

**Problem Statement:**

Dallas County is the second most populous county in Texas and the ninth-most populous county in the country (Community Commons ACS 2016). The Texas population has grown at a rate substantially outpacing that of the United States, and the north Texas region, which includes Dallas County, has led that growth. The north Texas population boom can be attributed to strong economic growth with major corporations moving their headquarters to the Dallas-Fort Worth Metroplex (e.g. Toyota Motor Corporation, Active Network, and Liberty Mutual Insurance, among others). But Dallas is a *Tale of Two Cities*, a northern sector that is healthy, wealthy and thriving, and a southern sector which is unhealthy, impoverished and struggling. The African American/Black and Hispanic/Latino populations in the southern sector are greatly affected by social determinants of health that contribute to poor physical activity, limited access to healthy foods and fragmented community linkages that result in delayed access to health services and overall poor health outcomes.

Despite strong economic growth, Dallas is still plagued by poor income distribution and high rates of poverty. More than 19% of Dallas County residents live in poverty, including 29% of children. The population grew by 14% from 2000-2014, however persons living in poverty grew by 65% and the number of children living in poverty increased 77% for the same time period. (Dr. Tim Bray, Institute for Urban Policy Research, The University of Texas at Dallas, presentation to the Public Health Improvement Work Group, January 2016). The 2016 Texas Health Dallas Community Health Needs Assessment (CHNA) reported that African Americans/Black (24%) and Hispanic/Latino (24.7%) ethnic groups experienced poverty rates over three times higher than Whites (6.8%) in the hospital's service areas including zip code 75217 in southern Dallas. Additionally, a CHNA report from Parkland Health & Hospital System (Parkland), one of the country's largest public health systems, highlights challenges in patient navigation and disparities in location of health services as contributors to weaknesses in health access among low-income groups in southern Dallas.

The Federal Reserve Bank of Dallas reports that Dallas-Fort Worth is home to 52 of an estimated 8,700 Opportunity Zones (OZs) throughout the United States. The city of Dallas alone is home to eighteen (18) OZs offering new capital gains tax incentives to promote investor activity. This is especially beneficial for low-income communities and underserved neighborhoods where high-risks often deter investors.

Such is the case with Pleasant Grove, a community that comprises much of zip code 75217 where the SocioNeeds Index is 98.2 (Healthy North Texas 2019). The SocioNeeds Index is a measure of socioeconomic need that is correlated with poor health outcomes. 75217 is thus the 4<sup>th</sup> ranked out of the 82-zip code area for Dallas County. Focus groups conducted by the Texas Health Community Health Improvement team revealed that the population of 75217 classifies themselves as the *working poor*. As shown in Map 1 below, OZ tract number: 48113009301 falls within Pleasant Grove.

The 2017 Tax Cuts and Jobs Act, followed by the Second Round of Proposed OZ Guidance released on April 23, 2019, have removed barriers for investment in the Pleasant Grove community. Investments which are expected to generate accelerated progress in this area and would increase the return on investment of this initiative. Studies suggest that leading a healthy life can help one thrive in many areas throughout life's journey. The YES Dallas Initiative will equip youth and families with an increased awareness of what it means to lead a healthy lifestyle, targeted education on nutrition, and skills and assets to reduce risky behaviors.

For this proposal to the Office of Minority Health and Office on Women's Health, Texas Health Research & Education Institute and its collaborative partners will focus efforts in the Pleasant Grove neighborhood (zip code 75217), located in the southern sector of Dallas. The total population for the neighborhood is 85,582. Overall, the majority of the population identifies as Hispanic (65%), and nearly 26% of the population is

**Table 1. Texas Counties with Most Opportunity Zones**

	Number of OZs	Percent of Total
<b>Harris</b>	105	16.7
<b>Bexar</b>	24	3.8
<b>Hidalgo</b>	23	3.7
<b>Travis</b>	21	3.3
<b>Dallas</b>	18	2.9

Source: Federal Reserve Bank of Dallas

African American/Black. This neighborhood has been identified by Texas Health as a priority area for community health engagement to address factors negatively affecting the social determinants of health.

**Map 1. Designated Opportunity Zones Spread Across Texas**



**Source: Federal Reserve Bank of Dallas** <https://www.dallasfed.org/cd/pubs/opportunity/opportunity2.aspx>

In Pleasant Grove, more than 43% of the adult population is obese, and 36% of the population has high blood pressure (57% of the Medicare population has high blood pressure). More than 16% of the population suffered from mental distress in the past 30 days. These health concerns are coupled with high rates of poverty in the community—31.2%— more than double the rate for the DFW metropolitan area (13.3%). The child poverty rate in Pleasant Grove is 45% (U.S. Census Bureau American Community Survey, 2017).

With limited economic opportunities, access to healthy foods is also a major concern for residents of the Pleasant Grove community. In fact, more than 54% of the population in 75217 report limited access to healthy foods, and the food insecurity rate is nearly 20%, which highlights a specific need for access to healthy foods. Based on a report published by Children at Risk, 49% of Dallas County children are overweight or obese. Lower-income residents are likely to suffer from obesity and other diet-related health problems at rates significantly higher than those of the population as a whole. These same families are also likely to have few, if any, places in their communities in which to shop for reasonably priced, nutritious foods (*Food for Every Child*, 2015).

