COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./DUE DATE
NSF 17-568 **10/05/17**

☐ Special Exception to Deadline Date Policy

FOR NSF USE ONLY
NSF PROPOSAL NUMBER
1801163

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)
DUE - ATE-Targeted Research on Technician Education

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
10/05/2017	**1**	**11040000 DUE**	**7412**	**069687242**	**02/20/2018 1:07pm S**

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)
593102112

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE
University of South Florida

AWARDEE ORGANIZATION CODE (IF KNOWN)
0015370000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE
University of South Florida
3702 Spectrum Blvd.
Tampa, FL. 336129446

NAME OF PRIMARY PLACE OF PERF
University of South Florida

ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE
University of South Florida
3702 Spectrum Blvd.
Tampa ,FL ,336129446 ,US.

IS AWARDEE ORGANIZATION (Check All That Apply) ☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT **PathTech LISTEN: Mixed Methods Longitudinal Investigations of Students in Technician EducatioN**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ **687,609**	**36** months	**09/01/18**	

THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW
☐ BEGINNING INVESTIGATOR
☐ DISCLOSURE OF LOBBYING ACTIVITIES
☐ PROPRIETARY & PRIVILEGED INFORMATION
☐ HISTORIC PLACES
☐ VERTEBRATE ANIMALS IACUC App. Date _____
PHS Animal Welfare Assurance Number _____
☒ TYPE OF PROPOSAL **Research**

☐ HUMAN SUBJECTS Human Subjects Assurance Number _____
Exemption Subsection _____ or IRB App. Date _____
☐ INTERNATIONAL ACTIVITIES: COUNTRY/COUNTRIES INVOLVED
_____
☒ COLLABORATIVE STATUS
A collaborative proposal from multiple organizations (PAPPG II.D.3.b)

PI/PD DEPARTMENT
Sociology

PI/PD FAX NUMBER
813-974-6455

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CO-PI/PD				

CERTIFICATION PAGE

Certification for Authorized Organizational Representative (or Equivalent) or Individual Applicant

By electronically signing and submitting this proposal, the Authorized Organizational Representative (AOR) or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding conflict of interest (when applicable), drug-free workplace, debarment and suspension, lobbying activities (see below), nondiscrimination, flood hazard insurance (when applicable), responsible conduct of research, organizational support, Federal tax obligations, unpaid Federal tax liability, and criminal convictions as set forth in the NSF Proposal & Award Policies & Procedures Guide (PAPPG). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U.S. Code, Title 18, Section 1001).

Certification Regarding Conflict of Interest

The AOR is required to complete certifications stating that the organization has implemented and is enforcing a written policy on conflicts of interest (COI), consistent with the provisions of PAPPG Chapter IX.A.; that, to the best of his/her knowledge, all financial disclosures required by the conflict of interest policy were made; and that conflicts of interest, if any, were, or prior to the organization's expenditure of any funds under the award, will be, satisfactorily managed, reduced or eliminated in accordance with the organization's conflict of interest policy. Conflicts that cannot be satisfactorily managed, reduced or eliminated and research that proceeds without the imposition of conditions or restrictions when a conflict of interest exists, must be disclosed to NSF via use of the Notifications and Requests Module in FastLane.

Drug Free Work Place Certification

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent), is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Proposal & Award Policies & Procedures Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☒

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Proposal & Award Policies & Procedures Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:
(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure of Lobbying Activities,'' in accordance with its instructions.
(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Proposal & Award Policies & Procedures Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:
(1) community in which that area is located participates in the national flood insurance program; and
(2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:
(1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
(2) for other NSF grants when more than $25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR) (This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the Certification Pages, the Authorized Organizational Representative is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Chapter IX.B. , the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research. The AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.

CERTIFICATION PAGE - CONTINUED

Certification Regarding Organizational Support

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the Broader Impacts Review Criterion as well as the Intellectual Merit Review Criterion, and any additional review criteria specified in the solicitation. Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.

Certification Regarding Federal Tax Obligations

When the proposal exceeds $5,000,000, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal tax obligations. By electronically signing the Certification pages, the Authorized Organizational Representative is certifying that, to the best of their knowledge and belief, the proposing organization:
(1) has filed all Federal tax returns required during the three years preceding this certification;
(2) has not been convicted of a criminal offense under the Internal Revenue Code of 1986; and
(3) has not, more than 90 days prior to this certification, been notified of any unpaid Federal tax assessment for which the liability remains unsatisfied, unless the assessment is the subject of an installment agreement or offer in compromise that has been approved by the Internal Revenue Service and is not in default, or the assessment is the subject of a non-frivolous administrative or judicial proceeding.

Certification Regarding Unpaid Federal Tax Liability

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal Tax Liability:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has no unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

Certification Regarding Criminal Convictions

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Criminal Convictions:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has not been convicted of a felony criminal violation under any Federal law within the 24 months preceding the date on which the certification is signed.

Certification Dual Use Research of Concern

By electronically signing the certification pages, the Authorized Organizational Representative is certifying that the organization will be or is in compliance with all aspects of the United States Government Policy for Institutional Oversight of Life Sciences Dual Use Research of Concern.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME **Kimberly Johns**	**Electronic Signature**	**Oct 5 2017 4:52PM**

TELEPHONE NUMBER	EMAIL ADDRESS	FAX NUMBER
813-974-1914	**kjsmith8@usf.edu**	

NATIONAL SCIENCE FOUNDATION
Division of Undergraduate Education

NSF FORM 1295: PROJECT DATA FORM

The instructions and codes to be used in completing this form are provided in Appendix II.

1. **Program-track** to which the Proposal is submitted: **ATE-Targeted Research on Technician Education**
2. Name of **Principal Investigator/Project Director** (as shown on the Cover Sheet):
   Tyson, William
3. Name of submitting **Institution** (as shown on Cover Sheet):
   University of South Florida
4. **Other Institutions** involved in the project's operation:
   Hillsborough Community College

Project Data:

A. Major Discipline Code: **86**
B. Academic Focus Level of Project: **LO**
C. Highest Degree Code: **D**
D. Category Code: **R**
E. Business/Industry Participation Code: **NA**
F. Audience Code: _ _ _ _ _ _ _ _
G. Institution Code: **PUBL**
H. Strategic Area Code: _____
I. Project Features: _ _ _ _ _

Estimated number in each of the following categories to be directly affected by the activities of the project during its operation:

J. Undergraduate Students: **150**
K. Pre-college Students: **0**
L. College Faculty: **0**
M. Pre-college Teachers: **0**
N. Graduate Students: **0**

PROJECT SUMMARY

Overview:

PathTech LISTEN seeks to advance knowledge of pathways into and out of technician education by conducting longitudinal interviews and a follow-up survey with a purposeful sample of 150 participants drawn from two waves of the national PathTech LIFE survey. Of the 528 participants from 24 colleges in Wave 1 (April 2017), 372 (70%) expressed interest in participating in future research and shared their contact information. Wave 2 is ongoing from October to December. The primary focus of the proposed project is to initiate a research-based tracking mechanism of students and workers in advanced technology fields. This focus will be facilitated through the following objectives (1) factors that motivated students to pursue technician education, (2) how students faced academic and personal challenges while enrolled, and (3) post-enrollment educational and employment outcomes. This project will also examine technician education program best practices associated with recruitment, retention, and tracking student post-enrollment outcomes. Research on students and collecting information on program policies will allow this project to gain important insight on how programs facilitate student outcomes. In addition, this study draws from a diverse cohort of students from all demographic backgrounds and life experiences.

Intellectual Merit:

The proposed study addresses a documented knowledge gap about pre-college and post-college career and educational pathways of advanced technology students. There are no systematic and/or comprehensive longitudinal data collection efforts dedicated to two-year college AS/AAS STEM programs comparable to the Baccalaureate and Beyond Longitudinal Study (B&B:93) or other similar investigations of four-year university students and their post-graduate outcomes. The PathTech team seeks to fill this niche by building on their prior work to construct a survey instrument that could be widely used to gather longitudinal data on technician educational and occupational pathways. This study will broaden our understanding of student pathways to account for the complex lives of the emerging technician workforce.

Broader Impacts:

The knowledge gained through this study can greatly inform current practices in two-year colleges, particularly through identifying ways in which pathways into, through, and out of two-year AS/AAS programs differ from four-year college pathways on which policy, practice, and scholarship in higher education are often based. Prior PathTech research finds that coursework and certifications are tightly coupled with industry needs, therefore students may simply seek to complete one or two courses to advance their career. These findings indicate the need to measure not only program completion but participation, as an important basis for planning and resourcing in technician education. These findings contrast the emphasis on performance-based funding initiatives that focus on two-year college degree completion. In addition, longitudinal research connects two-year colleges to industry through students' lives. The transition to successful adulthood rests on many factors including academic credentialing, stable jobs, financial independence, provision for families, as well as continued personal growth and development across the life course. Technician education provides a pathway for success and well-being throughout these key life course transitions. The broadest impact of this proposed work is the possibility for a more stable, skilled, and secure workforce and community.

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Appendix (List below.) **(Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)**		
Appendix Items:		

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

Results from Prior NSF Support

The proposed PathTech LISTEN project is the third Targeted Research in Technician Education project in the PathTech mixed methods research agenda. Both prior projects were collaborations between the Florida Advanced Technological Education (FLATE) Center at Hillsborough Community College (HCC) and the PathTech research team at the University of South Florida led by Dr. Will Tyson.

Florida's Advanced Technological Education Center of Excellence (FLATE)

Florida's Advanced Technological Education Center of Excellence (FLATE) (DUE #1204751; $3,450,747; 10/01/12-06/30/18) is a statewide ATE Regional Center for Advanced Technological Education that supports manufacturing technician education and related high school programs for curriculum, outreach and professional development throughout the state. The FLATE Engineering Technology (ET) Degree Program showed more than 1,700 students enrolled in the ET degree program. Women's enrollment also increased from 10% to 12%. In 2016 FLATE provided 6,678 hours of professional development to 2,999 educators and 1,003 workforce members, economic and manufacturing personnel in multi-day workshops, presentations, and through online webinars at hundreds of events in Florida, nationally, and worldwide. FLATE/HCC also has two collaborative projects with the goals of developing, disseminating, and maintaining activities that broadly promote the impact and outcomes of the NSF ATE community through a number of media and event outlets including 10 advanced technology education-focused conferences that expose over 3000 community college educators annually to the NSF ATE program as a funding source as well as a resource for technical education curriculum and best practices, "ATE Collaborative Impact Project" (DUE #1261914; $439,193; 06/01/13-03/31/18) and "ATE Collaborative Outreach and Engagement Project" (DUE #1723419; $629,663 05/01/2017-04/30/2021) with the University of Wisconsin-Madison.

PathTech Tampa Bay

"Successful Academic and Employment Pathways in Advanced Technologies" (NSF #1104214, $1,196,790, 9/01/11-8/31/15) or PathTech Tampa Bay (TB) examines pathways into high school and community college engineering technology (ET) programs, and to and from the local workforce. PathTech TB completed interviews with 175 unique individuals from high school, community colleges, and industry recruited with help from FLATE.

- 67 ET A.S. degree students at four community colleges
- 4 ET faculty and administrators at four community colleges
- 27 employers from local technology and advanced manufacturing businesses
- 70 high school engineering or ET career academy students at four high schools
- 4 high school career academy teachers and 3 district STEM curriculum administrators

Interviews were audio recorded, transcribed, and thematically coded. Coding trees were developed based on a priori and emergent themes. Case studies comprehensively described the experiences of the six community college women and profiles of industry companies and employers (Smith 2017). These well-established qualitative methods identified both emergent and saturated themes in the data. The community college student interviewees also completed a short survey with questions about age, marital and caregiving status, educational attainment, funding sources of their ET degree, and parental educational attainment. PathTech TB also utilized national data from the 1997 National Longitudinal Study of Youth (NLSY97) on education and employment pathways. The project team tracked a cohort of 1997 high school graduates through early adulthood by collecting data on their schooling, employment, and personal histories (Fletcher and Tyson 2017).

