b. PATHS-UP Strategic & Detailed Logic Model (WFD/CoI)

PATHS-UP
Precise Advanced Technologies and
Health Systems for Underserved Populations

PATHS-UP WFD & CoI Logic Model

1) Improve healthcare access, enhance the quality of service and life, and reduce the cost of healthcare in underserved populations
2) Develop a culturally diverse workforce of innovators that possess disciplinary expertise, motivation to serve the underserved, and practice inclusivity in their work habits and product designs
3) Facilitate sustainability of the ERC through continuous data-driven improvement within ERC programming

GRADUATE STUDENTS

Objectives	Inputs	Activities	Where/When Activities Occur	Outputs	Shorter-term Outcomes	Method/Instrument	Longer-term Outcomes
Increase graduate students' knowledge and skills	**RESOURCES** • Human capacity • Financial capacity (NSF Funding) • University resources • Technology resources • Partnerships with communities **STAKEHOLDERS** • Graduate student participants/scholars/mentors • Undergraduate scholars as mentees or VIP team members • Postdoctoral scholars • PATHS-UP Faculty Mentors • Industry partners • Community members • Institutional partners • PATHS-UP Governing bodies (boards, committees, Leadership teams) **SYSTEMS** • Recruitment systems • Mentoring structure • Onboarding • Culture of Inclusion Training • Professional development • Curriculum development • Research dissemination • Reporting & data collection systems • Evaluation & monitoring • Mechanisms for cross-institutional collaboration **STRUCTURES** • Student Leadership Council (SLC) • PATHS-UP leadership structure • Multi-institutional collaboration • Research thrusts • External evaluation team • Executive Committee • EPIC • Leadership Teams • Communication structures (formal and informal) • Decision-making structures (formal & informal) **Culture** • Inclusion • Equity • Diversity	Experiential Learning Program for Graduate Students • Conduct PATHS-UP related research with excellence and integrity • Participate in research thrust project meetings involving collaboration with other PATHS-UP university partners. • Participate in PATHS-UP WFD related activities, such as the Student Leadership Council (SLC), outreach events, professional development activities, and diversity and inclusion training. • Receive mentorship from faculty and/or post-docs in research lab • Participate in an experiential learning opportunity outside of the standard research requirement of the degree. • Complete MOU and annual reflection of experience - PATHS-UP Lecture Series by Innovation Ecosystem & SLC / Seed Funding Proposals • Promote PATHS-UP to prospective students • Become a PU Alumni Member who keeps in touch via surveys with ERC staff after graduation and • Disseminate PATHS-UP research through relevant channels such as peer-reviewed journals, academic conferences, and events • Mentor at least one undergraduate student • Be mentored by faculty or post-docs in lab • Participate in diversity & inclusion workshops • EDI speaker series - Diversity mentors program - Quarterly mentoring sessions to encourage students to pursue internships in industry and to enroll in professional societies	TAMU, Rice, FIU, UCLA; Fall/Spring/Summer	Program Deliverables • Conference Papers / Journal Publications • Conference Presentations • Patents • participation in trainings and workshops	• Graduate students increase discipline-specific knowledge