Reimagining and Elevating the Value of Apprenticeships in Secondary Schools

A Case Study of the Charlotte-Mecklenburg Schools Advanced Manufacturing and Engineering Youth Apprenticeship Program

AASA The School Superintendents Association and
Booz Allen Hamilton:
Apprenticeship Outreach, Content Development and Dissemination, and Thought Leadership for Secondary School Administrators

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INTRODUCTION

Social media, news outlets, as well as educational and business leaders are sounding alarms about the astounding levels of student loan debt facing many recent college graduates. There is also a growing recognition of economic inequalities facing many U.S. citizens, the lack of alignment between college majors and available employment pathways, and a dramatically changing workplace in the process of being transformed by technology and artificial intelligence. This powerful combination of competing forces has resulted in a national dialogue about re-imagining the organization, structure, and purpose of high school—and reshaping the way it prepares our students for success in both 21st century post-secondary education and the rapidly transforming world of work.

In response to these issues, AASA the School Superintendents Association is developing a comprehensive program to engage secondary school administrators in exploring the benefits of youth apprenticeships. This program will provide district and school leaders a combination of subject matter expertise, advisory services, stakeholder management, and communications support to highlight the benefits of apprenticeships. It will contribute to the development of a national knowledge base that grows secondary educators' ability and willingness to engage with the apprenticeship ecosystem, including: (1) a comprehensive toolkit involving case studies in both written and video formats; (2) a process for beginning and sustaining apprenticeships; and (3) a rich set of related resources for use with professional development.

This work is undertaken as part of Booz Allen Hamilton's (BAH) youth apprenticeship awareness engagement with the Department of Labor's Office of Apprenticeship. AASA is committed to supporting BAH's responsibility to develop partnerships with organizations reaching education administrators to ensure the scaling of apprenticeship programs in alignment with local, regional, state, and national workplace priorities. Specifically, AASA is helping to fulfill the Department of Labor's requirement to build and distribute content to populate the educator section on **Apprenticeship.gov** to increase educators' access to information to foster the next generation of apprenticeship programs.

This initial case study provides a detailed introduction to the concept of apprenticeships as an ecosystem designed to support the preparation of participating students for a variety of career pathways while ensuring their success in post-secondary education. This first case study explores the Advanced Manufacturing and Engineering apprenticeship program at Olympic High School, an award-winning initiative that is part of the Charlotte-Mecklenburg Schools Career and Technical Education (CTE) Program. It includes a discussion of the importance of apprenticeships and a detailed analysis of how the Olympic High School program aligns with best practices in this field. The case study concludes with a set of suggestions for beginning and sustaining state-of-the-art apprenticeships. Administrators and community leaders can use these suggestions to begin or assess apprenticeship programs in their respective schools and districts.

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A Case Study of the Charlotte-Mecklenburg (NC) Schools Advanced Manufacturing and Engineering Apprenticeship Program

Part One: *The Importance of Apprenticeships in 21st Century Education*

Apprenticeships have the capacity to become a game-changing part of students' high school experience. They combine on-the-job training in a variety of career pathways while offering students opportunities for college/university credit during their high school and post-secondary years. The corporate and business leaders in Charlotte-Mecklenburg, North Carolina, are unanimous in their need for highly skilled individuals to fill the high-tech positions they are offering—but which often go unfilled because of candidates' lack of 21st century skills and prior experience in needed specialty areas.

This case study explores the essential components (i.e., the "apprenticeship ecosystem") of an award-winning apprenticeship offered by Charlotte-Mecklenburg Schools (CMS), the Olympic High School Advanced Manufacturing and Engineering apprenticeship program. We begin the study with answers to the following essential questions:

- What is an apprenticeship?
- Why do many educators and business leaders consider apprenticeships an "idea whose time has come"?
- What are the benefits of apprenticeships being an essential part of public school students' education today?
- What are the key elements of a successful apprenticeship "ecosystem"?

What Is an "Apprenticeship"?

When the AASA team visited Charlotte-Mecklenburg Schools to learn about the Olympic High School Advanced Manufacturing and Engineering Youth Apprenticeship Program, team members were startled by what they saw 17 and 18-year-olds doing—from using a complex computer-driven crane system to lift a multi-million dollar seal onto a $150

million dollar turbine to using complex blueprints to using a range of engineering skills to design high-tech manufacturing resources.

The capacity of these young people—under the careful guidance and support of highly skilled on-site mentors and coaches—reinforces the power of youth apprenticeships to provide meaningful career preparation while empowering students to develop a range of 21st century academic and workplace competencies (e.g., technical skills, communication, self-presentation and self-regulation, creative problem solving and critical thinking, and collaboration as part of a site-based team).

Youth apprenticeships combine classroom instruction and on-the-job professional experiences, allowing students (typically during their eleventh- and twelfth-grade high school years) to pursue a significant career pathway, earn a salary while being mentored from experienced mentors and coaches, and learn in an experience-based and "blended" setting (combining formal classwork with highly structured workplace experiences leading to potential career options in the chosen pathway).

In comparison to other work study options such as internships, youth apprenticeships allow participating students to remain with a business, corporation, or other organization for two years and beyond. Many of the apprentices interviewed for this case study went on to enjoy lucrative and productive careers in the organization in which they studied and worked, including opportunities for college credit through Central Piedmont Community College (leading to an Associate's Degree complementing their workplace career skills and knowledge).

For educators interested in developing an apprenticeship program in their district, it is useful to consider key recommendations and requirements established by the U.S. Department of Education:

1. Focus on High-Yield, High-Needs Career Pathways Benefiting the U.S. Workforce: Youth apprenticeships ensure that career development programs align with state and local workforce system needs. They result in workers who are highly skilled and productive with access to stable careers. Currently, the U.S. Department of Labor emphasizes a range of high-yield, high-needs employment areas aligned with youth apprenticeships, including Advanced Manufacturing, Construction, Energy, Finance and Business, Healthcare, Hospitality, Information Technology, Telecommunications, and Transportation.

2. Evidence-Based Benefits to Students: The U.S. Department of Labor reinforces multiple benefits of youth apprenticeships for students, including hands-on career training; improved skills and competencies related to success in both career and post-secondary settings; career decision-making and preparation focusing on career growth areas, competitive salaries, and freedom from tuition debt. Successful youth apprentices also earn a certified portable credential(s) accepted by industries and employers throughout the United States.

3. Benefits to Federal, State, and Local Governments: The economies of these jurisdictions benefit significantly from successful youth apprenticeships, including sustained technical assistance and support to improve the workforce; national credentialing reinforcing national industry-recognized standards; tax credits available in many states for employers participating in apprenticeships meeting federal guidelines and standards; and access to federal resources, including funding from many federal programs specifically designed to sustain and scale apprenticeships in high-yield, high-needs employment areas.

Apprenticeships as an Idea "Whose Time Has Come" in 21st Century Education

The old adage "Nothing is so powerful as an idea whose time has come" has a powerful and profound application to youth apprenticeships. Business and corporate leaders as well as educators, students, and parents interviewed for this case study universally agree that successful apprenticeships can transform students' view of themselves, prepare them for career pathways about which they may have no initial understanding or affinity, and greatly expand the pool of highly skilled workers. The latter is especially significant in light of the multiple unfilled positions in advanced high-tech fields, including cybersecurity, advanced manufacturing, and engineering.

According to Robert L. Lerman (Emeritus Professor of Economics at American University) in his study "Apprenticeships: Helping Youth Develop the Skills Needed by Today's Employers": *Policy makers are searching for ways to deal with the erosion of middle-class jobs and the highest rates of youth joblessness since the 1950s…For decades, the transition from school to career has been challenging for youth…Apprenticeships are distinctive in meeting both the supply side and the demand side of the labor market. When robust apprenticeship systems are in place, youth learn employability skills for rewarding careers, youth unemployment is kept low, the state's productivity is kept high, and employers are ensured a workforce with strong technical and employability skills.*

Finally, the importance and potential of youth apprenticeships are already clearly evident in many European countries, including Austria, Denmark, Germany, Australia, and England. In these countries, students begin their apprenticeships during their late high school years and over a three-year period, combine work-based learning with classroom study in public career schools. Unlike many of these countries (e.g., Germany, where 3.7 to 3.9 percent of the total labor force participate in apprenticeships), only 0.3 percent of the labor force in the United States has participate in some form of apprenticeship.

The Benefits of Apprenticeships as an Essential Part of Students' Education in a Change-Dominated and Technology-Driven World

In addition to clear benefits to employers, the workforce, and the economy, youth apprenticeships offer a powerful alternative for students hungry for engagement, authenticity, purpose, and a sense of self-actualization. As cited in The Abell Report (April 2015), "Apprenticeship combines classroom-based vocational education,

structured work-place learning, and paid work and production to help youth master an occupation." Why are these outcomes—and the overall youth apprenticeship experience—such a significant addition to students' educational options? They reinforce powerfully the latest research in neuroscience, cognitive learning theory, and project-based learning:

1. A successful youth apprenticeship program reinforces students' capacity for developing and applying a range of higher order reasoning skills, including critical thinking, creative problem solving, and analysis.

2. The experiential learning approach evident in both classroom preparation courses and on-site apprenticeship work experiences address students' innate need for high levels of engagement, multi-sensory learning options, growing levels of independence and autonomy, and self-efficacy.

3. Effective apprenticeship programs reinforce what has been called the "gradual release of responsibility" learning continuum. Specifically, students learn best when they receive initial modeling and coaching to develop requisite knowledge and skills—and then participate in growing levels of independent application and self-guided performance.

4. Youth apprenticeships address the wide range of skills, competencies, and dispositions referred to by federal and state governments as the "Portrait of a 21st Century Graduate." These include the capacity to work successfully as a member of a group; communicate in written, spoken, and multi-media formats; acquire and apply a range of advanced technology skills and competencies; and a capacity for self-directed work leading to clear outcomes and goals.

5. The apprenticeship experience is powerfully aligned with growing national emphasis upon "personalizing" the learning experience for students. Small classes that students experience in their pre-apprenticeship coursework universally emphasize project-based learning, cooperative learning, and ongoing coaching and mentoring by the instructor. On-the-job work experiences also stress the importance of clear professional tasks, orientation and sustained on-site professional learning, and continuing coaching and feedback provided by on-site mentors and coaches (with clearly articulated performance-based evaluation criteria).

Key Components of a Successful Apprenticeship "Ecosystem"

One of the most powerful recommendations the AASA team discovered in its visit to Charlotte-Mecklenburg was the concept of the apprenticeship "ecosystem." Specifically, a powerful and effective apprenticeship requires an organic blending of structures, systems, policies/regulations, and professional development to begin—and to sustain itself.

Successful apprenticeships offer students a constellation of interconnected support services and interventions. They provide students with multiple post-graduation options, including college enrollment, entrance to an adult apprenticeship program, commencement of full-time work in the context of a career pathway, or a combination of these opportunities. This "ecosystem" involves several very clear and universal requirements for its success, sustainability, and scalability:

1. A Clear Template or Model for Apprenticeship Design: An essential component of the successful youth apprenticeship is alignment between students' academic experience and industry workforce needs. Schools and districts considering implementation of an apprenticeship have a range of design options, including programs organized at the state, regional, or local level. All public apprenticeships must align with Department of Labor requirements, mandates, policies, and regulations.

2. Effective Curriculum and Instruction: The learning paths, skills, and competencies reinforced within a youth apprenticeship require a clear, coherent, and aligned curriculum and course of studies validated by the school district, high schools and colleges, and participating business and organizational partners.

3. Meaningful and Effective School-Based Personnel and Expectations: Successful apprenticeship programs such as the Olympic High School Advanced Manufacturing and Engineering program have highly skilled and committed personnel, including a program coordinator, guidance counselor, and a principal and administrative staff responsible for ensuring viable program and policy implementation. This part of the apprenticeship ecosystem also involves clear and sustained support, resources, and oversight by central office personnel, including the district's Career and Technical Education Director.

4. Meaningful and Multi-Faceted On-the-Job Learning: Participating businesses provide students with supervision and mentoring designed to reinforce learners' successful mastery of key skills and technical requirements, capacity for high quality task completion, and orientation to the organizational culture and expectations of the business and the industry it represents.

5. Involvement of Key Partners: Business and corporate partners are essential for ensuring an effective apprenticeship. These individuals and groups provide ongoing feedback and recommendations concerning their needs for future employees, the range of technical and workplace skills required for a specific career pathway, and ideas for curriculum design.

6. Parent Support and Understanding: Effective apprenticeships require that parents and guardians understand the potential benefits and requirements of an apprenticeship. Involving parents and guardians is an essential pathway for encouraging student participation and exploration of potential career pathways. The ecosystem, therefore, must provide a range of information sessions,

orientation options, and counseling services—which should begin at the middle school in a formal sense and at the elementary level via career exploration activities for younger students.

