OPPORTUNITY AMERICA

Federation for Advanced Manufacturing Education

TAMAR JACOBY

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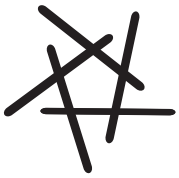

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INDUSTRY-DRIVEN APPRENTICESHIP CASE STUDY

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ABOUT THE AUTHOR

Tamar Jacoby is president of Opportunity America, a Washington-based nonprofit working to promote economic mobility—work, skills, careers, ownership and entrepreneurship for poor and working Americans. A former journalist and author, she was a senior writer and justice editor at *Newsweek* and, before that, the deputy editor of *The New York Times* op-ed page. Her articles have appeared in *The New York Times, The Wall Street Journal, The Washington Post, The Weekly Standard* and *Foreign Affairs*, among other publications. She is the author of "Someone Else's House: America's Unfinished Struggle for Integration" (Free Press, 1998). Her edited volumes include "Reinventing the Melting Pot: The New Immigrants and What It Means To Be American" (Basic Books, 2004) and "This Way Up: New Thinking About Poverty and Economic Mobility" (American Enterprise Institute, 2017). Since 2008, she has also been president of ImmigrationWorks USA.

ABOUT THE ORGANIZATION

Opportunity America is a Washington-based nonprofit promoting economic mobility—work, skills, careers, ownership and entrepreneurship for poor and working Americans. The organization's principal activities are research, policy development, dissemination of policy ideas and working to build consensus around policy proposals.

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PREFACE

Changing technology, growing skills mismatches and weak wage growth are drawing attention to the need for more sophisticated, more relevant career and technical skills, especially for workers who lack a four-year college degree. Among the most effective ways to raise skill levels and prepare workers for rewarding careers is with apprenticeships that combine classroom learning and paid on-the-job experience, teaching skills in demand across an industry. Yet it has proven surprisingly difficult to scale apprenticeship in the United States.

In 2018, just three-tenths of one percent of US workers were enrolled in civilian apprenticeship programs—about 450,000 apprentices, compared to nearly 20 million students in degree-granting postsecondary institutions.

President Donald Trump aims to dramatically increase this number by encouraging industry groups to develop and oversee programs, including in sectors that have not traditionally relied on apprenticeship training. An approach of this kind would align with a long American tradition of employer-sponsored, apprenticeship-like training that is not registered with state or federal agencies. Yet little is known about these programs—how widespread they are, how effective or whether and how they maintain quality standards absent regulation by the government. This study begins to address that gap.

The case study that follows is part of a larger project—a paper by Tamar Jacoby and Urban Institute fellow Robert I. Lerman that explores the landscape of independent earn-and-learn training, drawing on four case studies, a half-day convening of employers and employer associations and lessons from other countries with robust apprenticeship systems to reflect on the Trump administration's approach and offer recommendations for policy.

Among the most important findings of that broader study: newly available data from the US Department of Education's 2016 Adult Training and Education Survey (ATES) suggest that about the same number of American workers have participated in unregistered earn-and-learn training as in registered apprenticeship programs.

Like registered programs, independent offerings appear to be common in the construction trades, but also an array of other industries. Some are fostered and supported by national industry associations; others arise spontaneously, at the initiative of an enterprising employer. Employers who participated in the study were all but unanimous in explaining why they chose to offer unregistered earn-and-learn programs: the flexibility it gave them to meet rapidly changing business needs.

This case study is one in a series of four standalone profiles of quality unregistered apprenticeship programs in industries where the approach may be particularly prevalent: construction, advanced manufacturing, health care and automotive maintenance and repair.

Independent earn-and-learn training is a great and largely untapped opportunity: an effective and, for employers, relatively accessible way to upskill workers, improve the quality of jobs and increase productivity, while significantly expanding apprenticeship in the US.

The goal of the case studies and the paper is to explore this potential and propose how the nation can tap it for the benefit of workers and employers.

Federation for Advanced Manufacturing Education

AT A GLANCE

The Federation for Advanced Manufacturing Education's advanced manufacturing technician (FAME AMT) program is a two-year earn-and-learn experience that prepares college-age and older students for careers as industrial maintenance workers. As in a classical apprenticeship, trainees divide their weeks into time spent in class and time on the job, learning by doing and earning competitive wages. The hallmark of the FAME model: employer collectives, each made up of 10 to 25 companies in a single regional labor market, determine every aspect of the program and its delivery.