related to POC technologies • Graduate students develop their research skills • Graduate students increase confidence in research development and implementation • Graduate students increase transferable skills including leadership, communication, and networking	• Multi-ERC Survey • Immersive experience reflection • MOU • Self-Reflection Toolkit • Faculty Mentor survey	• Graduate students' PATHS-UP research is published • Graduate students report growth over years in program • Graduate students' PATHS-UP research produces enabling technologies
Develop graduate students' awareness regarding opportunities and interests in STEM				Program Deliverables: • MOU & Fellow Checklist • Reflection Statement about PATHS-UP immersive experiences [research/internship/study abroad/community outreach/data collection/focus groups/stakeholder engagement) # graduate students with Internship/Co-op/Shadowing experience/ Global Experience (research/internship/study abroad)	• Graduate students increase awareness of different stakeholders in academia and in the industry • Graduate students are aware of (or increase awareness about) opportunities and interests in careers in various sectors (i.e., academia, industry)	• Multi-ERC Survey • Immersive experience reflection • MOU • Self-Reflection Toolkit	• PATHS-UP graduate fellows matriculate into academia or into industry
Become a part of a PATHS-UP community				# of graduate students with Test-Bed Immersion experience (community outreach/data collection/focus groups/stakeholder engagement); # of graduate students (PATHS-UP Fellows) with involvement in community # PATHS-UP research disseminated	• Graduate students increase awareness about the medical needs of low-resource, underserved communities • Graduate students understand their role serving the community through PATHS-UP Research Thrusts • Graduate students gain a network within PATHS-UP • Graduate students & faculty disseminate PATHS-UP research	• Multi-ERC Survey • Immersive experience reflection • MOU • Self-Reflection Toolkit • SLC SWOT survey	• Graduate students experience a change in attitudes about designing for underserved communities • PATHS-UP research is disseminated widely • Some alumni build own programs focused on underserved communities
Benefit from and promote a Culture of Inclusion				# of PATHS-UP Fellows (% who are women; % who are URMs; % people with disabilities) # of PATHS-UP MOUs submitted from Fellows (% of applications from women; % of applications from URMs) # of graduate students (PATHS-UP Fellows) serving as research mentors to PATHS-UP Scholars # PATHS-UP EDI workshops	• Graduate students feel valued, included, and treated fairly • Graduate students feel represented in their experiences • Graduate students recognize the ERC places emphasis and value on diversity and inclusion • Graduate students are supported by their faculty mentors and are satisfied with the mentorship received • Graduate students increase their understanding of the necessity of cultural humility and competency for serving PATHS-UP communities	• Multi-ERC Survey • Immersive experience reflection • MOU • Self-Reflection Toolkit • Graduate student climate survey • EDI Workshop participation & surveys • COI Anonymous Reporting	• Increased representation among graduate student researchers in STEM at PU institutions • PATHS-UP programs consistently demonstrate a culture of inclusion, collaboration, and empowerment