7. Student Engagement and Knowledge: The learner, of course, is the heart and soul of an effective apprenticeship. Like parents and guardians, students should receive an introduction to the value and potential impact of apprenticeships as a viable educational option for them. Counseling and educational services should begin in students' elementary school experience, including investigations of potential career options and related educational requirements to pursue that pathway. At the middle school level, students should receive even more intentional and purposeful counseling and support for investigating their future career and educational options, including orientation to the possibilities and requirements of an apprenticeship.

8. College and University Partners: Many successful apprenticeships offer students the option of earning post-secondary education credits for coursework taken as part of the apprenticeship experience. In Charlotte-Mecklenburg, for example, Olympic High School Advanced Manufacturing and Engineering students can earn multiple college credits (via Central Piedmont Community College) while working in their business site. Typically, the credit- and degree-granting site works closely with industry leaders to ensure close alignment between the college courses students take and the workplace technical skills required for their on-site success.

9. Additional Program Supports: A range of supports will ensure that an apprenticeship ecosystem is viable and sustainable, including: (a) programs to develop educator awareness and commitment; (b) effective recruitment practices; (c) clearly articulated orientation and screening criteria; and (d) industry-recognized credentialing (once again, reinforcing the need for a rigorous, aligned, and cohesive program of studies and on-the-job training experiences for the apprentice).

Insights About the Olympic High School Youth Apprenticeship "Ecosystem": Reflections from Key Stakeholders

1. **Rod Gavin (Chair, North Carolina Apprenticeship Council and Former Co-Chair, State Apprenticeship Council Alliance):** "Technology is one of those areas that is becoming much more skills focused, much more about the skills and experience and the right certification vs. necessarily having a degree. Just based on where we have been for the past several decades, degrees still have a lot of value. But increasingly, it's about what the degree is and represents. That's the part of the conversation, as an alliance, we still have chamber roles and responsibilities. We're in the economic development world, so we're focused on recruiting businesses, supporting the growth of businesses that are here, working to retain businesses as much as possible.

   Talented workforces really become a driver. We look at it as being intricately interwoven with economic development. It's becoming the primary reason for why a company decides to move to a new market, to a new area, whether or not they want to grow there, whether or not they decide to stay there. So it's really become the linchpin of development and public policy. Decisions are really being made based on talent and workforce. Can I get the people that I want an need in the county, in the region, where I'm doing business? Because that's much more cost effective. Yes, lots of big companies can recruit talent from all over the world. And they'll continue to do that. But they want the majority of their workforce to come from the immediate community."

2. **Superintendent Clayton Wilcox: "**In our effort to improve as a school system, I think what we've learned is that we have to prepare our kids for the world that they face so the concept of youth apprenticeships is for us is an issue of economic mobility. We believe that having our kids prepared for a career will also allow them to perhaps move on to college or university and not shoulder that heavy debt that sometimes is associated with going to college. So for us, it's really an important equity tool."

3. **Principal Erik Olejarczyk:** "At Olympic High School, we are approximately 50% free and reduced lunch here. What interests me as an educator is to ensure that we are putting our children in a situation where they can reach their full human and economic potential. When you look at the data and the statistics for the majority of college graduates, we're not necessarily meeting the needs of everybody. The apprenticeship programs we offer are an alternative pathway for our children where we have literally seen families transcend social gaps and experience positive social mobility."

4. **Michael Raelon (Program Coordinator):** "We try to help parents understand that the apprenticeship program that is really a vehicle for upward economic and social mobility. We try to help them understand what's going on in the real world today.

Millennials are the most educated generation, yet half of them with college degrees are unemployed or underemployed. Today in Charlotte there are 50,000 unfilled technical jobs, most of them don't require four-year degrees. In the grand scheme, when we know that there are so many jobs of opportunity that deal with the advanced manufacturing industry that are technical related jobs, that kids can earn a ticket into the middle class while they're in high school. It really provides them the opportunity to experience upward economic and social mobility and helps them identify what degrees and licenses and certificates actually have any value today in a 21st century global economy that's wrapped around technology."

5. **Kelly Trainor (Central Piedmont Community College):** "From our perspective, the purpose of the youth apprenticeships is to align students and education with what's needed in the work force and the trends that are developing in it. Its purpose is to help connect students with industry. While it's similar to other work-based learning programs such as co-op and internships, it goes a lot further because it offers a paid experience for program participation and a clear structure set up for students to succeed in a career pathway. One of the key parts of the apprenticeship that a lot of people seem to forget about is that apprenticeships are employer and industry based. That industry helps identify the skills that are required and collaborate on any kind of training plans. They're involved with delivering paid on-the-job training experience."

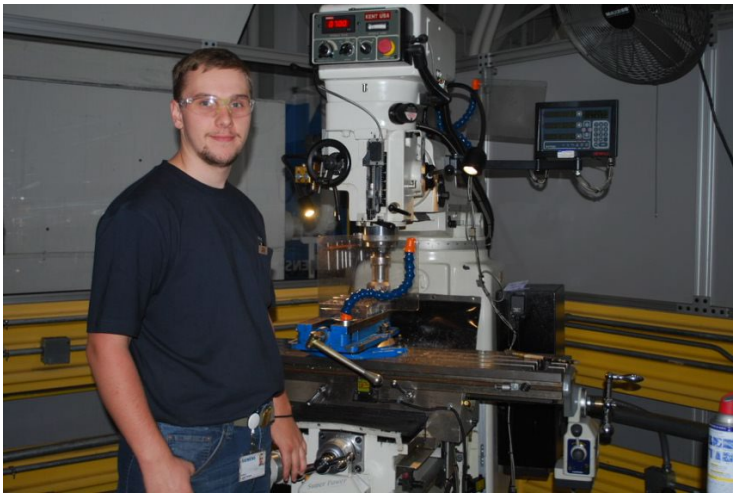
6. **Nathan Mundo (Student):** "The apprenticeship has really helped me get excited about learning. The thing that I've done here that's gotten me really, really excited, was seeing how my work affects the people using it. When I work on a lot of things, I don't really see how it affects users. But when I get a project that I had to do myself involving a very important part of our software, I took a while. But when I got that done I knew that everybody was seeing it, everybody was using it, everybody was benefiting from it. That gave me a lot of pride. It made me really happy."

7. **Kim Gregory (Parent): "**We were pulled into the apprenticeship program and saw the value of Olympic through the diligence of a guidance counselor there who was willing to say, 'Look, we've got to have some way of really making a broader connection for these kids who don't even know why they're going to school. They're just going because they know they have to go. And we need to bring the awareness to them that times are different compared to coming up under the Baby Boomers or the generation after the Baby Boomers. We had a little bit more time to figure it out, what we wanted to be when we grew up, but the competition has changed. We're a global economy, we're a global communications world. You've got to be able to communicate with someone in another country within minutes."

Study Group Suggestions:
How Are Your Building Your Apprenticeship Ecosystem?

Guide Questions	Ideas and Recommendations
1. How does your study team define the term "youth apprenticeship"?	
2. How would you explain the growing importance of apprenticeships to your staff, students, and parents?	
3. In your opinion, who are the students who might benefit the most from an apprenticeship?	
4. To what extent do the apprenticeship(s) currently available in your school or district align with the recommendations in this section?	
5. Are there recommendations your team might make for improving your apprenticeship ecosystem?	

<u>Part Two</u>: *An Exemplary Apprenticeship "At-a-Glance": Olympic High School's Advanced Manufacturing and Engineering Program*



The Olympic High School Advanced Manufacturing and Engineering program is an award-winning career pathway academy designed to teach students about manufacturing processes, product design, robotics, and automation. Its course sequence includes an Introduction to Engineering Design, Principles of Engineering, Computer Integrated Manufacturing, and Engineering Design and Development.

On-site experiences involve training and career development in a range of Advanced Manufacturing and Engineering companies, including Siemens, Chiron, Hyde Park Partners, and Yaeger Industries. In addition to powerful preparation for a career in Advanced Manufacturing and Engineering, successful students receive CPCC Articulated Credit and college credit via Central Piedmont Community College. This introductory section provides an overview of the program focusing on the following essential questions:

- What is the Olympic High School Advanced Manufacturing and Engineering Apprenticeship Program?
- Who are the students participating in this program?
- What are the success factors that make this program an award-winner?
- What is the significance of career pathways? How does this program relate to the other career pathways addressed at the school?

An Introduction to Charlotte-Mecklenburg Schools and Its Commitment to Career and Technical Education

Charlotte-Mecklenburg Schools (CMS) is located in the Charlotte, North Carolina region and provides instruction to more than 146,000 students in kindergarten through 12th grade in 170 schools throughout the cities and towns of Mecklenburg County. Its student

population represents 160 different countries and a range of cultural and ethnic backgrounds. The district offers a range of magnet programs in 37 of its schools. Its staff includes more than 18,000 teachers, support staff, and administrators. Its 175 schools include 31 high schools, 46 middle schools, and 95 elementary schools, as well as three alternative schools.

The school district's Career and Technical Education (CTE) programs are extensive and reinforce students' early career discovery and skill development in a wide variety of hands-on courses. CMS offers 19 career pathway options in CTE. The program's mission is "to maximize academic achievement by engaging middle and high school CMS students in rigorous and relevant learning to prepare for post-secondary education and careers." Briefly, the design principles of the CMS CTE program include the following:

1. **Discover:** While still in middle school, CTE allows CMS students to begin to explore their career interests. A variety of career fields called "pathways" are offered in high school to help students with the 21st century skills needed for a global economy.

2. **Unleash:** Sequenced CTE career pathway courses give CMS high school students the framework to begin to move toward their career goals. They have extensive opportunities to receive industry-recognized certifications, earn credits toward post-secondary degrees, or begin their careers after graduation.

3. **Soar:** This phase involves a commitment to ensuring that CMS students are prepared for higher-level courses in college as well as a wide range of high-wage, high-skill, and high-demand careers. The variety of apprenticeships offered at high schools throughout the district reinforce this commitment.

An Overview of the Olympic High School Advanced Manufacturing and Engineering Program

Olympic High School is located in a southern region of the direct that is becoming a major hub for manufacturing and engineering. Its Advanced Manufacturing and Engineering program represents an awarding-winning example of the high school's focus on supporting a variety of "small learning communities" within its campus. The school's personalized approach emphasizes a range of 21st century skills, including (1) critical thinking and problem solving; (2) creativity and innovation; (3) communication verbally and in writing; (4) collaboration and teamwork; and (5) social-emotional development, including a range of non-cognitive abilities.

The school offers six career pathway programs, including Advanced Manufacturing and Engineering, Architecture and Engineering, Biomedical Exploration, Carpentry, Software Development, Business Management, and Culinary Arts and Hospitality. The Advanced Manufacturing apprenticeship program offers a combination of in-school and on-the-job experiences. Its primary focus is on manufacturing processes, product design, robotics,

and automation. The geographic corridor in which the school is located is becoming a major manufacturing and engineering hub within the region, with business and corporate sponsors of apprenticeships that include the following companies:

1. **Siemens:** A global corporation focusing on electrification, automation, and digitalization. It is one of the world's largest producers of energy-efficient, resource-saving technologies. The company is also a leading supplier of power generation and transmission as well as medical diagnosis.

2. **Chiron:** This multi-national group specializes in high-speed, precision-focused automated vertical machining centers, providing machining of complex workpieces at minimal costs. It also provides comprehensive services and digital support for optimal machine operation.

3. **Groninger USA:** This global manufacturing corporation specializes in high-precision filling and closing machines, including machine solutions for manufacturers of pharmaceutical, consumer healthcare, and cosmetics products.

4. **Livingston and Haven:** This company is a leading industrial technology provider in the Southeast, specializing in providing solutions in the automation, hydraulic, pneumatic, lubrication, and connector industries.

A Student Profile: Who Participates in This Apprenticeship Program?

Students who enter this apprenticeship program demonstrate a high degree of interest in career pathways involving manufacturing and engineering. Typically, they display a high degree of spatial and mechanical intelligence and enjoy learning experiences that are experiential, hands-on, authentic, and purposeful. Entrance includes certain course requirements (e.g., advanced mathematics, science, written communication) and a minimum 2.5 GPA. Students also must complete a program application form and have parental consent. The Advanced Manufacturing and Engineering career pathway requires students' successful completion of the following program sequence:

1. **Course Sequence:** Introduction to Engineering Design, Principles of Engineering, Computer Integrated Manufacturing, and Engineering Design and Development.

2. **Attainment of OSHA Industry Credentials**: 10 hours aligned with Occupational Safety and Health Administration standards.

3. **Central Piedmont Community College Articulated Credit:** In addition to Computer Integrated Management/MAC 121 Introduction to CNC, students have the option during later years in their apprenticeship to complete an Associate Degree in Engineering, emphasizing engineering technology.