PathTech LIFE: Learning, Interests, Family, and Employment

"PathTech LIFE: Constructing a National Survey of Engineering Technology Students through Regional and Statewide Testing" (NSF #1501999, $778,031, 9/01/11-8/31/15) is an ongoing national survey of individuals completing coursework, certification, and AS/AAS degrees in advanced technologies at community colleges. The project seeks to understand how learning, interests, family, and employment (LIFE) experiences impact student decisions to enroll, return for further coursework, and/or pursue a certificate or degree. This national quantitative study is a logical extension of the regional qualitative work in PathTech TB. Students face numerous and complex life challenges (i.e., family, personal, school, and work) that influence their school-work-life balance, educational and employment pathways, and motivation to enroll into and complete certificate and degree programs. The PathTech LIFE Survey

collects data on community college students completing coursework, certification, and AS/AAS degrees in four fields (engineering technologies, advanced manufacturing, micro and nano technologies, and energy and environmental technologies).

Survey questions are based on PRiSM Decision Model for Adult Enrollment (Stein & Wanstreet, 2006), Schlossberg's Transition Theory (Schlossberg, 1984), and explanatory models from PathTech TB. The pilot surveys were systematically evaluated using the Delphi method by an expert panel made up of two members each from FLATE, six ATE Centers, and the external evaluator. Pilot survey respondents (N=244) received $25 for completing the 25 minute surveys in April and November 2016. In response to recommendations from community college partners, the project partnered with Qualtrics to optimize the survey and shorten it to 15 minutes and hired an External Communications Consultant to communicate directly with all participating colleges and assist FLATE in recruiting colleges to distribute surveys to their students. As a result, 528 students from 24 colleges completed the Wave 1 national survey in April 2017. Students received $25 for completing the survey. All colleges received a summary findings report. Colleges with a response rate 50% or higher received a findings report specific to their college. Colleges with a 70% response rate or higher also received a $250 stipend. The Wave 2 survey is being distributed to more than 40 colleges from October to December 2017.

Intellectual Merit of Prior NSF Support

PathTech projects address documented knowledge gaps about pre-college and post-college career and educational pathways of advanced technology students. The knowledge gained through PathTech research allow staff, administrators, and faculty to learn more about the challenges their students face in the classroom and in everyday life that impact their likelihood to enroll from semester to semester and earn credentials. PathTech also seeks to inform social science and education scholars who tend to focus on elite high school students and four-year university pathways. In this respect, PathTech seeks to elevate scholarship on two-year colleges and the "T" in STEM to match our knowledge on university STEM pathways. PathTech TB and LIFE focus primarily on gaining knowledge about the backgrounds of technician education students and their motivations for enrolling and continuing in these programs. The "Who?" and "Why?" are crucial to developing frameworks for understanding educational and employment pathways.

Analyses of PathTech LIFE data use a representative sample of 387 students from the 14 colleges with a response rate of 50% or above. The majority of students were between the ages of 18-30 although some colleges catered to traditional age students and others primarily catered to non-traditional age students including students over 35 years old. Over 84% of respondents were men, corresponding with national data on students enrolled in engineering technology programs. Over 63% of students identified as White although students could indicate multiple races. More full-time students were employed part-time, and more part-time students are employed full-time. Only **34% of full-time students** had jobs related to their field, compared to **48% of part-time students**. Prior to beginning the program, **51% of students had not enrolled in a 2-year or 4-year institution**. More students had previously enrolled at a **2-year college (34%)** compared to those who enrolled in at a **4-year college (19%)**. Among the 113 students who had enrolled in a 2-year college, **39% had earned an associate degree**. Among the 73 students who had enrolled in a 4-year university, **half earned a bachelors degree**. The majority of students experienced a **positive change** on **employment** and **other major life events** in the 12 months before enrolling in the program. Fewer than 25% of students experienced a negative change in **employment**, **family**, and **other major life events**. Though, **44% of students** reported experiencing a **negative change** in their **financial situation**.

PathTech TB identified **four profiles of ET students** based on their primary motivations and goals for entering the program (Tyson and Jayaram 2014). ***Learning*** students entered with a high school diploma or GED and had been indifferent toward schooling in the past. They had a winding job history, but knew they enjoyed working with their hands. They found ET courses interesting and became interested in pursuing a college degree for the first time. ***Credentialing*** students had some college experience and a stable work history, but no ET experience. They sought to earn a certificate or degree that will allow them to change careers and get into a good tech job. ***Re-skilling*** students had careers in manufacturing or related fields were unemployed or underemployed. They were taking ET courses and seeking certification to stabilize their job situation and better support their families. ***Empowering*** students sought to fulfill their life-long dream of earning a college degree as a means of self-empowerment to gain the respect of others.

PathTech LIFE respondents ranked 16 items based on PRiSM Decision Model for Adult Enrollment (Stein & Wanstreet, 2006) to reveal reasons they enrolled. Factor analyses generated five scales ranging from 0-10. The mean score is in parentheses followed by an example scale item and examples of groups with higher scores.

- **Skill Building** (6.9) – "I have always liked to build and fix things with my hands"
  - Men, single students, full-time workers
- **Academic Effort** (5.6) – "I am willing to make the effort to complete the program"
  - Traditional age students, single students, never enrolled in college
- **Job and Financial Concerns** (4.9) – "A change in employment or job responsibilities"
  - Men, married, separated, or cohabitating students, part-time workers, students with bachelor's degrees
- **Personal Well-Being** (4.7) – "I want to improve my self-esteem"
  - Full-time workers (compared to part-time workers)
- **Family and Other Concerns** (3.3) – "A change in family commitments"
  - Non-traditional age students, men, Black and Asian students, full-time workers

PathTech findings provide community college administrators and faculty with a better understanding of the students they serve in terms of their unique lived experiences and challenges as they navigate the higher education landscape as a path to a better life. Further, this research make theoretical contributions to education research by introducing concepts from the adult education and counseling literature to explore the lived experiences of non-traditional students and adult learners from a variety of backgrounds. Perhaps the greatest potential to grow knowledge is the construction of a national dataset of demographic, academic, personal, and work characteristics and experiences of technician education students.

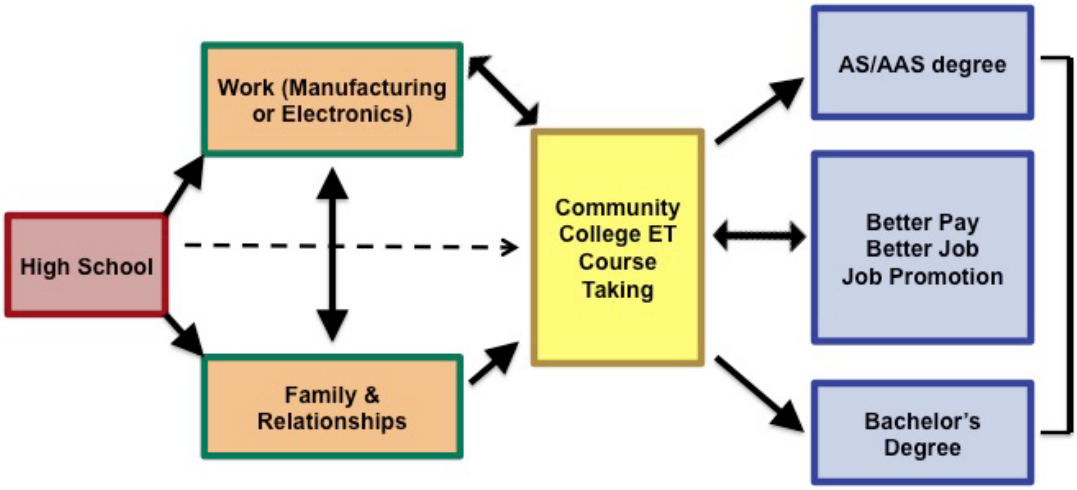
Broader Impact of Prior NSF Support

Explanatory frameworks based on the PathTech TB socio-demographic survey and interviews with community college students revealed: (1) Individuals from **diverse academic and employment backgrounds** have disparate goals for their ET enrollment, but believe ET courses and/or credentials will **greatly enhance their career prospects** and be **a transformative force** in their lives. (2) Students are encouraged to enroll in ET courses through their **inclination for hands-on work** and previous **ET-related educational and work experiences**, information learned from **word of mouth**, **program websites**, and **recruiters** (particularly true for veterans), and desire for **career stability** and **a better life**. For many students, the return to school was marked by **job loss** and/or **need for re-skilling** in order to be marketable and valued in the current economy. (3) ET students transition **between school and work** while experiencing **other life transitions** as well. Several older students 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 (Tyson and Jayaram 2014).

Smith (2017) found women ET students were more likely to report serving in a caregiver role to their children or parents, making school-work-life balance and even more salient factor for them. Women reported that it is vital that ET courses are convenient and flexible so that they can accomplish their work, family, and caregiving responsibilities. Women viewed online courses as one positive option; however, they sometimes missed the camaraderie of the classroom. Affordability was also crucial to their decision to continue ET coursework. Women embraced the challenge of taking mathematics and/or science courses and did not express any doubts about their ability to excel in these courses. Women and men shared the above motivations for completing ET courses and pursuing ET credentials and were also driven by a desire to gain respect from their male work colleagues and their family.

Figure 1 shows how students enter community college with different work and family experiences, reflecting different positions in the life course. Students also seek different outcomes from their schooling, an associate's degree or eventually a bachelor's degree and/or an improvement in their employment situation (Tyson and Jayaram 2014).

Figure 1. Emerging Pathways Among Community College Engineering Technology Students



Findings support the adoption of a pathways model as fewer and fewer students experience a linear progression from school to work, or a "pipeline". In this respect, community college is not just a destination with a simple entrance and exit. Instead individuals "re-skill" or move fluidly between school and work, in order to meet current economic demands for a highly skilled workforce that keeps up with changes and innovations in technology. PathTech LISTEN describes student progression into and out of engineering technology programs as "cycling" in order to address this disconnect and speak to non-linear school-to-work transitions.

Fletcher and Tyson (2017a) determined the educational pathways and key life course transitions of young adults who enter Science, Technology, Engineering, Mathematics, and Health (STEMH) technician and professional jobs using the 1997 National Longitudinal Survey of Youth (NLSY) dataset, tracking high school students from 1997 into adulthood through 2009. Using hierarchical linear modeling (HLM), this study found that individuals were significantly more likely to enter technician and professional STEMH occupations as they got older, but were no more likely to enter these occupations after marriage or divorce. Individuals were more likely to enter STEM technician occupations after having children. Enrolling in 2-year and 4-year institutions and earning vocational certificates were significantly and positively associated with entering both STEMH technician and professional occupations, even taking into account STEMH associate's and bachelor's degree attainment.

PathTech examines how individuals from a variety of backgrounds navigate technician education while balancing the personal challenges inherent to juggling multiple social roles and responsibilities (i.e., student, worker, parent). Perhaps the hallmark of PathTech projects is partnering with various stakeholders in K-12, higher education, and industry who have participated in this research or attended presentations.