An offshoot of a training regimen developed over several decades by Toyota Motor North America at its flagship Georgetown, Kentucky, plant, AMT has been adopted by more than 300 companies across 11 states.[1] Firms come together in employer collectives and partner with community colleges to adapt a highly standardized curriculum that combines technical training with employability skills, problem solving and lean manufacturing practices. It's a relatively small, elite program—now some 400 graduates a year total—but growing, and leadership is exploring organizational changes that would allow it to scale nationwide.[2]

LABOR NEED

According to the US Bureau of Labor Statistics, 522,000 manufacturing jobs stand empty today.[3] Over the decade ending in 2028, Deloitte and the Manufacturing Institute predict the industry will need to fill 4.6 million positions, and as many as 2.4 million of them may go unfilled because employers cannot find skilled workers.[4]

Yet according to Toyota and other FAME employers, these numbers tell only part of the story. A generation of manufacturing workers is retiring. At many firms, robotics and other new technology are creating new jobs, often more demanding than the positions they're replacing: jobs for highly skilled and adaptable technicians, adept at problem solving. Perhaps most challenging, says FAME founder Dennis Dio Parker, most American entry-level technical workers are "underskilled and not work-ready," lacking in soft skills and analytic ability and not competitive with entry-level workers in Europe and Asia.[5]

Generally more skilled and better paid than ordinary production workers, industrial maintenance technicians are responsible for keeping a manufacturing facility operational and efficient, avoiding disruptive breakdowns and expensive downtime. Duties include equipment installation, testing, routine maintenance, preventive procedures, troubleshooting and repair work.

Entry-level technicians can earn $40,000 to $50,000 a year. After three years, according to FAME employers, many earn as much as $65,000 or more.[6]

BACKGROUND

The FAME AMT program evolved over nearly three decades of trial and error by Toyota and other manufacturing employers.[7] The Toyota Georgetown plant established its first prehire training in the late 1980s, building on a company culture that values personal behavior and lean manufacturing practices as if not more highly than technical expertise. From the start, the curriculum included employability skills and manufacturing efficiency. Already in the early 1990s, the program was geared to produce what the firm called "multiskilled" technicians, proficient across four essential trades: electrical, fluid power, mechanics and fabrication—a combination Toyota says can reduce its workforce needs by up to one-third.[8] Also in the '90s, the company added an on-the-job component, supplementing classroom learning with work experience in the factory.

In the early years, all training took place in-house: instruction paid for by Toyota, at Toyota, delivered by Toyota employees.

Three critical breakthroughs transformed the program in the early 2000s.

First, Toyota experimented with outsourcing its prehire training, partnering with several Kentucky community and technical colleges to provide the academic portion of the multiskilled curriculum for a fraction of what it cost at the company.

Second, around the same time, managers at the Georgetown plant began to rethink the notion of classroom learning, moving all instruction to a dedicated space configured to resemble a factory floor—no seats, no desks, no lecturing teacher—filled with state-of-the-art machinery. The rationale for this and many other features of the AMT program, including eight-hour days and year-round instruction: the student experience should resemble what trainees can expect to experience on the job as full-time workers.

Third and perhaps most significant, in 2008, Parker and an executive from the Kentucky Association of Manufacturers developed the idea of an employer collective: a group of companies with similar workforce needs that would come together to oversee and manage the training program. Over time, this would become FAME's most important, distinguishing feature. All consequential decisions at each location are made by a regionally based employer partnership. Member companies, often a mix of large and small, work together to choose the community college, recruit and select students, develop and approve curriculum, and more.

The Great Recession set the launch of the first employer collective back several years, and Toyota sponsored all 25 AMT students who began at Bluegrass Community and Technical College (BCTC) in August 2010. But in fall 2012, the first collective—Toyota and three other central Kentucky firms—partnered with BCTC to sponsor a first cohort of FAME students.

The idea spread quickly across Toyota North America. Over the next few years, Toyota manufacturing facilities in seven other states adopted the FAME model, recruiting nearby companies to form collectives. Soon, other employer groups not anchored by Toyota plants were following suit, coming together with guidance from Parker and the Kentucky department of economic development to establish independent FAME chapters.

Employers with similar workforce needs come together to manage the training program.