4. **Satisfactory Feedback and Evaluations from On-Site Mentors and Program Coordinator:** Many of the students in this apprenticeship program become full-time staff members in their designated apprenticeship organization.

Highlights of Success Factors Making the Program an Award Winner

The leaders of the Advanced Manufacturing and Engineering program are in agreement about key elements of the Advanced Manufacturing and Engineering program that have gained it powerful national recognition, including Distinguished status awarded by the National Academy Foundation (NAF). Leaders interviewed for this case study cited four recurrent themes associated with program quality and sustainability:

1. **The Power of Internal and External Oversight and Cross-Organizational Teaming:** As suggested previously, the apprenticeship ecosystem evident in the program involves multiple stakeholder groups, cross-functional teaming, and both internal and external oversight. Quality control is a powerful tool used to ensure that curriculum is updated to align with changing pathway standards, professional learning (both in-school and on-site) is recurrent and consistent. There is also continual monitoring of student progress, including feedback from district, school-based, and on-site mentors and leaders.

2. **The Power of Credentialing:** Students complete the apprenticeship program with a wide-ranging set of credentials, including the required 10-hour OSHA certification and additional advanced certifications extending from on-site and college credit experiences (supported through the partnership with Central Piedmont Community College).

3. **Making Curriculum and the Teaching-Learning Process Aligned, Cohesive, and Highly Intentional:** District, school, and on-site leaders were unanimous in the power of curriculum and instruction that is experiential, focused on real-world problems and decision making, aligned with national and international standards within the career pathway, and engaging for the learner. The entire curriculum implementation process involves a continual feedback-adjustment looping process in which continual review of student performance and achievement of standards-based outcomes results in an educational experience that is aligned, cohesive, intentional, and student-centered.

4. **Economic Benefits to Students, Parents, and Participating Companies:** This component is perhaps the most consistently cited benefit of the apprenticeship program cited by virtually all individuals interviewed. This component encompasses direct benefits and services to students (and their parents/guardians) related to enhanced career pathway access, related salaries, and the opportunity to earn an Associate's Degree while the student is being paid for on-site work. Leaders and mentors in every participating company or corporation cited the economic gains resulting from firms helping to develop and hire local talent, expanding the pool of qualified and technically proficient entering workforce participants.

Insights and Reflections from Leaders
About the Benefits of Apprenticeship Experiences

1. **Principal Erik Olejczyk:** "We operate under the National Academy Foundation (NAF), which essentially assesses the work that we do, and our first goal was to have all five academies reach the highest rating, which is Distinguished. We had three out of the five. The second smart goal was that we have 50% of our graduating class receive industry credentials. The third one was that every kid in our campus, all 2,600 would have some type of a work-based experience…We are only the second school in the entire country in the 30, 40 years that NAF has been in existence to have all five academies to be Distinguished. We blew away the second smart goal. We have 83% of our seniors that have received industry credentials. I say that to say we felt like that was the foundational work that we needed to do…This is the first time in Olympic's history that 83% of our seniors, which is 511, are receiving industry certifications or credentials. And that went from 155 two years ago to 281 last year. So it's been exponential."

2. **Kelly Trainor (Central Piedmont Community College):** "Employers are really responsible for helping us define, deliver, and document any kind of learning that's taking place. Similarly, high school counselors and other staff help to ensure that students are meeting their graduation requirements if they're in a youth apprenticeship program. Then attached to that as well, a third part of this are the post-secondary institutions that deliver college-credit education aligned with the apprenticeship focus area. This is a balancing act that needs to occur within higher ed, because with these apprenticeships we have to be conscious that companies aren't just training very specifically for their own particular training needs. We want to be sure that students are getting a broader based education so that they are ready for the work force in a more general sense. Really, we want to make sure we're not just focused on training but actually educating students."

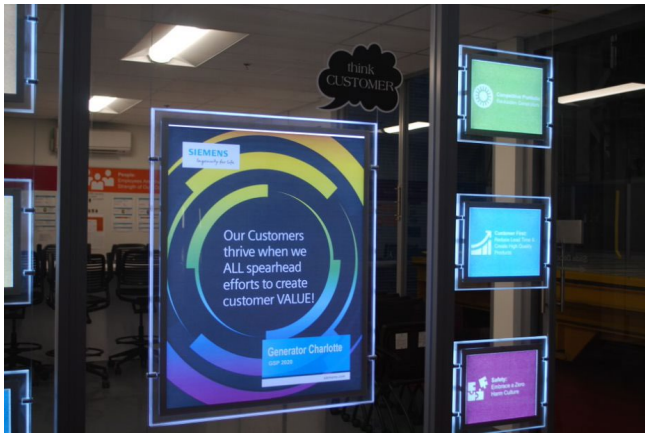
5. **Principal Olejarczyk:** "What we're hearing and what we're being intentional about is incorporating career development and rigorous industry standards into our curriculum. Because again, we want to close the gap. We want to close the deficit. We've known for so many years now that a lot of the focus nationally has been on test scores, test prep, things of that nature. And we know that ultimately that doesn't necessarily create adults who are ready for the real world. So we've shifted our focus to include the social emotional components, social skills, soft skills, and resiliency. When you see apprenticeship projects around here, we have the Habitat House that we'll be building with construction. We're building sheds where these truly are projects that align with what these children would be doing outside of school, so giving them that skill set that makes them more employable from the children's perspective, they are able to receive lucrative employment.They're getting paid while they're in class, they're getting their tuition paid for. They're going to come out of high school making 40 to $50,000 a year with tremendous opportunity for advancement. They're going to come out debt free."

6. **Susan Gann (CTE Director):** "For an advanced manufacturing, generally employers are investing, once you're in the apprenticeship program they're investing about $150,000 into that apprenticeship. So what I have likened that too is a scholarship. That has been the language that I think has been missing in helping leadership understand and helping our teachers understand, and most importantly our counselors understand. Because the counselors are the ones who typically don't have a whole understanding of why that should be promoted as equally as a four-year degree."

Study Group Suggestions:
What Can You Adopt or Duplicate from the Olympic High School Advanced Manufacturing and Engineering Program?

Guide Questions	Ideas and Recommendations
1. What does your study group consider to be the most important or impressive aspects of this apprenticeship program?	
2. As you reflect upon students in your own school or district, who might benefit from participating in an apprenticeship like this one?	
3. To what extent do you agree with the list of potential benefits of apprenticeships like the one presented in this case study?	
4. As you discuss the reflections from program leaders, which ideas and statements seem especially significant to you? Why?	
5. How might you share key components of this case study with other staff in your school and district?	
6. How might you introduce key concepts and recommendations to business and corporate sponsors in your area?	

<u>Part Three</u>: *Leadership in Action: Insights from Program and Business Leaders About the Olympic High School Advanced Manufacturing and Engineering Program*



Leadership at the school and district levels is essential for an apprenticeship program to succeed. In this section of the case study, we share insights and recommendations from CMS leadership related to what makes the Olympic High School program so successful. From the Superintendent to the school principal and program coordinator, there is universal acknowledgment that apprenticeships can transform students' sense of themselves, their preparation for post-secondary work experiences, and sense of personal efficacy, self-regulation, and aspirations for career success and life-long learning. We frame this exploration of program leadership through the following essential questions:

- What can educational and business leaders tell us about implementing, sustaining and scaling successful apprenticeship programs?
- How do district, school, and business leaders support students' development of 21st century workplace readiness skills?
- To what extent is a successful apprenticeship program an kind of ecosystem?

Leading an Effective Apprenticeship Program: Insights from School-Based, District, and Business Program Leaders

Effective leadership begins with a clear and sustainable vision. CMS Superintendent Clayton Wilcox puts it this way:

> "So you know, this apprenticeship program is powerful in a number of ways. But what I would say to any leader across the country, if you want to give your kids the opportunity to have mobility in terms of their future, to move beyond their current circumstance, the apprenticeship program is absolutely the way to go. Give your kids the tools to be successful now, so they can apply those tools, and then perhaps take their career to a place they've never even dreamed it would go."

All of the district, school-based, and business leaders interviewed for this case study were unanimous in supporting this vision. They are mutually supportive of apprenticeships as catalysts for transformation in the lives of students engaging in them. In spite of the range and diversity of roles and responsibilities, the program and business leaders we interviewed shared the following insights about effective leadership in the context of apprenticeships:

1. **Effective Leaders Share a Common Dedication to the Vision, Long-Range Goals, and Benefits to Students of the Apprenticeship:**

   The vision of the program is clear. It leaders universally acknowledge the importance of making learning come alive for students—and the power of aligning classroom and on-the-job learning experiences. Long-range goals are shared by participating organizations, although there may be variations in on-site design resulting from the corporation's focus and apprenticeship model. Perhaps most significantly, leaders reinforce the recurrent theme that effective apprenticeships are mutually beneficial for students, their parents, and the community/region. Leaders revisited multiple times the economic benefits to students (building significant career preparation skills and aptitudes while relieving them of tuition loan indebtedness) and to the participating businesses sponsoring apprenticeships (ensuring that they expand the pool of local and available workers capable of prospering in a demanding and technology-driven workplace).

2. **Program Leaders Are Committed to Collaboration and Ongoing Quality Control:**

   Leaders of the program support the notion that collaboration combined with high levels of standards-driven quality control are essential for program effectiveness and student academic, professional, and social-emotional growth. The worksites we visited use a team-based model in which there is consistent evidence of shared decision-making, problem-solving, and creative innovation. Student apprentices become an integral and positive part of these work teams. Additionally, they all have site-based mentors with extensive technical experience and knowledge; these mentors function as coaches, support systems, and advisors to apprentices, many of whom are experiencing a professional setting for the first time.

   Quality control is also essential at the district, school, and apprenticeship site levels. Industry standards are carefully integrated into the school-based curriculum, with project-based learning reinforcing students' development of skills and competencies necessary for on-site success. Similarly, a Total Quality Management approach is evident in all of the businesses we visited, with a clear commitment to project management with clearly articulated roles, deadlines, deliverables, and performance criteria.

3. **Exemplary Apprenticeship Leaders Are Purposeful and Effective Change Agents:**

   The 21st century workplace is undergoing tremendous transformation in light of continuing breakthroughs in a variety of technologies and professional expertise. Leaders of the CMS Advanced Manufacturing and Engineering program were all consistent in underscoring the need for change facilitation as an essential part of program leadership.

   The school district and school are aligned in terms of their strategic planning goals and processes. Similarly, each of the sponsoring sites is committed to updating its approaches, programs, and practices as industry standards change and expand to encompass technological and related factors of transformation.

   The apprenticeship program reinforces the idea that change is a consistent and unavoidable process. Leaders must see into the future and articulate their vision for where the district, school, and business are heading. As change agents, apprenticeship leaders are clear that they must continually engage and involve all stakeholder groups, keeping them informed about changing standards, expectations, and structural modifications needed for program improvement, scalability, and sustainability.

Building and Sustaining Workplace Readiness Skills

Effective apprenticeships require that leaders at all levels and locations reinforce common outcomes. Specifically, successful apprenticeships build and sustain students' workplace readiness skills while preparing them for a range of other post-secondary options. As program coordinator Michael Raelon states:

> "The greatest benefit I think for kids is relevancy and authenticity with what they're doing. They're getting to connect the dots between what's going on in classrooms and its relevancy in the real world. Plus, you know, within our experience, we believe in making kids who are career and college ready so most of them don't have any background or context to understand what jobs are even out there today."

Program leaders revisited many times the importance of students' technical proficiency and skills, including acquiring, integrating, and applying industry-based performance standards in authentic projects and professional tasks. They were also very clear that there are universal expectations about what constitutes a successful 21st century worker, what many refer to as "soft skills." These included repeated statements about the value of the following:

1. **Communication Skills:** Leaders (as well as parents and classroom educators) emphasized how important—and frequently underdeveloped—many students' communication skills may be. These include a need for apprentices to write clearly, coherently, and with evidence to support claims and assertions. They must

also be able to present ideas and proposals in a variety of formats, including technology-based ones. Finally, leaders were universal in their acknowledgment of the need for workers to be active listeners who can follow, paraphrase, and respond to the input and assertions of others.

2. **Collaboration and Team Participation Skills:** Program leaders also value students' ability to engage in collaborative tasks involving a range of participating team members. They must use their communication skills to engage in team activities, including clearly understanding task requirements and performance criteria, deadlines, required deliverables, and group interface processes.

3. **Self-Regulation and Self-Management Skills:** The value of the apprenticeship experience includes students' acquisition and application of self-monitoring strategies. As they receive feedback and mentoring/coaching advice—as well as on-the-job immediate feedback from colleagues—apprentices must self-regulate, monitor their own cognitive and emotional responses, and self-manage to ensure successful completion of assigned individual and group tasks.

