DEVELOPING INTEGRATED, CONTEXTUALIZED INDUSTRY MATHEMATICS CURRICULA IN SHORT TERM CERTIFICATE PROGRAMS

Dirk A. Keaton[1]
So Others Might Eat Center for Employment Training

ABSTRACT

Many educators in community-based adult education organizations are attempting to adopt Integrated Education and Training (IET) strategies. In this paper, the author describes how he has collaborated with instructional and program staff to develop and deliver an integrated, contextualized industry mathematics curriculum. He highlights the impact of this curriculum on student success, instructional delivery, and school culture while underscoring the challenges posed by adopting IET, a methodology developed for community colleges, in a community-based organization.

CONTEXT

So Others Might Eat Center for Employment Training (SOME CET) offers two Integrated Education and Training (IET) programs: Building Maintenance Service Technician (BMST) and Medical Administrative Assistant (MAA). IET is a service delivery strategy in which students receive workforce training, workforce preparation, and basic education services concurrently. All students receive 660 or more hours of workforce training, approximately 70% of which is hands-on. In addition, both programs include integrated, contextualized basic skills courses that are co-taught by the basic education and industry instructors. Students also participate in two workforce preparation courses: Career Development and Shop Talk. Career Development is a 60-hour-long course that covers topics such as business communication, job searching, and networking. Shop Talk, a 24-hour-long course, teaches students how to better "utilize resources...work with others, understand systems, and obtain skills necessary for successful transition into and completion of postsecondary education or training or employment," all of which are defined by the Workforce Innovation and Opportunity Act of 2014 (WIOA) §113-128 as workforce preparation subjects. Each program is designed to be completed in 6 to 9 months. All participants take an industry-recognized certification exam—The National Health Association Certified Medical Administrative Assistant or the Environmental Protection Agency

1 The author would like to acknowledge the assistance of Lonnie Murray, Ameisha Gathers, Blaine Vann, Sofya Leonova, Anna Christ, Vaughn Edmeade, Carlynn Miller-Gore, Judy Mortrude, Mikhaila Richards, and Jesse Zarley in preparing this paper and the continued assistance and support of all his SOME CET colleagues.

608 Type I—upon completion. After securing employment, graduates participate in a year-long Retention Services program. The employment retention specialists serve as mediators between employed graduates and their places of work and help graduates identify and remedy barriers that may interfere with successful employment.

SOME, SOME CET's parent organization, is an interfaith, community-based nonprofit that exists to help the poor and homeless of our nation's capital. We meet the immediate daily needs of the people we serve with food, clothing, and health care. We also work to help break the cycle of homelessness by offering services such as affordable housing, job training, addiction treatment, and counseling to the poor, the elderly, and individuals with mental illness. Because of the range of services offered by SOME, we can easily refer SOME CET clients to services such as housing, behavioral health services, and other medical care.

We chose to provide integrated, contextualized basic skills courses because of the diverse and profound needs of both SOME CET's students and those of DC adult learners in general. Despite DC's deserved reputation as one of the most educated cities in America, many of DC's poorest residents lack the basic skills they need to enter middle-skill employment. Fewer than 25% (24.36%) of all persons who took eCASAS tests at American Job Centers scored at least at the 8th grade level on both math and reading in FY 2016 (Department of Employment Services, 2017).[2] Moreover, more than 90% (90.78%) of DC residents who participated in WIOA Title II adult education programs in FY 2016-2017 read and/or did math at an 8th grade level or lower (Office of Career, Technical, and Adult Education).[3] SOME CET's students' scores mirror these statistics. Although 80-90% of all SOME CET students have a high school diploma upon entering the program, the average student enrolls with a CASAS math score of 225 (Adult Basic Education Intermediate High, 6th grade equivalency) and a reading score of 236 (Adult Secondary Education Intermediate Low, 9th grade equivalency).[4]

Many DC residents are prevented from entering job training programs because they have low basic skills. DC has historically required students to both have a high school diploma and to read and do math at least at an 8th grade level before qualifying for Individual Training Accounts (which are funded with WIOA Title I dollars). Many training providers, regardless of their funding source, have adopted these requirements. While DC's Workforce Investment Council[5] overturned this regulation in April of 2016, many training providers have not changed

2 Most DC programs use the "Grade Levels for WIOA Title I Funded Agencies and Youth Providers" to determine grade level (Comprehensive Adult Student Assessment Systems). All grade level equivalencies given in this paper are based on that document.