Additional Work

PathTech also examined high school skill development based on narratives of 70 students and four teachers from engineering/engineering technology themed career academies at four high schools and 27 industry leaders. Fletcher and Tyson (2017b) found that employers expressed an urgent need for technical skills using appropriate equipment and technologies, teachers were teaching students technical skills by simulating the real-world work environment, and students valued their abilities to transform their classroom project ideas into tangible products. The PathTech research team is preparing manuscripts for publication in peer reviewed journals on the following topics:

- work to school transitions and cycling among community college students
- tangible and intangible benefits of community college technician education
- how social and personal skills desired by industry are taught and learned in high school career academy classrooms
- how high school teachers and district administrators balance college prep and career readiness goals in career and technical education

Relevance to Current Proposal

PathTech Tampa Bay was a regional, primarily qualitative examination of high school, community college, and industry perspectives on engineering technology pathways. PathTech LIFE is a national quantitative study of community college technical education students. Both studies focus on student experiences while enrolled. In this respect, PathTech LIFE is the second phase of a *partially mixed* ***sequential*** *equal status research design*, a mixed methods approach in which qualitative and quantitative phases take place sequentially with each having equal weight (Leech & Onwuegbuzie, 2009, p. 268). PathTech Tampa Bay yielded explanatory models of student **pathways, career goals, and school-work-life balance** that informed the construction of the PathTech LIFE survey.

PathTech LISTEN seeks to follow-up with PathTech LIFE respondents in 2019, 2020, and 2021 after they completed the survey in 2017. LISTEN will create a purposeful sample of LIFE respondents based on their demographic characteristics and life experiences as of 2017. In addition, the research team will use LIFE responses to add prompts to the LISTEN protocols that are unique to the respondent. In this respect, LISTEN will turn PathTech LIFE into the first step in a longitudinal study that tracks former (and possibly current) students to learn about their post-college schooling and work experiences. The long term goal is for LISTEN to transition the PathTech agenda into a *partially mixed* ***concurrent*** *equal status research design*, a mixed methods approach in which quantitative and qualitative phases occur concurrently and have equal weight (Leech & Onwuegbuzie, 2009, p. 268). In other words, LISTEN and future PathTech studies would simultaneously include longitudinal surveys and longitudinal interviews conducted with a subset of respondents, each conducted every one or two years. The FLATE/HCC team will utilize their expansive networks to gain information about program recruitment, retention, job placement, and student tracking efforts to complement knowledge gained on student pathways.

Introduction

PathTech LISTEN is a partnership between the Florida Advanced Technological Education Center (FLATE) at Hillsborough Community College (HCC) and sociologists from the University of South Florida (USF) to track student post-enrollment short-term outcomes and understand how programs facilitate technician education experiences and transition into the workforce. The proposed study will accomplish this goal through three activities: (1) The USF research team will conduct two stages of **in-depth interviews with a national sample** of former advanced technology students; (2) The USF team will conclude the three-year project by designing, constructing, and pilot testing a **follow-up longitudinal survey** of former students based on knowledge gained from the two stages of interviews; (3) FLATE/HCC will compile a report on recruitment, retention, career counseling, job placement, and student tracking practices employed by advanced technology programs funded by ATE or affiliated with ATE Centers. This mixed methods approach will allow respondents to reflect on their past technician education experiences, current work and schooling situation, and describe their aspirations and goals. By including programs, this study gains institutional knowledge of pathways and efforts to influence and track post-enrollment student outcomes.

This study makes three specific empirical contributions. First, this study will illuminate pathways into technician education and student school-work-life balance concerns to yield information programs can use to increase recruitment, retention, and completion of certificate and AS/AAS programs. Second, this study will help broaden scholarship from a STEM pipeline model to a reality-driven model that accounts for the complex, often cyclical, work-school-work transitions and overlaps students experience. Third, this study will use access to survey data from several underrepresented groups, including women, immigrants, veterans, and individuals with disabilities to tell the stories of the diversification of the technician workforce of the future. By interviewing people across different demographic/life experience groups, we hope to identify patterns among different groups (demographic and life experience groups) in order to help programs address student needs and track student outcomes post-program. We seek to meet this goal by addressing the following questions:

1. How do students from diverse backgrounds at different life stages (non-traditional, married, parents) experience their advanced technology program? How do they address challenges they face? What supports contribute to successful experiences in advanced technology programs?
2. What are students' short-term educational goals? Did students accomplish their short-term educational goals (i.e. complete specific coursework, earn certificate or degree)?
3. What aspects of an advanced technology education prepare students meet their broader educational goals (i.e. transferring to a four-year university and earning a bachelor's degree) and/or employment goals (i.e. increased wages, promotion, getting a new job)? What aspects of the advanced technology education are the barriers to meeting broader educational goals and/or

employment goals?

4. What program and institutional efforts do colleges around the country employ to increase recruitment of students from diverse backgrounds, to increase retention and persistence, and to stay connected to former students?

Project Activities

The USF research team will conduct two rounds of interviews and a follow-up survey with 150 former (or current) students over three years. This iterative approach will allow participants to reflect on their past student experiences, present educational and employment achievements, and future aspirations and goals. This study will sample a cohort of students surveyed during two waves of the ongoing 2017 PathTech LIFE (NSF #1501999) National Survey. Of the 528 students from 24 colleges who participated in the April 2017 Wave 1 survey, 372 (70%) expressed interest in participating in future PathTech research and shared their contact information. The result of this effort will link survey and interview data to form a complete narrative of student experiences before, during, and after enrollment in technician education programs. In other words, PathTech LISTEN will transform PathTech LIFE from a cross-sectional survey into the first stage of a longitudinal research agenda.

FLATE/HCC will complement this investigation by examining how technician education program practices complement student enrollment, program experiences, and post-enrollment work and schooling outcomes. FLATE will compile a report on recruitment, retention, career counseling, job placement, and student tracking practices employed by advanced technology programs funded by ATE or affiliated with ATE Centers. FLATE will also assist in triangulating findings from prior PathTech research. Participating programs with high response rates receive findings reports specific to their colleges. Programs can develop responses to how students described program resources and their satisfaction with the program in the survey.

FLATE will also use their expertise in program development to work with administrators to develop best practices that attend to any challenges reported in relation to retention and completion of programs. FLATE will conduct this effort by hosting sessions at national conferences such as Hi-TEC and the ATE Principal Investigators Conference and regional meetings like the Florida Forum on Engineering Technology. These forums serve as existing spaces for program administrators to discuss how to implement best practices to better serve students. These are fitting spaces for dialogue about how programs can apply findings from PathTech Tampa Bay, PathTech LIFE, and PathTech LISTEN to better address students' needs and progress. This approach also offers programs insight into how future longitudinal research could impact program development and grow the technician workforce.

Elevating the Status of Technician Education and Community Colleges

Community colleges serve a particularly key role in preparing underrepresented, underprepared, and less affluent students for the workforce, many of whom aspire to transfer to four-year universities and earn bachelor's degrees or beyond (Bensimon & Santiago, 2013). Groups such as women, underpresented minorities, non-traditional students, veterans, and the disabled may face unique challenges that influence their educational and employment trajectories. Even though community colleges play a pivotal role in our national agenda of providing access as well as broadening participation of underrepresented students with advanced technology degrees and careers, the empirical literature on the role of community colleges in expanding opportunities in the technology and manufacturing workforce is limited (Wang, 2013). Studies that are limited to one dimension such as training, job experience, or work-life balance, cannot fully examine **complex interactions between school, work, family, and the economy** and how individuals are nested in each of these spheres throughout the life course.

The proposed study addresses a documented knowledge gap about pre-college and post-college career and educational pathways of advanced technology students. There are no systematic and/or comprehensive longitudinal data collection efforts dedicated to two-year college AS/AAS STEM programs comparable to the Baccalaureate and Beyond Longitudinal Study (B&B:93) or other similar investigations of four-year university students and their post-graduate outcomes. Longitudinal investigations are limited to national datasets such as High School and Beyond and the 1979 or 1997 National Longitudinal Study of Youth which track high school students, but do not specifically focus on technician education. This study seeks to fill this niche and construct a survey instrument that could be widely used to gather longitudinal data on technician educational and occupational pathways. PathTech LISTEN attempts to place technician education students and their unique pathways into scholarship on education and

transitions into adulthood and the workforce that is often predominated by studies of high school and four-year university graduates.

The study design incorporates two stages of interviews that will be analyzed using continuous and dynamic coding techniques. Findings will be used to construct and pilot test a longitudinal survey instrument that can accurately reflect the complex lives and trajectories of these populations. The proposed study continues the investigators' long-term mixed methods research agenda and contributes to methodological advancement and validation through triangulation of multiple research methods in educational and occupational attainment.

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Life Course Transitions

Three bodies of literature inform the proposed research study: life course theory, the transition to adulthood, and status attainment research. Each of these fields underscore the importance of longitudinal research.

Life course theory is a framework for analyzing individual's lives within social, cultural, and historical contexts, which are overlapping spheres that impact the trajectory of people's lives. Research based on life course theory seeks to: 1) place individuals within a cohort in which shared cultural and social references form a basis for normative sets of transitions through the life course and 2) illustrate how early life experiences form antecedents for subsequent experiences. The life course perspective insists that people cannot be understood in a vacuum; rather, fully understanding the contextual forces that influence people's lives is essential to understanding their life transitions and trajectories. Glen Elder (1974) defines life course theory through five key principles: life span development, human agency, historical time and geographic place, timing of decisions, and linked lives. His 1974 longitudinal analysis of the children growing up during the Great Depression found that economic deprivation followed by the post-war economic boom differentially impacted children and their parents, that is experiencing a time of economic and social uncertainty and relative poverty as a child versus as a parent had very different consequences and ramifications for personal growth, development, and self-understanding across the life course.

Glen Elder's work (1974, 1981, 1990) has become especially foundational for sociologists who study educational and occupational pathways as an example of seminal longitudinal research in studying how macrosopic social change and microscopic life experiences coalesced, and the importance of observing students in the context of developmental, social, and historical age to represent their position in the life course, the structure of their lives, and the historical context of their cohort respectively and in tandem. Education research adopts life course theory to show how educational pathways and trajectories intersect with the life course as well as macro-level social and economic factors and micro-level family and social circumstances (Elder 1974, Elder 1981, Eisenberg & Goldrick-Rab 2016, Settersten et al 2010). In particular, scholars are interested in analyzing how educational pathways intersect and become overlaid on life course transitions as well as factors such as migration and a period following major military interventions (Elder & Caspi 1990, Spiro et al 2016).

The transition to adulthood is traditionally marked by five classic milestones: completing education, entering the labor force, becoming financially independent, getting married, and becoming a parent, in that order, timing, and sequence (Mortimer and Aronson, 2000; Shanahan, 2000). In today's world, formal education is often ongoing, with several starts and stops. Young people are often working and attending school at the same time or cycling between the two to keep pace with necessary credentials (Carnevale, Smith, & Strohl, 2010). In addition, many young adults stay financially dependent on their families of origin, and family researchers have empirically shown the changing nature of families in today's society that comprise diverse sets of kinship arrangements. In short, many of the traditional markers that culturally conveyed movement into adulthood simply do not hold the same universal meaning in contemporary society anymore. Technician education and advanced technologies are also an important part of this cultural shift. Generations ago, a high school diploma led to stable manufacturing jobs that paid wages that could support a family on one income. Deindustrialization, automation, and outsourcing led to a new post-industrial economy reliant on a highly skilled and educated workforce. In short, the transition to adulthood is no longer a linear and simple progression. It is instead an often long and complicated process that has developed in response to the changing economic contexts in order to fill the need for a skilled workforce with the right credentials.