4. **Higher-Order Reasoning Skills and Dispositions:** Leaders were unanimous in reinforcing the idea that the workplace is transforming itself as we speak. As Michael Raelon asserted many times, we may be preparing students today for careers that might not even exist in the next decade. Therefore, apprentices must be able to respond to these changes using a range of critical dispositions and higher-order reasoning processes. Leaders consistently cited analytical thinking, critical judgement, investigation, and research skills as essential for the 21st century workplace.

5. **A Capacity for Demonstrating Vision and Creativity:** Like the leaders of this program, students must have both a personal vision and a clear sense of the vision and mission of the organization for which they are working. All of the leaders also reinforced the power of creativity and self-expression, ensuring that workers like their apprentices are encouraged to see alternative perspectives, creative alternatives, and methods for transcending existing paradigms to reveal new and more productive ways of completing tasks.

Leadership That Sustains an Apprenticeship Ecosystem: Aligning School-Based and On-Site Programs and Practices

The apprenticeship as an ecosystem is a recurrent metaphor used by many of the leaders we interviewed. Specifically, they suggest that the apprenticeship represents an interdependent set of human resources, support structures, policies and practices, and legal requirements necessary for sustaining the success and viability of individual apprentices as well as the sustainability and scalability of the apprenticeship program.

We thought that the best way to express this metaphor was to provide a verbatim analysis from former Chamber of Commerce leader Rod Gavin:

> "Well, [a successful apprenticeship] represents a very broad group of stakeholders. As a regional organization now, we're representing up to 16 counties. That includes 12 in North Carolina, and then four South of the border in South Carolina. In the advanced manufacturing space, and even the construction space, we've probably seen the most traction as it relates to youth apprenticeships or apprenticeship for those under 18, but I think we're still scratching the surface, there's a lot more work to be done. Because, on the manufacturing side, we have such a strong presence of European-owned companies, Germany in particular; it is just a model/a culture they are very familiar with.
>
> "They bring that mind set and they bring that culture. And it's been great, because that's been a big reason for why we've been able to move some youth apprenticeships forward. Construction as an industry, that has a history, that has a tradition of apprenticeships or similar types of programs. And there's a lot of activity around that. As a matter of fact, we're hosting a workforce development and education meeting at the Goodwill Construction Skills Training Center, which is new, actually. They partnered closely with Charlotte Mecklenburg schools, through Piedmont community college, and they've got a nonprofit called The Rock which is helping to coordinate a lot of that activity as well."

In essence, all effective apprenticeship leader recognize the powerful interconnections that comprise the ecosystem in which they are partnering and navigating. Educators new to the concept—or in search of ideas for enhancing the scale and sustainability of their own apprenticeship programs—will benefit from the next resource, a set of direct quotes from CMS leaders and the business partners with whom they work as part of this apprenticeship network.

Leading Effective Apprenticeships: Reflections from Charlotte-Mecklenburg Education and Business Leaders

1. **Dr. Clayton Wilcox (Superintendent, CMS):** "When I began having conversations with colleagues at national conferences like AASA or other places, I began the conversation by saying, you know, are your kids prepared for the 21st century? And when they'd say, well, you know, I don't know, or well, yes they are, but then I'd say you know what, one way that we're having great success is through our apprenticeship programs. And then I'd say to them, you need to talk with your businesses and industries about their needs are. Pull together some advisory councils and start to shape what your community needs. You know, by and large, that's been really a successful formula for a number of folks who have visited here in Charlotte. They've walked away and say, you know what, that first step that we took was the most important step. And that was getting to know their business leaders, their industry leaders, and trying to figure out what it is their community can best use."

2. **Michael Raelon (Program Coordinator): "**So each company invests $175,000 in the apprentices to train them, to educate them. They pay for their college education while they're in classrooms at our high school and the college classrooms they're in. They start at nine dollars an hour in our classroom. Their last year in college they make $16 an hour. So our kids never have to ask that question: Why do I need to learn this? Trust me, these companies would not be paying you an hourly wage and all your college tuition unless they knew that you need to master this content and the skills they want you to have so that one day that you can be valuable for them and become the best possible employee."

3. **Roger Collins (Siemens Mentor and Site-Based Program Coordinator):** "The state apprenticeship agency doesn't work directly for the US Department of Labor's Office of Apprenticeship, but they still have to meet the criteria set aside by the federal law. But North Carolina is an SAA state and so Apprenticeship NC is our state agency and so I am chairman of the advisory council to the state agency. As chairman of the council, I am part of the State Apprenticeship Council Alliance. We're made up of the council chairs from the states and territories that are SAA states and we're direct advisory group to the US Department of Labor's Office of Apprenticeship. I also deal with a lot of states and territories with their own apprenticeship agencies."

4. **Rod Garvin (Charlotte Business Alliance):** "Our Workforce Development Education Committee is a way that we're bringing stakeholders together to talk about workforce development in the context of economic mobility, which you probably have heard of, is a huge issue and cause in our community. We try to highlight these different industries and different career pathways that are that we know are in demand that are high growth. So you know, we've got construction coming up, we had meetings around healthcare, energy and utilities. You know, we put a spotlight on these different industries where, you know, we may not just be talking about

apprenticeships, but it's about you know, what are the opportunities? You know, what are the gaps? You know, how do we close the gap between employers and the education and training institutions? How do we create more collaboration and partnership? How do we find the right work-based solution?"

"Youth apprenticeship is starting to enter into that conversation more and more. I was a part of a delegation of leaders that went to Denver. This particular trip was sponsored by the Charlotte Executive Leadership Council, which is a group of CEOs of large businesses that have a presence in Charlotte, they really weighed in into this education workforce and larger economic mobility conversation, dealing with, you know, affordable housing, you know, transportation and other issues that are related to that. But you probably come up around this your research, but again, happy to send you more information. Colorado is really ahead of the curve in the youth apprenticeship models. Denver has really embraced this as a key model for workforce development."

"The state has really gotten behind it. And Career Wise, which is a nonprofit that was started by an advanced manufacturer who founded a nonprofit to help solve his own talent challenge. And now it's become a real champion for youth apprenticeships across the nation. We went to learn about what they're doing, to figure out how can we do more of it here. NC community colleges, it's a credentialing body in North Carolina, so if you want to do registered apprenticeships, their the group to work with. Many would say that the registered are preferable there are some additional supports that come with that. Sometimes you may be unregistered like Road to Hire is doing around the IT Apprenticeships."

"The goal, as you said, it's dynamic, it's really about what makes the most sense for the company or the organization. What makes the most sense for the organization – it doesn't have to be a one size fits all. The Charlotte Mecklenburg schools' current Technical Education Board, which is, in the school system, the groups that are most focused on work-based learning solutions. So, you know, part of my role on the board, I'm kind of wearing two hats, one as your representative of the Alliance, but two, trying to be the advocate for innovative work-based learning solutions. And we talk about apprenticeships, and in particular, we're really looking at a pre-apprenticeship model that we are calling a Career Ready Lab."

"It really comes out of NAF, which is the sort of career academy credentialing organization, but the Career Ready lab would be more of a pre-youth apprenticeship experience, where, you know, before getting into, you know, an intensive two to three-year program, students would get exposed to a particular industry and career as a summer project working in groups. So they would be assigned a company, get to work with company employees, get to work on a project-based learning experience, you know, get that experience in terms of working on a team and in a working group, getting exposed to different skill sets, and different roles. And then ideally, as a part of the continuum, they can move into an apprenticeship, either within that company or perhaps another company. So again, we're very early. I mean, we're, we're really

scratching the surface. Part of what keeps me up at night is being encouraged by the foundation but knowing that there's so much more we can do and so much farther we can go."

5. **Thomas Ray (Apprenticeship Lead, Groninger USA Investment):** "The apprenticeship program's a great opportunity for a young person, especially for somebody coming out of high school. Um, especially for the person who may be thinking about college but may not know exactly what direction they're going to go in when they go to college, because you can rack up a lot of debt going to college. Um, one of the things that, that we like to call it is, is free college and a paycheck."

6. **Clifton Vann (Livingston-Haven):** "What I love about it is seeing the changes that occur in these young people. Uh, number one, the ones that come in here and their eyes light up, and go, "Oh my gosh, I didn't know this was a possibility. That's what I want to do now." And with that, there's motivation to go continue my education, if that's what's needed. Now all of a sudden education has some context, and I'm not just going 'cause my parents said I gotta go. I'm going 'cause I see the endgame now, I see what I wanna do.' The other thing that excites me is that I see these young people bring new energy into my own building. They bring new ideas. You know, in the world of IT that we live in today, my 13-year-old is the expert at my house."

Study Group Suggestions:
Leadership of an Effective Apprenticeship Program

Guide Questions	Ideas and Recommendations
1. In general, what do you and you study group members consider to be the traits of effective leaders today?	
2. What do you consider to be the most important traits of an effective leader of an apprenticeship program?	
3. To what extent do you agree that effective apprenticeships represent a kind of "ecosystem"? In your opinion, what are the components of such an ecosystem?	
4. What are the implications of the ideas and recommendations presented in this section for your own school-based or district apprenticeships?	

Part Four: *Capturing the Student Voice: What Do Advanced Manufacturing and Engineering Apprentices Tell Us About Their Experiences in School and On-Site?*

Students today are hungry for experience-based learning opportunities that allow them to acquire and expand their proficiency in key workplace competencies, including the capacity for on-the-job communication, technical skills application, participation as an effective member of a team, and higher-order reasoning (e.g., problem solving, decision making, critical thinking and evaluation).

Apprentices in the Olympic High School Advanced Manufacturing and Engineering program share with us their personal observations about the impact of the program on them, including their post-secondary education and career plans. They also share powerful insights into how their school-based learning experiences can be enhanced through an expanded focus upon in-depth investigation, cooperative learning, and authentic problem solving in response to real-world issues and decisions. Essential questions explored with these students include:

- What do students tell us about their experiences in the Olympic High School Advanced Manufacturing and Engineering program?
- What do the students in the program tell us about the power and impact of their apprenticeship experience?
- What can educational leaders learn from these students about promoting classrooms that are engaging, experiential, and meaningful?

Student Reflections on the Apprenticeship Experience

William Yager, a graduate of Olympic High School and a current apprentice at Groninger USA, nicely synthesizes what a majority of apprentices say about the program:

> "In my junior year of high school, I heard about the apprenticeship in one of my engineering classes and I came home and told my parents. I was like, 'Hey this apprenticeship thing it sounds kind of cool' and they immediately told me, 'No, you're going to college.' And I said, 'Okay, I'm going to college.' I continued with what I was doing in high school, and then in my senior year, I heard about the apprenticeship again, and it still sounded really, really cool. So I told my parents again and I was like, 'You know, let's just check it out. Let's just go to the orientation, see what it's about, whatever.' I went and took my parents with me to a different company than I'm working at now and they saw the facilities, the program, what was they were offering, and the opportunities that an apprenticeship opens up and immediately changed their mind. They said, 'No, no you're not going to college. You're gonna take this apprenticeship.'"

William Yager's story resonates with the stories and feedback the case study team heard from current students and Olympic High School graduates in the process of completing their on-site apprenticeship and degree-level college work at Central Piedmont Community College. The following are the recurrent themes we revisited in multiple interviews with apprentices about what motivated them to participate:

1. **The Power and Impact of the Apprenticeship Experience:**

   Many of the students we interviewed were consistent in their advocacy for the apprenticeship experience. They frequently cited how it transformed their view of themselves, their future career pathways, and the relevance of post-secondary education. Specifically, students cited the value of the experience-based, hands-on, and mentor-supported learning experiences they had while at their job site. They felt a new sense of their personal efficacy and their capacity to be successful in challenging and technology-based problem solving and decision-making. Additionally, they described their satisfaction at being a part of a culture and team that values interdependence and shared investigation while simultaneously dignifying the individual worker and value he or she brings to the workplace.

2. **Students' Surprise at Discovering the Apprenticeship as an Alternative to Their Previous Expectations About Post-Secondary Plans:**

   Like William Yager, many of the students we interviewed were clear that the apprenticeship came as a bit of a surprise to them and their parents. A majority of them assumed that they would be applying to and attending a college or university after graduation. Both students and parents confirmed that they had been conditioned to assume that this was the normal, appropriate, and expected "next step" in students' path toward adulthood. Once students and their parents attended

a series of information and orientation sessions, however, they frequently discovered the potential of the apprenticeship to offer a viable alternative with both financial and academic benefits. We also heard frequently that students attracted to the apprenticeship experience were searching for something more meaningful, experience-driven, and collaborative than traditional academic settings like high school or post-secondary education. The apprenticeship seems to be especially appropriate for learners who value independence and alternative pathways for expressing themselves and their skills and talents.

