

# PathTech



**Successful Academic & Employment Pathways  
in Advanced Technologies**

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# PathTech ATE PI Showcase Overview

- Project Overview
- Community College/University Partnerships
- Project Goals
- Interdisciplinary Research Team
- Research Methodology
- Tampa Bay Manufacturing Students
- Engineering Technology Pathways

# Successful Academic and Employment Pathways in Advanced Technologies (NSF #1104214)

- Targeted Research in Technician Education
  - \$1.2 million over 4 years (2011-2015)
- ATE Center/University Partnership
  - Florida Advanced Technological Education Center (FLATE) at Hillsborough Community College
  - University of South Florida, Department of Sociology and College of Education

# ATE Targeted Research in Technician Education

- **Mission** (from ATE program solicitation)
  - ATE supports targeted research on technician education, changing roles of technicians in the workplace, and topics that advance the knowledge base needed to make technician education programs more effective and more forward-looking
  - Results inform practices in technician education programs, emphasizing dissemination to practitioners
  - Projects represent a true collaboration--reflected in the activities, the leadership, and the budget--between well-qualified researchers, two-year college educators and other stakeholders

# Community College Partners

## Hillsborough Community College (Tampa)

- Advanced Manufacturing



## St. Petersburg College (Clearwater)

- Biomedical Systems, Quality,  
Digital Design & Modeling



## Polk State College (Lakeland)

- Advanced Manufacturing



## State College of Florida (Venice)

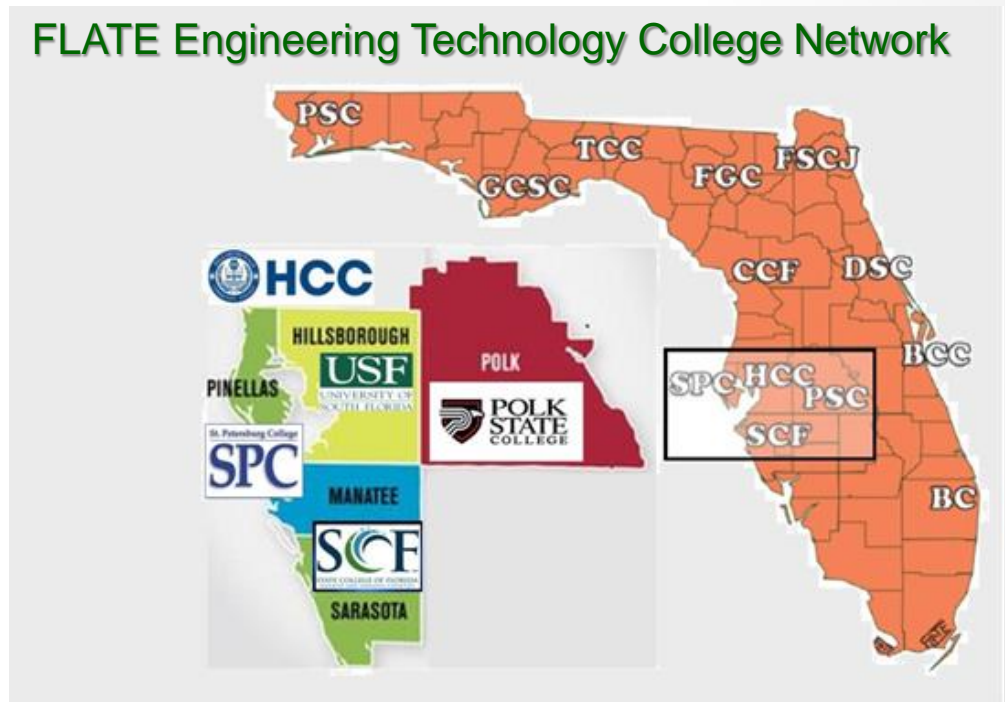
- Electronics, Digital Design & Modeling



# Community College Partners

PathTech partnerships with ET program faculty and administrators help researchers connect with:

- ET students
- ET graduates
- High school career academies
- Industry partners



# Community Engagement



# Project Objectives

- Understanding recruitment and pathways into engineering technology
- Providing information to improve ET education
- Increasing the visibility of ET programs
- Providing information to help meet workforce demands



# Pathways Research

- Individuals transitioning from school to work often simultaneously experience other life transitions
- Expectations for educational and occupational attainment influenced by social class, race/ethnicity, gender, geography and societal norms

# Pathways Research

- Decrease of a linear progression from school to work (“pipeline”)
- Individuals “re-skill” by cycling between school and work
  - To meet economic demands for a highly skilled workforce
  - To keep up with innovations in technology

# Pathways Research

- Targeted research reveals pathways to:
  - enroll in technician degrees
  - earn industry certification and degrees
  - get and keep a job
  - provide for their families

