meaningfully incorporated in instruction:

- APS should acknowledge differences in vocabulary and perceptions among students and staff regarding what "career exploration" means and why it is important, and make clear connections when it is part of instruction and academic planning.
- Provide students greater flexibility to take high school courses while in middle school, thus freeing up time in high school to explore careers.
- Embed opportunities for students to explore careers into the Whole Child plan.
- Prepare for the *Profile of a Graduate* standards (effective 2018-2019) so that APS graduates possess workplace skills and qualities, technical knowledge, and other life-ready attributes.

STAFF RESPONSE:
Staff has developed the following plan to promote career exploration as a component of each CTE class and increase student knowledge about CTE options. Career awareness information will be reviewed and shared with all stakeholders to broaden career awareness as noted below.

Action Plan for Recommendation #1			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
Explore and utilize opportunities within APS that increase awareness of and participation in CTE courses. Work with schools and departments to encourage career exploration opportunities for students in the classroom.	Develop a Communications Plan	Consistent communication message and media outlet	• Review present communication data • Meet with stakeholders to determine area of need • Meet with School and Community Relations to develop a communications plan
	Develop alternative course implementation options	Optional course delivery models	• Review online and alternative course options • Develop an optional course delivery system and pilot

Work-Based Learning

RECOMMENDATION #2.

Increase student knowledge of and participation in the positive experience of work-based learning opportunities.

CTE work-based learning opportunities provide a foundation that APS can build upon as it looks to provide more workplace and career opportunities for all students. CTAE should:

- Continue to work with Urban Alliance, Virginia Hospital Center Chamber of Commerce, and Linden Resources as well as other business and organizational partners.
- Follow up on business partners' suggestions to the program, such as increasing publicity, identifying areas for growth, taking steps to increase partnerships, and instituting processes such as having students complete a standard job application to ensure student interest and commitment.

STAFF RESPONSE:

Staff will continue to enhance the number of work-based learning opportunities for students. Communication to students and families about these experiences will also increase so more stakeholders know about these opportunities.

Action Plan for Recommendation #2			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
Increase student knowledge of and participation in the positive experience of work-based learning opportunities.	Enhance awareness of work-based learning opportunities	More students and parents will know about work-based learning opportunities	• Review information from the focus group to identify suggestions for communication. • Develop a marketing plan to enhance communication to stakeholders regarding work based learning experiences.
	Increase the number of work-based learning opportunities offered in CTE classes.	Increase the number of business partners that will provide work-based learning opportunities.	• Identify possible business partners in the different pathways and clusters. • Meet with businesses to develop a work-based learning model that works for them. • Develop an MOU for each business partner that will partner with APS.

Alignment with Workforce Needs

RECOMMENDATION #3.

CTE offerings align with many local job openings, required skills, and required certifications. An analysis of current workforce needs highlights areas for APS to consider for the future.

As we prepare to develop our next strategic plan, APS should look for opportunities to expand the variety of CTE offerings at each of the high schools. A review of workforce trends indicated potential for the following:

- Capstone engineering courses in high school
- Introduction to medical sciences
- Dual enrollment – getting both high school and college credit while in APS
- Increased flexibility of offerings
- More internship opportunities
- Change of focus from advanced coursework to Profile of a Graduate alignment

STAFF RESPONSE:

Staff will continue to review the program of studies offerings; update them according to future employment trends and student interest: and submit new offerings through the state approval process.

Action Plan for Recommendation #3			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
CTE offerings align with many local job openings, required skills, and required certifications. An analysis of current workforce needs highlights areas for APS to consider for the future.	Provide up-to-date CTE course offerings	Course offerings meet future employment trends	• Work with Advisory Committee to review POS and make recommendations • Work with WIOA Executive Director to identify future employment trends in the area
	Provide strong foundational skills in Creativity, Collaboration, and Critical Thinking	PBL lessons being implemented in CTE classes	• Embed Project-Based Learning throughout curriculum documents • Implement Project Based Learning activities once each quarter
	Implement	Increase credential pass rate	• Review course credentials regularly • Modify credential choices to stay current with industry needs

Note that data collection did not encompass coursework in departments outside CTAE. For instance, it does not capture the senior experience.

Quality of Instruction and Student Outcomes

RECOMMENDATION #4.

Explore effective ways to deliver and accurately assess higher-level questioning in CTE instruction.

Observations of CTE instruction show high levels of classroom organization, instruction that authentically models the world of work, and project/problem-based learning. Analysis and inquiry along with engagement in higher-level questioning stood out as areas for improvement.

STAFF RESPONSE:

Among the most important components of quality CTE instruction are creativity and innovation. Staff will look closely at this recommendation to promote ways to increase the analysis and inquiry within each CTE class as defined by the goals below.

Action Plan for Recommendation #4			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
Explore effective ways to deliver and accurately assess higher-level questioning in CTE instruction.	Increase Analysis and Inquiry being observed in CTE classes	Teachers are providing meaningful analysis and inquiry opportunities within the CTE class	• Identify best practice in higher order thinking skills in a CTE classroom • Provide professional learning opportunities to implement higher order think skills within CTE classes
	Determine an accurate way to assess higher order thinking skills in CTE	Use of a tool to identify higher order thinking skills in CTE	• Identify tools that will help observers see higher order thinking skills in the CTE class • Provide professional learning opportunities for observers to become more proficient at identifying higher order thinking skills
	Implement	Observe teachers providing higher order thinking opportunities to CTE students	• Share data and findings with teachers • Provide training for observers to identify higher order thinking in CTE classes. • Include examples of higher order thinking assessments and teaching and learning experiences in curriculum documents

Safety

RECOMMENDATION #5

Take steps to ensure that all CTE classrooms consistently follow appropriate safety procedures.