3. **The Deep and Enduring Value of Site-Based Career Opportunities Provided by the Apprenticeship:**

   In addition to the educational benefits of the apprenticeship—including its ability to offer meaningful, personalized, and technology-driven teaching-learning experiences for students craving such experiences—students and their parents were also adamant about the career and financial benefits of their participation. They consistently cited the cost savings associated with industry-sponsored credit options, including the payment of an engineering Associate's Degree by participating mentorship businesses and corporations. The chance to exit the program debt free of student loans was a powerful incentive and outcome. Similarly, students frequently compared their ability to enter a career path with a high level of certification and skills training, allowing them to begin full-time work at a much higher entry salary than their peers who had not participated in an apprenticeship.

4. **The Need for Earlier Access to Counseling and Information About Career Pathways and the Value of Apprenticeships:**

   Universally, students confirmed that career awareness opportunities—especially access to information about the apprenticeship experience—should begin much earlier and more frequently. They suggested that more formal and consistent career pathway counseling and education should occur as early as elementary school. Expanded opportunities for students and their parents to visit apprenticeship sites in action should be a fundamental part of this orientation process, including chances for middle school students to have this opportunity. Students interviewed—in addition to program leaders—also confirmed the value and need for counselors to have professional experience and training in the design and potential of apprenticeships to benefit an expanded pool of students.

   Many respondents also reinforced the value of expanded information and education about these programs to students who may otherwise not even consider the possibility of participation. Specifically, students in lower-income situations and those identified as English Learners—including those who may find themselves as care and support givers to their families and younger siblings—should receive more extensive counseling about the value and potential offered by apprenticeship programs.

Student Insights About Their Apprenticeship Experience vs. the Traditional Classroom

Students interviewed for this case study expressed pride in Olympic High School and the range of services, programs, and opportunities it provided them. They also expressed deep loyalty to the staff and teachers with whom they worked. At the same time, they indicated that their learning experiences in more traditional academic courses would have benefited from an expanded emphasis upon the following instructional techniques and practices (which they asserted were consistently evident in their apprenticeship coursework and on-site training):

1. **Clearly Communicated Task Expectations and Performance Criteria:** Unlike some of their academic classes, students suggested that their CTE classwork and their on-site training framed learning outcomes clearly. Tasks were purposeful, authentic, and clearly delineated. Similarly, they were very clear about what was expected of them—and the performance criteria they were expected to demonstrate to be successful in task completion.

2. **Experiential Learning:** Students were highly consistent in valuing the experience-based and real-world learning in which they were engaged in their various apprenticeship courses and their on-site learning experiences. They universally enjoyed being a valued member of a team, contributing to purposeful and authentic tasks, and experiencing opportunities for both independent and collaborative approaches to decision-making and problem-solving.

3. **Focus on Social-Emotional Learning:** The students we interviewed were highly consistent in acknowledging the care and attention they received from both their apprenticeship Olympic High School teachers and their colleagues and mentors on-site. What is currently referred to as "social-emotional learning" recurred as a theme expressed by many students, including their awareness of classroom and work cultures that were caring, supportive, safe and inviting, and mutually supportive. They also valued how committed teachers and mentors were to their individual growth, development, and success.

4. **Personalization:** As suggested previously, students benefited greatly from the high levels of personalized attention, coaching, and mentoring they received both in-class and on-site. Teachers and mentors consistently seemed to take their personal growth and development to heart, helping students progress with clear and rigorous expectations while providing intervention and support when students struggled or required extra assistance. The entire on-site experience also reflects, according to many students, a focus on project-based work that is authentic, clearly delineated, and applicable to the world beyond the classroom.

5. **Collaboration and Team Interaction:** An extension of the personalized and social-emotional learning-focused nature of the apprenticeship experience, many

students were especially grateful for their interactions with on-site adults with extensive technical skills and experience. They seemed to welcome the students to their teams and reinforced an ethos of collaboration and shared approaches to task completion. Students also valued experiences that involved ambiguity and creativity, i.e., situations that were unanticipated and unpredictable, requiring on-the-spot modifications, decision-making, and problem resolution.

Student Voices:
Reflections on Their Apprenticeship Experience

1. **Chad Robinson (Graduate and Apprentice at Siemens):** "I think my dad was working on his Master's at that time too. He was in engineering. I told him all about the apprentice program, and he was like, are you serious? Why are you even thinking about this? That just sounds like an amazing opportunity. He told me I should definitely take it. Because the fact that I'm getting four years of work experience, I'm coming out no debt whatsoever, and I get a guaranteed job, that's kind of hard to beat that. Many people in university would dream to have that job. Then he says some of his friends, they just couldn't handle the university route. Maybe they just weren't mature enough or whatever it may be. They have to drop out or change their major or do something else. So he thought that this was a really good opportunity for me."

2. **Alejandra Garcia Mejia (Accounting, Livingston-Haven):** "I started exploring new programs as a new apprentice. I found a position in accounting department. And I found that it's a great group of people to help you, to learn and guide you to the path that I wanted to be after you graduate from high school. That's what attracted me to it."

3. **Eric Prue (Project Manager and Former Apprentice):** "So, the apprentices here, they do a lot of things. When I was an apprentice here, I did software development. I built things. You've got to be willing to take on stuff you're not comfortable with and you've got to say, yeah, I'll do it, even if you don't know what you're doing. But, go ahead and do it. You've got to be willing to take it on and figure it out, so there's a lot of opportunities to try a lot of different things and figure out what you like doing as a career."

4. **David Gupta (Manufacturing Apprentice, Livingston-Haven):** "I'm trying to learn new skills and advance my knowledge in this field that I want to join in the future at Livingston and Haven."

5. **Nathan Mundo (Junior Software Developer, Livingston-Haven):** "When I was an apprentice I learned how to work in a more professional environment, how to handle dealing with other people, and deadlines, and stuff like that…It's really important…When I told my parents about becoming an apprentice, they were a little concerned. They eventually came around to it and decided it'd probably be a good thing to just actually get my hands in earlier than anyone else would."

6. **Vi Nguyen (Automation Technician, Shrone America):** "Well, I'm on a rise, and I'm growing and I'm learning, and I have so much motivation to keep going. And I want to bring that and apply everything that I can here in, you know, towards my future. Because, at the end of the day, you need to look out for yourself. And, I've learned a lot from it, and, and I'm ready to take it back and use it."

7. **Alex (Member, Student Interview Panel):** "For me, I didn't know really what I want to be after high school, and I took this one class that did apprenticeship stuff and the teacher helped me, gave me field trips and stuff to it and I went to it and I actually enjoyed doing that and I'm pretty good in math so I was like, 'I'll give it a shot' and I'm here."

8. **Frankie (Member, Student Interview Panel):** "So, especially growing up, a lot of my family was kind of like, 'If you don't go to a four-year college, if you don't get higher education, that means you're screwed.' If you go straight to work, you're screwed. You're not going to get a good job, you're not going to pay off debt, you're going to end up stagnant. And so it took a little bit of explaining, a little bit of convincing just to get the point across that it's different now. Back then… My dad, he just finished paying off his student debt and he's in his 60s. I'd decided I didn't want to do that, you know? Four-year college is a very traditional way of doing it, but traditions have changed; it's different now. It's not the same. I've had a little bit of doubt coming from my family about it, but…"

9. **Nick (Member, Student Interview Panel):** "I was actually one to hesitate quite a bit. When I was originally in that whole mindset that a four-year school's the way to go, and I didn't think that internships and apprenticeships or two-year degrees and so on wasn't quite going to get you there, but after kind of looking more into it and understanding from hands-on experience from other people, I realized that it's definitely an alternate pathway that gets you the same outcome, if not better. My mom definitely really pushed me to go towards it and I'm very glad I did."

10. **Kevin (Member, Student Interview Panel):** "I'm currently in the program and it's one of these things where they look for you to be teachable. I had no experience other than doing some small inventory on this and some things that you're gaining is you're gaining this hands-on experience and in my company, at least at Groninger, we focus on pushing you towards a pathway. I originally wanted to go into this being an engineer. However, I excelled more towards the service side of wiring and refurbishment, so I'm being pushed towards that pathway and gaining those skills and that's the thing that a lot of these companies do and a lot of these apprenticeships focus on is they want to kind of put you in this pathway. They want to kind of meld you into one of these careers."

11. **Frankie (Member, Student Interview Panel):** "I think even for classes that aren't associated with apprenticeships, getting hands on, getting different projects that kind of show you the connection from that topic into the real world really sparks an interest rather than just the theory behind it."

Study Group Suggestions:
Exploring Students' Experiences in the Apprenticeship Program

Guide Questions	Ideas and Recommendations
5. As you discuss the student experience, what do you consider the major benefits they identify with their apprenticeships?	
6. Who are the students you know who might benefit from participating in an apprenticeship? Why?	
7. What insights do these students bring about their apprenticeship experience compared to their other academic coursework?	
8. To what extent do classroom in your school or district reflect the recommendations presented here? Which instructional practices would you emphasize? Why?	

Part Five: *The Parent Experience*

Parents were unanimous in their praise for the impact the Advanced Manufacturing and Engineering program has had upon their students' preparation for both career pathways and post-secondary education. They acknowledged that they had initial concerns at first, not fully understanding the scope and breadth of the opportunities the program would offer. Their anxiety diminished greatly over the course of the program as they observed their student growing in technical knowledge, self-esteem and efficacy, and clarification of future goals and aspirations. The unique parent perspectives center around three essential questions:

- What do the parents of Olympic High School Advanced Manufacturing and Engineering apprentices tell us about the program and its influence on their students?
- How do parents' perceptions of the apprenticeship experience differ before, during, and after their child's participation in the program?
- What can we learn from these parents about school and district communication about the value and importance of apprenticeships?

Insights and Observations from Parents of Olympic High School Advanced Manufacturing and Engineering Apprentices

Parents were unanimous in confirming the benefits to their students of participation in the apprenticeship experience at Olympic. Their one-on-one and group interviews revisited several powerful and recurrent themes:

1. **Apprenticeships as a Powerful Motivation for Learning:**

   Olympic High School parents consistently praise the Advanced Manufacturing and Engineering Program for its ability to motivate students, enhance their understanding of the importance of education and related technical training, and provide a sense of authenticity, purpose, and self-advancement.

Many of the parents commented upon the ways in which participation in the program renewed students' sense of how current academic and workplace preparation can enhance their prospects for the future.

They also suggested that their students greatly benefited from the ways in which the program enhanced their "soft skills" development, including an expanded ability to communicate in both spoken and written contexts, participate actively and effectively as part of a team, and make connections between the academic knowledge and skills they were learning—and their application to real-world projects and professional tasks.

2. **The Contrast Between Traditional Classroom Instruction and On-the-Job Training and Mentoring:**

   Parents were also highly consistent in asserting that until their students began on-site observation and participation, they approached their traditional classroom learning environment as somewhat predictable and mechanical. Many suggested that their students did not see the direct applications of what they were learning to their own lives—or the world around them.

   When students need to apply mathematical and engineering principles and skills to solve a real-world professional problem or help their team creatively address a workplace decision, the abstractions of these and other academic disciplines come alive for participating students.

   These parents also suggested that post-secondary education became a meaningful option to their students—many of whom viewed it initially as just "something they were told to do." When the professional experiences offered via the internship site integrates options for college credit (and a full two-year Associate's degree), students experience the connectedness and alignment missing in more traditional approaches to learning.

3. **The Value of Apprenticeships for Students with Non-Traditional Learning Profiles:**

   Students in the Olympic High School Advanced Manufacturing and Engineering Program shared common learner profiles that seemed to be connecting threads among the range of personalities and interests they demonstrated. Parents frequently stated that their apprentice students deeply value hands-on, tactual-kinesthetic experiences to reinforce their learning of abstract concepts and principles.

   Parents often suggested that it was during their students' apprenticeship program that learning started to become "alive" for these learners. They deeply valued

ways in which students acquired advanced technical knowledge and skills in response to authentic, purposeful, and professional work tasks.

Students also benefited from the feedback and emotional support provided by their on-site mentors, many of whom brought years of professional experience and technical expertise to their one-on-one and small group interactions with Olympic apprentices.

4. **The Economic Value and Impact upon Students' Future Career Choices:**

   This consistent theme was evident among virtually every stakeholder group interviewed for this case study. Every one of the parents reinforced the enormous economic savings and benefits of the apprenticeship experience. These included frequent parent reference to increased economic potential of their students, expanded access to advanced careers with multiple opportunities for promotion and advancement, and tuition and related college expenses (in light of the program's affiliation with Central Piedmont Community College).