In Dallas, the latest Centers for Disease Control and Prevention (CDC) Middle School Youth Behavior Risk Survey (YRBS) data available from 2011 found that 18.3% of Hispanic/Latino students (the majority ethnic/racial population of youth living in Pleasant Grove) were not physically active for a total of at least 60 minutes on one (1) day, and 62.2% were not physically active for a total of at least 60 minutes on five (5) days. Of these students surveyed, 39.5% played video games for three (3) or more hours a day, and 49.2% watched television for more than three (3) hours a day. Of those students, 42.2% reported not going to physical education for one (1) day or more during the week.

African American/Black students reported higher rates of not engaging in physical activity for at least 60 minutes on at least one (1) day at 24.5%. However, fewer African American/Black students reported inactivity on five (5) or more days (54.8%) compared with Hispanic/Latino students (62.2%). Both groups reported high levels of inactivity on all seven (7) days of the week (at least 60 minutes of physical activity) at 73.5% of black students and 76.9% of Hispanic/Latino students. African American/Black students reported higher rates of video game activity (44.9%) than Hispanic/Latino students, and 18% more African American/Black students reported watching three (3) or more hours of television per day (67.3%) than Latino/Hispanic students.

Fewer African/Black students reported not going to physical education for one (1) day or more during the week (37.3%) than Hispanic/Latino students. Among both groups, 33.6% of African American/Black students reported not playing one (1) or more sports, while 19.1% more Hispanic/Latino students (52.7%) reported not playing one (1) or more sports. Broken out by sex, more than 60% of Hispanic/Latino girls reported not

playing one (1) or more sports, and more than half of Hispanic/Latino boys (53.3%) reported not playing one (1) or more sports. The results highlight the need to engage more of our middle school children in physical activity on a regular basis.

### **Organizational Capability:**

Texas Health Research & Education Institute (THRE) is the lead applicant on behalf of Texas Health Resources herein referred to as “Texas Health”. Texas Health has a long history of caring for those in need. Together with community leaders, we are identifying and addressing the social and environmental conditions that affect overall health. Texas Health is one of the largest faith-based nonprofit health systems in the United States and is the largest in North Texas in terms of patients served. Its mission is “to improve the health of the people in the communities we serve.” The system includes 29 hospitals in a 16-county region of north Texas, as well as outpatient facilities, home health and preventive and fitness services to provide the full continuum of care for all stages of life. The system also operates a health plan; seven accountable care organizations; a foundation; a population health, medical research and education institute; and Southwestern Health Resources, a clinically integrated network that brings together University of Texas Southwestern Medical Center and Texas Health to provide increased access to primary care and specialized care.

To address social determinants of health and address health disparities among the most vulnerable in our North Texas service area, Texas Health has reframed how we engage with the communities we serve to better: leverage existing partners; address social determinants of health; and use data to drive community health improvement at the local level. Our approach to community health improvement is called Community Impact. This approach leverages our community impact by intentionally partnering with community partners to address local needs in innovative ways. Community Impact program and partnership priorities are community-led and focused on good results, while also aligning with the Texas Health mission and our vision for a healthy future for north Texans. Through our community network, Texas Health has identified a key set of priorities to be addressed locally and considered based on their relation to social determinants of health and their impact on health outcomes. Our Community Impact priorities are as follows:

#### **Community health improvement:**

- Impact of exercise, nutrition and weight on chronic disease
- Access to health service and health care navigation and literacy
- Mental health and substance abuse

#### **Social determinants of health:**

- Culturally appropriate health and nutrition education
- Food security such as availability of affordable, healthy food
- Reliable access to preventive health care and affordable prescriptions
- Addressing social and community isolation

The major engine to deploy Community Impact in North Texas are five (5) unique regional Community Impact Leadership Councils (CILCs) that represent counties in the Texas Health service area with oversight from the Texas Health Community Impact Board. The five regions are: Dallas/Rockwall; Tarrant/Parker; Collin; Denton/Wise; and Southern (Ellis, Erath, Hood, Johnson and Kaufman counties). The CILCs are comprised of community leaders responsible for recommending outcome-driven programs and partnerships.



The regional CILCs have been instrumental in determining priority areas of focus to invest Texas Health community resources. Through Community Impact, Texas Health has prioritized resources in Zip Code 75217, which encompasses the Pleasant Grove neighborhood of Dallas, the target geographic area of the proposed YES Dallas Initiative, as well as 75212 in West Dallas and a marginalized community in 75032 in South Rockwall.