UNDERGRADUATE STUDENTS

Objectives	Inputs	Activities	Where/When Activities Occur	Outputs	Shorter-term Outcomes	Method/Instrument	Longer-term Outcomes
Increase undergraduates' knowledge and skills	**RESOURCES** • Human capacity • Financial capacity (NSF Funding) • University resources • Technology resources • Partnerships with communities **STAKEHOLDERS** • Graduate student participants/scholars/mentors • Undergraduate scholars as mentees or VIP team members • Postdoctoral scholars • PATHS-UP Faculty Mentors • Industry partners • Community members • Institutional partners • PATHS-UP Governing bodies (boards, committees, Leadership teams) **SYSTEMS** • Recruitment systems • Mentoring structure • Onboarding • Culture of Inclusion Training • Professional development • Curriculum development • Research dissemination • Reporting & data collection systems • Evaluation & monitoring • Mechanisms for cross-institutional collaboration **STRUCTURES** • Student Leadership Council (SLC) • PATHS-UP leadership structure • Multi-institutional collaboration • Research thrusts • External evaluation team • Executive Committee • EPIC • Leadership Teams • Communication structures (formal and informal) • Decision-making structures (formal & informal) Culture • Inclusion • Equity • Diversity	REU: 10 week summer research experience located at PATHS-UP institutions VIP: Semester-long team-based, interdisciplinary research experiences located at PATHS-UP institutions during academic year (i.e., Fall, Spring, Summer) for course credit		Program Deliverables • # of PATHS-REU Workshops held • Student products – Research Plans • Student products - Progress Reports • Student products - Final Research Poster • Student products – Conference Papers / Journal Publications • Student products – Conference Presentations - participating in trainings and workshop	• Undergraduate students gain exposure to research techniques • Undergraduate students develop technical skills in their chosen PATHS-UP field • Undergraduate students develop transferable skills, such as written and oral communication skills • Undergraduates gain confidence conducting research	• Multi-ERC Survey • Summer 2020 REU Focus Group • Student deliverables: Reflection statements (2) with mentor	• Undergraduates progress into graduate programs in STEM • Undergraduates contribute to published PATHS-UP research
Develop undergraduates' awareness regarding opportunities and interests in STEM		Activities for participants: • Exposure and practice designing, conducting, and analyzing biomedical experiments that can ultimately change the paradigm for the health of underserved populations • Make contributions towards real translational research objectives. • Gain experience with cutting-edge methods for modeling system behavior, detecting chemical biomarkers, constructing multiplexed assays, and designing custom biomaterials. • Develop computational skills by processing complex datasets from experiments. • Practice using cutting-edge research tools and techniques. • Prepare and submit: Research Plan, Progress Reports, Final Research Poster • Attend PATHS-UP workshops focused on: preparation for research, graduate school, and careers/professional development. • Participate in diversity & inclusion workshops • EDI speaker series - Diversity mentors program - Quarterly mentoring sessions to encourage students to pursue internships in industry and to enroll in professional societies	REU: TAMU, Rice, FIU, UCLA Summer - May thru September (start/end dates for the 10 week program slightly vary across 4 sites) • TAMU/FIU/Rice – May thru August • UCLA – June thru September VIP: TAMU, Rice, FIU, UCLA Fall/Spring & Summer • TAMU/FIU/Rice – May thru August Fall/Spring/Summer - September thru August • UCLA – June thru September	# PATHS-UP alumni matriculating to industry or academia	• Undergraduate students increase interest in pursuing a graduate degree or career in STEM • Undergraduate students gain self-efficacy related to pursuing a degree/career in STEM field • Undergraduate students increase awareness about the benefits of graduate education and about the graduate application process	• Multi-ERC survey • Faculty Mentor/Leadership Survey • REU focus group 2020 • Deliverables: reflection statements (2) with mentor	• PATHS-UP undergraduates progress into graduate programs in STEM • PATHS-UP undergraduates matriculate to industry • PATHS-UP undergraduates matriculate to academia • PATHS-UP students make informed decisions about their careers
Become a part of a PATHS-UP community				# engagement in PATHS-UP events	• Undergraduate students are introduced to different PATHS-UP Research Thrust areas and the research community • Undergraduate students learn how their work in PATHS-UP lab fits into the mission of the center • Undergraduate students gain a network within PATHS-UP • Undergraduate students develop awareness of how PATHS-UP can be helpful in addressing problems in medically underrepresented and underserved communities	• Multi-ERC Survey • Participant deliverables: Reflection statements (2) • Summer 2020 focus group • COI Anonymous Reporting	• Undergraduate students engage within a collaborative PATHS-UP network • Undergraduate students enroll in graduate programs at PATHS-UP partner universities
Benefit from a Culture of Inclusion				• # of applications for program (% of applications from women; % of applications from URMs) • # offer for program (% of offers for women; % of offers for URMs) • # participants for program (% of participants who are women; % of participants who are URMs)	• Undergraduate students feel valued, included, and treated fairly • Undergraduate students feel represented in their PATHS-UP research experiences • Undergraduate students recognize that the ERC places emphasis and value on diversity and inclusion • Undergraduate students are supported by (faculty & graduate student) mentors and are satisfied with mentorship received	• Multi-ERC Survey • Participant deliverables: Reflection statements (2) • Summer 2020 focus group • COI Anonymous Reporting	• Increased representation among undergraduate students in STEM at PATHS-UP institutions • PATHS-UP undergraduate programs consistently demonstrate a culture of inclusion, collaboration, and empowerment

