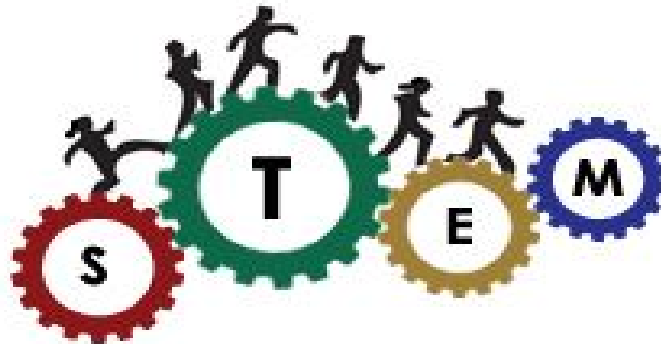


PathTech



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

Understanding Engineering Technology Education and Career Pathways through Research and Community Engagement



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Presentation Overview

William Tyson and Lakshmi Jayaram

The "Pipeline" Metaphor: An Iconic Symbol for STEM Workforce Development or Mythical Understanding of Pathways into High-Tech Fields?

Rebekah Heppner

Pathways into High-Tech Manufacturing Careers: Where Do Internships in Engineering Technology Really Lead?

Chrystal A. S. Smith

Women Forging Ahead in Traditionally Male Dominated Engineering Technology Field



PathTech Overview

- Project Description
- 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

- National Science Foundation (NSF) Advanced Technological Education (ATE) 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



What is 'ATE'?

Advanced Technological 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

Role of Community Colleges and Technical Education

- **Community Colleges:**
 - Trains students for technical jobs
 - Provides continuing education in related fields for community members
 - Prepares students for transfer to a four-year institution
 - Known for welcoming non-traditional, immigrant, and first-generation college students

- **Technician education:**
 - Prepares students for entry into jobs across industries
 - Important for individuals not pursuing graduate degrees or manual labor fee-for-service jobs
 - Offers 're-skilling' for technician jobs, making technicians more competitive for the job market

Project Goals

- 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

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)

Community Engagement



Presenting at Fall 2013
Florida Forum on
Engineering Technology



Will Tyson meeting with Dr.
Eric Roe, Polk State College



Will Tyson, FLATE Director Marilyn
Barger, Rebekah Heppner touring
Draper Labs (St. Petersburg) during
FLATE Industry Advisory Council
meeting

Community College Partners

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

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

FLATE Engineering Technology College Network



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

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
 - High School Students~25
 - Community College Students~60

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 and Industry

- 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
- 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

'Pipeline' or 'Cycling'?

The "Pipeline" Metaphor: An Iconic Symbol for STEM Workforce Development or Mythical Understanding of Pathways into High-Tech Fields?

- William Tyson and Lakshmi Jayaram

Focus of paper: the intersection of school, work, family, the economy and life course

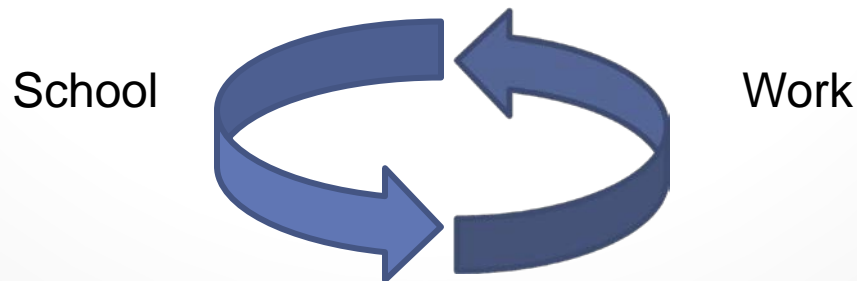
'Pipeline' or 'Cycling'?

'Pipeline': linear progression from school to work

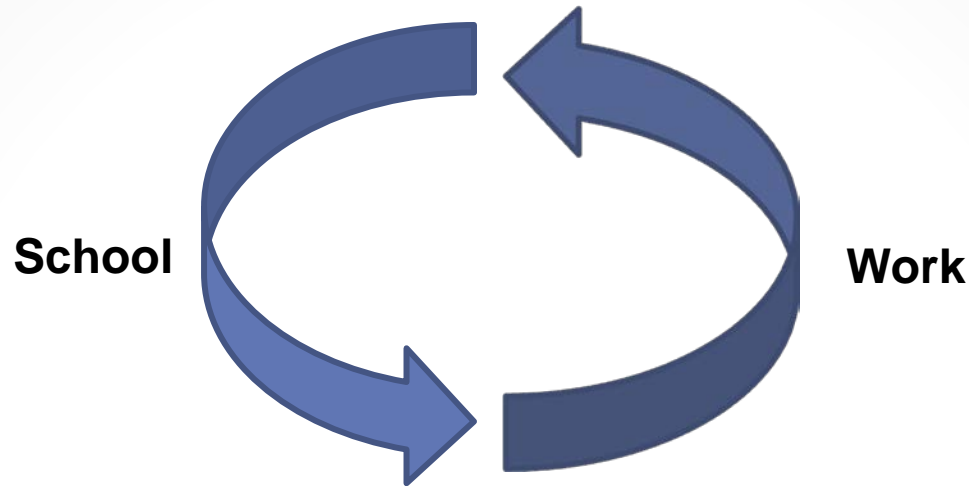


However, fewer and fewer students are experiencing linear progressions from school to work. Also, students experience other life transitions in addition to 'school-to-work.'