# Pathways Research

- Understanding the confluence of pathways and social forces gives leaders and policymakers the tools to:
  - support education and employment
  - improve the life chances and well-being of the citizenry
  - foster progress as an educated and skilled nation

# Interdisciplinary Research Team

- PI: **Will Tyson, PhD** (Sociology)
- Co-PI: **Lakshmi Jayaram, PhD** (Sociology)
- Co-PI: **Marie Boyette, PhD** (FLATE Associate Director)
  
- Project Manager: **Chrystal Smith, PhD** (Anthropology)
- Quantitative Investigator: **Eddie Fletcher, PhD** (Education)
- Post-doc: **Margaret Cooper, PhD** (Sociology)
- Qualitative Consultant: **Rebekah Heppner, MBA, PhD** (Anthropology)
- Graduate Assistants:
  - **Pangri Mehta, MA** (Sociology)
  - **David Zeller, MA** (Sociology)
  - **Michael DiCicco, MA** (Education)

# Quantitative Goals

- Develop a profile of recent high school graduates who enroll in manufacturing AS/AAS programs
- Determine educational and employment outcomes among comparable graduates who:
  - Enroll in other Community College programs
  - Enroll in university STEM and non-STEM majors
  - Do not pursue post-secondary degrees
- Examine long range outcomes of ET graduates

# Data and Variables

## Transcript data from Tampa Bay area high school graduates

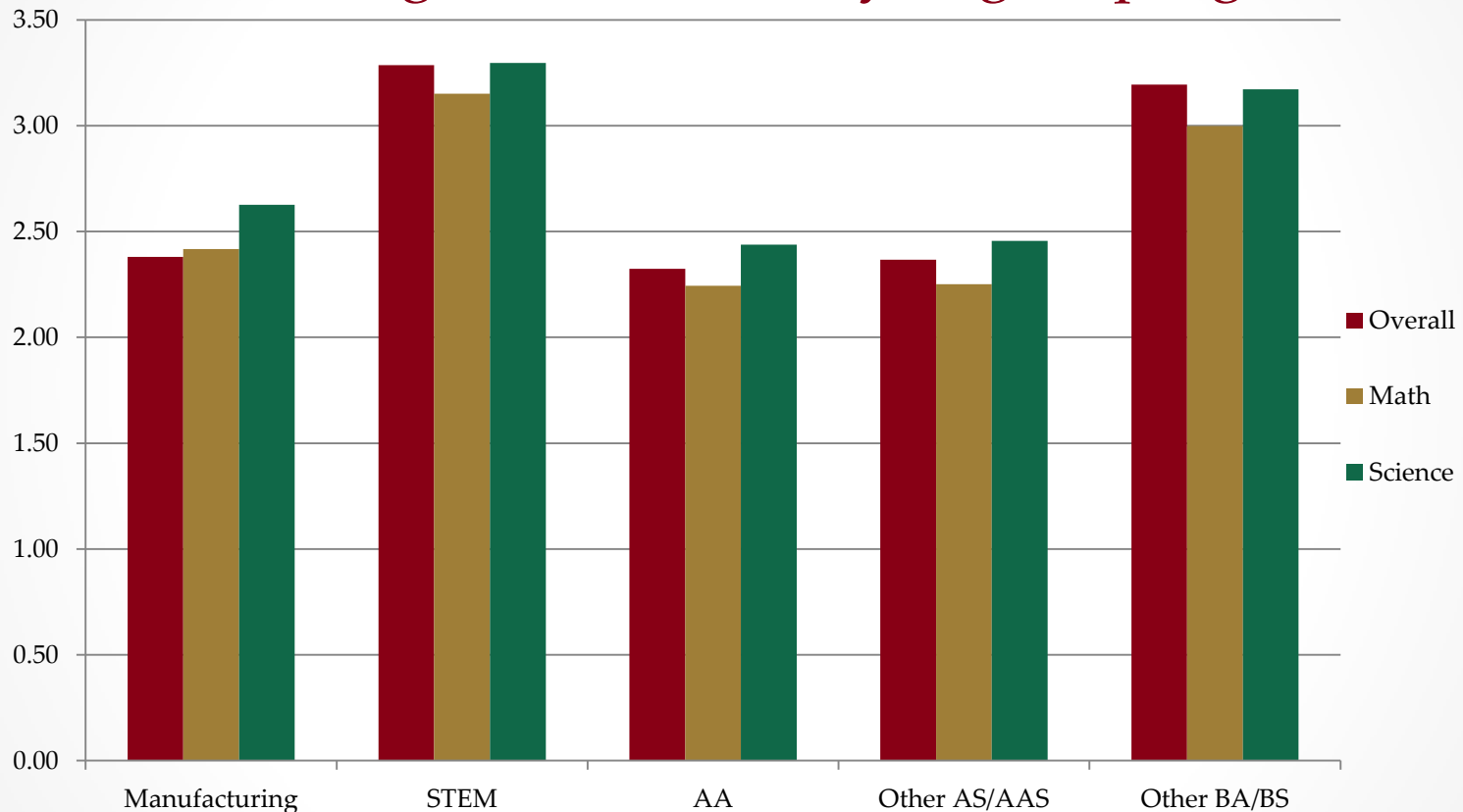
- Provided by Florida Department of Education (FLDOE) PK-20 Education Data Warehouse
- Articulation between high schools, community colleges, and universities
- Career academies and CIP codes → career clusters