In 2014, Kentucky governor Steve Beshear took the concept statewide, bringing what were by then six Kentucky collectives under one umbrella. His most important step: some $170 million in capacity-building investment at the state community and technical college system. He also named a statewide KY FAME board of directors and established a statewide degree track that could be readily adopted at any Kentucky community college where a collective sprang up.[9]

Today, the FAME network stretches diagonally across the map of the southeastern US from West Virginia and Kentucky to Louisiana and Texas. Eight collectives include a Toyota factory in their membership; 19 do not. Most employers are classic manufacturers, but several are not. Jim Beam, L'Oreal and the H-E-B supermarket chain are among nonmanufacturing member companies that sponsor and hire industrial maintenance technicians. Enrollments have grown rapidly from just a handful of students in 2012. In the first seven years, some 600 trainees passed through the program. The current entering class numbers close to 400.

All 27 chapters have the same organizational structure. All have similar expectations for active yearly and monthly engagement by employer members. All follow a similar process in choosing and collaborating with a community college

partner. Colleges across the network teach the same three-pillared curriculum—technical skills, professional behavior and lean manufacturing practices. Students across the network meet the same academic standards and divide their time in the same way between school and work. Together, the 27 chapters make up an informal national network held together by annual conferences, organizational guidance, standardized professional development for teachers, shared templates for promotional material and more, including a robust esprit de corps.[10]

HOW IT WORKS

Students. Unlike most of the community colleges where it is housed, FAME AMT is a selective program. Among the criteria for admission:

- Have a high school diploma or the equivalent.
- Have ACT, SAT or equivalent math scores near the top third of the distribution.
- Be college-ready—require no remedial work to meet college standards.
- Show initiative, grit and a strong desire to succeed in the program.
- Gender, racial and ethnic diversity strongly emphasized in student recruitment.

Employers. Employers are in the driver's seat at FAME AMT. This is the overarching principle that dictates virtually every aspect of the program. The number one customer is not the student; it's the employer. The ultimate goal is preparing workers with skills in demand among local employers. Members of the employer collective make every important decision about the program and its delivery. They:

- Choose the college partner, often through a selective process.
- Can terminate the relationship if the college doesn't meet employer standards.
- Require the college to teach the AMT curriculum and approve every course.
- Recruit and select students, visiting high schools, interviewing all applicants.
- Meet monthly with the college to make decisions about the program.
- Visit the college regularly to interact with students and evaluate student presentations.
- Structure the on-the-job experience at their companies.
- Determine wage levels for trainees—the FAME-recommended minimum or higher.
- Market the program to other employers, growing their chapter and seeding others.

Community colleges. FAME leadership encourages employer collectives to be demanding customers, setting the highest possible bar in their relationships with community colleges. Each college must:

- Sign a memorandum of understanding with the employer collective.
- Convert classroom space into a factory-floor-like advanced manufacturing center.
- Equip the center with state-of-the-art machinery, donated or purchased.
- Dedicate instructors, preferably hired out of industry.
- Adopt AMT curriculum, securing new accreditation if necessary.
- Adopt the AMT calendar: five straight semesters, eight hours a day.
- Adopt the AMT weekly schedule: two days at the college, three days at work.

- Structure learning as AMT prescribes: hands-on practice of content delivered online.

- Prepare students to earn associate degrees along with AMT certifications.

Curriculum. The three-pillared core curriculum is an essential feature of the program. Its goal: to prepare adaptable, analytic, "global best" manufacturing technicians who can maintain increasingly sophisticated manufacturing machinery and adapt to changing technology, solving unforeseen problems and communicating effectively. "The emphasis is on the person," FAME leadership explains, "the technician, not the technology."[11] What students learn:

- Three equal parts: technical skills, professional behaviors and manufacturing best practices.

- Multiskilled technical preparation—electrical, fluid power, mechanical and fabrication.

- Technical content based on a factory task analysis reflects industry needs and standards.

- Professional behaviors including initiative, diligence, communication and teamwork.

- Five manufacturing practices, including safety, problem solving and workplace efficiency.

- Responsibility for maintaining safe, factory-like learning area as if in a working facility.

- Program goal: standardized skills, consistent quality—and core content is highly standardized.

- Technical instruction is geared to the community college calendar; progress in other areas is competency-based.

- There is extensive one-on-one instruction and coaching at the college and in the workplace.

Work-based learning. As in a classical apprenticeship, FAME aims to coordinate classroom learning with on-the-job experience. Employers, college partners and students share responsibility for this coordination.

- Explicit goal: "Try before you buy"—companies aim to hire graduates.[12]

- Companies are required to pay wages that cover tuition, books, fees, room and board.