'Cycling' addresses this disconnect and speaks to non-linear school-to-work transitions.



'Cycling' in Order to 'Re-Skill'



'Re-Skilling': pathways characterized by fluid movement between school to work and work to school

- Re-skilling has become necessary to survive in the current economy and its demands for a highly skilled workforce

'Cycling': fluid system of transitions between school, work and family

- Contemporary economy requires re-skilling of technician workforce
 - Community college- not just a destination with a simple entrance and exit
 - Pathways between school and work are necessitated by broader market demands and personal life histories

Pathways Research

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

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, however funding uncertainties potentially derail their hopes for future degree attainment.

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

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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

Findings

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What Positive Information Flows: HS Teachers

- Findings reveal that instructors play an instrumental role 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 **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 are 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

Findings

Factors Influencing ET Enrollment

Life Experiences:

- Inclinations
- Education
- Work

Information Flows

“How” Information Flows

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“What” (Mis)Information Flows Shaped By

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

Motivations:

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

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

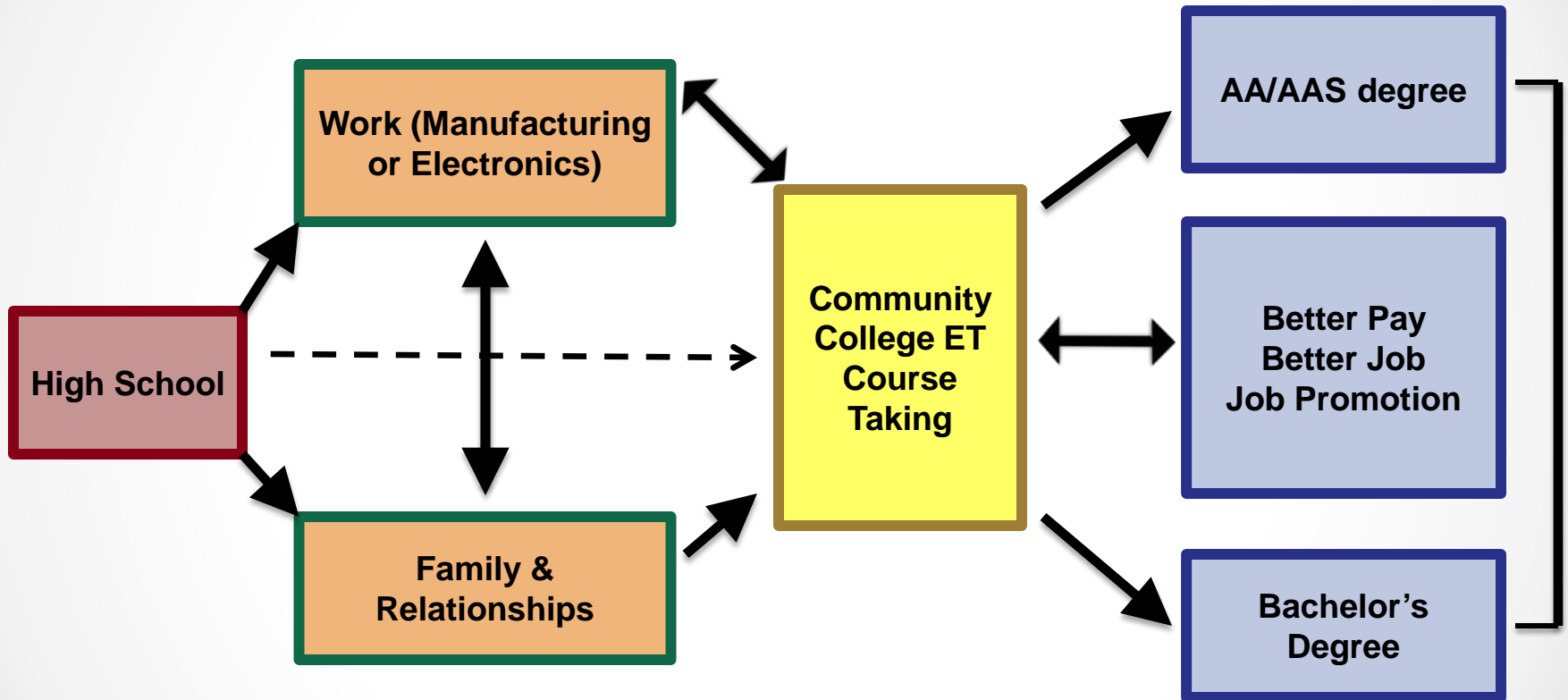
This theme is **critical to note** because all of the ET students interviewed so far are returning to school many years after completing high school. This age demographic appears consistent across programs in ET in the Tampa Bay area.

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.

Emerging Pathways



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 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

Thank You!

PathTech



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