## Variables of interest

- Math and science course taking and achievement
- Post-secondary program enrollment
  - Manufacturing (cluster 13)
  - STEM (cluster 15)
  - AA degree transfer
  - Other AS/AAS and bachelor's degrees

# Student Profiles

## Mean high school GPA by degree program

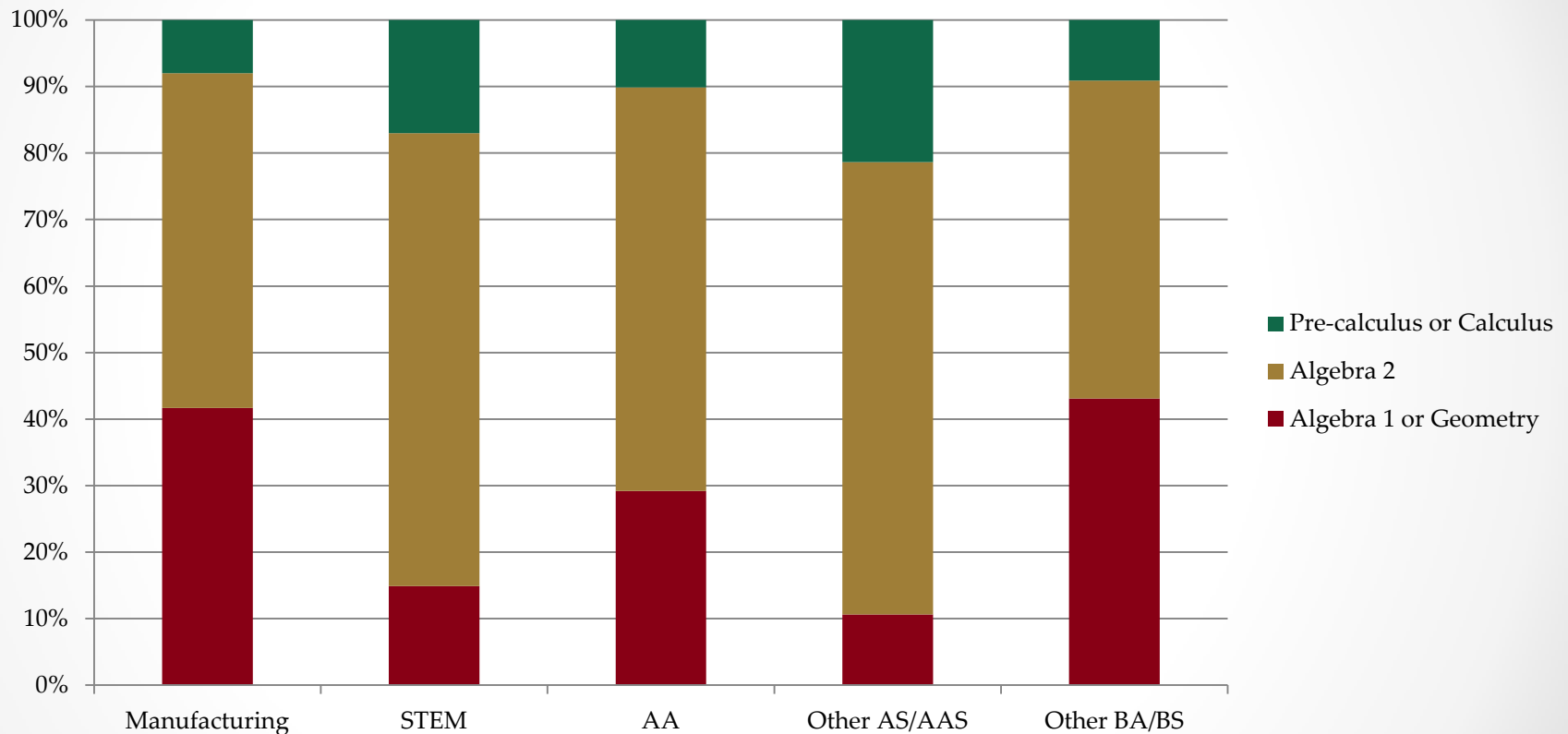


Manufacturing students are comparable to AA and AS/AAS students, and STEM majors are comparable to other BA/BS students with only slightly higher math and science grades.