Attainment and the Role of Community Colleges

Status attainment theory aims to conceptualize the way our ultimate educational and occupational pathways are a reflection of both achieved and ascribed characteristics. Early status attainment models relied heavily on predicting one's mobility across the life course as well as the next generation's possibility for mobility on generation one's social origins. In this model, father's education and occupation strongly predicted not only how far he would go in his life, but how far his child would as well, leading to a rather deterministic representation of society where social mobility was limited. In contrast, contemporary status attainment models instead favor emphasis on achieved characteristics such grades, test scores, educational expectations, and parental involvement. In other words, social origins may not be wholly predictive of social destinations, and a major factor in disrupting a thesis of social reproduction is the transformative role of schooling. As more opportunities arise for young people to become educated, skilled, and credentialed, theoretically speaking, we would anticipate greater social mobility, less poverty, and overall improved societal stability and well-being.

A few decades ago, community colleges were conceptualized in the academic literature as a place where students go to "cool-out," or in other words, a place for [failing] high school students to become permanently marginalized from the mainstream of social and economic life (Clark, 1960, 1980). Community college education was not found to be a stepping stone towards a four-year college nor as an opportunity for a terminal degree that provided relevant credentials for jobs in the contemporary economy (Rosenbaum 2007, Goldrick-Rab 2010, Schudde & Goldrick-Rab 2014, Shaw & Goldrick-Rab 2003). The indictment of community colleges increased as traditional metrics of enrollment, retention, and completion rates indicated community colleges failed to pave pathways to meaningful educational or occupational trajectories (Schuetz 2008, McClenney 2007, Hossler et al 2009, Bailey et al 2004, Derby & Smith 2004, Wild & Ebbers 2002, Goldrick-Rab 2006). Several studies have also pointed to the particularly challenging experiences and circumstances of racial-ethnic minority students, first generation college students, and non-traditional students who are over-represented in community colleges (Flynn 2015, Goldrick-Rab & Sorensen 2010). Recent research in the "college for all" era (Rosenbaum 2001) and post-industrial economy dependent on skilled technical workers reveals how community colleges facilitate re-skilling through flexible programs that align closely with the needs of today's economy (American Association of Community Colleges 2011, Goldrick-Rab 2013, Rosenbaum et al 2013). Older students who may have been stigmatized in their secondary schools and sent to community colleges to "cool out," now report transformative experiences in their post-secondary schooling experiences (Tyson & Jayaram 2014, Goldrick-Rab & Kinsey 2013, Rosenbaum et al 2016).

Giving Voice to Underrepresented Groups

Another area of concern in the literature pertains to underrepresented groups. In particular, scholars have noted challenges experienced by women, minorities, and individuals with disabilities in post-secondary STEM education programs. Weber (2011) noted the necessity for role models for female students while Gorman et al. (2010) echoed the need for women professionals to mentor female students. O'Riley (1996) stated the need for new narratives to be told which would indicate the diversity of the students. The collective story told to students and potential students is limited by racism and sexism, as well as not reflecting some experiences of rural workers. Townsend (2009) also asserted that community colleges needed to provide a supportive climate for minorities and women students. This included the importance of changing discourse about women and minorities and the representation of minority and women faculty who are paid equitably. Success in STEM will increase "racial and ethnic equality," according to Beede et al. (2011). STEM community college programs also offer promising avenues for students with disabilities to reach their potential within more student focused environments (Rule et al., 2011; Garrison-Wade and Lehman, 2009).

The Need to LISTEN

Community colleges serve a particularly key role in preparing underrepresented, underprepared, and less affluent students for the workforce, many of whom aspire to transfer to four-year universities and earn bachelor's degrees or beyond (Bensimon & Santiago, 2013). Groups such as women, underrepresented minorities, non-traditional students, veterans, and the disabled may face unique challenges that influence their educational and employment trajectories. Even though community colleges play a pivotal role in our national agenda of providing educational access as well as broadening participation of underrepresented students with advanced technology degrees and careers, the empirical literature on the role of community colleges in expanding opportunities in the technology and

manufacturing workforce is limited (Wang, 2013). Studies that are limited to one dimension such as training, job experience, or work-life balance, cannot fully examine complex interactions between school, work, family, and the economy and how individuals are nested in each of these spheres throughout the life course.

Taking these bodies of literature together, a few important research objectives emerge. The changing historical and economic contexts are leading to longer transitions to adulthood for younger cohorts in today's society as well as increased re-skilling needs for older cohorts. Though more educational opportunity exists today, research has tended to focus on the dichotomy between low and high skill workers, or those who complete high school versus college, and educational pathways that lead to middle-skill jobs in today's job market remain understudied. Gaining a deeper understanding of pathways for this group will have impact on the possibility to hasten transition to adulthood and social mobility across the life course.

As such, we hypothesize that PathTech LISTEN will uncover the ways that technician education is part of a larger story about the changing fabric of our global society and contemporary economy alongside the postmodern family. The technician programs of community colleges now pave a way for marginalized individuals and families of previous generations to enter and thrive in the mainstream of society. This fundamental shift in the meaning of this type of post-secondary schooling is a central focus of PathTech LISTEN as well.

Research Design

The proposed study adopts a mixed methods longitudinal research design. Longitudinal methods allow researchers to collect data over multiple periods of time, analyze it in the same or similar matter at different periods of time, and draw comparison of data over time (Menard 2008). Qualitative methods, particularly through semi-structured interviews, allows researcher to concentrate on the details and develop in-depth narratives from individual experiences. Quantitative longitudinal methods, such as surveys, allow for empirical investigations of change over time among a variety of individuals across social contexts.

PathTech LISTEN is a unique blend of qualitative and quantitative approaches in which each informs the other and yields three empirical advantages over comparable work. First, PathTech LIFE survey results provide national context for the individual experiences of former students. Interview methods alone are a strategy to hear student stories, understand their social and educational backgrounds, learn what interested them about technician education, and chart their pathways into community college and into the workforce. But small interview samples are not generalizable to the larger population nor is it possible to determine the extent to which the sample reflects the larger population. This study samples students to interview based on their survey responses and those responses are in context of the national database. Second, PathTech LIFE survey results reveal a wealth of information about each interviewee. Typically, researchers have no information about interviewees, as was the case with students interviewed PathTech Tampa Bay. Third, qualitative analyses will provide a deeper understanding of patterns and trends to provide illustrative cases for the quantitative analyses of PathTech LIFE survey findings. Survey methods paired with longitudinal interviews yield a deeper understanding of the mechanisms undergirding their experiences beyond reporting outcomes. By using the interview data to inform survey construction, we will have high confidence that the full range and scope of questions are being asked. If LISTEN and future studies are funded, this project has potential to fully capture advanced technology schooling and work experiences, from early interest through job placement, leading to unprecedented knowledge of technician students and workers.

Further, the benefits of a longitudinal qualitative study are multi-fold: researchers will be able to establish a deeper rapport with respondents, we will understand both short- and long-term benefits and challenges associated with technician education rather than a snapshot as cross-sectional studies provide, and we will also be able to develop a deeper understanding of patterns and trends emerging in the survey analysis of PathTech LIFE and provide illustrative cases for the quantitative analyses. As such, there are several sociological studies that have utilized the approach of drawing qualitative samples from existing survey samples (e.g. The Beginning School Study, Welfare, Children, and Families: A Three City Study, The National Longitudinal Study of Adolescent to Adult Health, etc). In such studies, the groups of people being studied were considered difficult to reach, transient, and/or unreliable to maintain ties for a longitudinal study. These are also characteristics of many community college students.

However, those studies coupled qualitative and quantitative work to form relationships with respondents that utilizes both methodologies resulting in sustained participation in the research.

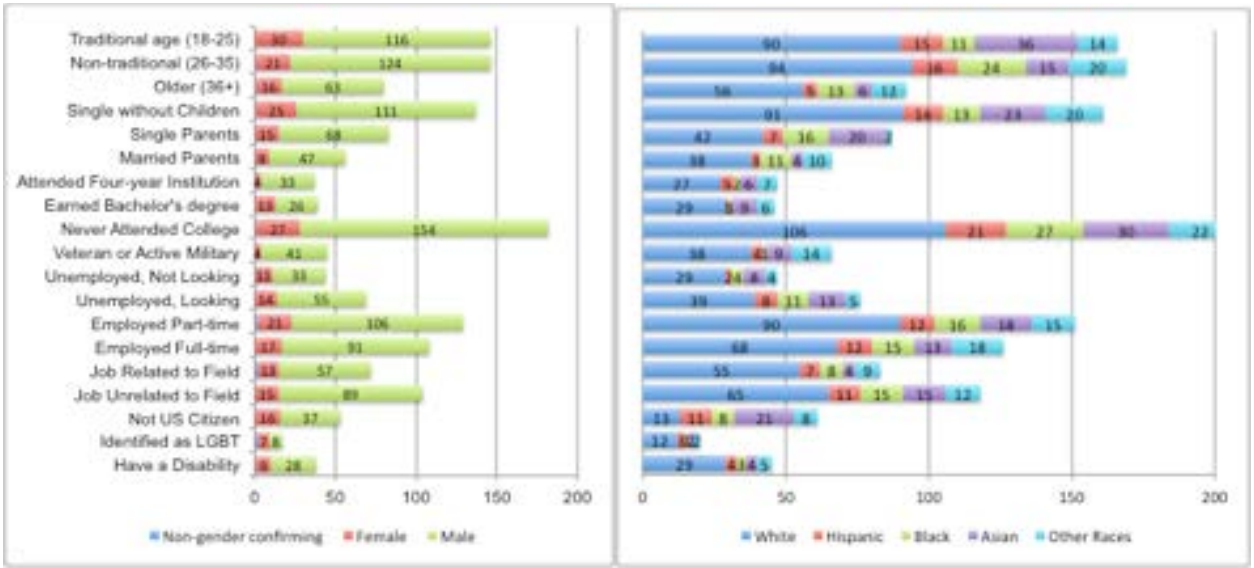
Timeline

Time	Task
Year 1	
Sept - Dec	Develop protocols, secure IRB approval, pilot instruments
Jan - Apr	Recruit participants for Round 1 of interviews
May - Aug	Administer Round 1 interviews
Year 2	
Sept - Dec	Analyze Round 1 interviews
Jan - Apr	Revise protocols, secure IRB approval, pilot instruments
May - Aug	Administer Round 2 interviews
Year 3	
Sept - Dec	Analyze Round 2 interviews
Jan - Apr	Develop survey instrument, secure IRB approval, pilot survey
May - Aug	Administer survey to interview sample and analyze for accuracy with interview data

Sampling and Recruiting

PathTech already has evidence of similar success through the PathTech LIFE Survey. Over 70% of Wave 1 survey respondents expressed interest in participating in a future study and shared a permanent email address. Figure 2 illustrates that this group of 372 students from the Wave 1 survey is particularly diverse with respect to demographics and life experiences. For example, the study can recruit from 39 students with bachelor's degrees, 83 single parents, 45 veterans or active military, 17 students who identify as lesbian, gay, bisexual, or transgender. In-depth interviews with these students can yield a wealth of knowledge about unique pathways among students with unique experiences and challenges. This sampling pool is also representative of the sample in that no factor predicted interest in further research. In addition, Wave 2 (Oct-Dec 2017) respondents will be added to the PathTech LISTEN sampling pool.

Figure 2. Sampling Pool from PathTech LIFE Wave 1



The sampling pool will be sent a short screening survey. Those willing to participate in a follow-up interview will be given a short questionnaire to confirm contact information, days/time when it would be convenient to contact the respondent, and brief demographic information. Project staff will contact the interested participants within 24 hours to schedule the interview, which will then occur within one week.