**2A. Goal, Objectives, and Targets**

The overall goal is to increase youth participation in sports programming and reduce barriers to play for 6-8<sup>th</sup> grade students. Our short-term objectives are to improve student knowledge about nutrition and physical activity and increase physical activity participation. Long-term objectives are to increase physical activity participation, improve physical literacy, and improve eating patterns. Moreover, by the end of the program, it is anticipated that the YES Dallas Initiative will conduct a minimum of 12 cooking demonstrations, 12 nutritional education workshops, and a minimum of four (4) evidence-based Cooking Matters six (6)-week courses in conjunction with North Texas Food Bank. The YES Dallas Initiative will provide a minimum of 24 physical activity education sessions, match a minimum of 30 students with a mentor to provide additional education and exposure to allied health careers and potential opportunities, and maintain a minimum of 130 students in each grant year engaged in sustained YES Dallas Initiative activities over at least a six (6)-month period.

The project will measure progression and success through a multi-pronged evaluation approach in order to answer the questions: 1) *Are we achieving our objectives?* and 2) *What is the impact/change occurring?*

<b>Table 2.1. Goal, Objectives, &amp; Targets</b>	
<b>Goal: To increase youth participation in sports programming and reduce barriers to play for 6-8th grade students in the Pleasant Grove Community of Dallas.</b>	
<b>Obj 1:</b> Increase knowledge and physical literacy through physical activity program	<b>Short-term Targets (By the end of year 1)</b>
	<b>Target 1.1:</b> There will be 10% increase for the students in YES Dallas who meet age-appropriate physical health guidelines over baseline, especially among girls in the Pleasant Grove area of Dallas.
	<b>Target 1.2:</b> At least 75% of youth participants in YES Dallas will demonstrated increased knowledge over baseline about health benefits of regular exercise.
	<b>Target 1.3:</b> At least 75% of youth participants in YES Dallas will demonstrated increased knowledge about health benefits of regular exercise than the youth in the comparison group.
	<b>Target 1.4:</b> There will be significant increased exposure among targeted youth to mentorship opportunities.
	<b>Long-term Targets (By the end of year 2)</b>
	<b>Target 1.5:</b> There will be 15% increase for the students in YES Dallas who meet age-appropriate physical health guidelines over baseline, especially among girls in the Pleasant Grove area of Dallas.
<b>Target 1.6:</b> At least 75% of youth participants in YES Dallas will demonstrated increased knowledge over baseline about physical literacy.	

## ❖ ENVIRONMENT/ RESOURCES

The study will take place in an Asian Indian community gathering place, the BAPS Sri Swaminarayan *Mandir* in Stafford, Texas in collaboration with *BAPS Charities, Houston Chapter*. The *mandir* is a Hindu place of worship, also called a temple, with a large congregation that gathers weekly for services. In addition, the *mandir* hosts several festivals throughout the year that attracts members of the larger South Asian community. This setting will be able to provide a robust pool of potential participants for this study. Average weekly attendance to services is 200-400 people and during festivals several thousand people come to the *mandir*.

The *mandir* has several rooms that can be reserved for study purposes. The rooms are equipped with tables, chairs, and audio-visual equipment such as a microphone, and data projection system to facilitate data collection. Portable privacy screens are available for use to protect participant privacy and maintain confidentiality during data collection. The space is adequate for this research study and the PI has permission to use the facilities for this proposed study. The PI has conducted a previous study<sup>1</sup> at this *mandir* and has established trust, rapport, and a good working relationship with the *mandir's* leadership and medical teams. The PI has also collaborated with the BAPS *Mandir* on various projects over the past 5 years. The PI is a medical volunteer during the *mandir's* annual health fair, and has also conducted workshops on diabetes prevention, risk factors, and lifestyle modification for the community at the *mandir*. A letter of support from BAPS Charities is included in Appendix A indicating their willingness to collaborate on this project and to allow recruitment and data collection to take place at their *mandir* campus in Stafford, Texas.

Four laptop computers/tablets with necessary software are available for use by the PI and Graduate Research Assistants (GRAs) from the School of Physical Therapy are available to assist with data collection, data entry, and data analysis for the study. In addition, desktop computers in the Physical Therapy faculty and research offices are networked through direct and secured access to the internet to facilitate effective data management and communication among the research team members.

Two GRAs are available to assist the PI with this project. The GRAs are DPT students in the DPT-PhD Fast Track program. These students began their dual degree program in the fall of 2018 with the PI as their major advisor. The GRAs will assist with preparation of study documents, data collection, data entry, data management, data analysis, and development of presentation and/or manuscript for dissemination.

The PI is experienced in training and mentoring graduate students to conduct research. The PI successfully utilized graduate students over the course of several years to design and conduct her published pilot study on this topic at this *mandir*. The two DPT-PhD students are currently working with the PI as part of their critical inquiry projects for the DPT degree; the PI will mentor and train these students as GRAs to execute this project as part of their PhD training.