# Student Profiles

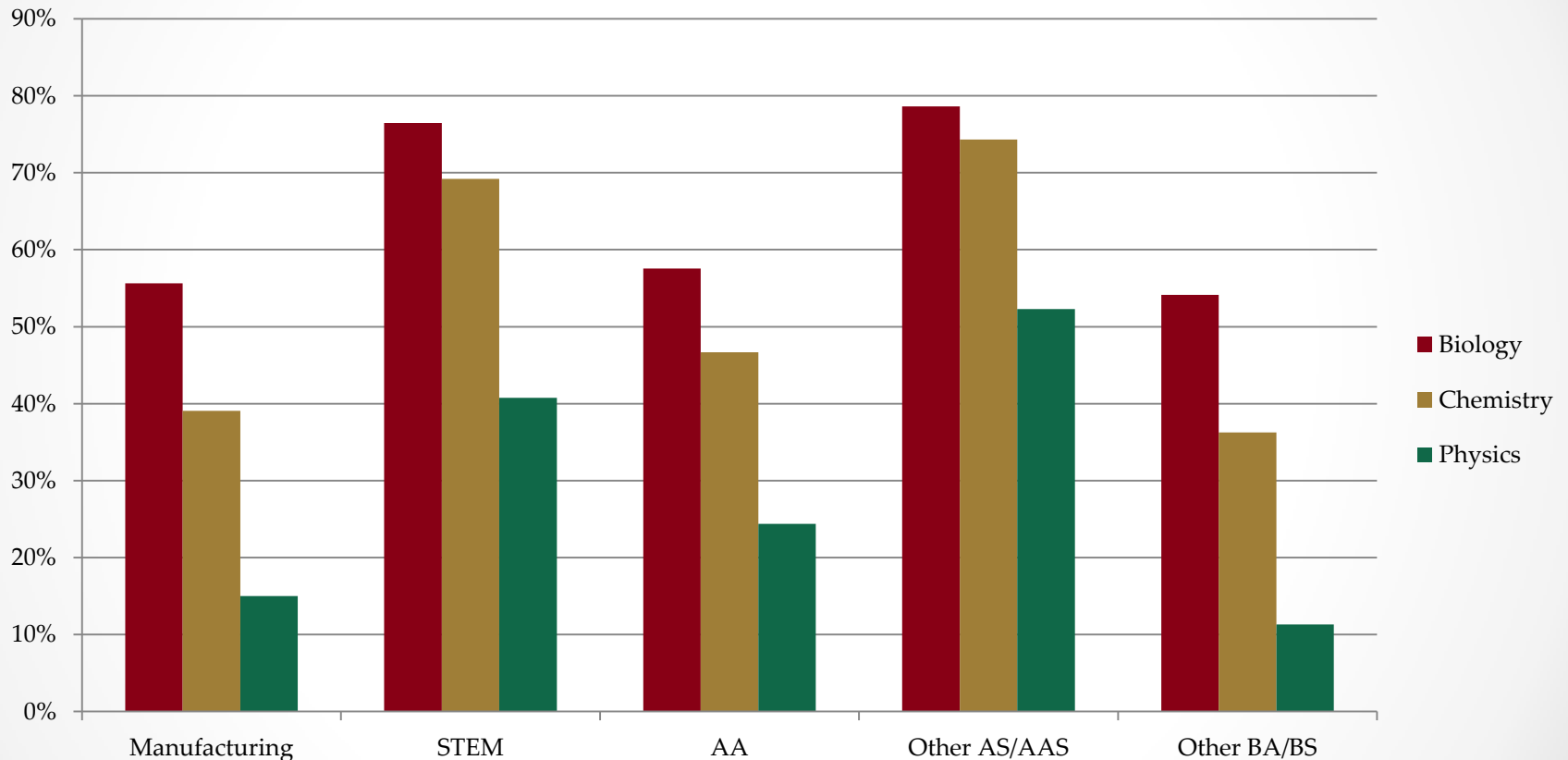
## Math Coursetaking by degree program



Manufacturing students are least likely to take Pre-calculus or Calculus.