Rapid response will lead to higher participation rates. Further, incentive gifts will be sent immediately, which will help pave the way for continued participation in the next wave of data collection. Another strategy we plan to employ relates to the calls themselves. In our current smartphone atmosphere, caller ID is a given. A strange number popping up from an unknown area code is likely to be sent to voicemail or dismissed all together. To help address this obvious roadblock to making contact with potential participants, we plan to establish an internet-based phone number dedicated to the project such that when calls are placed from this number, the caller ID will read something like "PathTech LISTEN – University of South Florida." We believe this will help increase the possibility that our calls will be recognized and answered. Taken together, all these strategies will help alleviate attrition.

Efforts will be made to recruit a diverse sample of respondents such that all under-represented groups within technician education are represented in the study. We aim to not only gain a deeper understanding of experiences common to all technician students, but also to those that might be specific to under-represented or non-traditional students as well. In particular, efforts will be made to incorporate racial and ethnic minorities, women, veterans, first generation students, students with disabilities, and those from urban populations. The study aims to sample a total of 150 students, including approximately 15-20 students from the groups listed in Figure 2. This sampling strategy follows Green and Thorogood's (2004: 103-4) argument that "the experience of most qualitative researchers is that in interview studies little that is 'new' comes out of transcripts after you have interviewed 20 people." The research team estimates that interviewing 20 individuals from each large target group will lead to sample saturation. We anticipate considerable overlap from students who fall into multiple groups (i.e. disabled veterans, single mothers, minority non-traditional students). For this reason, we expect to interview 150 people twice over the course of the project and pilot test the survey with the same group. Participants will be offered $50 for each interview and $25 for completing an approximately 15 minute survey.

Methods and Analysis

Table 1 summarizes topics to be included in interview protocols for each round of interviews. Interviewees will be asked a common set of questions as well as specific modules that develop their survey responses and emergent themes from further analyses of PathTech LIFE data to be conducted in Year 1.

Table 1. Summary of Interview Protocols

Round 1 (Summer 2019) - Past and Present	Round 2 (Summer 2020) - Present and Future
Pre-enrollment background	Current work-school-life status
Technician education experiences	Changes to life plans
Use of college supports and resources	Achievements and credentials earned
Challenges faced and overcomed	Impact of experiences on current status
Decisions to continue/delay/stop schooling	Aspirations for the future
Current work-school-life status	Reflections on pathways

Data will be collected via phone interviews or using Skype or similar interface at the preference of the interviewee. A review of methodological literature reveals that there are no significant differences in responses in person in comparison to phone. These findings are corroborated with data collection experience with PathTech Tampa Bay. Conversation will be recorded and transcribed. This proposed project will utilize a continuous, iterative, and dynamic form of coding and data analysis that will allow for triangulation of findings at multiple junctures. There are three key elements that will assist in the analytic process: 1) interview summaries and field notes, 2) codebooks, and 3) software-assisted coding plans.

The interviewer will keep field notes for each interview and write a summary of the interview immediately at the culmination of the conversation along with any field notes that will help identify the affect of the respondent. The summaries will be indexed and shared with the PI, Co-PIs, and senior project personnel so that there is real time knowledge of the types of themes emerging from the data collection efforts. The PI will develop the coding scheme based on the interview summaries and develop the skeleton of coding trees based on emergent themes. These codes will be used to analyze interview transcripts when available. The codebook will be kept and updated continuously.

The entire research team will code interview transcripts and analyze coded segments for both saturation as well as exceptions using Atlas.ti 8, a cutting edge qualitative analysis software program. This approach will facilitate timely completion of interview analysis and assist in developing Round 2 interview protocols such that they build on Round 1 findings and go deeper into areas of interest. This type of iterative analysis is a hallmark of qualitative work and forms the basis for depth of inquiry. The triangulation strategy will comprise several components, including traditional methods such as member checking through various forums, meetings, and conferences with stakeholders. Perhaps the most challenging as well as meaningful part of the proposed study will be development of the longitudinal survey design. Feedback from respondents about the pilot survey will, in many ways, be the most powerful form of triangulation. We will learn if and in what ways the survey instrument captures life, school, and work changes and dynamics, and gain important substantive and methodological feedback from respondents.

Applied Research Component

An important aspect of the proposed research is to share results with community colleges and position programs to utilize the findings to impact their programs. Alongside opportunities to apply research findings, FLATE will review advanced technology program efforts to increase retention and persistence as well as efforts to track students' educational and employment outcomes after they leave college. Efforts will be made through online forums and conference sessions to allow research and practice to come together. FLATE is uniquely suited to facilitate such a process by way of their role on the research team and as leaders within ET programs. By better understanding student experiences and program policies, we hope to uncover successful strategies and best practices for influencing student pathways.

Evaluation Plan

Benjamin Reid, Principal Evaluation Consultant for Impact Allies, will lead the External Evaluation of the project. Benjamin is the External Evaluator for a NSF ATE Center, has a Masters of Business from the University of Florida and professional training from EvaluATE, and has been both faculty and staff for a university and a community college. Reid is also the External Communications Coordinator of PathTech LIFE. The design seeks to address the need to review and provide feedback on data collection and analyses. The evaluator will compile an annual evaluation of project activities in response to the following questions:

- To what extent did the research project focus on the effectiveness of technician education?
- To what extent did the data collection procedures, analyses, draft publications, and dissemination plans change between planning and implementation for quality and enhancement of the research's impact?
- To what extent did PathTech LISTEN achieve its primary objectives?
- To what extent did the research and publications prove and help improve the effectiveness of technician education?

Indicators	Data Sources & Collection Methods	Analysis & Interpretation
Interview and Survey Questions Data Collection Process Analyses Accuracy Publications Dissemination	For implementation evaluations, project personnel will provide the draft questions for interviews and surveys, plan for data collection procedures, draft analysis design and method, intended publications and dissemination channels. For outcome evaluations, Qualtrics, project personnel, interviewees, publishers, and recipients of PathTech LISTEN's announcements and publications will provide the results of	For implementation evaluations in pursuit of quality improvement, best practices, checklists, and subject matter experts will be used in conjunction with the Delphi technique, a method of group decision-making and forecasting that involves successively collating the judgments of experts. For outcome evaluations, mixed methods quantitative and qualitative approach using descriptive, visualized data to compare NSF ATE Targeted Research's

	the implementation, outputs, outcomes, and impacts.	and PathTech LISTEN's intended outcomes, activities, and deliverables.

The evaluator will conduct 6-8 meetings a year with the project team and email as needed to accomplish evaluation deliverables. The timeline exist to systematically move from draft materials collected to implementation evaluation for quality and enhancement prior to implementing an activity; and likewise for outcome evaluations, to move from data collected to outcome and summative evaluations.

Table KEY: 1) data collected, 2) reports submitted; IE) Implementation Evaluation, OE) Outcome Evaluation

Year1, Quarter 1&2	Y1, Q3&4	Y2, Q1&2	Y2, Q3&4	Y3, Q1&2	Y3, Q3&4
2: Detailed evaluation plan including Logic Model 2: Data collection instruments 1: Interview and Survey Questions 1: Data Collection Process	2: IE, Interview and Survey Questions and Data Collection Process 1: Dissemination Plan	1: Analysis Method and Researchers 2: IE, Analyses draft and Researchers and Dissemination Plan	2: OE, Interview and Survey Questions and Data Collection Process 1: Survey and Interview Data	2: OE, Data Collected and Analyses 1: Draft Publications 2: IE Draft Publications	2: OE, Publications and Dissemination 2: Lessons Learned Executive Summary 2: Summative Evaluation

Dissemination Plan

Required dissemination efforts included under Other Annual Activities above include completing annual reports and the final report at the end of the project and participating in the Showcase at the ATE Principal Investigators meeting in October. We will also present project updates at the Florida Forum on Engineering Technology (ET Forum), a semi-annual meeting of ET educators, administrators, industry leaders, and vendors from throughout Florida. Meetings typically occur in September and March. PI Dr. Tyson and Co-PI Dr. Jayaram have presented at the ET Forum as part of both prior PathTech projects.

The project team will present at one conference a year geared toward technician education and/or community colleges such as the American Association of Community Colleges or Hi-TEC. In addition, PI Tyson, Co-PI Jayaram, the GAs and the lead evaluator will attend sociology conferences to present our findings and promote ATE Targeted Research. We plan to submit at least three manuscripts to peer reviewed journals in sociology or education over the duration of the project. We will attempt to publish from each wave of interview data as well as about advancement of applied components of the research as well.

FLATE will publish a report on policies and practices used to boost retention and persistence at advanced technology programs around the country to disseminate to other ATE Centers and Projects. We will consider conducting webinars and other media strategies if deemed beneficial by FLATE stakeholders and the external evaluator.

Management Plan

Dr. Will Tyson, Principal Investigator is an Associate Professor of Sociology at the University of South Florida. His research examines interpersonal and structural influences on STEM educational and career pathways out of high schools, community colleges, and four-year universities. Dr. Tyson will lead all phases of the project. Specifically, he will conduct quantitative analyses of PathTech LIFE data for sampling purposes and dynamically code interview summaries as interviews are conducted. Dr. Tyson has over 13 years of experience as an NSF grantee serving in multiple roles on seven different projects totaling $6.9 million. The proposed project continues the PathTech research agenda Dr. Tyson started as Principal Investigator of PathTech Tampa Bay (NSF # #1104214) from 2011-15 and PathTech LIFE (NSF #1501999) from 2015-18. Dr. Tyson has served on several expert panels and advisory boards related to STEM education research and practice, including the editorial board of *Sociology of Education* (2011-13, 2017-19) and the National Academy of Engineering (NAE) Committee on Engineering Technology Education (2014-16).

Dr. Lakshmi Jayaram, Co-Principal Investigator is an Research Associate at the University of South Florida. Dr. Jayaram's research focuses on the sociology of education, educational disparities, as well as education policy and reform. Her work will include oversight of the entire qualitative research process, including human subjects review, recruiting participants to the study, developing interview guides and protocols, interviewing participants and coding narrative data, training graduate and undergraduate students in both data collection and analysis, writing research reports that detail study findings, and assist in writing annual reports.

Dr. Marilyn Barger, Co-Principal Investigator is the Executive Director of FLATE. She will coordinate FLATE/HCC efforts to compile information on program efforts to encourage recruiting, retention, career and job placement, and tracking students. She will also advise the USF team on survey protocols and sampling strategies.

Broader Impact

PathTech LISTEN attempts to place technician education students and their unique pathways into scholarship on education and transitions into adulthood and the workforce that is often predominated by studies of high school and four-year university graduates. This study makes three specific empirical contributions. First, this study will illuminate pathways into technician education and student school-work-life balance concerns to yield information programs can use to increase recruitment, retention, and completion of certificate and AS/AAS programs. Second, this study will help broaden scholarship from a STEM pipeline model to a reality-driven model that accounts for the complex, often cyclical, work-school-work transitions and overlaps students experience. Third, this study will use access to survey data from several underrepresented groups, including women, immigrants, veterans, and individuals with disabilities to tell the stories of the diversification of the technician workforce of the future.

The broader impact of the proposed research rests on the application of findings to the development and betterment of ATE/CC programs, particularly as a departure from current practices. First, scholarship and practice based on four-year programs prioritizes degrees and number of majors. For example, performance-based funding initiatives in many states allocate two-year college funding based on metrics such as degree completion that may not reflect the efficacy of these programs. In asking current students about their backgrounds, current experience, and future aspirations, prior PathTech research found that coursework and certifications are tightly coupled with industry needs, therefore students may simply seek to complete one or two courses to advance their career. These findings indicate the need to measure not only program completion but participation, as an important basis for planning and resourcing in technician education.