Additionally, the *mandir* has a robust volunteer pool that regularly assist with projects. The study will benefit from the unique feature of the community environment, as this will facilitate recruitment and engagement of participants in the project. The *mandir* environment is also a "real-world" setting, which will offer a unique opportunity for these GRAs, who are future community health promotion scholars, to immerse themselves in the local South Asian community to better understand the health needs of this understudied and rapidly growing population. It will deepen the understanding of GRAs in conducting translational research that moves from efficacy to effectiveness of community-based intervention studies and what factors may contribute to lifestyle changes among a select ethnic/minority population. This study is also in line with the vision of Texas Woman's University to graduate citizens who have a strong sense of community health.

## ❖ RESEARCH PLAN/NARRATIVE

### *Specific Aims*

My long-range goal as a new Principal Investigator (PI) is to reduce risk for and incidence of diabetes among South Asians in the US. One in ten people in the US have diabetes and one out of four people with diabetes do not know that they have it. One out of three Americans has prediabetes and nine out of ten people with prediabetes do not know they have it.<sup>1</sup> Among Asians, Asian Indians (AIs) had the highest prevalence of diabetes from 2013 to 2015 at 11.2%, followed by Filipinos (8.9%), and Chinese (4.3%). Other Asian groups had a prevalence of 8.5% during this period.<sup>1</sup> The proposed work builds on my published pilot work that demonstrated the effectiveness of the translated NIDDK-sponsored Diabetes Prevention Program (DPP) into a community-based culturally tailored group lifestyle modification program that *reduced* diabetes risk factors among *Gujarati* US Asian Indians (AIs).<sup>2</sup> During the pilot work, observations by the PI and anecdotal reports from participants indicated that various facilitators and barriers may have contributed to the positive lifestyle changes and the reduction in diabetes risk factors seen. Though the change in diabetes risk was significant in the pilot study, why and how some participants were able to make lifestyle changes and reduce their risk factors for diabetes while others were not is still unknown. This is the critical next step towards creating programs with greater impact on decreasing diabetes risk and reducing diabetes incidence among this population. *This proposed study will help generate data for subsequent qualitative research to explore why and how these factors affect barriers to and facilitation of lifestyle modification.* This new knowledge will inform re-design of the culturally tailored lifestyle modification program from the pilot study for implementation with a larger population of South Asians living in the US. Through this research stream, I hope to generate and contribute to the knowledge and literature regarding effectiveness of community based programs that reduce the incidence of diabetes. To date, little is known about the psychosocial factors of behavior change and their influence on risk factors for diabetes among AIs in the US. Thus, *the objective of this study is to explore the relationship between psychosocial factors that influence lifestyle change and the risk factors for diabetes among AIs in the US.* The rationale for this study is to fill a gap in the literature that exists in current effectiveness studies that do not adequately address how psychosocial factors are related to risk factors for diabetes among AIs. An indepth understanding of their influence on diabetes risk (outcomes) will be critical to better design future interventions targeting this high risk yet understudied population. This approach will provide a more complete picture and a deeper understanding of the context in which psychosocial factors may precipitate risk for diabetes. To achieve this goal, we will pursue this specific aim:

**Aim 1.** Examine the relationship between demographic and psychosocial factors that influence behavior change and known risk factors for diabetes among AIs in the US.

*Hypothesis 1:* Participants with higher self-efficacy, social support, knowledge of diabetes, and perceived susceptibility to diabetes will have significantly lower hemoglobin A1C (HbA1C) level and central obesity (as measured by waist circumference).

### ***Research Strategy***

#### *Significance*

In the United States, 30.3 million Americans have diabetes and 84.1 million have pre-diabetes.<sup>1</sup> Racial and ethnic minorities have a higher prevalence of diabetes than non-Hispanic Whites; Asian Indians (AIs), one of the fastest growing Asian subgroups, is disproportionately burdened by the disease.<sup>3</sup> An analysis of 3 year aggregate data from the National Health Interview Survey (NHIS) showed that AI, the largest South Asian group in the US, were 130% more likely to have diabetes than non AIs.<sup>4</sup> A higher prevalence of diabetes among AI adults (14% - 35%) has been reported in the literature as compared to other Asian subgroups and the general US population<sup>2, 5, 6</sup> due to several risk factors. Some of these are modifiable risk factors that increase with acculturation and westernization:<sup>7</sup> overweight/obesity, abdominal adiposity, high blood pressure, physical inactivity, and poor diet.<sup>8-16</sup>

In the US Diabetes Prevention Program (DPP) trial,<sup>17</sup> a 58% reduction in diabetes risk was achieved through modest weight loss and moderate-intensity exercise 5 times weekly. This lifestyle intervention was shown to be more effective than metformin in a 10 year follow-up study.<sup>18</sup> Translation of the DPP has taken place in various settings.<sup>19-23</sup> Programs that have tailored the DPP materials to address language, cultural, and economic barriers have been effective in high risk Latino and African American populations.<sup>24-25</sup> Studies investigating the

effectiveness of community based DPP translational programs that are culturally tailored for AIs in the US are scarce<sup>1,26,27</sup> yet AIs are the largest Asian subgroup in Texas with a higher burden of diabetes than other racial/ethnic sub-groups.<sup>3-5</sup> Cultural factors that hinder behavior change in AIs include gender roles, body image, physical activity misconceptions, cultural priorities, cultural identity and explanatory model of disease.<sup>38</sup>