# Student Profiles

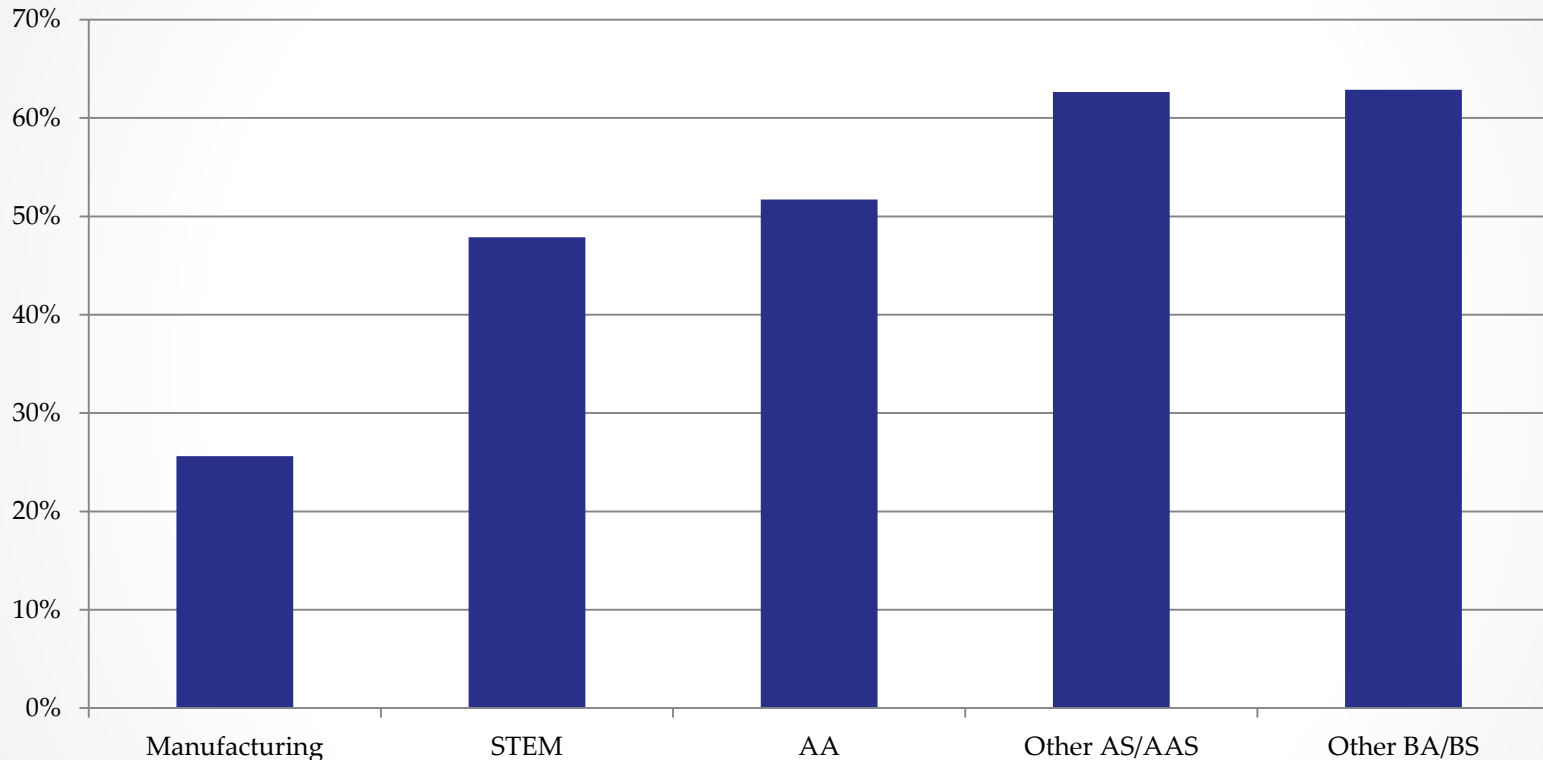
## Science Coursetaking by degree program



Manufacturing students take science courses at a comparable rate to non-STEM BA/BS students.

# Student Profiles

## Percent Female by degree program



Women make up about a quarter of students who enrolled in Manufacturing programs compared to almost half of STEM programs.

# Qualitative Goals

- Develop narratives of ET pathways through interviews with high school students, community college students, employers and employees in the industry
- Understand background factors, current experiences, and expected future trajectories through in-depth interviews

# Interview Questions - Students

- **High school** students were asked to discuss:
  - what prompted their interest in pursuing advanced technology education
  - descriptions of their coursework
  - future plans
- **Community college** ET students were asked to discuss:
  - how they came to learn about ET programs
  - the factors that influenced their decision to enroll in an ET program
  - their high school preparation
  - their perceptions of the ET job market

# Interview Questions - Administrators

- ET program **administrators** were asked about:
  - the institutional and historical development of engineering technology programs
  - key elements of ET degree programs
  - the type of students these programs attracted and retained
  - ways in which community colleges were working to support their graduates in pursuing employment opportunities

# Interview Questions - Industry

- Interviews with **industry leaders** focused on better understanding:
  - the skill sets they currently seek in ET workers
  - recruitment and hiring processes
  - their perception of the skill sets and fields of knowledge that will be essential for the future workers in this field

# Initial Qualitative Research

- In-depth interviews with 25 high school students and ET students
  - Purpose: to determine educational and occupational pathways leading them to ET education and employment opportunities
  - Findings add to our knowledge of ET education programs and inform future research questions



# Methodology

- **Data collection** - facilitated by community college and high school instructors who invited us to their classes
- **Interviews** - conducted by the PathTech qualitative team (faculty, post docs, and graduate research assistants)
  - Occurred on the community college and high school campuses during times specified by the school
  - Lasted 20-30 minutes
  - Interview transcripts were coded and thematically analyzed