3 Because of differences in fiscal years and reporting requirements between the American Job Centers, the district's WIOA title 2 providers, data from identical time frames and the percentage of title II students who scored below an 8th grade level are not available.

4 Based on an analysis of SOME CET's CASAS test data since 7/1/2014, when we first implemented ECASAS tests.

5 A local body that functions as our Workforce Investment Board

their entry requirements. Even before adopting IET, SOME CET did not require students to have high school diplomas and only required students to have a CASAS Math score of 214 (Adult Basic Education Intermediate Low, 4th grade equivalency) and a reading score of 224 (Adult Basic Education Intermediate High, 6th grade equivalency).

IET was a relatively new strategy in 2013 when SOME CET fully implemented the model. When developing our model, most of the IET programs and initiatives that we researched—I-Best, FastTRAC, and Accelerating Opportunities—were delivered at community colleges and the level and nature of the support services offered by each varied considerably. Washington State piloted I-BEST, the most famous of all career pathways initiatives, in the 2004-2005 school year and fully implemented it in 2007-2008. Though I-BEST introduced integrated, contextualized instruction to a wider audience, most I-BEST programs did not include a workforce preparation component.[6] Minnesota's FastTRAC is a more robust IET model as it includes a navigator who provides support services, referrals, assists in career development and job searches, recruits and orients students, and serves as a bridge to the college (i.e. helping students register). FastTRAC programs also incorporate "bridge" courses, contextualized basic skills courses for students who don't achieve the scores necessary to enter true FastTRAC programs. The bridge courses in half of the FastTRAC programs in 2011 "included job search skills [such as] finding jobs, resume preparation and intervention, and less commonly, job retention" as part of their curriculum (Burns, Lindoo, Dincau, Speck, & DeMaster, 2013, p. 24). Jobs for the Future's 2011 Accelerating Opportunities Initiative required all participating states to provide "academic and social student supports" such as the services of a FastTRAC-style navigator as well as services like tutoring, career counseling, financial counseling, advising, and access to computer labs (Anderson, et al., 2015).

I-Best, FastTRAC, and Accelerating Opportunities differ considerably from SOME CET's IET model as they were designed for the community college context and represented a collaboration between multiple schools and nonprofits. In a FastTRAC program, for example, a technical instructor employed by a community college may co-teach with a basic education instructor who works for the local school system. Their class may be held in a community college classroom, and a nonprofit may employ the navigator who handles the cases of students in that class. This strategy of combining multiple resources is often referred to as "braiding." While SOME CET does "braid" funding (students' tuition is supported by a variety of foundation grants, private donations, SNAP Education and Training funding, which provide funding for 80 students, and WIOA Title II, which provides funding for 90-100 students), we are a single, community-based nonprofit which hosts all of the IET programming and employs all of the program staff and instructors.

6 Though research on I-Best is limited, Wachen, Jenkins, & Van Noy noted in their 2010 essay that only a third of I-BEST programs had designated a main point of contact who could connect I-BEST students to resources.