Second, understanding how students cycle between school and work and balance personal, family, and social obligations can help programs develop policies and practices to better help students navigate the multiple roles they occupy. Such policies could respect the complexities of student life and encourage students to stay in the program longer and gain greater skills and credentials.

Third, the proposed study will offer insights into the experiences of underrepresented groups which will assist programs in developing efforts to increase recruitment and retention of specific groups of students. Finally, the proposed research will also give programs a way to connect with industry by way of placement and tracking. As programs gain better information about where their students land, they may cultivate relationships with those employers and institutions, and build a foundation for placement of future technicians as well.

Overall, the transition to successful adulthood rests on many factors including academic credentialing, stable jobs, financial independence, provision for families, as well as continued personal growth and development across the life course. Technician education provides a pathway for success and well-being throughout these key life course transitions. The broadest impact of this proposed work is the possibility for a more stable, skilled, and secure workforce and community.

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Clark, B. (1980). The “cooling-out” function revisited. In Vaughan, G. (ed.), *Questioning the Community College Role* (New Directions in Community Colleges No. 32) (pp. 15-31). San Francisco: Jossey-Bass.

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Elder, Glen H., Jr. 1974. *Children of the Great Depression*. Chicago: University of Chicago Press.

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Elder, Glen H., Jr. and Avshalom Caspi. 1990. "Studying Lives in a Changing Society: Sociological and Personological Explorations." Pp. 201-47 in Studying Persons and Lives, edited by A.I. Rabin, Robert A. Zucker, and Susan Frank. New York: Springer.

Fletcher, Edward and Will Tyson. 2017. “Bridging Technical Skills Gaps between High School Students and Local Employers.” *Journal of Research in Technical Careers* 1(1): 20-31.

Fletcher, Edward and Will Tyson. 2017. “A Longitudinal Analysis of Young Adult Pathways to STEMH Occupations.” *Career and Technical Education Research* 42(1): 35-55.

Flynn, Ellen E. 2015. “It’s All About Saving Face: Working with the Urban College Student.” *College Student Journal* 49, no. 2: 187-194.

Kuehn, Daniel. 2017. “Analyzing the Engineering Technician and Technologist Workforce: Data Coverage and Gaps” Urban Institute

Goldrick-Rab, S. “Following Their Every Move: How Social Class Shapes Postsecondary Pathways.” *Sociology of Education.* January, v79n1. pp. 61-79. (2006).

Goldrick-Rab , S. (2010). Challenges and opportunities for improving community college student success . *Review of Educational Research* , 80 (3), 437 – 469

Goldrick-Rab, S., Broton, K., & Gates, C. *Clearing the Path to a Brighter Future: Addressing Barriers to Community College Access and Success.* Association of Community College Trustees, Washington DC. (2013).

Goldrick-Rab, S. “Accountability for Community Colleges: Moving Forward.” In K. Carey and M. Schneider (Eds), *Accountability in American Higher Education.* Palgrave. (2010).

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Goldrick-Rab, S. & Sorensen, K. 2010. "Unmarried Parents in College." *Future Of Children* 20, no. 2: 179-203.

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Rosenbaum, J. [James], K. Cepa, and J. Rosenbaum [Janet]. 2013. Beyond the one-size-fits-all college degree. *Contexts* 12(1): 49–52.

Rosenbaum, J. [James], C. Ahearn, and J. Rosenbaum [Janet]. 2016. The community college option. *Education Leadership* 73(6): 48–53.

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Schuetz , P. (2008). A theory-driven model of community college student engagement . *Community College Journal of Research and Practice* , 32 (4–6), 305 – 324 .

Settersten Jr., Richard A., and Barbara Ray. 2010. "What's Going on with Young People Today? The Long and Twisting Path to Adulthood." *Future Of Children* 20, no. 1: 19-41.

Shanahan, Michael (2000). "PATHWAYS to adulthood in changing societies". Variability and Mechanisms in Life Course Perspective: 669. Shaw, K. & Goldrick-Rab, S. “Market Rhetoric Versus Reality in Policy and Practice: The Workforce Investment Act and Access to Community College Education and Training.” *Annals of the American Academy of Political and Social Science.* v586, March, 172-193. (2003).

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Spiro, Avron, Richard A. Settersten, and Carolyn M. Aldwin. 2016. “The Long-Term of Military Service in Aging and the Life Course: A Positive Re-Envisioning” The Gerontologist 56(2): 381.

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Tyson, W. & Jayaram, L. (2014, August). Work to School Transitions and the Transformative Role of Community College Education. Paper presented at

the Annual Meetings of the American Sociological Association, San Francisco, CA.

Wang, X. (2013). Community colleges and underrepresented racial and ethnic minorities in STEM education: A national picture. In R. Palmer & J. Wood (Eds.), *Community colleges and STEM: Examining underrepresented racial and ethnic minorities* (pp. 3-16). New York, NY: Routledge.

Wild , L. , & Ebbers , L. (2002). Rethinking student retention in community colleges . *Community College Journal of Research and Practice* , 26 (6), 503 – 519 .

Will Tyson, Associate Professor
Department of Sociology
University of South Florida

Biographical Sketch

a. Professional Preparation

Wake Forest University	Sociology and Psychology	BA, 1998
Duke University	Sociology	MA, 2001
Duke University	Women's Studies	Graduate Certificate, 2003
Duke University	Sociology	PhD, 2004

b. Appointments

2012 – present	Associate Professor, Sociology, University of South Florida
2005 – 2012	Assistant Professor, Sociology, University of South Florida
2004 – 2005	Post-doctoral Research Associate, College of Education, University of South Florida

c. Publications

i. Publications Most Closely Related

Fletcher, Edward and Will Tyson. 2017. "Bridging Technical Skills Gaps between High School Students and Local Employers." *Journal of Research in Technical Careers* 1(1): 20-31.

Fletcher, Edward and Will Tyson. 2017. "A Longitudinal Analysis of Young Adult Pathways to STEMH Occupations." *Career and Technical Education Research* 42(1): 35-55.

Tyson, Will. 2011. "Negative Impact of Employment on Engineering Student Time Management, Time to Degree, and Retention: Faculty, Administrator, and Staff Perspectives". *Journal of College Student Retention: Research, Theory & Practice 13(4):* 479-498.

Tyson, Will. 2011. "Modeling Engineering Degree Attainment Using High School and College Physics and Calculus Coursetaking and Achievement." *Journal of Engineering Education* 100(4): 1-18.

Tyson, Will, Chrystal A. S. Smith, and Arland Nguema Ndong. 2010. "To Stay or to Switch? Why Students Leave Engineering Programs." Pp. 53-80 in *Becoming an Engineer in Public Universities: Pathways for Women and Minorities*, edited by Kathryn M. Borman, Will Tyson, and Rhoda Halperin. New York: Palgrave MacMillan Ltd.

ii. Other Significant Publications

Tyson, Will and Josipa Roksa. 2017. "Importance of Grades and Placement for Math Attainment." *Educational Researcher* 46(3): 140-142.

Tyson, Will and Josipa Roksa. 2016. "How Schools Structure Opportunity: The Role of Curriculum and Placement in Math Attainment." *Research in Social Stratification and Mobility* 44: 124-135.

Tyson, Will and Kathryn M. Borman. 2010. "'We've All Learned a Lot of Ways Not to Solve the Problem': Perceptions of Science and Engineering Pathways among Tenured Women Faculty". *Journal of Women and Minorities in Sciences and Engineering*, 16(4): 275-291.

Borman, Kathryn M., Will Tyson, and Rhoda Halperin, eds. 2010. *Becoming an Engineer in Public Universities: Pathways for Women and Minorities*. New York: Palgrave MacMillan Ltd.

Tyson, Will, Reginald Lee, Kathryn Borman, and Mary Ann Hanson. 2007. "Science, Technology, Engineering and Mathematics (STEM) Pathways: High School Science and Math Coursework and Postsecondary Degree Attainment". *Journal of Education for Students Placed At Risk* 12(3): 243–270.

d. Related Synergistic Activities

1. Conceptual and Research Advisor for "Promoting the Development of STEM Tech Employability Skills: A Review of Practices and Needs in the ATE Community" (DUE #1700703, PI: Louise Yarnall, 2017-20)
2. Advisory Board Member of "Community College Roots of STEM: Interactive Influences of Individual, Secondary School, and College Factors Predicting the Success of Underrepresented Groups" (DRL #1420363, PI: Elizabeth Stearns, 2014-19)
3. Member of the National Academy of Engineering (NAE) Committee on Engineering Technology Education (2014-16)
4. Invited participant at STEPWork 2016: Positively Impacting the Sustainability Efforts of STEP Grants, University of Central Florida.
5. Invited participant at Pinellas STEM Collaborative Labs at St. Petersburg College. St. Petersburg College, Pinellas County Schools, WorkNet Pinellas and the Science Center of Pinellas, May 2012.

Marilyn Barger

Florida Advanced Technological Education Center of Excellence (FLATE)

Hillsborough Community College

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813.259.6578

mbarger@hccfl.edu

(a) Professional Preparation

Agnes Scott College	Chemistry	B.A. 1973
University of South Florida	Civil Engineering	B.S. 1983
University of South Florida	Civil/Environmental Engineering	Ph.D., 1989
University of Michigan	Environmental Engineering	1989-1991

(b) Appointments

Vice President, Ambrose Gormley, Inc.	1991-present
Executive Director, FLATE	2004-present
Associate Professor, Hillsborough Community College	1999-2004
Assistant Professor, Florida State University	1995-1999
Assistant Professor, Hofstra University	1991-1995

(c) Products

(i) Five products most closely related to the proposed project:

1. Barger, M., M. Boyette, R. Gilbert. "The Florida Plan for Engineering Technology Education, Journal of Engineering Technology (JET) spring 20014.
2. "Working with Industry Partners", Conference for Industry Education Collaboration (CIEC), Conference Proceedings, February 2017.
3. Twelve Years of Growth and Success at Douglas L. Jamerson Elementary School Center for Mathematics and Engineering; American Society of Engineering Education (ASEE), Conference Proceedings, June 2016
4. Integrating Environmental Sustainability Concepts and Practices into Florida's Engineering Technology Education System, Conference for Industry Education Collaboration (CIEC), Conference Proceedings, Feb. 2014
5. Preparing a new Generation of Technicians, International Innovation, Disseminating science, research and technology, Issue 126 -2014, page numbers (17-19), www.researchmedia.eu

(ii)Five other significant products:

1. AVS Science Educator's Workshop Workbook (www.avs.org) 2017 edition

2. Barger, White Paper – Manufacturing Day Tours: Student Feedback Shows Huge Impact – http://fl-ate.org/wp-content/uploads/2014/11/Journal-Tour-Comments-Article_FINAL1.pdf) August 2015
3. D. Newberry, M. Barger, Modularizing Emerging Technology Education: Two Case Studies, American Society of Engineering Education (ASEE), June 2013
4. FLATE Best Practice Guides: http://www.fl-ate.org/Best_Practices/ (2010-2017)
5. ET Degree Paves the Way for Florida's Manufacturing Workforce, A Pipeline to Industry - Association for Career and Technical Education (ACTE) Techniques. January 2014, p. 40, www.acteonline.org.

(d) Synergistic Activities

1. Advisory Service: National Association of Manufacturers: Manufacturing Institute Education Council (2011-present); National Coalition of Advanced Technology Centers (NCATC) Board of directors (2015); Manufacturing Skills Standards Council (MSSC) Panel of Experts and (Industry Leadership Committee (2010-present); National Academy of Science Engineering Professional Societies Committee (2015-present)
2. Developed and distributed nationally multi-media curriculum content for NSF-ATE and the US Department of Education that connected engineering examples for STEM applications in high school science and math.
3. National Visiting Committee for NSF ATE Centers: 360, TIME, AMTEC, CARCAM, SMART, RCNGM.
4. Provide STEM professional development for elementary, secondary and post-secondary faculty in Florida and across US.
5. HI-TEC Conference Chair 2010, 2015 and Executive Committee 2009-present

LAKSHMI JAYARAM, PH.D.