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# Findings

## Factors Influencing ET Enrollment

### Life Experiences

- Inclinations
- Education
- Work

### Information Flows

#### “How” Information Flows

- Friends
- Colleagues
- Websites
- Recruiters

#### “What” (Mis)Information Flows Shaped By

- Teachers (+)
- HS Counselors (-)
- Confusion between Engineering/ET (-)

### Motivations

- Security & Stability
- Education
- Better Job & Higher Income

# Life Experiences

- Students articulate **life experiences** leading to pathways into ET:
  - inclination towards building, fixing things, and using their hands
  - previous education, and specifically, high school coursework and extracurricular opportunities lead students to the ET program
  - current work experiences, often in ET-related fields, propelling students into ET degree programs

# Life Experiences

- **Personal Inclinations:**

“...I was just interested in the field from the get-go. I had always been interested in the...blueprinting process and everything from architectural to mechanical anything really, blueprinting-wise. ...it started like with ‘Roller Coaster Tycoon’ type of things and then you know progressing...it’s very interesting, I think, I just take it that it’s because it’s what I’m into for me. ...I think they had offerings to where you could take a test to see what you were supposed to do but I already knew. And so I had known since I was ten.”

(Edward)

# Life Experiences

- **Educational Experiences:**

“I took a couple of technical classes in high school, and thought it was fun...so I wanted to do more with it...They had computer programming. They had little majors for us like, mine was Pre-Engineering.... When they had me take computer programming classes then I took a drafting class on my own, basic softwares, stuff like that....I’m actually in the Solid Works class now and I had Solid Works in high school. So I pretty much know my way around because of the classes I took in high school and it helps me become better in what I am doing. Obviously I can further my education here, but it’s not like I’m being thrown in and I don’t know what I’m doing. I actually know what I’m doing by having high school experience.”

# Life Experiences

- **Work Experiences:**

“[M]ilitary-wise I’m a career avionics technician...So I’ve been military trained to work on aircraft avionics... gives me a little more, furthers my knowledge basically in military training... that I can apply outside civilian-wise when I retire from the military.... I graduated from electronics school from the military so [the ET program] really builds on to it, gives us a lot more in-depth knowledge into everything and makes us more of a technical level as well, instead of a systems trouble-shooter. Gives you a lot more in-depth as far as technical information goes and fixing.”

(Curtis)

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# How Information Flows

- Students learn about ET programs through:
  - **Personal social networks**
    - discussions with a friend, partner or coworker
  - **Internet**
    - research on the internet to learn more about ET as a field and the courses offered
  - **Recruiters**
    - recruiters at military installations were particularly helpful in sharing information about the field

# How Information Flows

- **From Friends:**

“...so far everything I heard from my friends who had gone through the program, the classes and stuff they were learning, it’s right on par with what they told me. It’s a very thorough program, lots of information, a lot of technical data, a lot of the stuff I was looking for...”

(Curtis)

# How Information Flows

- **Through Colleagues/Professional Networks:**

Edward said he has “met a few people that work with engineering companies” and believes that these contacts will help him to “try and just get [his] foot out there.”

# How Information Flows

- **From Internet Resources:**

“Through the website, the Internet, pretty much I was looking for a job and they required me to have some technology background on certain softwares [*sic*] so I went on the community college website and looked up what kind of classes they’ve got available and there was a huge section of it.”

(Anthony)

# How Information Flows

- **Through Recruiting Efforts:**

“...we have about four and a half miles of the St.Pete/Clearwater airport, it’s a big base there, avionic/techs everywhere so this school is really close to where the base is. They do a good job of advertising there.”

(Curtis)

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# What Positive Information Flows: HS Teachers

- Findings reveal that instructors play an instrumental role instrumental in attracting students and motivating them to pursue ET
  - High school interviewees state that their instructor is the best aspect of their program, and explain how much he has taught them and nurtured their interests
  - Community college students discuss how they just keep taking classes with the same group of instructors, regardless of the course

These testimonials illustrate the transformative educational experiences instructors and classroom learning provides, and give us a mandate to explore educators' roles in supporting and improving pathways into ET fields.

# What Positive Information Flows

- **Teachers:**

“It’s really interesting stuff when you’ve got someone like Mr. Bell who’s as passionate about it as he is and can talk to people. And he’s very outgoing and it’s a catalyst for getting people involved, getting high school kids involved. Mr. Green is really good, does the AutoCAD classes. I took some of his, and my electronics teacher, he’s great. He’s fantastic. I mean I wouldn’t be able to get through most of these classes without him because it’s a lot, but it’s a great program.”