CHALLENGES

I was hired as the Adult Basic Education (ABE) instructor in December of 2012 and was tasked with developing and delivering integrated, contextualized adult basic education courses. I had previously worked as a basic education instructor at Living Wages, a local high school equivalency program, and as a computer instructor at a trade school. Working in both contexts gave me a unique understanding of the techniques used to teach both basic and industry skills. Though I had not developed integrated lessons per se, Living Wages is a program dedicated to popular education. This doctrine, founded by Paulo Freire, suggests that students learn best when they engage in dialogue with instructors about topics that are relevant to their everyday life. While at Living Wages, I incorporated local news and neighborhood events, students' goals, and students' interests into lessons. Developing industry lesson plans seemed to be an extension of this work. However, I faced three challenges upon starting the program at SOME: 1) the industry instructors and I were new to co-teaching, 2) industry instructors had limited time dedicated to co-planning, and 3) SOME CET's enrollment strategy lead to new students enrolling in my class biweekly.

Both my co-teachers and I had little to no experience co-teaching. Initially, some instructors were resistant. Lonnie Murray, one of the BMST instructors, started at SOME CET in November of 2012. He was concerned about the effect that co-teaching would have on the classroom environment since he had "just gotten the rhythm" of teaching his class. This was also his first teaching position, and he worried that I would try to "tell him what to do" because I had more teaching experience (personal communication, October 25, 2017). Others worried that having a math instructor in their classroom would send the message that they weren't equipped to teach math themselves. This was especially true for those industry instructors who lacked confidence in their own math ability.

We also had limited time to co-plan and deliver instructional material. SOME CET students participate in 30 hours of instruction a week. This includes 2 hours of Shop Talk, 6 hours of Career Development, 3 hours of integrated basic education, and 19 hours of industry instruction. While the employment retention and professional development specialists deliver Shop Talk and Career Development, respectively, industry instructors are wholly or partially responsible for delivering the remaining 22 hours of content. As a result, industry instructors have a limited amount of time to perform their administrative duties, meet with their supervisors, and plan lessons. Co-planning took up this valuable time, and since I had little background in the building maintenance or the medical administration industry, our early meetings were lengthy and not very productive.

SOME CET's biweekly enrollment model also presented challenges. After completing a 1-2 week long introductory course, students are incorporated into existing industry classes. This means that on their third week, students might enter a plumbing unit and work alongside students who have been in the same program for several months. While this enrollment

model is common for technical schools, adult basic education programs in DC usually operate on quarter or semester schedules. When I first started teaching adult education in 2008, the received wisdom was that students should study the four basic operations (addition, subtraction, multiplication, and division), fractions, decimals, percentages, geometry, and algebra (usually in this order). Classes typically "cycled" through these topics, and most programs waited until the "cycle" restarted to enroll new students. Advocates of this enrollment model argue that mathematical knowledge is scaffolded. In other words, the acquisition of new concepts (i.e. percentages) is predicated upon knowledge of certain, foundational concepts (i.e. multiplying decimals, long division, and the use of ratios and proportions). To teach effectively in this environment, I would have to go against conventional wisdom and create a curriculum that would allow students with varying grasps of foundational concepts to participate and succeed in the same lesson.

IMPLEMENTING CHANGE

Though we did not realize it at the time, SOME CET set out to create a new model of co-teaching. I-Best paired industry instructors with adult basic education instructors who spent at least 50% of their time co-teaching. Wachen, Jenkins, & Van Noy in "How I-BEST Works" emphasized that "facility with [team teaching] often develops on the job, slowly, over a period of time." One of the instructors interviewed even likens the process to a "marriage" (2010, p. 19). I was mandated to begin co-teaching with 4 different instructors by the end of January 2013. Because of this time frame and the number of instructors I had to work with, 50% co-teaching was out of the question, and I had to find ways to quickly develop successful working relationships with each of the instructors. Several factors contributed to the success of our integrated, contextualized basic education curriculum: the support of management, meeting with industry and ABE instructors to develop shared priorities, collaboratively drafting lesson plans with industry instructors, observing industry instruction during my first months at SOME CET, and creating materials targeted to our students' learning needs.