   Parents—and students as well—frequently presented examples of friends and peers who had not taken the apprenticeship route, choosing instead to go directly to a college or university. Many of them struggled finding their way, including pursuing multiple options for future career paths. In contrast, parents stressed that the apprenticeship experience focused their students, gave them a sense of purpose and future possibilities, and reinforced the economic and personal value of integrating the work experience with aligned academic coursework as the post-secondary level.

5. **The Need for Expanded Parent/Guardian Orientation and Information Sessions to Reinforce What Apprenticeships Are—and the Value They Offer:**

   Another recurrent theme voiced by a majority of parents is the need for expanded awareness and orientation sessions, which should be conducted much earlier in students' academic career. Many parents were unaware of what an apprenticeship is—and how it might benefit their students. Additionally, a majority of them received only minimal information about the multiple apprenticeships available in CMS until their students were late in their middle school careers.

   They suggest that career awareness sessions for parents occur as early the intermediate levels of elementary school—with some career-related activities appropriate for even young students at the primary level. At the secondary level, parents emphasized that a more detailed set of information and orientation sessions occur for middle school students and parents, including counselors helping parents and students to understand how course selection and performance can impact future career choices and opportunities.

Changing Perspectives: How Do Parents' Perceptions of the Apprenticeship Program Change Before, During, and After Their Child's Participation in It?

Finally, many parents stressed that because of their need for earlier and more extensive information about apprenticeships, their perceptions of the program radically changed at their students participated in it. Prior to their students' enrollment, many parents assumed that college or university attendance was the only post-high school options appropriate for their students.

As student participation in on-site work experiences began, many parents marveled at the clear changes in attitude, efficacy, and maturity their students were demonstrating. They were often heartened by the ways in which their children were being absorbed into the corporate culture, becoming part of a meaningful set of work teams. They were also deeply impressed by the apprenticeship site's commitment to offering students a range of experiences rather than concentrating in a single focus area.

Finally, a majority of parents concluded that the apprenticeship proved to be an invaluable choice for their students. It offered not only financial reward (including the preparation for a well-paying career and free college tuition), but a context in which their students matured and grew—realizing their own potential and their capacity for meaningful decision-making and problem-solving related to a range of life experiences.

Parent Perspectives:
Insights from Parents of Olympic High School Students in the Advanced Manufacturing and Engineering Program

1. **Evie Robinson:** "At Olympic they encourage the kids, because I don't know if Chad would have done it on his own, about doing the internship program. So, he was able to do three internships while he was here at Olympic. And so he's got a little taste of everything and just kind of realized what niche he wanted to be in and just kind of like the whole environment and everything. So he learned something new from every single place, and I think that was a big stepping stone. And also, he had a lot of friends that did go through the four-year college and didn't have a job, so he was also seeing that with his friends. I think that was one of the things that kind of swayed him."

2. **Michelle Hickey:** "Let him find something. I knew that Kevin was not college bound. Like traditional sense. Kevin's always been my take apart, put it back together, hands-on kind of kid. He got involved with robotics. I was pushing towards coding; he was like, no. When this came up, this was a perfect fit for him. This made the most sense. This was something that he enjoyed doing. For him, I knew it wasn't ever going to be a college track."

3. **Michelle Hickey:** "Working with different people at different stages. I know for Kevin, one of the things he's learned is when you're on a project with somebody-it's different from school where it's just for a grade, but when you're working on a project and there's a deadline and stuff, you have to sometimes set aside your own ego and work with other people-there are strengths and weaknesses across the board. You can get mad that somebody's not doing their half of the job and you can just be like, well, I'm not going to do it for them, or you can step up and help out with the project or help them do something better. His collaboration skills have definitely taken more of a workplace feel in how he deals with-even with how he interacts at home and with other people."

4. **Michelle Hickey:** "But the fact that the high school program has partnered with so many companies and then if you don't make the high school program, you can go into our community college and they also have an apprenticeship program. So the opportunity is there. If you don't do it now, you can do it in college and that how it's presented to our students is another viable alternative. And something that can make a bigger difference in their lives-like I said, I have a traditional path with my daughter and my two sons are non-traditional. So, just being able to explore those opportunities. I think Olympic does as great job of just marketing that and making those business connections."

5. **Kim Gregory:** "And so, so many of our kids come out of our school now, they don't have the critical thinking that they need to kind of … their teachers have been kind of prompting them, "Here's what I'm looking for", but are they able to think outside of the box? Are they able to problem solve? And that's kind of what these extra-curricular, I wouldn't say clubs, these types of … what's a better way to put this? This connection with the business community will bring to these kids. They're able to kind of go, 'Ah-ha. I think I like robotics. Well if I like robotics then maybe I'm interested in programming.

Okay so maybe I should sign up for Digigirlz, Mom, and do that this summer.' And so that was the line of thinking, one thing kind of little stepping stone to another."

6. **Kim Gregory:** "You don't need to go to college and decide, "I want to be an architect", if you're trying to be one you need to have a good idea about that probably by the 10th grade, I would think. And it just is the way the world is now. I think that it is highly, I think it's almost negligent for teachers and parents to not really impress upon kids, and maybe I'm wrong, but to let them know that this is just a different area, it's more competitive and you better know what you want to be almost. You better have three, four, five good ideas, a Plan A, a Plan B and a Plan C almost as you're approaching high school so that … what I've learned or what I've seen now, even compared to India, I've seen that as a parent approaching high school again, we have to choose."

7. **Kim Gregory:** "If you're in a college situation you're going to be talking and kind of, they're going to teach you along the way with four years how to market yourself, but for those kids who are able to get out earlier, they're a little bit more savvier than the rest. They can kind get out there and stick their necks out, they're able to take a few more risks because they feel comfortable communicating and being kind of up front and in a situation where they are networking face-to-face versus behind the desk, behind the computer. I would say they're coming out of their comfort zone and so to me, the faster they come out of that comfort zone, as a junior and being able to be polished, putting them out there at that company makes them polished. They're learning to … people are asking them questions and they're realizing, 'Oh my goodness, did I give a good feedback? Did I look that person in the eye? Do they believe me? Will they come back to me later?'"

8. **Kim Gregory:** "So I think those are things that … skills, those are the soft skills that folks don't usually get until they've gone through school and then they're looking for someone to kind of coach them and they end up learning it. Often, it's their first job and they're making a lot of mistakes. So why not make those mistakes earlier in a space environment, an internship, an apprenticeship situation where someone's holding your hands, but you're also kind of at an early age, you're out there. And you're talking to people, you're connecting. And that's what missing, and it's a part that we're going to continue to have to work with these kids because we … even though we're doing business day to day on our devices, you still have to be able to talk to people."

Study Group Suggestions:
What Do These Parents Tell Us About the Value of Apprenticeships?

Guide Questions	Ideas and Recommendations
1. What insights do the ideas presented by these parents give you about publicizing the design and benefits of apprenticeships in your school or district?	
2. What are the recurrent ideas and insights presented here that have implications for your apprenticeship program(s)?	
3. To what extent do you agree with these parents that schools today seem to emphasize college attendance rather than preparing students for the world of work?	
4. What kinds of orientation and information sessions would you recommend for your school or district to help parents understand the value of apprenticeships?	

Part Six: *Implications for District and School-Based Leaders: What Can We Learn from the Success of the Olympic High School Advanced Manufacturing and Engineering Apprenticeship Program?*

What can we learn about the potential and power of the apprenticeship experience from the stakeholder groups interviewed for this case study? This final section explores the implications and transferable insights that the Advanced Manufacturing and Engineering Apprenticeship program offers to educators considering the development or enhancement of similar programs in their schools and districts. We explore the following focus areas through these essential questions:

- What are key guiding principles for an effective apprenticeship?
- To what extent is an effective apprenticeship program an eco-system of interdependent structures, processes, and best practices?
- Who are the key stakeholders comprising this apprenticeship eco-system?
- What should district and school-based leaders consider when beginning an apprenticeship program?
- How can district and school-based leaders work effectively with apprenticeship site sponsors, mentors, and coordinators to maximize the sustainability and scalability of a program?
- How can leaders of an apprenticeship program ensure quality control as the program expands and develops over multiple years?

Guiding Principles for an Effective Apprenticeship

Guiding principles identified by the U.S. Department of Labor are clearly evident in the sustained operations of the Olympic High School Advanced Manufacturing and Engineering apprenticeship program. In this section of the case study, we make recommendations for educators considering starting an apprenticeship program, based upon the U.S Department of Labor principles as they manifest in the CMS program. The United States Department of Labor identifies five major guiding principles for ensuring effective apprenticeship programs:

1. **Active Involvement of Business, Including Apprenticeship Councils, Industry Associations, and Other Partnerships Sharing Administrative Tasks Related to Maintaining the Apprenticeship:**

   A key component of the Olympic High School program's success is the active and sustained involvement of such corporate participants as Siemens, Chiron, Groninger USA, Livingston-Haven, and Daetwyler. These companies provide a combination of supports for the program, including sustained engagement on the part of its leadership, on-site professional learning, careful and sustained mentoring for apprentices, and active involvement in providing updates about workplace needs and requirements. Similarly, both on-site and school district leaders are continually involved in outreach to regional, state, and national apprenticeship councils, industry councils, and Central Piedmont Community College.

2. **Structured On-the-Job Training, Including Support and Coaching from Experienced Mentors On-Site:**

   The commitment of corporate, business, advisory board, and post-secondary partners is a powerful component of the Olympic program's success and sustainability. For students aspiring to growth and promotion in their chosen career pathway, however, the structured on-the-job training provided them has—in many cases—been transformational. The students interviewed for this case study almost universally agreed that the type of training and education they receive in their respective workplaces gives them a sense of efficacy, success, engagement, authenticity, and purpose. They were also very clear that unlike many of their high school classes, their education on-site was highly personalized, relevant, and inspiring. Many of them were especially proud of the independent or collaborative projects they had completed, experiencing a true sense of accomplishment. They also unanimously agreed that the support and coaching they received from experienced mentors on-site had built both interpersonal bonds and communication skills and a powerful sense of belonging and affiliation with the workers and business leaders they encounter on-site.

3. **Classroom-Based Academic Instruction Related to the Technical and Academic Competencies Required for the Job:**

   The unique course requirements associated with Advanced Manufacturing and Engineering reinforce the technical and academic competencies required for apprentices' chosen career field and pathway. Classes observed by the visiting case study team were consistently small, personalized, and focused on one-on-one and small-group instruction. The curriculum sequence and its implementation were highly aligned with industry standards and the required technical knowledge and skills required for success on the job. At the same time, it was evident that classrooms emphasized a range of 21st century workplace competencies (parallel to many states' Portrait of the Graduate profiles), including technical skills,

communication skills (written and oral), presentation skills, critical and analytical reasoning, creative expression, and soft skills (e.g., interpersonal relations and communication, contributing to team operations, investigation and research, and technology competency).

4. **Reward for Apprenticeship Skills Gains, Including Wages as Students Begin Work and Pay Increases as They Meet Identified Performance Benchmarks:**

   This principle was a universal and recurring theme in the interviews conducted for this case study. Specifically, students, parents, school leaders, and corporate/ business sponsors all were clear that youth apprenticeships offer unique economic opportunities and the potential for upward mobility for many participating students. In addition to wages earned throughout the apprenticeship experience, interview subjects affirmed the growing wages frequently awarded as students meet or surpass identified performance criteria and related benchmarks. Even more importantly, students and their parents were consistent in praising the value of the apprenticeship experience since it expanded students' career awareness, interests, technical skills, and capacity for entering the workforce at a much higher level of the career ladder than they might have with just a high school or college diploma.

5. **Nationally Recognized Credentialing That Is Portable and Provides Certification That the Apprentice Is Fully Qualified for a Position in the Chosen Industry or Career Field:**

   Increasingly, employers (especially those in high-tech, high-demand fields) are only hiring individuals with certified technical knowledge and skills required for available positions. Certifications and micro-credentialing are a powerful and growing phenomenon in the workplace—and will be increasingly important for workers as the 21st century evolves and workplace expectations increase. Our interviews frequently revisited the issue of the need to align and tighten the ways in which college and universities are preparing students for the changing workplace—and the value of graduates entering the workplace with certified technical skills and competencies. As suggested previously, the Olympic High school apprenticeship programs offer both required OSHA certification as well as manufacturing, engineering, and computer certifications available through Central Piedmont Community College.

Engaging the Right Stakeholder Groups and Individuals

In a recent *Washington Post* article (June 18, 2019, A18), Senator Gary Peters (D-Michigan) asserted: "Other countries have strategic visions [for manufacturing]. There's no reason we can't. Something I believe to my core is that you can't be a great country if you don't actually make products that you can sell around the world. So many countries understand the importance of their manufacturing sector. They invest…they nurture…and they work on coordinated policies to make sure the sector is healthy and

vibrant. Yet we really haven't done that in this country. Manufacturing has played a back-seat role."