A. Professional Preparation

Washington University, St. Louis, MO	English Literature	B.A. 1994
University of Chicago, Chicago, IL	Public Policy	M.P.P. 1997
Johns Hopkins University, Baltimore, MD	Sociology	MA 2005
Johns Hopkins University, Baltimore, MD	Sociology	PhD 2009

B. Appointments:

August 2017 – present

Research Associate, PathTech LIFE, University of South Florida
(Co-Principal Investigators: Will Tyson, Ph.D., Eddie Fletcher, Ph.D, and Danielly Orozco, Ph.D.)

August 2014 – May 2017

Assistant Professor of Sociology, University of Tampa
Taught courses in the accredited Applied Sociology program and have earned teaching awards. Served on the University Diversity Committee and as a mentor to the President's Fellows Program.

January 2013 – July 2014

Research Assistant Professor of Sociology, University of South Florida
Qualitative Lead Investigator, "Successful Academic and Occupational Pathways in Advanced Technology,"
(Principal Investigator: Will Tyson, Ph.D.)

August 2012 – May 2013

Visiting Assistant Professor of Sociology, University of South Florida
Instructor for courses in the Undergraduate Program in Interdisciplinary Social Sciences

August 2010 – August 2012

Assistant Professor of Sociology and Africana Studies, Virginia Tech
Faculty Affiliate, Program in Women's and Gender Studies, Virginia Tech
Affiliated with the Center for Race and Social Policy as well as the Center for Peace Studies and Violence Prevention.

August 2009 – August 2010

Instructor & Curriculum Advisor, Center for Peace Studies and Violence Prevention, VT
Developed and taught core curriculum for undergraduate certificate program in Peace Studies and Violence Prevention.

June 1997 – June 2002

Presidential Management Internship Program
Completed rotations at The White House, Department of Justice, Senate Foreign Relations Committee, and abroad through the Department of Defense.

C. Products Most Closely Related:

2014 Tyson, Will and Lakshmi Jayaram. "Work to School Transitions and the Transformative Role of Community College Education," Annual Meeting of the American Sociological Society, San Francisco, CA

2014 Tyson, Will and Lakshmi Jayaram. "The 'Pipeline' Metaphor: An Iconic Symbol for STEM Workforce Development or Mythical Understanding of Pathways into High-Tech Fields?" Annual Meeting of the Society for Applied Anthropology, Albuquerque, NM

2013 Tyson, Will, Lakshmi Jayaram, Eddie Fletcher, Patricia Frohrib, and L. Allen Phelps. "ATE Targeted Research in Action: FLATE/PathTech and Fox Valley/METTE Partnerships to Improve Student Outcomes," National Science Foundation Advanced Technologies in Engineering Principal Investigator Meeting, Washington, DC

2013 Tyson, Will, Lakshmi Jayaram, Margaret Cooper, Pangri Mehta, David Zeller. "PathTech: Building Partnerships with Community Colleges to Study Pathways to Advanced Technology Degrees," Annual Meeting of the Southern Sociological Society, Atlanta, GA

2005 - 2009 Jayaram, Lakshmi. "Qualitative Data Analysis Workshops," Department of Sociology, Johns Hopkins University, Baltimore, MD

D. Other Significant Products:

2018 Bennett, Pamela R., Amy Lutz, and Lakshmi Jayaram. *Parenting and Schooling in Diverse Families*. New York: Russell Sage (Forthcoming).

2015 Lutz, Amy and Lakshmi Jayaram. "Getting the Homework Done: Social Class and Parents' Relationship to Homework," *International Journal of Education and Social Science* 2(6): 73-84.

2013 Jayaram, Lakshmi. "Aggressive Behaviors in the Classroom," *SAGE Sociology of Education: An A-to-Z Guide*.

2012 Bennett, Pamela R., Amy Lutz, Lakshmi Jayaram. "Beyond the School Yard: The Contributions of Parenting Logics, Financial Resources, and Social Institutions to the Social Class Gap in Structured Activity Participation" *Sociology of Education*, 85(2): 131-157.

2008 Bennett, Pamela R., Amy Lutz, Lakshmi Jayaram. "Keeping Active, Keeping Safe: A Look at Participation in Structured Activities in Working-Class and Middle-Class Families" *Poverty and Race* (March/April Issue).

D. Synergistic Activities

2016 Exhibitor for University of Tampa, Annual McKnight Fellows Meeting, Tampa, FL

2016 Faculty Mentor for University of Tampa team, Client Problem-Solving Competition, Annual Meeting of the Association for Applied and Clinical Sociology, Denver, CO

2015 – 2017 Appointed to the University Diversity Committee, University of Tampa

2015 – 2017 Faculty Advisor, Department of History, Sociology, Geography and Legal Studies, University of Tampa

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of South Florida

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
William T Tyson

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **William T Tyson - Principal Investigator**	1.00	0.00	1.00	**9,130**	
2. **Lakshmi Jayaram - Co-Principal Investigator**	12.00	0.00	1.00	**61,000**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	13.00	0.00	2.00	**70,130**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**2**) GRADUATE STUDENTS				**10,862**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**1**) OTHER				**14,456**	
TOTAL SALARIES AND WAGES (A + B)				**95,448**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**17,944**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**113,392**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**8,700**	
2. INTERNATIONAL				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **7,500**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**7,500**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**5,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**23,950**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**5,436**	
TOTAL OTHER DIRECT COSTS				**34,386**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**163,978**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.5000, Base: 176042)**					
TOTAL INDIRECT COSTS (F&A)				**87,141**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**251,119**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**251,119**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
William T Tyson

ORG. REP. NAME*
Kimberly Johns

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of South Florida

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
William T Tyson

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **William T Tyson - PI**	1.00	0.00	0.00	**9,221**	
2. **Lakshmi Jayaram - Co-PI**	12.00	0.00	0.00	**61,000**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	13.00	0.00	0.00	**70,221**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**2**) GRADUATE STUDENTS				**10,970**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**1**) OTHER				**14,820**	
TOTAL SALARIES AND WAGES (A + B)				**96,011**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**17,963**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**113,974**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**8,700**	
2. INTERNATIONAL				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **7,500**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**7,500**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**9,000**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**14,950**	
6. OTHER				**5,708**	
TOTAL OTHER DIRECT COSTS				**29,658**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**159,832**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.5000, Base: 141724)**					
TOTAL INDIRECT COSTS (F&A)				**70,153**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**229,985**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**229,985**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
William T Tyson

ORG. REP. NAME*
Kimberly Johns

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **University of South Florida**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **William T Tyson**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **William T Tyson - PI**	1.00	0.00	0.00	**9,313**	
2. **Lakshmi Jayaram - Co-PI**	12.00	0.00	0.00	**61,000**	
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	13.00	0.00	0.00	**70,313**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**2**) GRADUATE STUDENTS				**11,080**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**1**) OTHER				**15,196**	
TOTAL SALARIES AND WAGES (A + B)				**96,589**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**17,980**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**114,569**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**8,700**	
2. INTERNATIONAL				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **3,750**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**3,750**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**12,475**	
6. OTHER				**5,993**	
TOTAL OTHER DIRECT COSTS				**18,468**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**145,487**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 49.5000, Base: 123269)**					
TOTAL INDIRECT COSTS (F&A)				**61,018**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**206,505**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**206,505**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **William T Tyson**

ORG. REP. NAME*: **Kimberly Johns**

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION: **University of South Florida**

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR: **William T Tyson**

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **William T Tyson - PI**	3.00	0.00	1.00	**27,664**	
2. **Lakshmi Jayaram - Co-PI**	36.00	0.00	1.00	**183,000**	
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**2**) TOTAL SENIOR PERSONNEL (1 - 6)	39.00	0.00	2.00	**210,664**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**6**) GRADUATE STUDENTS				**32,912**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**3**) OTHER				**44,472**	
TOTAL SALARIES AND WAGES (A + B)				**288,048**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**53,887**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**341,935**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**26,100**	
2. INTERNATIONAL				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **18,750**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**18,750**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**5,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**32,950**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**27,425**	
6. OTHER				**17,137**	
TOTAL OTHER DIRECT COSTS				**82,512**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**469,297**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**218,312**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**687,609**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**687,609**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME: **William T Tyson**

ORG. REP. NAME*: **Kimberly Johns**

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification (USF)

A-C. Salary, wages, and fringe benefits
Dr. Will Tyson is the PI for this project. He is requesting 1 summer month and 1.125 academic months for each of the three years of the project.

Dr. Lakshmi Jayaram is a co-PI for this project. She is requesting 12 academic months of salary as a Research Associate at a rate of $61,000 for each of the three years of the project.

Fringe rates for personnel are calculated at 18.80%. The proposed level of commitment for this project is appropriate to the scope of work and is required to fulfill the objectives of this project.

Two graduate students are requested for all three summers at a summer rate of $5,431. Fringe will be calculated at 0.30% with annual GA insurance at $1,990.

Total Salary, wages, and fringe: $113,392 (Yr 1), $113,974 (Yr 2), $114,569 (Yr 3) = $341,935

D. Equipment

E. Travel

Drs. Tyson and Jayaram seek travel funds to attend the following meetings each year of the project:

Florida Forum on Engineering Technology (aka ET Forum) - This is a forum hosted by our FLATE partners twice a year on a Thursday and Friday in the Fall (Sept or Oct) and Spring (March or April). These meetings take place at community colleges in Florida. Some potential destinations require driving less than 2 hours. Other destinations require longer drives or flight and two nights of lodging; therefore, travel and lodging needs vary. Cost are estimated for two destinations under 2 hours away, three drivable destinations that will require lodging, and one destination over the duration of the grant that will require lodging and flight (such as the Spring 2015 meeting in Key West). Estimated: $300 each per year.

National ATE Principal Investigators Conference – This is the annual PI meeting for the NSF ATE in Washington, DC. The project gets complementary registration and two nights of hotel for the PI. Costs are estimated for one night lodging, pre-conference workshop registration, transportation, and incidentals. Estimated: $800 each per year.

Community College, Technician Education, or Engineering Education Conference – These conferences allow the USF research team to share research and develop relationships with national community college faculty and administrators as well as representatives from STEM industries. Examples of such conferences include HI-TEC (High Technology Exchange Conference), League of Innovation, and AACC (American Association of Community Colleges). Dr. Tyson or Dr. Jayaram will attend with Dr. Barger from FLATE. Costs are estimated for registration, transportation, lodging, and incidentals. Estimated: $2,000 per year.

Social Science and Education Conferences – These conferences allow the team to share research and collaborate with fellow scholars around the country. Between the two of them, Drs. Tyson and Jayaram will attend three social science and/or education conferences a year to present

research. Example conferences are ASA (American Sociological Association) and AERA (American Educational Research Association). Costs are estimated for registration, transportation, lodging, and incidentals. Estimated: $1,500 per conference per year.

Total travel: $8,700 each year = $26,100

F. Participant Support Costs

The research team seeks to interview 150 people and offer incentives of $50 in Year 1 and Year 2. In Year 3, we will administer a pilot longitudinal survey and offer a $25 incentive to complete a 15 minute survey. This survey incentive mirrors our successful strategy for the PathTech LIFE Survey. Estimated: $18,750 total.

G. Other Direct Costs

Materials and Supplies
$5,000 is requested in Year 1 to purchase a computer, phone/video conference recording equipment, an Atlas.ti 8 five party license (qualitative analysis software), and any other software or hardware necessary to complete interviews and analyses.