The importance of management's support cannot be overstated. Our management team reiterated to instructors that integrated, contextualized education was not an experiment that we were trying out, but a strategy that we were committed to adopting. My manager, Veronica Wright, also checked in with me regularly to ensure that industry instructors were meeting expectations. If an instructor was, for example, not co-teaching, she would monitor the situation and communicate expectations to them when necessary.

I created industry instructor buy-in by, first, focusing on lessons that addressed instructors' priorities. Both industry courses had existing lessons and assignments that required mathematical knowledge. For example, the final two units in the Medical Administrative Assistant course require students to maintain a simulated petty cash box, reconcile a bank statement, and calculate patient balance (including percentages) on patient ledger cards. By

developing lessons focused on these subjects, I created goodwill and met instructors' needs.

After meeting instructors' needs, I made my own requests. For example, I found that students in a plumbing class had difficulty multiplying decimals. I asked Blaine Vann, one of the BMST instructors, how plumbers use decimal multiplication. He told me about offsets (which is the vertical distance between two fittings). Offsets are used to measure the travel, the distance between two angled fittings. To calculate the length of a travel, one multiplies a constant, a decimal like 1.414, with the length of the offset. We then worked together to develop several lessons focused on calculating offsets.

We developed these lessons through a system of drafting. I usually began lesson planning by asking leading questions like, "when does an HVAC technician add or subtract fractions?" When the industry instructor said, "I add fractions when I'm trying to determine the height of a split system (a unit that combines a heater and air conditioner) and subtract them when I calculate the distance between the duct and the split system," I would ask follow-up questions like, "how tall is the average split system" and "how far does a duct hang down from a ceiling?" I would take the measurements they gave me and work with them to develop several example word problems. Then, I would attempt to solve the problems in front of them, asking them questions about the process they use when necessary. After the meeting was over, I would do my own research (i.e. looking up additional measurements and scenarios in which HVAC technicians use fractions) and expand the example questions into a full-length assignment or packet.

After my draft lesson plans were complete, I presented them to the instructors for feedback. While I would often take the lead in the initial planning conversation, the industry instructors gave much more enthusiastic feedback and suggested helpful and creative additions to the lesson during the follow-up meetings. For example, I presented Lonnie Murray with a relatively simple lesson on calculating Boyle's Law that largely used examples from physics textbooks. He enhanced the lesson by suggesting that I incorporate the "drag," or the volume of the tubes used in an HVAC recovery system. I suspect that this method was effective because I leveraged each of our strengths: I had been trained as an instructor and could structure activities as effective lessons while Mr. Murray and the other industry instructors had the ability to think creatively about their industries. These planning sessions would generally last for an hour, but developing and revising the drafts was very time-consuming. During my first nine months at SOME CET, I estimate that I devoted about 50% of my time to writing and revising lessons. This investment of time on my part may seem excessive, but it enabled us to maximize our limited co-planning time.

Observing industry lessons had the greatest impact on my development and delivery of lesson plans. During my first year at SOME CET I attended a few industry classes a week, outside of my industry math classes. I first did so with the intention of serving as a "model

student." In many I-BEST classrooms, the adult basic education instructor spends all or part of their time as a "model student" who learns the trade alongside the students and asks questions or requests more clarification from the industry instructor when necessary (Wachen, et al. 2010). While I was occasionally able to help struggling students or ask a clarifying question, I found that I benefitted much more from being in the class than the student did. Through attending industry classes, I learned much more about the trade, the lessons the teacher taught, and the terminology he or she used. Moreover, I could refer to specific moments or topics from a previous day's lesson when giving my own lecture. For example, when teaching how to calculate using Ohm's Law, I could refer to the definitions, metaphors, and examples that the industry instructor used in his or her basic electrical theory lecture. Referring to colleague's instruction can help students to draw connections between material across disciplines and to develop a global understanding of their field.[7] As I became more familiar with the trades and the instructors' favorite terms and explanations, observing classes became less necessary.