(Dan)



# What **Negative** Information Flows

- An area of frustration was **high school counselors'** lack of knowledge about associate's degree programs in technician education
  - Several students wished they had learned of these technical education/employment opportunities sooner in their educational careers
- Students' narratives also convey some **confusion and ambiguity** over the differences between **engineering and engineering technology**.
  - Students discuss aspirations of becoming an “engineer,” but often the work they are describing centers on technical tasks and processes
  - Some students even expressed disappointment that their ET coursework would not count as “prerequisites” for bachelor's programs in engineering

# What Negative Information Flows

- **High School Counselors**
  - High school counselors perceived by students as not really understanding their interests, unaware of the ET field and potential opportunities
  - Students exhibited frustration that counselors are not more helpful

# What Negative Information Flows

- **Engineering/Engineering Technology**

“...[A] lot of people here are set on just getting their two year degree. Some people have been working for fifteen, twenty years and want to go back to school and just get their associate’s which this is perfect, [this]is great but if you really want a four year degree I don’t think they tell you enough...about how to get further educated.”

(Brian)

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# Motivating Factors

- Students described factors that motivated them to seek degrees and/or credentials in ET:
  - hopes for social mobility
  - higher pay
  - better jobs
  - the possibility for the two-year degree to lead towards a bachelor's degree

This theme is **critical** to note because all of the ET students interviewed so far are returning to school many years after completing high school. This age demographic appears consistent across programs in ET in the Tampa Bay area.

# Motivating Factors

- Many students entered the workforce or military after high school and most already had experience in manufacturing or similar industry. Their return to school was often marked by:
  - a job loss and/or
  - need for re-skilling in advanced technologies
  - marketability in the current economy

These older students also often have partners and children, and many discuss their need to provide for their families as a key element motivating their desire to enter and complete the ET program.

# Motivating Factors

- **Stability & Security**

- Darryl had worked as a police officer, but now that he has a wife and children, he is concerned about his safety:
  - “My family depends on me and if I had to pay a small price and get my degree, I will have to do it because I have children and I have a wife at home, so I have to do what I have to do for them.”

# Motivating Factors

- **Further Education**

- “I don’t want to just stop at the associate’s level. I do want to get a bachelor’s also, but I want a stepping stone right now, and get my associate’s and get into the field that I want to get into, and then I’ll work on my bachelor’s.”

(Darryl)