Consultant Services

- A transcriptionist is requested at a rate of $20/hr for 3 hrs per interview for 150 interviews for each year of the project.
- Impact Allies ($42,375) – External Evaluator Ben Reid.

Subaward
Per USF policy, the first $25,000 of each subaward is included in calculations of indirect costs. Subawards include:

- Hillsborough Community College (HCC) ($103,816) – FLATE and Co-Principal Investigator Dr. Marilyn Barger

Other-Tuition
Tuition is requested for two graduate students for each summer at 6 in-state credit hours per year. In Year 1, tuition is calculated at $431.43 per credit hour accounting for an annual inflation rate of 5%.

H. Total Direct Costs
The total direct costs requested is $581,470.

I. Indirect Costs
Indirect costs are calculated at 49.5% of the modified total direct costs, which does not include participant costs or tuition ($441,035). The total indirect costs requested is $218,312.

J. Total Direct and Indirect Costs
The total requested funds is $799,782.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Hillsborough Community College

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Marilyn T Barger

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Marilyn Barger - Co-PI**	1.60	0.00	0.00	**12,510**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	1.60	0.00	0.00	**12,510**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**1**) UNDERGRADUATE STUDENTS				**1,008**	
5. (**1**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**6,473**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**19,991**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**3,081**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**23,072**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**4,895**	
2. INTERNATIONAL				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,500**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**1,500**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**29,467**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 20.0000, Base: 23071)**					
TOTAL INDIRECT COSTS (F&A)				**4,614**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**34,081**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**34,081**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Marilyn T Barger

ORG. REP. NAME*
Kimberly Johns

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 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Hillsborough Community College

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Marilyn T Barger

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Marilyn Barger - Co-PI**	1.60	0.00	0.00	**12,885**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	1.60	0.00	0.00	**12,885**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**1**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**6,667**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**19,552**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**4,178**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**23,730**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**4,875**	
2. INTERNATIONAL				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,500**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**1,500**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**30,105**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 20.0000, Base: 23729)**					
TOTAL INDIRECT COSTS (F&A)				**4,746**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**34,851**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**34,851**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Marilyn T Barger

ORG. REP. NAME*
Kimberly Johns

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Hillsborough Community College

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Marilyn T Barger

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Marilyn Barger - Co-PI**	1.60	0.00	0.00	**13,272**	
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	1.60	0.00	0.00	**13,272**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**1**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**6,867**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**20,139**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**4,269**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**24,408**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**4,595**	
2. INTERNATIONAL				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**1,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**30,003**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **MTDC (Rate: 20.0000, Base: 24407)**					
TOTAL INDIRECT COSTS (F&A)				**4,881**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**34,884**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**34,884**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Marilyn T Barger

ORG. REP. NAME*
Kimberly Johns

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
Hillsborough Community College

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Marilyn T Barger

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Marilyn Barger - Co-PI**	4.80	0.00	0.00	**38,667**	
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	4.80	0.00	0.00	**38,667**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**1**) UNDERGRADUATE STUDENTS				**1,008**	
5. (**3**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**20,007**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**59,682**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**11,528**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**71,210**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. U.S. POSSESSIONS)				**14,365**	
2. INTERNATIONAL				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**4,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**4,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**89,575**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**14,241**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**103,816**	
K. SMALL BUSINESS FEE				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				**103,816**	

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Marilyn T Barger

ORG. REP. NAME*
Kimberly Johns

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Budget Justification (FLATE Subaward)

A. Senior Key Personnel
Dr. Marilyn Barger, will serve as Co-Principal Investigator and will commit 13.3% (1.6 months/year) of her time to all three years of the project. She will serve as the liaison to the University of South Florida for HCC for this project and will coordinate all participating ATE centers and projects as well as other participating colleges programs across the country. Dr. Barger will also be involved in student interview question development.

B. Other Personnel
Funds to support one part-time undergraduate student researcher (15 hr/wk) for all three years to assist with coordination and planning of meetings, data handling and entry, and other tasks.

C. Fringe Benefits
Project personnel's salary includes a standard 3% cost of living raise each year. Fringe is calculated for calendar months at 15.57% for all full-time faculty, staff, and part time undergraduates. Medical benefits for full time personnel are charged at a rate of $8500 annually.

E. Travel

Funds are requested to visit 4 out-of-state college programs to collect data and verify retention intervention programs in years 1 and 2 and 2 programs in year 3. Travel cost per trip is requested at $900/ trip. This includes $500 for airfare plus 2 hotel nights per trip at $130/night, per diem ($36/day, 2.5 days) and miscellaneous (shuttle, etc) expenses. Travel in state is requested to visit Florida colleges for the same purpose and attend PathTech meetings. Mileage reimbursement is requested at the state rate of $0.445/mile. $1500 ($500 airfare, $400 hotel nights, $400 registration, $36/day per diem, 3 days, and miscellaneous parking and local transportation) is requested to travel to one national conference for dissemination in year 3.

F. Participant Support Costs

G. Other Direct Costs

1. Materials and Supplies
We request funds to allow for shipping and postage materials to partner members, office supplies, consumables to support the project's activities such as materials for the meetings and reproduction of draft documents, items for dissemination, etc. All materials and supplies will be for the exclusive use of this project for the project period.

I. **Indirect Costs**

The off campus indirect rate for HCC is 20% on salary, wage, and fringe.

J. Total Direct and Indirect Costs

The total requested funds is $103,816.00

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Will Tyson

Other agencies (including NSF) to which this proposal has been/will be submitted: National Science Foundation

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

PathTech LIFE: Constructing a National Survey of Engineering Technology Students through Regional and Statewide Testing

Source of Support: National Science Foundation

Total Award Amount: $778,031 Total Award Period Covered: 9/1/15-8/31/18

Location of Project: University of South Florida

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr: 2.0

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

PathTech LISTEN: Longitudinal Interviews with Students in Technician EducatioN

Source of Support: National Science Foundation

Total Award Amount: ~$800,000 Total Award Period Covered: 9/1/18-8/31/21

Location of Project: University of South Florida

Person-Months Per Year Committed to the Project: Cal: Acad: 1.125 Sumr: 1.0

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

PathTech LIFE: Constructing a National Survey of Engineering Technology Students through Regional and Statewide Testing (Supplemental Funding Request)

Source of Support: National Science Foundation

Total Award Amount: $ 155,586 Total Award Period Covered: 9/1/17-8/31/18

Location of Project: University of South Florida

Person-Months Per Year Committed to the Project: 0 Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project: Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Marilyn Barger	Other agencies (including NSF) to which this proposal has been/will be submitted: NA

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Florida's Advanced Technological Education Center of Excellence

Source of Support: NSF

Total Award Amount: $2,900,000 Total Award Period Covered: 10/1/12-12/30/18

Location of Project: HCC, Tampa FL

Person-Months Per Year Committed to the Pro- 6.4 Cal: ☒ Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Centers Collaborative for Technical Assistance

Source of Support: NSF

Total Award Amount: $900,000 Total Award Period Covered: 11/1/14-8/30/18

Location of Project: HCC, Tampa, FL

Person-Months Per Year Committed to the Pro- 0.9 Cal: ☒ Acad: Sumr:

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: ATE Collaborative Outreach and Engagement Project

Source of Support: NSF

Total Award Amount: $649,000 Total Award Period Covered: 05/01/2017-03/31/2021

Location of Project: HCC Brandon, FL

Person-Months Per Year Committed to the Pro- 3 Cal: ☒ Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

PathTech LISTEN

Source of Support: NSF

Total Award Amount: $800,000 Total Award Period Covered: 9/01/2018-8/30/2021

Location of Project: University of South Florida, Tampa, FL

Person-Months Per Year Committed to the Pro- 1.7 Cal: ☒ Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Pro- Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: Lakshmi Jayaram	Other agencies (including NSF) to which this proposal has been/will be submitted. National Science Foundation

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

PathTech LIFE: Constructing a National Survey of Engineering Technology Students through Regional and Statewide Testing

Source of Support: National Science Foundation

Total Award Amount: $778,031 Total Award Period Covered: 9/1/15-8/31/18

Location of Project: University of South Florida

Person-Months Per Year Committed to the Project. Cal: 2.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

PathTech LISTEN: Longitudinal Interviews with Students in Technician EducatioN

Source of Support: National Science Foundation

Total Award Amount: ~$800,000 Total Award Period Covered: 9/1/18-8/31/21

Location of Project: University of South Florida

Person-Months Per Year Committed to the Project. Cal: 12.0 Acad: Sumr:

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

PathTech LIFE: Constructing a National Survey of Engineering Technology Students through Regional and Statewide Testing (Supplemental Funding Request)

Source of Support: National Science Foundation

Total Award Amount: $ 155,586 Total Award Period Covered: 9/1/17-8/31/18

Location of Project: University of South Florida

Person-Months Per Year Committed to the Project. Cal: 12.0 Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: $ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

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*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

Facilities, Equipment and Other Resources

Laboratory: FLATE at Hillsborough Community College has manufacturing-related laboratories available although none will be needed for this project.

Clinical: N/A

Animal: N/A

Computer: Each member of the research team and evaluation teams have access to office and personal computers.

Office: PI Will Tyson has standard office resources in the University of South Florida Department of Sociology. Co-PI Lakshmi Jayaram has access to standard office resources in the University of Tampa Department of Sociology. Co-PI Marilyn Barger has standard office resources at the Florida Advanced Technological Education Center (FLATE) at the Brandon Campus of Hillsborough Community College**.** Lead external evaluator Ben Reid has standard office resources. Each has one desktop computer with teleconferencing capabilities and locked storage space within a locked office.

Other: Each person has access to department or collaborative office resources including at least one copier, one printer, one fax machine, and one conference room.

Major Equipment: N/A

Other Resources: N/A

Data Management Plan (DMP)

1. Data and materials
This study will produce digital recordings and transcripts of interviews. This study will produce quantitative survey data collected using the Qualtrics survey platform.

2. Standards to be used for data
All survey data will be stored USF's secured computer servers. The data will be stored and managed in Atlas.ti 8, Microsoft Word, and Microsoft Excel.

3. Policies for access and sharing data
All information and documents (i.e., informed consent forms, interview recordings) completed by research participants will be used for research purposes only and will be kept in strict confidence. Confidentiality will be maintained by assigning participants' numerical identifiers. Participants will be informed that their personal information and responses will not be used for any other purposes than conducting statistical analyses and obtaining results for eventual publication.

All physical materials will be secured on-site (e.g., locked cabinets and locked offices) at Dr. Tyson's Office. Informed consent documents, participants' contact information, and other identifying documents will be stored in a separately from the data in a locked filing cabinet and will only be available to the research staff involved in this project.

All members of the USF research team will have access to the datasets. They will have received training in human subject issues required of all investigators and signed confidentiality statements. As part of the regular ethical research review protocol, all research instruments and activities along with the external evaluator will be submitted to the IRB divisions USF and participating universities as required.

5. Plans for Archiving Data
According to USF IRB policy, the PI "must maintain all research records (e.g. signed informed consent documents, source documents, case report forms, laboratory results, and regulatory binder documents) to allow for a complete accounting of study activity for a minimum of *five (5) years* after the study is closed by the IRB" (USF IRB 5.0, 5.1, 5.1.1).

At the conclusion of the project, hard copies of all project documents will be continued to be stored on-site (e.g., locked cabinets and locked offices) at Dr. Tyson's office. PI and co-PIs will have access to these files. All study documents such as scholarly articles, white papers, and presented papers will be uploaded to the project Web site so they will be available to other STEM researchers and the general public.