If a lifestyle intervention program is to help participants make changes in health behaviors in order to reduce their risk factors for diabetes, then the psychosocial factors that could drive behavior change and influence the risk reduction outcomes of an intervention program must be considered.<sup>28</sup> Lifestyle modification programs that have targeted psychosocial constructs have had success in increasing physical activity.<sup>29-33</sup> There is, however, a gap in the literature on which of these psychosocial processes are actually responsible for diabetes risk reduction outcomes in group-based community lifestyle modification programs for AIs in the US.<sup>1,26,27</sup> Results published in previous studies included little information on which established measures were utilized to assess psychosocial factors associated with lifestyle behavior change, and how any of the measures were modified beyond translation into a different language, to take into account cultural variation. This is a critical barrier to progress in the field of implementation of translational DPP programs among at-risk groups such as AIs. Hence, further clarity is necessary to establish why and how risk reduction may be dependent on psychosocial factors.

Thus, the purpose of this study, which is phase 1 of a two-part study will explore the relationship of demographics and four psychosocial factors with two diabetes risk factors among AIs in the US. This study will help fill an important gap in the literature by identifying factors that may influence outcomes. This study will generate data for the second part that will explore why and how these factors affect barriers to and facilitation of lifestyle modification. Overall, the results from the two-part study will inform the re-design of culturally tailored diabetes prevention programs for South Asians in real-world community settings.

#### *Innovation*

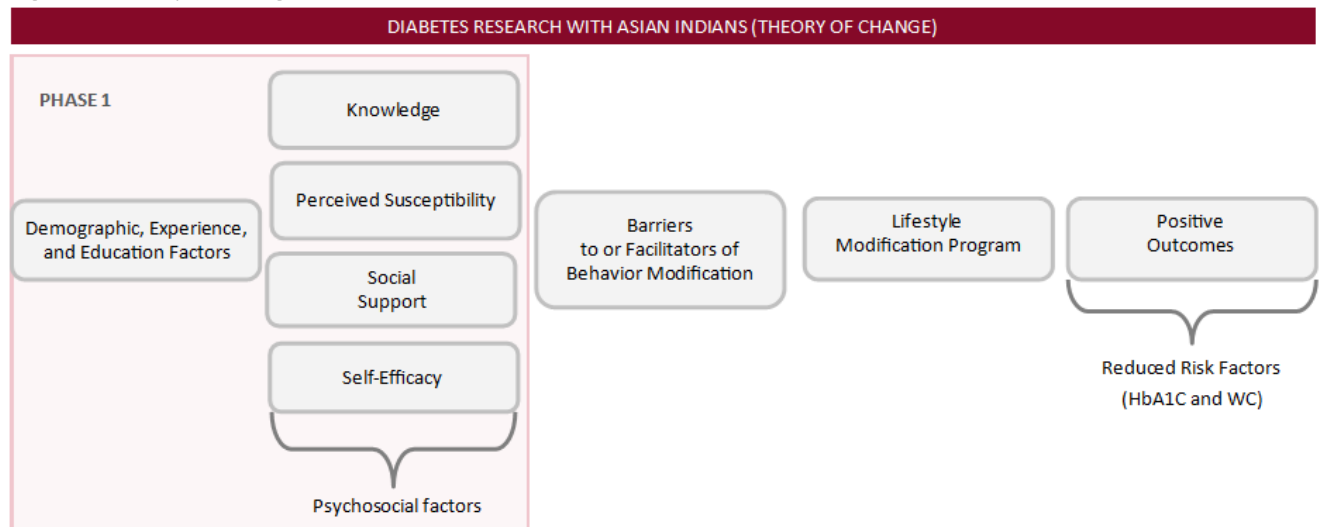
Previous impact studies<sup>1,26,27</sup> on diabetes prevention through lifestyle modification among AIs have not examined the why and how of intervention effectiveness. A significant difference in outcomes between groups that receive lifestyle modification and the control group are reported among these studies. Yet, none have explored why some people have a favorable outcome after undergoing lifestyle modification while others do not. Understanding the why and the how of a program's effectiveness can assist in building a better program that can have a higher impact on the intended target population. Hence, a shift in current approaches is needed. To our knowledge, this will also be the first study to examine use of several established measures of psychosocial factors in a study among AIs in the US. This project will provide a crucial step to move diabetes prevention research and practice beyond a focus on program outcomes to determining why and how behavior modification may occur, so that community based lifestyle modification programs can yield higher impact in reducing the burden of diabetes among South Asians in the US.