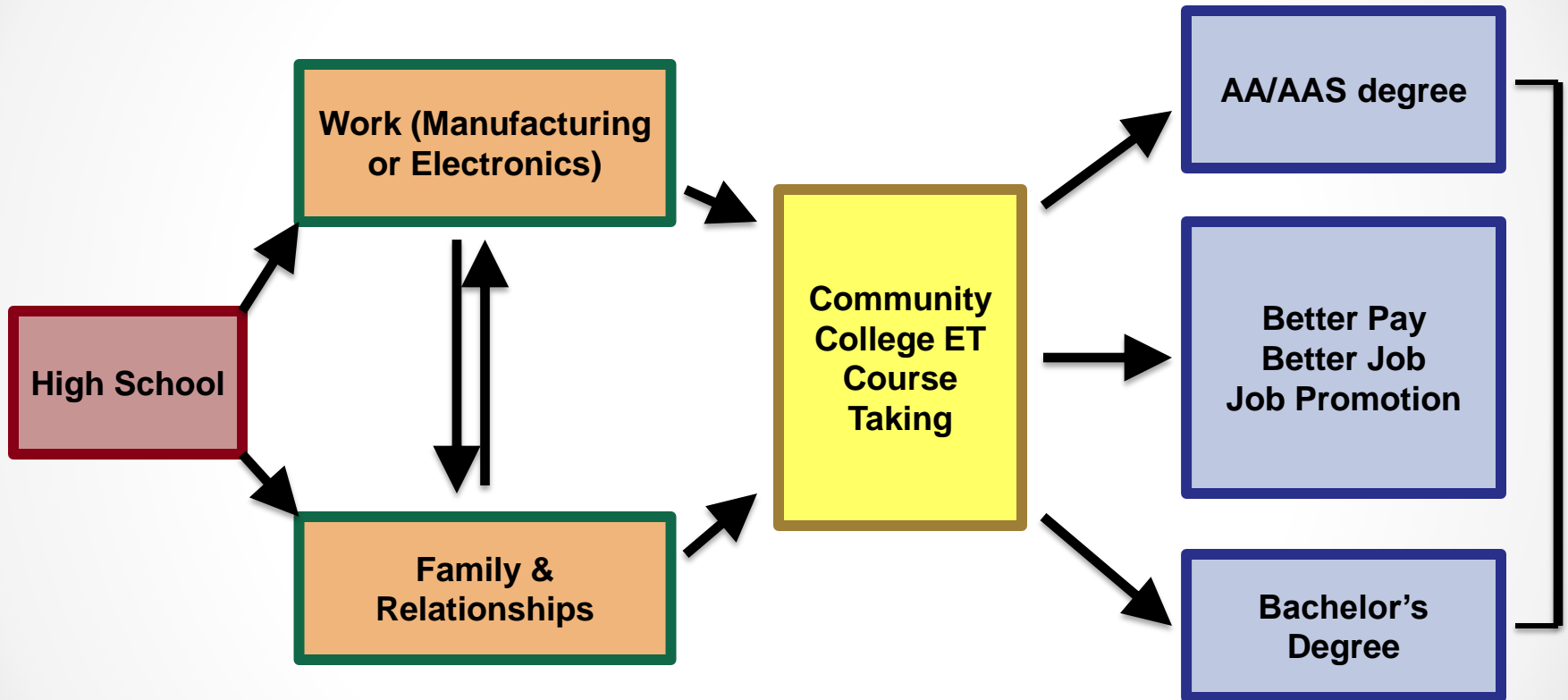


# Motivating Factors

- **Higher Income**

- Ian talked about his goals of improving his income. He talked about now being able to break “the glass ceiling” of \$15 or \$16 dollars an hour. Although some thought that was a good salary, he felt that, “In reality, that isn’t very much, you know...That’s why I went back and I finished my AS degree and I’m taking a few more classes for my AA. I’m just hearing a lot that there’s a lot of engineering jobs but there’s not enough people to fill them.”

# Emerging Pathways



# High School Student Findings

- High school data analysis reveals varied future plans:
  - About 1/3 had completed high levels of math and science coursework in high school and are **bound for four-year universities to study in STEM fields**
  - About 1/3 of the students were **considering associate's degree programs in technician education**
    - Most of these students are only interested in programs which offer formal co-operative education (“co-op”) opportunities to work in relevant industry jobs while taking classes

# High School Student Findings

- About 1/3 **could not afford to continue in school** without assistance. Their plans include:
  - joining the military in a technical field with hopes of going back to school with support from the GI Bill
  - entering the technician workforce

These students desired postsecondary schooling, but share an uncertainty about funding post-secondary education due to their family finances, thus potentially derailing their hopes for future degree attainment.

# General Policy Recommendations for Community Colleges

- Develop highly informational websites to improve the information flows about both what technician education is, and how to enter and succeed in these programs
- Focus recruitment efforts on mid-career individuals seeking to re-skill and/or develop technical expertise to re-enter the workforce
- Work specifically with high school counselors to improve their knowledge of the differences between engineering and engineering technology and the many opportunities for technicians in the current economy

# Suggestions for Improving the High School Recruiting into ET programs

Given the palpable stress personal finances presented for continuing in school, many more interested students with solid high school foundations would be attracted to associate's degree programs if **financial assistance** were more readily available. In particular, **scholarships, grants, and loans** would be very helpful.

# Suggestions for Improving the High School Recruiting into ET programs

Community colleges should more actively promote existing **dual enrollment** programs and explore partnerships with high schools to encourage dual enrollment to make programs more convenient for parents and students. Dual enrollment programs allow public high school students to gain important industry certifications that could lead to pathways straight into technician jobs.

# Suggestions for Improving the High School Recruiting into ET programs

High school and community college students are very attracted by opportunities for **co-op experiences**. This approach removes what students see as the abstract nature of what a technician's job is and allows students to understand and experience it first-hand. In addition, students view co-op opportunities as a concrete way to prove themselves and hopefully get a good job in the future with that experience.



# Suggestions for Improving the High School Recruiting into ET programs

Educators can play a vital role in facilitating student development in technical fields. As a result, we recommend inquiry into developing **a professional network for technician educators** across educational institutions, spanning secondary and post-secondary programs, to connect and develop an infrastructure to "send" students from high school CTE classes into ET community college programs.

# Next Steps

- Continued Full Qualitative Study in the Tampa Bay region:
  - Interviews at four community colleges and four high schools with ET programs
  - Interviews with ET program administrators and instructors
  - Interviews with employers in five counties
  - Focus groups and follow-up interviews to triangulate analysis

# Papers in Progress

- The Impact of Florida Career Academy Legislation on In School and Postsecondary Student Outcomes
- Multiple Educational and Occupational Pathways Intersecting with the Life Course: Preliminary Analysis of PathTech Pilot Data
- Industry Perceptions of Technician Skill Acquisition and Development: A Case Study of Tampa Bay
- Improving Pathways from High School to Community College Technician Education Programs: Policy Recommendations from the PathTech Pilot Analysis
- Deindustrialization, Reindustrialization, and Engineering Technology Education in Florida
- Women forging ahead in traditionally male dominated Engineering Technology fields
- Pathways into High-Tech Manufacturing Careers: Where do internships in engineering technology really lead?
- The Pipeline Metaphor: An Iconic Symbol for STEM Workforce Development or Mythical Understanding of Pathways into High-tech Fields?