AFFILIATED STUDENTS

Objectives	Inputs	Activities	Where/When Activities Occur	Outputs	Shorter-term Outcomes	Method/Instrument	Longer-term Outcomes
Facilitate broader workforce development by producing interdisciplinary students who gain practical experience in public health through the 5 yr BS/MPH program	• 5yr degree plans for BS in Engineering (i.e., ISEN, ITDE, etc.) and MPH • Undergraduate students from PATHS-UP Institutions • Faculty – from Schools of Engineering or Schools of Public Health • NSF Funds / Industry Contributions	Students take courses to earn a Bachelor's of Science in engineering and Master's in public health (MPH) in 5-year timeline	TAMU (launch in Year 4) Rice (existing) Fall/Spring, Summer	Undergraduate Students • # of applications for program (% of applications from women; % of applications from URMs) • # of offer for program (% of offers for women; % of offers for URMs) • # of accepts/participants for program (% of participants who are women; % of participants who are URMs) • # students graduate with multidisciplinary degree Program Deliverables • Student products - Progress Report on Practicum	• 4+1 MPH Programs are developed at all four partner institutions	• Enrollment records	• All PATHS-UP institutions develop and implement a 4+1 MPH program • Employers become actively engaged in setting direction for the BS/MPH students and hire the students • Students graduate with a multidisciplinary degree

				FACULTY			
Objectives	**Inputs**	**Activities**	**Where/When Activities Occur**	**Outputs**	**Shorter-term Outcomes**	**Method/Instrument**	**Longer-term Outcomes**
Integrate PATHS-UP research into curricula through development of new courses and/or modules from research pillars for existing University courses, through a joint effort between faculty and students	RESOURCES • Human capacity • Financial capacity (NSF Funding) • University resources • Technology resources • Partnerships with communities STAKEHOLDERS • Graduate student participants/scholars/mentors • Undergraduate scholars as mentees or VIP team members • Postdoctoral scholars • PATHS-UP Faculty Mentors • Industry partners • Community members • Institutional partners • PATHS-UP Governing bodies (boards, committees, Leadership teams) SYSTEMS • Recruitment systems • Mentoring structure • Onboarding • Culture of Inclusion Training • Professional development • Curriculum development • Research dissemination • Reporting & data collection systems • Evaluation & monitoring • Mechanisms for cross-institutional collaboration	PATHS-UP faculty, post-docs, and grad students design and develop PATHS-UP module/course descriptions, anticipated student learning outcomes, lecture materials, in-classroom active learning exercises, hands-on lab exercises, student assignments/deliverables	TAMU FIU Rice UCLA Fall/Spring, Summer	# courses developed	• PATHS-UP research is disseminated within classrooms • Newly created modules and/or courses will be accessible for all PATHS-UP institutions and will be housed in a common repository for ease of access • Newly created modules and/or courses highlighted during PATHS-UP quarterly meetings	Faculty/PI survey or interview # courses developed	• PATHS-UP material is disseminated and used across institutions • Advertise/promote newly designed courses to PATHS-UP Scholars and STEM students broadly
Develop and promote a culture of inclusion throughout PATHS-UP center	STRUCTURES • Student Leadership Council (SLC) • PATHS-UP leadership structure • Multi-institutional collaboration • Research thrusts • External evaluation team • Executive Committee • EPIC • Leadership Teams • Communication structures (formal and informal) • Decision-making structures (formal & informal) Culture • Inclusion • Equity	• Participate in diversity and inclusion workshops • Mentor PATHS-UP students - Diversity mentors program - Quarterly mentoring sessions to encourage students to pursue internships in industry and to enroll in professional societies	TAMU FIU Rice UCLA Fall/Spring, Summer	demographics of faculty Col attendance at Directors meetings # diverse professionals and URM STEM scholars providing talks/workshops # Implicit bias trainings	• PATHS-UP faculty have appreciation for diversity and inclusion within the center • PATHS-UP faculty promote an inclusive environments for students through mentorship • PATHS-UP faculty are from diverse backgrounds • Development of a system to select diverse and URM STEM professionals and scholars to provide lectures and serve as role models	• Demographics of faculty • Multi-ERC Survey • Multi-ERC Survey • EDI Workshop Surveys • Faculty Mentor/Leadership Survey • COI Anonymous Reporting data	• Increased diversity in recruitment and retention of faculty at PATHS-UP institutions/departments • PATHS-UP programs demonstrate a culture shift (exclusion/bias to inclusive, collaborative, empowering environment)