#### *Approach*

The Theory of Change Model (Figure 1) illustrates the approach we will utilize in our research. The PI's published pilot RCT results showed that a 12-week culturally tailored group-based lifestyle intervention program was feasible and more effective than general advice or print materials to help *Gujarati* AI participants reduce HbA1C, a main risk factor for developing diabetes. Furthermore, the intervention group sustained their positive outcomes at the six month follow up post-intervention. HbA1C changes showed significant interaction of time and group at  $F(92,88) = 17.116$ ,  $p < 0.0005$  with follow-up analysis of simple effects indicating significant differences in the intervention group between pre and post and pre and follow-up ( $p < 0.0005$ ). Over the course of the intervention from baseline to follow-up at 24 weeks, 26.9% of the intervention group participants had reversal from prediabetes to normoglycemia compared to the control group that had an inverse change with 5% of the group progressing from normoglycemia to prediabetes. Changes to central adiposity as measured by waist circumference were similar with a significant interaction of time and group at  $F(2,88) = 3.337$ ,  $p = 0.04$ . Follow-up analysis of simple effects revealed a significant difference in the intervention group between baseline and 12 weeks ( $p = 0.015$ ).<sup>1</sup> Although the pilot study took into account the demographic and education factors and how these may have influenced the positive outcomes of decreased risk factors for diabetes, it did not take into account the potential psychosocial factors that may have facilitated or impeded behavior modification during the intervention program nor how these factors may have impacted the positive outcomes of the study.<sup>1</sup> Therefore, in this first phase of a two-part approach, we will fill the gap between the previous study and the

proposed one by exploring that relationship between factors. Then, we will carry the results over into the second phase to inform the re-design of the originally piloted lifestyle modification program for implementation in a larger South Asian population living in the US.

**Figure 1: Theory of Change**



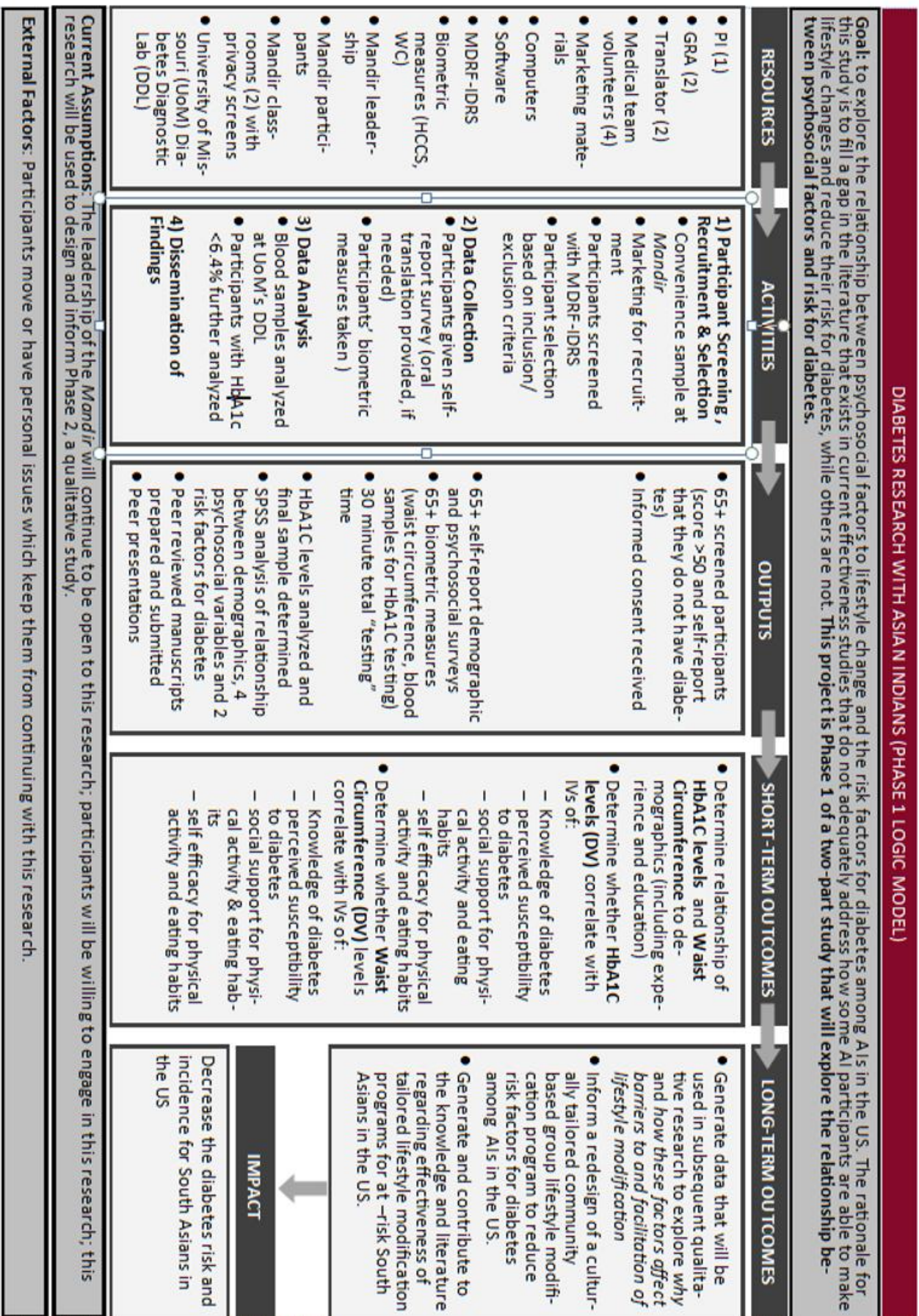
Overall Strategy: The Logic Model (Figure 2) illustrates the planned research approach for this project. This study will utilize a descriptive correlation design to explore the relationships between the demographic factors, psychosocial factors (knowledge of diabetes, perceived susceptibility to diabetes, social support and self-efficacy), and the risk factors for diabetes (HbA1C level and waist circumference). The activities, outputs, and short-term outcomes of this phase will lead to the long-term outcome of generating data that will be the foundation for subsequent qualitative research, which will explore why and how psychosocial factors affect lifestyle modification. This information will enhance the development of a future large-scale community intervention trial that will take into account the psychosocial mediators and how best to design a program that helps people overcome barriers and enhance facilitators for lifestyle change. In turn, this may lead to positive outcomes that will have a deeper impact in reducing risk and incidence of diabetes among South Asians in the US. All data collection will take place at the BAPS *Mandir* in Stafford, Texas.