- Each employer is responsible for structuring the workday at their company, and it varies from firm to firm.

- Companies are encouraged to assign each student an experienced mentor.

- Employers and colleges are encouraged to talk regularly about student progress.

- Students are expected to absorb and adapt to the culture of the firm where they work.

- Many firms offer post-graduation internships—an extra year—to teach company-specific skills.

Funding. FAME AMT is designed to be free for students, economical for companies and self-sustaining, with minimal government support. FAME leadership encourages employer collectives to cover their own costs. The rationale: the more funding comes from government, the less independence employers are likely to have. But the model leverages existing state subsidies for community college education, and several states have made robust investments in community college training facilities. Kentucky also offers ongoing in-kind help: legal services, marketing and promotional material.

- Wages cover college costs, students pay nothing additional and graduate debt-free.

- Cost to college and collective varies widely depending on local circumstances.

- Average cost per student for a company is $60,000 over two years.[13]

- Typical startup cost for a college using existing facility and equipment is $300,000 to $1.5 million.
- Employer collective is encouraged to furnish two robots—average total cost, $50,000.
- Most colleges seek additional funding to purchase a manufacturing simulator—$160,000.
- Annual cost if college hires new faculty is $200,000.
- Two states have built new, dedicated training facilities to house the program—$4 million to $25 million investments.

Developing a pathway. AMT prepares high school graduates for jobs that do not require four-year degrees. But FAME leadership envisions the AMT experience as one step on a "hop-on, hop-off" career pathway that begins in pre-kindergarten and ends potentially in a master's degree. To realize this goal:

- K–12 STEM curriculum provider Project Lead the Way helps recruit AMT applicants.
- A partnering university offers manufacturing business degrees—bachelor's and master's.
- Partnering universities offer a tailored manufacturing engineering program.
- Fifteen to 20 AMT graduates are currently enrolled in bachelor's programs.[14]
- First AMT student earned a business master's in 2018.[15]

METRICS AND RESULTS

FAME leadership envisions the program as a triple win, paying off for companies, colleges and students. The promise, if everything works as expected: companies will find they are able to hire better-skilled employees; colleges will be equipped to offer more sophisticated, successful career programs; and students will walk away debt-free with a high-paying job. Six years after the launch of the first employer collective, standards and metrics are still evolving. Some results are in; others have yet to materialize or be measured.

Payoff for students. The clearest and best-measured result is the payoff for students. Successful completers graduate debt-free with an associate degree, an AMT certificate, an average of three short-term community college certificates and 1,800 hours of on-the-job experience. According to FAME leadership, graduation rates across the 27 existing college programs range from 70 to 95 percent, and all students who graduate do so on time—after five semesters—with the rest of their class.[16] Nationwide, the graduation rate for first-time, full-time community college students is 30 percent over three years.[17]

Payoff for the company. According to FAME leadership, an average of 90 percent of those who graduate proceed to full-time employment at the company that sponsored them for earn-and-learn training.[18] Several FAME employers also report anecdotally that the performance of AMT graduates surpasses that of employees who have not gone through the program. Five years after the first AMT graduation, several Toyota facilities have promoted one or more alumni to the position of team leader—a promotion that managers say otherwise generally takes more than a decade.[19]

Skills in demand industrywide? According to FAME leadership, little or nothing in the AMT technical curriculum is geared specifically to the automotive industry. "These skills are in demand across the manufacturing sector," Parker says.[20]

The core curriculum was developed at Toyota in the late 1980s and later verified by an independent, third-party analysis of the skills in demand at the Georgetown plant—a so-called Developing a Curriculum (DACUM) process conducted by the University of Eastern Kentucky in 2008. How DACUM works: a team of researchers questions a panel of six to eight high-performing incumbent workers to determine the tasks and skills that are

essential for each job, then develops an occupational profile that can be translated into curriculum.[21] Yet, despite its Toyota roots, the FAME curriculum is now endorsed by more by more than 300 manufacturing companies, most of which do not make automobiles.[22]

Third-party quality control. All trainees who complete the AMT program receive associate degrees from accredited community colleges. They also earn FAME-specific AMT certificates.[23] To date, FAME leadership has seen no need for independent accreditation or other third-party validation. But this may change as the program grows: state or federal agencies providing funding are likely to require some form of external quality assurance, either by the government or an independent employer group.