When I developed my lesson plans, I had to design them wholly or partly from scratch. This is because there were few adequate industry lessons and curricula directed at my students' skill level in 2013. As I mentioned above, most students at SOME CET do math at an ABE Intermediate High level. While educators in both Minnesota and Washington state had made lessons and curricula publicly available online, many of the best were directed at students who performed at a much higher or lower educational functioning level than my students and many were directed at ESL students.

Similarly, most of the industry math textbooks available could not be used without adaptation. Some assumed a high level of math proficiency and devoted most of their space to word problems and provided only brief explanations of the text (e.g. ATP's Math for the Building Trades). Others focused on general workforce applications rather than a specific industry sector (e.g. Steck Vaughn's Math Skills for the Workforce). Still others (e.g. Mathematics for the Health Sciences by Joe R. Helms) offered high-quality, integrated exercises but were written for a college audience. Adapting these texts made it easier for lower-level students to engage in higher-level math.[8] For example, some medical textbooks will present Clark's Rule as follows:

$$Infant\ Dosage = \frac{Patient\ weight \times Adult\ Dosage}{150}$$

7 Similarly, Melissa C. Leavit argues that referring colleagues' ideas during lecture allows students to "achieve higher levels of synthesis and integration into their study of new material" (2006).

8 SOME CET went through a similar process when designing its curriculum. While we use textbooks (like Delmar's Administrative Medical Assisting) which are designed for a community college audience, we deliver our own tests rather than those provided with the book. Our tests are shorter and less comprehensive than those created by the textbook companies and generally focus on the skills that one most needs to succeed in their target profession.

This algebraic formulation looks unfamiliar to many of my students who may not have passed or even taken an algebra course. However, if it is reformulated like so:

$$\frac{patient\ weight}{150} \times adult\ dosage = infant\ dosage$$

it looks like a fraction multiplication problem, something more familiar to intermediate high students. Similarly, many electrical textbooks often require students to derive all three formulations of Ohm's law from

$$Watts = Volts \times Amps$$

By providing students with all three formulations, difficult calculations that industry professionals perform daily can be made accessible to students.

Creating and adapting content also allowed me to include more authentic industry materials. For example, plumbers use a manual called a fitting schedule to determine the size of fittings. Similarly, insulation companies publish tables for calculating the minimum and maximum amount of insulation to use per square foot. While these documents have obvious math applications, they are not created for educational purposes, and neither is likely to be found in an industry math textbook. Looking up these documents requires considerable research. However, incorporating them into classes makes industry math seem more real and lends credibility to instructors' claims that professionals use math daily.

Because of SOME CET's enrollment model, my math classes were composed of students whose industry experience, time in the program, and mathematical abilities varied considerably. SOME CET addresses this challenge in its industry courses by making each unit modular. The HVAC unit, for example, does not presuppose a knowledge of carpentry or electrical wiring (though relevant competencies from both are incorporated into lessons). We attempted to make our industry math courses just as modular by identifying a small set of math competencies with units in the curriculum. For example, we associated the units in the BMST program with the following competencies:

Unit	**Competencies**
Carpentry	Area, Reading Blueprints, Multiplying Fractions, Volume, Converting Weights and Measures
Electrical	Multiplying and dividing using decimals, formulas
HVAC	Volume, Area, Multiplying Fractions, Order of Operations, Solving Single Variable Algebra Equations
Plumbing	Adding and Subtracting Fractions, Multiplying Decimals, Converting Decimals to Fractions

Though some of the above units share competencies in common (i.e. HVAC and Carpentry), many do not (i.e. Electrical and Carpentry). As a result, new students felt less overmatched when entering a class with students who had spent more time at SOME CET. For example, a veteran student in an electrical class who had taken carpentry would not have much more of an edge over a new student since neither had taken courses that involved dividing decimals before. The competencies in each of these units are scaffolded. One, for example, must know how to divide decimals before they can use electrical formulas like Ohm's Law. However, the curriculum does not presuppose that one needs to be familiar with fractions before progressing to decimals (as many adult education curricula do). Moreover, the number of competencies addressed in each unit was small enough that a student who entered in the middle of a unit could catch up through warm-up assignments and the help of their peers.