Methodology:

**Participants:** Male and female adult AI participants will be randomly selected from a convenience sample of at-risk AIs attending events at the BAPS *Mandir* in Stafford, Texas. Convenience sampling will continue until final sample size of at least 65 people is reached. Prospective participants will have an opportunity to read an informed consent describing the study and ask questions of the research team members. Prior to any data collection, each participant will sign the informed consent form approved by the TWU Institutional Review Board (IRB). Inclusion Criteria: participants will be included if they are  $\geq 18$  years of age, have a diabetes risk score  $\geq 50$  as per the Madras Diabetes Research Foundation's Indian Diabetes Risk Score (MDRF-IDRS)<sup>34</sup>(Appendix B), and are willing to attend data collection sessions at the BAPS *Mandir*. Exclusion Criteria: self-report diagnosed diabetes. Recruitment will occur via flyers distributed during services at the *mandir*, posted on bulletin boards at the *mandir*, and via email or word-of-mouth by *mandir* leaders, key contacts, and medical team volunteers. GRAs will conduct recruitment via email, print flier distribution during community events at the *mandir*, and obtain consent from participants prior to data collection.



Figure 2: Phase 1 Logic Model for Research



Outcomes: HbA1C values and central obesity are established clinical risk factors for diabetes.<sup>9,12</sup> Each participant will be assessed for these outcome or dependent variables. As stated in the Logic Model (figure 2), one of the

short-term outcomes will be to determine whether HbA1C level is correlated with demographics or with any of the four psychosocial predictor or independent variables. The Bio-Rad Hemoglobin Capillary Collection System (HCCS) will be used to obtain a blood sample via finger prick for HbA1C test (%) using the manufacturer's standardized protocol for specimen collection, labeling, storage, and shipping. This same procedure was utilized in the pilot study conducted by the PI. The PI will train GRAs in the finger prick and specimen collection using the vials in the HCCS kit. Each vial will be labeled with the participant's code, and then stored in a portable cooler. At the end of each data collection day, the collected specimens will be shipped to the Diabetes Diagnostic Laboratory (University of Missouri, Columbia) for analysis using guidelines provided by the manufacturer and the laboratory. The second outcome is to determine whether central adiposity is correlated with demographics or with any of the four psychosocial predictor or independent variables. Central obesity will be identified with waist circumference measurement (cm) using a Gulik Anthropometric measuring tape following a standardized protocol. Self-efficacy, social support, knowledge of diabetes and perceived risk for diabetes are cited as potential predictor or independent variables that can mediate behavior modification.<sup>28-33</sup> Widely utilized self-report scales that measure self-efficacy and social support constructs related to lifestyle behavior changes by Sallis<sup>35,36</sup> are presented in Table 1.

**Table 1: Self-Efficacy and Social Support Scales**

Measure/Scale	Items/Time to Complete/Scoring	Psychometrics
Self-Efficacy for Exercise (Appendix C)	12-item self-report questionnaire that takes ~ 2 minutes to complete and is scored as means of 2 constructs	unknown
Self-Efficacy for Eating Habits (Appendix D)	20-item self-report questionnaire that takes ~ 3 minutes to complete and is scored as means of 4 constructs	Cronbach alpha = 0.83
Social Support for Exercise (Appendix E)	15-item self-report measure that takes ~ 5 min to complete and is scored as sum of items for 4 constructs	Cronbach alpha = 0.61-0.90 Test-Retest Reliability=0.55-0.86
Social Support for Eating Habits (Appendix F)	10-item self-report measure that takes ~ 3 min to complete and is scored separately for friends and family as sum items of 2 constructs	Cronbach alpha = 0.61-0.90 Test-Retest Reliability=0.55-0.86