The state of Kentucky is moving in this direction. According to Deputy Secretary for Workforce Development Josh Benton, starting in 2018, all AMT graduates in the state will be evaluated by a uniform assessment—a competency-based skills test developed and administered by an industry -backed, independent accreditor, the nationally recognized Automotive Technical Education Collaborative (AMTEC).[24] FAME leadership says it is encouraging other employer collectives in other states to consider requiring the AMTEC assessment.[25]

The whole person. When FAME employers and educators gather at annual conferences and other network convenings, they tend to talk less about technical skills than about the character of AMT graduates—what they call "the whole person." Few FAME gatherings are complete without one or more sessions designed to showcase students and give them an opportunity to display their personal and presentation skills.[26] Speakers may or may not be representative, but the program's ideal is clear: maturity, poise, purpose, discipline, commitment—qualities, FAME member companies assert, of the highest value to employers.

COMPARED TO REGISTERED APPRENTICESHIP

Although many aspects of the FAME model resemble classical apprenticeship, network leadership maintains that the program is "apprenticeship-neutral": individual employers may choose to register the training they offer on the job at the company or not, as they see fit.[27]

Parker and Benton describe FAME as a parallel track, similar to registered apprenticeship but with additional advantages for employers—reduced paperwork, less bureaucracy, more flexibility to make changes. "Employers, not the government, have the final say on things that need to be modified," Parker says.[28] According to Benton, this is what has allowed the program to grow as quickly as it has. "We want to serve our customers—the widest possible scope of customers," he explains. "The rigidity of the registered apprenticeship model is part of what's limiting its growth."

The one exception in Benton's eyes—the one advantage of registered apprenticeship—is the guidance it can offer small companies or those that have not provided training in the past, both of which often struggle to structure on-the-job work experience. "Not every company is Toyota," Benton explains. "Not every company has a culture of work-based learning. Many lack the resources to plan in-house training." Registered apprenticeship gives employers a ready-made, structured plan, coordinated with related classroom instruction.

FAME member companies that choose to register the training they offer at the firm participate in the collective like other members, making decisions about instruction and other activity at the community college. Registration and compliance with US Department of Labor or state apprenticeship agency requirements is independent and additional, something companies do alongside their participation in FAME. According to Benton, roughly 5 percent of 191 KY FAME member firms have registered their in-house training programs.

Among the similarities and differences between FAME and the traditional registered apprenticeship model:

Blends classroom and on-the-job learning. Like apprenticeship, FAME envisions a student experience that combines robust, structured classroom learning with equally robust, structured on-the-job training at the company. As in a classical apprenticeship, FAME expects close coordination between the two components—including by experienced employees designated as mentors, who supervise each student's time on the job. But unlike a traditional registered apprenticeship program, FAME does not require employers to record or report training activities that take place at the firm.

Skills in demand across the industry. As in a registered apprenticeship, FAME envisions that students are learning skills in demand across the manufacturing industry—not just at one company, but nationally, if not internationally. The registered apprenticeship model looks to government, state or federal, to assess whether training programs are preparing students to an industry standard. FAME expects its employer collectives to make the determination—and modify the program if necessary.

Portable credential. Trainees in a registered apprenticeship program earn journeyman certificates, often sought after and well-regarded, but rarely standardized, making it difficult for a future employer or other third party to assess a worker's skills. AMT students earn associate degrees and community college certificates—often equally opaque to future employers, especially when students move from state to state. The state of Kentucky has sought for some time to add an additional metric—a more portable credential, recognized nationwide—and the new state requirement that all Kentucky AMT graduates sit for an AMTEC assessment moves the program toward a more transparent, standardized outcome.

Graduated wages. Unlike in a registered apprenticeship, FAME does not require employers to offer specified wage increases as trainees move through the program and learn additional skills. FAME sets a baseline: companies must pay enough to cover tuition and other college costs so that students graduate debt-free. In Kentucky, this dictates wages of at least $12 an hour, and Benton estimates that the average across the state is $14 to $15.[29] FAME also encourages firms to offer additional performance incentives as students develop and demonstrate new skills.

The problem, according to Parker: "Not every company can afford to do that. Especially not small companies." In keeping with FAME's core principle, once college costs have been met, the decision about how much to pay AMT trainees is left to employers.

CHALLENGES

Not yet 10 years old and growing, FAME faces an array of challenges, many of them driven by a desire to scale the program nationwide.