RESULTS

During the first six months of implementing I-BEST (January through June of 2013), we saw an 11.75% increase in Educational Functioning Level (EFL) gains by post-tested students (students who took two or more CASAS tests while attending SOME CET). In each successive fiscal year, the number of post-tested students with EFL gains has exceeded 50%. Moreover, in FY 2015-2016, more than 67% of post-tested students achieved EFL gains, exceeding the percentage of students making EFL gains in the state by more than 12%. Furthermore, if we exclude those categories in which no students enrolled, such as ESL and ASE High, we exceeded state performance by more than 25% (Office of Career, Technical, and Adult Education). During FY 2015-2016, approximately 59% of all SOME CET students achieved EFL gains (as defined by NRS table 4). This exceeds the state percentage achieving EFL gains (excluding categories in which no students were enrolled at SOME CET) by approximately 31% and the overall state performance by approximately 25% (according to the NRS). This success not only lends credence to the effectiveness of integrated education and training, but also shows that a highly successful IET program can be built without having the high levels of co-teaching mandated by initiatives like I-BEST.

Furthermore, our experience provides evidence that lower-level learners and learners without high school diplomas can benefit from co-taught instruction. As I mentioned above, DC has historically required students to both have a high school diploma and to read and do math at an 8th grade level before participating in job training programs. As DC area programs have adopted IET, many have placed students without a high school diploma or 8th grade level reading and math proficiency into either bridge courses (which are generally contextualized but not integrated or co-taught) or un-integrated, un-contextualized basic skills courses. Similarly, many FastTRAC students with my students' CASAS or TABE scores would be required

to participate in a bridge class.[9] These "cut scores" are a reflection of a national debate about who can benefit from IET. Many educators and administrators, including advocates for low-scoring learners like Pickard (2016), are skeptical that students with low basic education scores can succeed in integrated, contextualized education or even bridge courses. SOME CET provides evidence that these students can succeed and that the "cutoff" for fully integrated, contextualized instruction can be lower than many educators believe.

Perhaps the most important result of implementing integrated, contextualized basic education was its effect on industry instructors. When I met with Rosalie Jaenisch, a FastTRAC industry instructor at Saint Paul College and head of that college's Medical Office/Health Information Technology Department, and Carlynn Miller-Gore, her basic education co-teacher, in November of 2013, Ms. Jaenisch told me that one of the most valuable things she learned from working with Ms. Miller-Gore was teaching techniques. Specifically, Miller-Gore taught Jaenisch how to use second language teaching techniques (such as those adapted from Dictation: New Methods, New Possibilities by Paul Davis and Mario Rinvolucri) to help students learn medical terms (personal communication, November 15, 2013). I have noticed that the industry instructors have acquired new and sharpened their existing teaching skills through working with me.

By co-teaching with industry instructors, I modeled behaviors that they adopted. For example, Lonnie Murray (personal communication, October 25, 2017) noticed how I would walk around the room while teaching, checking to make sure that students were comprehending and on task, and began to do so himself. He also appreciated how I would model thought (or explicitly describe my behaviors and thoughts I was having) when teaching students a new concept. After co-teaching a lesson on gauge reading with me, he began to use my technique for reading gauges while teaching students in the shop, and worked to model thought when introducing a new concept to his students. While Lonnie estimates that "less than 50%" of students used to be able to comprehend any of his lectures before he worked with me, he estimates that now, about "85% percent of students can understand."