Senator Peters' strong support for this industry parallels the multiple confirmations made by virtually every business and corporate leader interviewed for this case study. All of the participating corporations typically involve multi-national networks and organizations concentrating on advanced high-tech manufacturing and engineering. The leaders interviewed were unanimous in arguing for effective apprenticeship programs reflecting the workforce needs within a locale or region. The grow-your-own approach, according to these leaders, ensures a steady labor supply of highly qualified and well educated workers capable of fulfilling the evolving requirements of key industries.

As Thomas Ray of Groninger USA emphasized in his interview: "When I think about Groninger investing in apprenticeship, really it's the kind of thing where we can't really afford not to do it. Because one of the problems we have in the United States is the skills gap. In the Charlotte area alone there's about 6,000 jobs that can't be filled because we don't have people with the training to fill those positions. If you train someone coming in off the street, it's just as expensive to do it that way and if we do it this way with apprenticeships, we can bring those people up in the culture of the company and train them in the way that we want them to be trained."

When school and district leaders begin to consider the development of apprenticeship programs, it is critical that they involve business, corporate, and other financial sectors within their community or region. Early dialogues and sustained partnership will provide invaluable input concerning industry needs, hiring requirements, educational background and skills expected of entering workers, and projections for future growth. As the Olympic High School Advanced Manufacturing and Engineering apprenticeship program leaders assert, business and corporate sponsors are a significant and non-negotiable part of program development, initial implementation, sustainability, and scalability (i.e., the capacity to extend the program beyond the initial cohort of students it first serves.

Similarly, cross-institutional partnerships should include immediate participation by potential college and university partners within the area. In the Olympic High School program, for example, Central Piedmont College has been a significant partner since the inception of the program. It works closely with CMS staff to ensure that its Associate's Degree programs provide viable curriculum and instruction aligned with the industry standards and requirements of participating business partners. Without question, parents and guardians interviewed for this case study cited this partnership and its benefits to students as one of their most valued benefits—both to their participating children and to themselves. Successful apprentices complete their experience with solid work credentials, related certifications, and academic credit—resulting in thousands of dollars of savings in college tuition as well as significant advancement for students into their chosen career pathway.

Building an Apprenticeship Ecosystem: Important Structures, Processes, Best Practices, and Relationships

As we conclude this case study, it is important to revisit the concept of building an apprenticeship ecosystem. Any effective apprenticeship requires careful attention to workplace needs, building a clear rationale for stakeholder groups, building a coherent and aligned curriculum reflective of industry standards, and ensuring that on-site apprenticeship experiences are carefully monitored and supported through experienced mentors and organizational leadership.

Using the insights and observations of the various stakeholder groups interviewed for this case study, we conclude with the following recommendations for school and district leaders interested in beginning an apprenticeship program serving their students and the economic needs of their region:

1. **School Infrastructure:**

   Olympic High School's apprenticeship programs began as part of a GATES-funded smaller learning communities initiative. Each of its career pathway programs functioned autonomously as a separate academy. Recently, the school merged the separate academies and sub-schools into a single entity. In both forms of this infrastructure, the apprenticeships required—and continue to require—appropriate funding support, staffing, business and corporate site sponsorships for the apprenticeships, professional learning, and administrative oversight. Perhaps most significantly, the school infrastructure sustains a commitment to strategic planning to improve each apprenticeship program and move it toward NAF Distinguished status.

2. **Purposeful Project Management:**

   Another emerging field of emphasis in the 21st century economy is the concept of project management. The Olympic High School apprenticeship program clearly reflects a commitment to this process, with clear annual program performance targets aligned with the school and district's strategic plan. The project management approach includes clear monthly performance targets for each program, clear product and performance outcomes, identified individuals and groups responsible for leading initiatives, sustainable communication structures and processes, and accountability for reporting on achievement of project benchmark criteria—and appropriate program modifications if data suggests a need for improvement or enhancement of current operations and structures.

3. **Ensuring Sustainability of Funding Sources:**

   Subsequent to the cessation of GATES funding, the Olympic High School career pathway academies have been funded as part of the CMS district budget via Career and Technical Education funding (including district and Perkins funding sources). Sustaining an effective apprenticeship requires sustained and increasing budget allocations to address the need to acquire updated technologies, pay for

sustained professional development, fund staffing for both instructors and program coordinators, and related needs. School districts exploring apprenticeships for the first time should also consider the range of federal and state grant opportunities available in this field, especially since many of them focus upon start-up and scalability initiatives related to high-yield, high-needs occupational areas.

4. Business and Corporate Support Systems:

Perhaps the most striking and positive aspect of the Advanced Manufacturing and Engineering program profiled in this case study was the universal support evident among participating business and corporate leaders. They were unanimous in reinforcing the power of the apprenticeship to expand students' technical skills, preparation for an increasingly challenging and technical workplace, and ensure that local and regional hiring needs were being met. In addition to the clear benefits to students and their parents/guardians of the apprenticeship experience, there is a very powerful and clear benefit to local and state economies. Business and corporations can use their participation in apprenticeship sponsorship to increase the effectiveness of their workforce—and, in turn, increase the productivity of their organization.

5. Communication and Outreach:

CMS district leaders, school-based leaders, and members of both the corporate and community college sectors emphasized the power and necessity of sustained, clear, and collaborative communication and outreach. Similarly, guidance counselors, parents, and students reinforced the necessity of students and parents being introduced very early in students' education to the need for career awareness and career development. Parents especially need support in overcoming—as many Olympic High school parents told us—their initial apprehensions about the apprenticeship experience: *Is it right for my child? Will it prevent him or her from going to college? Isn't a college degree a requirement today for career entry and success?* We also heard frequently that there is a need for additional focus on professional development for teachers, administrators, and counselors on the value of the apprenticeship experience—and the value of informing parents and students about it early in their education.

6. Developing, Implementing, and Updating a Coherent Curriculum:

Students in the Olympic High School Advanced Manufacturing and Engineering program are required to complete successfully a four-course sequence aligned with industry standards, including Introduction to Engineering Design, Principles of Engineering, Computer Integrated Manufacturing, and Engineering Design and Development. They also complete OSHA's 10-hour industry credential requirement. The development and implementation of this highly technical curriculum requires clear and consistent professional development for a highly

qualified teaching staff, many of whom come to teaching with extensive industry experience. The curriculum receives continual monitoring and updating, including ongoing discussions with Central Piedmont Community College about alignment with its Associate's Degree program.

7. **Emphasizing Personalization and Technical Skills Development in the Classroom:**

   As suggested previously, one of the positive factors observed during the case study visit at Olympic High School was the high level of personalization and experiential learning during students' classroom experience. The classrooms emphasize hands-on learning under the guidance of a highly proficient and technically trained instructor. A variety of projects—including a summative CAPSTONE project—reinforce a movement away from mechanical test-focused assessment and evaluation in favor of authentic problem solving and decision making as well as technical application typically encountered in the workplace. There is little emphasis upon direct lecture, with didactic instruction integrated into on-the-spot coaching and modeling as students apply key skills and knowledge to real-world situations. This kind of instruction is highly consistent with current research on neuroscience applications to the teaching and learning process as well as the national focus currently on enhancing students' academic achievement by greater focus on personal interaction, cooperative learning, and project-based learning—what many refer to as an emphasis upon "Social Emotional Learning."

8. **Ongoing Oversight and Needs Assessment:**

   As part of the project management approach that is clearly evident in the Olympic High School model, the program also reflects a clear staff and corporate sponsor commitment to meaningful, purposeful, and sustained oversight and needs assessment. A successful apprenticeship requires flexibility and awareness of the need to change as technical advances, performance standards, and workplace protocols evolve and transform themselves. It was also clear to the case study visiting team that the program's focus upon external certification and award recognition (e.g., via its National Academy Program Distinguished status) takes into account industry standards, organizational requirements, and national standards that are rigorous, challenging, and current.

9. **Meaningful Program Evaluation:**

   The program's emphasis upon careful project management and its ongoing commitment to oversight and needs assessment results in a purposeful and sustained approach to program evaluation. The school, district, and participating business and corporate partners appear unanimous in the need to evaluate program outcomes and carefully monitor student progress. Program evaluation is especially critical in ensuring that students in the program are successful—and

receive timely intervention and support when they experience challenges or require extra coaching and mentoring. The performance criteria for each Olympic High School apprenticeship program are clearly articulated with results analyzed regularly as part of the school and district's approach to strategic planning.

10. Profiling Program Achievement and Success Stories:

Finally, we are delighted that the U.S. Department of Labor is demonstrating a commitment to expanding the scope and availability of apprenticeships. Through initiatives such as this case study approach, exemplary apprenticeship programs can become benchmarks and models for replication in other jurisdictions. Profiles of program achievement and related success stories—especially those focusing upon the achievements and progress of the apprentices themselves—can expand the awareness and knowledge base of educators, business leaders, parents, students, and other stakeholder groups about the value of apprenticeships—and their role in promoting students' academic and career success.

Concluding Reflections from Leaders and Participants of the Olympic High School Advanced Manufacturing and Engineering Program

1. **Rebecca Vasquez (Student): "**I think the biggest benefit of an apprenticeship is that you get more of a real world feel of the work force. Usually if you just go straight to college and just continue your studies, it's okay, but we're finding that a lot of people once they get out of college, they're missing that work skill. So I feel like the apprenticeship helps you with your technical skills, communication skills, just normal people skills, because there's a lot of dynamics of the people you're going to work with. I feel like the apprenticeship program helps you in that. It just prepares you better for the work force."

2. **Michel Raelon (Program Coordinator):** "Well, when the kids come back, we've had quite a few years of doing this, so one of the greatest things we did an alumni panel. We had alumni come back who have landed nicely. Many of them were apprentices. Many of them were part of our alternative pathway pro- pro- programs who were able to come back to discuss with students. One of them said: 'Hey. Pay attention! Go, you know, become aware, explore. Those aren't just words. That's how we found this. I left Olympic getting paid $45,000 as a 17-year-old to become a junior software developer, right?' As a result of his apprenticeship, he's now making a lot more in the grand scheme. It changed his life…"

3. **Clayton Wilcox (Superintendent, CMS):** "I think our apprenticeships are successful for a number of reasons, but one is because they're based on industry. And we have industry-based advisory boards that make sure that we are preparing our kids for the world that they'll actually face. This isn't just some intellectual exercise—this is an exercise that's rooted in real world applications of the skills. I think our apprentices will come out of CMS better prepared than any other apprentices that industry is going to look at."

4. **Clifton Vann (Livingston-Haven):** "We've really applied some principles that we understand well in industry, which I like to refer to as supply chain management. And so when you think about it, that's really the concept of getting the right product to the right customer, in the right condition at the right time. And so we should think about our human assets the same way. How do we get the right people in our company, in the right condition, at the right time? When you look at supply chain management today, customers and suppliers are highly integrated. Boeing owns the Vought company down in South Carolina because they wanted to enhance their ability to get products out the door correctly to them. So they've integrated their processes, their people, their knowledge and experience and their requirements to that supplier to make sure that product's coming out in the proper condition."

Study Group Suggestions:
How Can You Use These Recommendations to Begin or Enhance Your School or District's Apprenticeship Program?

Guide Questions	Ideas and Recommendations
1. What are your team's reactions to the five principles presented by the U.S. DOL for an effective apprenticeship?	
2. As you reflect upon existing apprenticeship programs in your school or district, which of these five principles is most evident?	
3. Using these five principles as starting points, are there areas in which your current apprenticeship(s) might be enhanced or improved?	
4. As you discuss the section on involvement of business and corporate leaders, what do your team members consider to be economic and workplace priorities and needs in your region?	
5. How might apprenticeships help your region to address these priorities and needs?	
6. What is your team's reactions to the ten recommendations presented at the end of the case study? In which areas are your currently succeeding? Are there any that might need attention or improvement?	

APPENDIX RESOURCES

(Frequently Asked Questions, Suggested Readings and On-Line Resources, and Case Study Outline Handout)

FREQUENTLY ASKED QUESTIONS

1. What is a youth apprenticeship?

A youth apprenticeship combines on-the-job training (provided by an employer in a business, industry, or related organization considered essential to the economy of a local area, region, or state) with job-related academic instruction in a curriculum aligned with national skills standards for a specific career pathway. Ideally, youth apprenticeships develop and grow as technologies advance and technical training requirements evolve. In many cases, students begin their youth apprenticeship in their eleventh- or twelfth-grade years, continuing their experience for a duration of three years or longer within the chosen career location. Many youth apprenticeship programs also offer the option of students earning college/university credit for post-secondary coursework supported by the apprenticeship sponsor.