Organic growth. FAME employers maintain that the best way to grow the network is from the bottom up. Just as employers oversee and manage the program, this thinking goes, they should also take the lead in promoting it and recruiting other companies. "When the community college recruits the employers, it doesn't work," one FAME member asserted at a recent network gathering. "If they or the state or someone else takes the initiative, that puts them in the driver's seat—and more than likely, companies won't get what they need out of the program."[30]

The challenge for the FAME network: relying on employer members to market the idea to other firms leaves a lot to chance. Most companies have limited time and resources, and without a more intentional growth strategy, the program may find it difficult to expand nationally. The state of Kentucky has struck a balance, according to

Benton, facilitating statewide growth while still relying on employer initiative and leaving essential decisions to new employer collectives.

Can other states follow suit? Can local chambers of commerce help? Or other employer associations? FAME leadership is looking for options that would permit continued bottom-up growth powered by employer initiative.

Quality assurance. A second challenge that comes with growth: maintaining quality across the network. Parker readily admits that some regional partnerships are better than others—more faithful to the FAME model and more effective in training students to the program's high standards. Here too the program struggles to find a balance, maintaining standards and structure while allowing employers ample room to make their own decisions.

Small, selective, propelled by employer enthusiasm and peer-to-peer employer recruitment, FAME relied in its first five years largely on voluntary quality control. "Why would employers join," Parker asks, "and then water down the standards that make the program successful?"[31] This voluntary approach is unlikely to guarantee rigorous standards as the network expands.

The state of Kentucky has moved to address the challenge by adopting the AMTEC test—requiring all Kentucky FAME students to sit for a uniform third-party assessment. Among questions for the future: Is AMTEC the best, most appropriate third-party assessment? Will collectives in other states make it or another, similar test a requirement for students? Are other performance metrics needed, and if so, what should they be?

Other occupations, other industries. The last frontier for FAME: adapting the model to prepare students for other occupations and other industries—beyond industrial maintenance technician.

FAME leadership believes this is doable.[32] Their argument: just one-third of the FAME curriculum is technical. The professional behaviors that make up the second pillar of the program are in demand across economic sectors: initiative, diligence, communication skills, teamwork. So, Parker and others claim, are the lean manufacturing principles that the program calls "competitive practices"—critical thinking, problem solving, time management, workplace organization, workplace efficiency, productivity and safety culture.[33]

The primary challenge for employer collectives in other sectors will be developing industry-specific technical content—ideally with a DACUM process or something like it to ensure that skills are up-to-date and in demand industrywide. One KY FAME chapter, in Owensboro, Kentucky, has developed a financial services curriculum.[34] Another chapter has piloted training for tool and die makers. The National Association of Manufacturers' educational arm, the Manufacturing Institute, is considering adapting the AMT model for a broad spectrum of additional manufacturing occupations—welder, machinist, computer numerically controlled (CNC) programmer and others.[35]

CONCLUSION

FAME AMT has won numerous awards in workforce education circles, local and national, and it is increasingly regarded as one of the best postsecondary job training programs in the US.[36] It combines the discipline and rigor of a traditional apprenticeship with more ample room for employer choice and more flexibility for companies. Much is required of participating employers but, because of the collective structure, much less than in a standalone apprenticeship at a single firm.

Many decisions still need to be made as the FAME network grows. But the core model developed nearly a decade ago at one company and now in use across 11 states would appear to hold lessons for anyone—employers, educators or policymakers—seeking to design effective earn-and-learn career education.

NOTES

1 Here and throughout this case study, unless otherwise noted, statements about company views and related information draw on Dennis Dio Parker (assistant manager, Toyota North American Production Support Center), interview with author, Georgetown, KY, June 24, 2016; Dennis Dio Parker, interview with author, Frankfort, KY, November 30, 2017; Dennis Dio Parker, site visits to KY FAME with author, Louisville, KY, September 28, 2017, March 27, 2018, and June 12, 2018; Dennis Dio Parker, email to the author, December 17, 2018; FAME, 2018 National Conference presentations, San Antonio, TX, May 14–16, 2018; FAME, AMT Live! presentations, Vincennes, IN, August 9, 2018; FAME, *Informational Handouts: Booklet Form (handout, Louisville*, KY, 2018; and FAME, *The Advanced Manufacturing Career Pathways: A Brief History* (handout, Louisville, KY, June 2016).

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24 Subsequent information and quotes from Josh Benton come from his previously cited 2017 interview with the author.

25 Parker, interview, 2017.

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32 Ibid.; and Parker, site visit, 2018.

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