As our relationships developed, I also began to directly teach my fellow instructors techniques like lesson planning and assessment. SOME CET, like most DC area trade schools,

9 For example, St. Paul's medical office assistant course required seventh grade reading and math for participation in the bridge and 8th grade reading and math for integrated coursework (Burns, et al, 2013). Furthermore, the audience for healthcare bridge curricula available through Minnesota's Atlas ABE database list varies considerably. One requires a CASAS reading 230-236 (8th-9th Grade, ABE Intermediate High to ASE Low), while another is targeted at students with TABE reading between 6.0-12.5 (usually correlated with 6th to above 12th grade level) and TABE math between 5.0 and 12.5 (Miller-Gore, 2017). In each of these cases, most of our students would have to take a bridge before proceeding to integrated instruction. Burns, et al also note that most FastTRAC participants take a bridge before entering integrated instruction (2013). Since most of my learners would have entered a bridge course in FastTRAC, this helps to account for the lack of publicly available integrated curricula targeted at my learners' level.

does not require industry instructors to have previous training or experience in education. Of the 11 instructors who I have taught alongside at SOME CET, 6 had not taught before arriving at SOME CET. Four of the medical instructors had taught at proprietary schools. These schools typically use packaged curricula (in which all lesson plans, PowerPoint presentations, and assignments are produced by a company like Delmar or Elsevier). Because of this, most instructors I worked with had never received formal training on how to write a lesson plan, structure a lesson, or assess student understanding. Many of the lesson plans that existed at CET upon my arrival did not reflect the activities that went on in the classroom. Moreover, many lessons were devoted entirely to lecture or lacked key components (such as assessments or opportunities for guided practice). For example, MAA instructors would often lecture on CPT codes and then release students to complete a CMS-1500 form without first showing learners how to properly fill out said form.

The managers, seeing the need to create consistency in the curriculum, encouraged me to provide internal professional development to the other instructors. I observed industry instructors' classes and met with them biweekly to go over the results of the observations. I then worked with them to improve their delivery and revise their lesson plans. Through this method, I taught instructors how to cold call confused or inattentive students, develop outcomes, and match assessments and instruction to the stated outcomes. I also enhanced their professional development by directing instructors to online courses offered by LINCS. Not only did these courses teach them additional skills such as formative assessment, but instructors would come to me to ask questions about topics that arose in the courses, enriching our conversations about student learning and progress.

This opportunity for collaboration also helped instructors to develop their own math abilities. One instructor, Ameisha Gathers, reported that co-teaching math with me gave her the confidence she needed to pursue her bachelor's degree, and another reported that co-teaching with me helped her study for the math portion of the GRE. Lonnie Murray (personal communication, October 25, 2017) also said that participating in industry math "rejuvenated" math skills that he hadn't used. Not only has he incorporated additional math concepts into his industry class, but he works with students to help reinforce lessons that I teach in the industry math class. He will often tie hands-on, practical lessons to recent math assignments. For example, if we do a packet focused on subtracting fitting allowances, he will take students to the shop the next morning and show them how to subtract fitting allowances in real life. This helps them retain math concepts and be more prepared for the next math class.

As the industry instructors developed their math skills, they have shared their experience with their classes, thereby raising enthusiasm for math. Whenever a new group of students arrives in Ameisha Gathers' class, she makes a point of saying how she "used to hate math" and tried to avoid it both in school and her personal life. She then shares the effect that working with me has had on her math ability and her confidence in it. Since Ms. Gathers is a

professional in their target field, students identify with her, and this testimonial helps students to see myself and Ms. Gathers as a team and encourages resistant students to "buy in" to industry math.