COMMUNITY MEMBERS & LEADERS

COMMUNITY MEMBERS & LEADERS

Objectives	Inputs	Activities	Where/When	Outputs	Shorter-term Outcomes	Method/Instrument	Longer-term
Increase community engagement and knowledge about health technologies, careers in STEM, and health promotion	• PATHS-UP participants and faculty • NSF Funds / Industry Contributions to Support PATHS-UP Fellows - Community opinion leaders - K-12 school administrators - Teachers and families - Trusted leaders from PATHS-UP working in testbed communities that are both underserved/under-represented	• Community engagement events • Events at K-12 schools / involving the K-12 community • Dissemination of PATHS-UP research • Implementation of PATHS-UP curricula in classrooms * Engineering on Wheels; Engineering EXPO (FIU) * Engineering Research Symposium for Teachers; Computing for Health Summer Academy, Computing for Health After School Program (RICE); * Community Health EXPO; Annual Summer Institute for K-12 Educators; 2 day Field Experiences for HS students (TAMU) * Undergraduate Research Experience Day; Warner Science Slam (UCLA)	Testbed communities Fall/Spring, Summer Texas A&M: Mercedes, Hidalgo County, Rio Grande Valley Rice University: Houston, Harris County FIU: Liberty City, Dade County UCLA: S. LA County	• # events • # participants in events • # K-12 students from testbed communities engaging with PATHS-UP • # partnerships with community-based organizations or schools	• Increased community knowledge about health technology • Increased community knowledge about educational opportunities through PATHS-UP • Relationship building (partnerships) with schools and/or community organizations in testbed communities	• 360 ERC records • Community survey at events	• Increased trust among test-bed community for PATHS-UP and for new medical technology • Increased engagement from testbed communities in PATHS-UP • Enhanced representation within STEM in testbed communities • Developed official pipelines of underrepresented populations who are taking advantage of PATHS-UP programming

HIGH SCHOOL STUDENTS

HIGH SCHOOL STUDENTS

Objectives	Inputs	Activities	Where/When	Outputs	Shorter-term Outcomes	Method/Instrument	Longer-term
Increase students' knowledge and skills	RESOURCES • Human capacity • Financial capacity (NSF Funding) • University resources • Technology resources • Partnerships with communities STAKEHOLDERS • Graduate student participants/scholars/mentors • Undergraduate scholars as mentees or VIP team members • Postdoctoral scholars • PATHS-UP Faculty Mentors • Industry partners • Community members • Institutional partners • PATHS-UP Governing bodies (boards, committees, Leadership teams) SYSTEMS • Recruitment systems • Mentoring structure • Onboarding • Culture of Inclusion Training • Professional development • Curriculum development • Research dissemination • Reporting & data collection systems • Evaluation & monitoring • Mechanisms for cross-institutional collaboration STRUCTURES • Student Leadership Council (SLC) • PATHS-UP leadership structure • Multi-institutional collaboration • Research thrusts • External evaluation team • Executive Committee • EPIC • Leadership Teams • Communication structures (formal and informal) • Decision-making structures (formal & informal) Culture • Inclusion	Young Scholars: • Conduct ≥ 6 weeks of PU research in the summer, • Receive mentorship from PU UG/grad students, faculty and trainees, and lab personnel • Participate in career and skill development workshops, • Make presentations (poster, platform) describing their research at the end of the program. - Diversity mentors program	TAMU, FIU, Rice, UCLA; Summer	YS Deliverables (Conduct PU research, poster and/or oral presentation, career intentions) # YS participating in workshops (Career development, skill development, CoI)	• YS gain exposure to research techniques • YS hone transferable skills such as communication skills and leadership • YS gain confidence conducting research	PATHS-UP Survey Student deliverables	• PATHS-UP YS progress into STEM fields, some at PATHS-UP institutions
Develop students' awareness regarding opportunities and interests in STEM					• YS increase awareness regarding future education and career goals • YS increase self-efficacy to achieve future education and career goals	PATHS-UP survey	• PATHS-UP students make informed decisions about their careers • Increased career awareness and core competencies of K-12 students in underserved school districts • Enhanced representation within STEM in testbed communities
Become a part of a PATHS-UP community					• YS understand the mission of the center • YS feel part of the PATHS-UP community	PATHS-UP survey	• YS progress into other PU programming • YS Participate in collaborative PU network/ ERC Wide activities
Benefit from and promote a Culture of Inclusion					• YS feel valued, safe, and included • YS are satisfied with the mentorship received in the lab • YS recognize the ERC places value on diversity and inclusion • YS feel represented in their research experiences	PATHS-UP survey	• Increased diversity in recruitment and retention of URM at PATHS-UP institutions/departments • PATHS-UP programs demonstrate a culture shift (exclusion/bias to inclusive environment; collaboration; empowerment)