2. According to the U.S. Department of Labor, what are the key components of an effective youth apprenticeship?

Youth apprenticeships may vary, depending upon the location and sponsoring business, corporate, or organizational agency, but all successful apprenticeships provide five essential components:

- Active Involvement of Business, Including Apprenticeship Councils, Industry Associations, and Other Partnerships Sharing Administrative Tasks Related to Maintaining the Apprenticeship
- Structured On-the-Job Training, Including Support and Coaching from Experienced Mentors On-Site
- Classroom-Based Academic Instruction Related to the Technical and Academic Competencies Required for the Job
- Reward for Apprenticeship Skills Gains, Including Wages as Students Begin Work and Pay Increases as They Meet Identified Performance Benchmarks
- Nationally Recognized Credentialing That Is Portable and Provides Certification That the Apprentice Is Fully Qualified for a Position in the Chosen Industry or Career Field

3. How do youth apprenticeships differ from other career development programs?

Youth apprentices are hired by an employer and receive a paycheck from their first day of work. Their wages increase as they progress in the worksite and demonstrate growing knowledge, skills, and technical competencies. Typically, an apprenticeship

lasts multiple years (averaging three years), beginning usually during students' junior year in high school. Unlike other career preparation experiences (e.g., shadowing, internships), apprenticeships complete their initial training with industry-recognized credentials. In some cases, they may also complete the program with earned college credits that may lead to an Associate or Bachelor's Degree.

4. Why are youth apprenticeships becoming a priority in the U.S. workforce?

A variety of factors reinforce the need for expansion of apprenticeship experiences for high school students. These include the reality that youth unemployment in the 16-18-year age range is at its highest since the 1950s. The vastly expanding technological knowledge base (including growing influence of Artificial Intelligence, automation, and reduction of the need for unskilled labor) is evident throughout the United States economy today. Many industry leaders decry the absence of highly skilled workers capable of succeeding in high-tech positions, with many such positions going unfilled. We are also witnessing a growing sense among many high school students that they hunger for experience-based and authentic learning experiences aligned with their personal search for efficacy and meaning. Finally, we continue to see the headlines and voices expressing concerned for college and university students graduating with high loads of student debt with little opportunity to use their majors or to enter highly technical career fields.

5. What are the career pathways considered high-yield, high-priority today?

Although specific locations and regions may experience differing priority areas in their workforce, the U.S. Department of Labor has identified the following high-priority workforce pathways in which there is growing need for highly trained and highly skilled workers: Advanced Manufacturing, Construction, Energy, Finance and Business, Healthcare, Hospitality, Information Technology, Telecommunications, and Transportation.

6. How do students benefit from participation in a youth apprenticeship?

Youth apprentices enjoy multiple benefits from their participation, including enhanced educational opportunities reinforcing their academic skills and knowledge as well as a powerful head start on entering a chosen career pathway. Apprentices receive hands-on career training, a comprehensive education aligning the academic and professional sides of their development, the potential for a long-term career in a growing career field, and one or more national credentials that are portable for presentation to employers and industries throughout the United States.

7. How do youth apprenticeships operate?

Apprenticeships typically have sponsors responsible for the overall operation of the program. These sponsors can be a single business or a consortium of businesses. According to U.S. Department of Education guidelines, sponsors can also represent a range of workforce intermediaries, including industry associations or joint labor-management organizations. Community colleges and community-based organizations can also serve as sponsors. Additionally, there is close alignment between the sponsoring agency and school district representatives at the central office and school-based levels. Appropriate instructors, program coordinators, and administrators at the school work closely with job site sponsors and mentors to ensure student progress and program sustainability.

8. For school districts considering youth apprenticeships, how flexible are available models?

U.S. Department of Labor guidelines and policies encourage flexibility and innovation. They emphasize the need for collaboration within the jurisdiction to ensure that proposed or operating youth apprenticeship programs are aligned with the workforce needs of a city, region, and/or state. That said, apprenticeship program design can be customized to meet the needs of participating businesses, including how, when, and where related instruction is provided to apprenticeships.

9. What services does the U.S. Department of Labor provide to support youth apprenticeships?

When schools and sponsors register an apprenticeship program with the U.S. Department of Labor, they gain access to the following services:

- Technical Assistance and Support
- National Industry-Recognized Credentialing
- High Quality and Rigorous Standards Aligned with Current Industry Requirements
- Potential Tax Credits for the Sponsoring Agency
- Access to Federal Resources to Support the Sustainability and Scalability of the Apprenticeship Program

10. Who are the external partners most frequently involved with school districts in youth apprenticeship programs?

A range of partners/sponsors are typically associated with youth apprenticeship programs, including: (a) businesses, consortia of employers, and industry associations; (b) labor and joint labor-management organizations; (c) state and local public workforce systems; (d) two- and four-year colleges that offer Associate and Bachelor's Degrees; (e) community-based organizations; and/or (f) economic development associates.

SUGGESTED RESOURCES

1. **WorkforceGPS: Navigate to Success, Including:**

   a. Framework on Registered Apprenticeship for High School Students (TEN 31-16)

   b. WIOA and Youth Apprenticeship Desk Aid (Using WIOA Adult, Dislocated, and Youth Funds to Support Apprenticeship)

   c. State and Local Apprenticeship Programs:

   - Wisconsin Youth Apprenticeship Program
   - Apprenticeship Carolina Youth Apprenticeship (South Carolina)
   - Apprenticeship Maryland
   - Georgia Youth Apprenticeship Program
   - CareerWise Colorado
   - School to Work Youth Apprenticeship Program (Rochester, NY)
   - Minnesota's Youth Apprenticeship Program
   - Charleston Regional Youth Apprenticeship Program
   - Kentucky TRACK Program
   - Making Apprenticeships Work for Opportunity Youth (Jobs for the Future)

   d. Youth Apprenticeship Tools:

   - Youth Apprenticeship: Action Planning Guide for Local Communities (Wisconsin)
   - Youth Pre-Apprenticeship Recruiting, Screening and Testing (North Carolina)
   - After-School Apprenticeship Program Toolkit (Collaborative for Building After-School Systems)
   - Charleston Regional Youth Apprenticeship Program Infographic (South Carolina)
   - Policies and Procedures for Bridging Youth Apprenticeship to Registered Apprenticeship (Wisconsin)
   - How to Implement a Pre-Apprenticeship Program (Ohio)
   - DOL YouthBuild Registered Apprenticeship Toolkit
   - High School Apprenticeship Tools (Department of Labor)

2. **Research Studies and Toolkits on the Design and Benefits of Youth Apprenticeships**

   a. Youth Apprenticeship: A Hopeful Approach for Improving Outcomes for Baltimore Youth
   b. Making Youth Apprenticeships Work for Illinois' Young Adults: Community Recommendations for Youth Apprenticeships

c. Potential Role of Secondary CTE Programs in Preparing Students for Apprenticeship Programs
d. North Carolina Youth Apprenticeship Guide – ApprenticeshipNC
e. Employer's Playbook for Building an Apprenticeship Program-The Manufacturing Institute
f. Creating a Program-American Institute for Innovative Apprenticeship

A Case Study of the Charlottle-Mecklenburg (NC) Schools Advanced Manufacturing and Engineering Apprenticeship Program

HANDOUT: Case Study Outline and Essential Questions

Part One: ***The Importance of Apprenticeships in 21st Century Education***

Apprenticeships have the capacity to become a game-changing part of students' high school experience. They combine on-the-job training in a variety of career pathways while offering students opportunities for college/university credit during their high school and post-secondary years. The corporate and business leaders in Charlotte-Mecklenburg, North Carolina, are unanimous in their need for highly skilled individuals to fill the high-tech positions they are offering—but which often go unfilled because of candidates' lack of 21st century skills and prior experience in needed specialty areas.

This case study explores the essential components (i.e., the "apprenticeship ecosystem") of an award-winning apprenticeship offered by Charlotte-Mecklenburg Schools (CMS), the Olympic High School Advanced Manufacturing and Engineering apprenticeship program. We begin the study with answers to the following essential questions:

- What is an apprenticeship?
- Why do many educators and business leaders consider apprenticeships an "idea whose time has come"?
- What are the benefits of apprenticeships being an essential part of public school students' education today?
- What are the key elements of a successful apprenticeship "ecosystem"?

Part Two: ***An Exemplary Apprenticeship "At-a-Glance": Olympic High School's Advanced Manufacturing and Engineering Program***

The Olympic High School Advanced Manufacturing and Engineering program is an award-winning career pathway academy designed to teach students about manufacturing processes, product design, robotics, and automation. Its course sequence includes an Introduction to Engineering Design, Principles of Engineering, Computer Integrated Manufacturing, and Engineering Design and Development.

On-site experiences involve training and career development in a range of Advanced Manufacturing and Engineering companies, including Siemens, Chiron, Hyde Park Partners, and Yaeger Industries. In addition to powerful preparation for a career in Advanced Manufacturing and Engineering, successful students receive CPCC-Articulated Credit and college credit via Central Piedmont Community College. This introductory section provides an overview of the program focusing on the following essential questions:

- What is the Olympic High School Advanced Manufacturing and Engineering Apprenticeship Program?
- Who are the students participating in this program?
- What are the success factors that make this program an award-winner?
- What is the significance of career pathways? How does this program relate to the other career pathways addressed by the school and district?

Part Three: ***Leadership in Action: Insights from Program Leaders About the Olympic High School Advanced Manufacturing and Engineering Program and Its Implications for Education***

Leadership at the school and district levels is essential for an apprenticeship program to succeed. In this section of the case study, we share insights and recommendations from CMS leadership related to what makes the Olympic High School program so successful. From the Superintendent to the school principal and program coordinator, there is universal acknowledgment that apprenticeships can transform students' sense of themselves, their preparation for post-secondary work experiences, and sense of personal efficacy, self-regulation, and aspirations for career success and life-long learning. We frame this exploration of program leadership through the following essential questions:

- What can Olympic High School administrators and program coordinators tell us about leadership of effective apprenticeships?
- How is the program coordinated?
- How do school and district leaders reinforce the relationship between school and apprenticeship sites?
- What are key lessons and insights other school and district leaders can learn from the Olympic program leaders?

Part Four: ***Capturing the Student Voice: What Do Advanced Manufacturing and Engineering Apprentices Tell Us About Their Experiences in School and On-Site?***

Students today are hungry for experience-based learning opportunities that allow them to acquire and expand their proficiency in key workplace competencies, including the capacity for on-the-job communication, technical skills application, participation as an effective member of a team, and higher-order reasoning (e.g., problem solving, decision making, critical thinking and evaluation). Apprentices in the Olympic High School Advanced Manufacturing and Engineering program share with us their personal observations about the impact of the program on them, including their post-secondary education and career plans. They also share powerful insights into how their school-based learning experiences can be enhanced through an expanded focus upon in-depth investigation, cooperative learning, and authentic problem solving in response to real-world issues and decisions. Essential questions explored with these students include:

- What do students tell us about their experiences in the Olympic High School Advanced Manufacturing and Engineering program?

- What do the students in the program tell us about the power and impact of their apprenticeship experience?
- What can educational leaders learn from these students about promoting classrooms that are engaging, experiential, and meaningful?

Part Five: ***The Parent Experience***

Parents were unanimous in their praise for the impact the Advanced Manufacturing and Engineering program upon their students' preparation for both career pathways and post-secondary education. They acknowledged that they had initial concerns at first, not fully understanding the scope and breadth of the opportunities the program would offer. Their anxiety diminished greatly over the course of the program as they observed their student growing in technical knowledge, self-esteem and efficacy, and clarification of future goals and aspirations. The unique perspective of parents focuses around three essential questions:

- What do the parents of Olympic High School Advanced Manufacturing and Engineering apprentices tell us about the program and its influence on their students?
- How do parents' perceptions of the apprenticeship experience differ before, during, and after their child's participation in the program?
- What can we learn from these parents about school and district communication about the value and importance of apprenticeships?

Part Six: ***Implications for District and School-Based Leaders: What Can We Learn from the Success of the Olympic High School Advanced Manufacturing and Engineering Apprenticeship Program?***

What can we learn about the potential and power of the apprenticeship experience from the stakeholder groups interviewed for this case study? This final section explores the implications and transferable insights that the Advanced Apprenticeship program offers to educators considering the development or enhancement of similar programs in their schools and districts. We explore the following focus areas through these essential questions:

- What are key guiding principles for an effective apprenticeship?
- To what extent is an effective apprenticeship program an eco-system of interdependent structures, processes, and best practices?
- Who are the key stakeholders comprising this apprenticeship eco-system?
- What should district and school-based leaders consider when beginning an apprenticeship program?
- How can district and school-based leaders work effectively with apprenticeship site sponsors, mentors, and coordinators to maximize the sustainability and scalability of a program?
- How can leaders of an apprenticeship program ensure quality control as the program expands and develops over multiple years?