RECOMMENDATIONS

SOME CET successfully developed and delivered integrated, contextualized basic skills curricula at a time when this technique was largely limited to community colleges. Because of the success of high-profile initiatives like I-BEST and the passage of WIOA, many nonprofit organizations, community colleges, and other providers are now attempting to develop integrated, contextualized curricula of their own. These educators can derive the following lessons from our example:

- Use ABE instructors as internal professional development resources—Adult education instructors often have more experience and formal training in how to teach and develop curricula than the industry instructors who they partner with. By creating formal and informal opportunities for ABE instructors to share their skills, industry instructors can improve their own delivery.
- Design contextualized materials directed at students with low educational functioning levels—While many off-the shelf contextualized math textbooks are not appropriate for students with low math skills, these materials can be modified and enhanced to serve students with low educational functioning levels.
- Include learners with low basic skills in contextualized, integrated instruction—Contextualized, integrated instruction is extremely beneficial to students with low basic skills. In integrated classes, the ABE instructor is able to reinforce concepts taught by the industry instructor, and vice versa.

By utilizing ABE instructors to develop and deliver curricula directed at low-skilled learners and strengthen industry instructors' teaching skills, programs can lower their "cut scores" and allow more adult learners to achieve occupational credentials and enter sustainable wage employment. This helps fulfill the vision presented by WIOA: that all adult education students can enter and advance in a career pathway. ⌘

REFERENCES

Anderson, T., Eyster, L., Lerman, I., O'Brien, C., Conway, M., Jain, R., & Montes, M. (2015, March). T*he Second Year of Accelerating Opportunity: Implementation Findings from the States and Colleges [White Paper]*. Retrieved November 5, 2017, from Urban Institute & The Aspen Institute: https://www.urban.org/sites/default/files/publication/43726/2000132-the-second-year-of-accelerating-opportunity.pdf

Burns, M., Lindoo, S., Dincau, J., Speck, R., & DeMaster, D. (2013). *Minnesota fastTRAC: Implementation Study of 2011 Career Pathways*. St. Paul: Department of Employment and Economic Development. Retrieved November 4, 2013

Comprehensive Adult Student Assessment Systems. (n.d.). *For WIOA Title I Funded Agencies and Youth Providers NRS Educational Functioning Levels to CASAS Scale Scores and Grade Levels*. Retrieved November 13, 2017, from https://www.casas.org/docs/default-source/wiaandnrs/casasnrs-grade-wiaI.pdf?sfvrsn=15?Status=Master

Department of Employment Services. (2017). *DOES Performance Responses FY16-17*. Retrieved November 5, 2017, from http://dccouncil.us/files/user_uploads/budget_responses/DOES_performance_responses,_FY16-17,_Part_1.pdf

Leavit, M. C. (2006, Fall). Team Teaching Benefits and Challenges. Speaking of Teaching, 16(1), p. 2. Retrieved November 10, 2017, from https://web.stanford.edu/dept/CTL/Newsletter/teamteaching.pdf

Lyons, C. (2015). English for Healthcare. Retrieved November 10, 2017, from http://atlasabe.org/resources/adult-career-pathways/health/english-for-healthcare

Miller-Gore, C. (2017). Medical Office Prep. Retrieved November 10, 2017, from http://atlasabe.org/resources/adult-career-pathways/health/medical-office-prep

Office of Career, Technical, and Adult Education. (n.d.). *Office of Career, Technical, and Adult Education National Reporting System*. Retrieved November 5, 2017, from https://wdcrobcolp01.ed.gov/CFAPPS/OVAE/NRS/login.cfm

Tran, J. (2014). Minnesota's Tomorrow: Equity is the Superior Growth Model. PolicyLink and The University of Southern California Program for Environmental and Regional Equity. Retrieved from http://www.policylink.org/sites/default/files/MNT_032514.pdf

Wachen, J., Jenkins, D., & Van Noy, M. (2010, September). How I-BEST Works: Findings from a Field Study of Washington State's Integrated Basic Education and Skills Training Program. Community College Research Center. Retrieved November 5, 2017, from https://ccrc.tc.columbia.edu/media/k2/attachments/how-i-best-works-findings.pdf

Workforce Innovation and Opportunity Act, 29 U.S.C. §§113-128. (2014).