TEACHERS

Objectives	Inputs	Activities	Where/When	Outputs	Shorter-term Outcomes	Method/Instrument	Longer-term
Increase teachers' knowledge and skills	RESOURCES • Human capacity • Financial capacity (NSF Funding) • University resources • Technology resources • Partnerships with communities STAKEHOLDERS • Graduate student participants/scholars/mentors • Undergraduate scholars as mentees or VIP team members	The RET is ≥ 6 week program and has multiple components including career and professional development (PD). • Participate in PATHS-UP research in summer and career and PD activities, • Receive mentorship from by PU faculty, students and trainees, • Participate in CoI workshop(s), • Translate their experiences into classroom lesson/activity plan modules. - Diversity mentors program	TAMU, FIU, Rice, UCLA; Summer	# of participants/ participant demographics # of modules, demos, and/or research presented # lessons/modules implemented in classrooms # lessons/modules submitted to TeachEngineeering.org # lessons/modules published on TeachEngineering.org	• Teachers increase research skills and confidence conducting research • Teachers gain foundational knowledge and skills within PATHS-UP disciplines • Teachers understand how their research translates to the classroom • Teachers gain teaching self-efficacy related to translating research to the classroom	PATHS-UP surveyRET Focus gro	- K-12 teachers report enhanced career awareness and foundation knowledge, esp engineering
Increase teachers' awareness of STEM careers, especially in engineering/technology	• Postdoctoral scholars • PATHS-UP Faculty Mentors • Industry partners • Community members • Institutional partners • PATHS-UP Governing bodies (boards, committees, Leadership teams) SYSTEMS • Recruitment systems • Mentoring structure • Onboarding • Culture of Inclusion Training • Professional development • Curriculum development • Research dissemination • Reporting & data collection systems • Evaluation & monitoring • Mechanisms for cross-institutional collaboration				• Teachers increase their awareness of careers in STEM, especially in engineering and technology • Teachers are aware of skills students need to be successful in STEM	PATHS-UP surveyRET Focus gro	• PATHS-UP teachers help students make informed decisions about their careers • Enhanced representation in STEM fields within testbed communities • Increased career awareness and core competencies of K-12 students in underserved school districts.
Become a part of a PATHS-UP community	STRUCTURES • Student Leadership Council (SLC) • PATHS-UP leadership structure • Multi-institutional collaboration • Research thrusts • External evaluation team • Executive Committee • EPIC • Leadership Teams				• Teachers understand the mission of the center • Teachers have an opportunity to work in a collaborative research team and become a part of a community of practice with researchers and teachers • Teachers implement the module or curriculum developed with high school students	PATHS-UP surveyRET Focus gro	• Implementation of new PU classroom modules in classrooms • Collaborative network of K-12 teachers/ participation in ERC-wide activities • Repertoire of PATHS-UP resources and materials
Benefit from and promote a Culture of Inclusion	• Communication structures (formal and informal) • Decision-making structures (formal & informal) Culture • Inclusion • Equity				• Teachers feel, valued, included, and treated fairly • Teachers are satisfied with mentorship received • Teachers recognize the ERC places emphasis and value on diversity and inclusion • Teachers feel represented	PATHS-UP surveyRET Focus gro	• PATHS-UP programs demonstrate a culture shift (exclusion/bias to inclusive environment; collaboration; empowerment)

297