Although student safety is the number one concern of each CTE teacher, the goal of 100% safety compliance in every CTE class is not being met.

STAFF RESPONSE:

The CTE staff will use the following plan to accomplish the 100% goal.

Action Plan for Recommendation #5			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
Take steps to ensure that all CTE classrooms consistently follow appropriate safety procedures	Increase teacher safety compliance	Have 100% teacher safety compliance	• Determine teacher safety needs • Provide safety classes for CTE teachers each school year
	Implement	Observe teachers using proper safety practices	• Set up a standard observation cycle to visit all CTE labs consistently throughout the school year

Dual Enrollment

RECOMMENDATION #6.

Clarify the value of dual enrollment to students and families to enhance its attractiveness to a wider range of students.

While the percentage of CTE completers earning advanced studies diplomas has increased over five years, more males than females achieved this goal in the last two years. Substantial gaps also exist for LEP, economically disadvantaged, black, and Hispanic students as well as student with disabilities.

STAFF RESPONSE:

Staff will communicate with students and families about the dual enrollment opportunities that are available in the CTE classes.

Action Plan for Recommendation #6			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
Clarify the value of dual enrollment to students and families to enhance its attractiveness to a wider range of students.	Enhance awareness of dual enrollment opportunities available in CTE classes	Development of a marketing plan to increase dual enrollment awareness and value	• Meet with schools and community relations on a marketing plan.
	Increase dual enrollment opportunities at the Career Center and Arlington Tech.	More dual enrollment courses being offered	• Meet with teachers and local colleges to identify possible courses that could be dual enrolled. • Dual enroll identified courses and teachers.
	Work with underrepresented groups to enhance knowledge of dual enrollment	Enrollment increases in underrepresented groups in dual enrollment classes	• Present dual enrollment opportunities to underrepresented groups. • Enroll underrepresented students in dual enrollment courses and provide needed support for student success.

Non-Traditional Participation

RECOMMENDATION #8

Explore opportunities to increase "nontraditional" participation by boys and girls in specific CTE program areas.

This evaluation found a significant variation between boys and girls on several measures of both program implementation and student outcomes.

STAFF RESPONSE:

Staff has made a concerted effort to promote nontraditional enrollment in CTE courses. Nontraditional teachers have been hired, and afterschool opportunities to encourage nontraditional participation has helped in some CTE areas. More work is necessary as outlined in the goals below.

Action Plan for Recommendation #7			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
Explore opportunities to increase "nontraditional" participation by boys	Increase non-traditional CTE enrollment	CTE labs look more inviting to non-traditional students	• Review class projects to ensure there are non-gender specific options

Action Plan for Recommendation #7			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
and girls in specific CTE program areas.			• Review labs to identify ways to make labs more non-gender specific
		Non-traditional students see themselves reflected in CTE coursework	• Increase representation of non-traditional genders in community and business partners; e.g., mentors, guest speakers, etc.
	Increase Non-traditional students in the STEM areas	Enrollment increases in STEM classes and clubs	• Explore opportunities to encourage and facilitate CTE participation in CTE program areas in which specific genders are underrepresented • Provide more non-gender specific STEM activities
	Implement	Enrollment increases in Non-traditional CTE classes	• Set goals with teachers • Provide support to address lab issues • Work with teachers to develop non-gender specific activities

Resources: Utility of Data Systems

Recommendation #8.

Clarify goals related to CTAE data and develop an actionable data collection and reporting system that supports monitoring and implementation of CTAE programs.

The CTAE Office needs to rethink how it is using data resources, with the goal to limit the number of separate systems that teachers need to work with and thereby create a consistent approach for monitoring student progress, providing data for program oversight and teacher collaboration, and building state and federal reports from the same data systems.

CTAE is working with Information Services to:

- Identify reports that are:
  - mandated by APS, state, and federal reporting requirements
  - needed to ensure consistency in course content and delivery of instruction
  - useful for school staff to have for planning purposes
  - useful for central office staff to have for planning purposes
- Simplify data collection processes with the goal of reducing the number of "locations" teachers must enter data and generally easing the burden of data collection.

- Develop standard reports for use by central and school-based CTAE staff to address questions enumerated in first bullet.
- Develop capacity among staff that enter and access this data.

STAFF RESPONSE:

Staff has developed the following plan to address the findings and implement the above recommendations. Staff will present any necessary policy changes and/or budget requests as appropriate.

Action Plan for Recommendation #8			
Recommendation	**Goal**	**Measures of Success**	**Action Steps**
Clarify goals related to CTAE data and develop an actionable data collection and reporting system that supports monitoring and implementation of CTAE programs.	Identify relevant data needs of teachers and state reporting	Identified list of CTE data needs	• Review state and federal reports to identify state data needs • Develop a list of CTE data to inform instruction • Identify standard reports that are needed
	Reduce data entry locations	One data entry system that collects and reports needed data	• Review data needs with IS • Identify missing data points • Develop an input system with IS
	Implement	Data collection system that meets the teachers' needs and the CTE office reporting needs	• Implement systems in Synergy • Develop reports that are identified as needed • Train teachers and staff to use system