Knowledge of diabetes and risk susceptibility to diabetes are the other two independent or predictor variables that can be measured using the Risk Perception Survey-Developing Diabetes (RPS-DD).<sup>37</sup> RPS-DD is an established 43-item survey for people at risk for diabetes which takes ~ 7 minutes to complete. The Diabetes Risk Knowledge sub section of the full survey consists of 10 items scored as a sum with higher score = more knowledge. The risk susceptibility to diabetes is averaged as a composite risk score for 32 items from the RPS-DD. Internal consistency for the RPS-DD range of reliabilities = 0.68-0.85 in DPP trial (Appendix G)

### Procedures:

The Logic Model outlines the four main activities that will be part of this study. Activity 1 involves screening, recruitment, and selection of participants. GRAs will schedule recruitment events at the BAPS *Mandir* with help of medical team volunteers from the *mandir*. During these events, a print flyer with inclusion and exclusion criteria, and the MDRF-IDRS will be distributed. GRAs will score the potential participants on the MDRF-IDRS. Those that score  $\geq 50$  and self-report that they do not have diabetes will be invited to take part in the study.

Activity 2 involves data collection. All data collection will take place in two classrooms at the *mandir*. Each classroom will have individual desks for participants to complete self-report measures and mobile partitions that will function as privacy screens where individual measurement of waist circumference and capillary blood collection will take place. Data will be collected on the variables of interest at one time point for each participant and this will take ~ 30 min per participant. After obtaining informed consent, each participant will provide demographic information and complete the self-report psychosocial measures. The PI and *mandir* volunteers will be available to provide oral translation of questions if needed. Data collectors will also note the specific questions asked about the measures or the comments made by the participants about any of the items on the measures. This information will be filed for later use in phase 2. Then, trained GRAs will measure waist circumference, and use the Bio-Rad Hemoglobin Capillary Collection System to collect a blood sample via finger stick from each participant using the manufacturer's standardized protocol for specimen collection, labeling,

storage and shipping. Samples collected will be shipped to the Diabetes Diagnostic Laboratory (University of Missouri, Columbia) for analysis for HbA1C.

Activity 3 will be analysis of HbA1C levels by the Diabetes Diagnostic Laboratory (University of Missouri, Columbia). Once results are known, data from participants whose HbA1C value was <6.4% will be included for data analysis. De-identified data will be coded and entered by GRAs in an Excel database then exported to SPSS 25 for analysis.

Activity 4 is dissemination of research findings through peer-reviewed manuscripts and presentations.

#### **Analysis:**

Descriptive statistics will be calculated for all variables, comprising means, standard deviations, medians, minima, and maxima for continuous variables, while frequencies and percentages, will be calculated for all categorical demographic variables. Distributions of the continuous variables will be examined to determine if normality assumptions are met and parametric testing is appropriate. Extreme outliers will be investigated for technical or clerical errors. Reliability of the various measures and constructs will be determined. Relationships of demographics with predictors and outcomes will be examined to determine covariates. Multiple linear regressions will then be used to determine what psychosocial factors and key demographics (e.g. gender, age) predict risk factors for diabetes. If overall model is significant, the relationship between each predictor and outcome will be assessed. The data will be analyzed using SPSS v.25.0. Alpha of .05 will be used to determine significance levels.

**Sample size determination:** A *Priori* power analysis using G\*Power 3.1.9 was conducted by TWU CRDA statistician to determine minimum sample size at power of 0.8, alpha level of 0.05, and moderate effect size ( $f^2$ ) of 0.20. It was found that 65 participants are required with 4 predictors or factors (for regression analysis).

**Table 2: Phase 1 Timeline**

September 2019	- Develop IRB application - Meet with BAPS <i>Mandir</i> leadership to identify potential dates/times for data collection
October 2019	-Submit IRB application -Train GRAs in data collection methods -Purchase equipment/supplies
November – December 2019	-Receive IRB Approval -Prepare data collection files: recruitment flier, script, informed consent forms, demographic form, self-report measures -Recruit <i>Mandir's</i> medical team volunteers to assist during screening events and during data collection
January – February 2020	-Screening/Recruitment Events at the BAPS <i>Mandir</i> -Data collection at the <i>Mandir</i> : GRAs will collect specimen for HbA1C and conduct WC measurement; participants will complete self-report and demographic surveys
March – April 2020	-Data analysis -Preparation for phase 2
May – June 2020	-Dissemination of results: prepare abstract for presentation at 1 national conference; manuscript preparation
July – August 2019	-Dissemination of results: prepare abstract for presentation at 1 national conference; manuscript preparation

**Other:** The anticipated time per participant is 30 minutes. The study will not commence until written approval of study protocols and informed consent forms have been obtained. Materials for data collection will be coded and the decoding information will be kept in a secure separate file in the PI's locked office. All participants will be made aware that their data will not be divulged to anyone outside of the research team. Participant codes will be used for statistical analysis. Results from this study will be used to qualitatively explore why and how these variables may influence lifestyle changes made by AIs.

## **B. PROJECT OBJECTIVES and PLANS**

Texas Woman's University proposes **TWU STAR – Scholarships, Teams, and Research** in response to the NSF's Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM) solicitation (DUE 17-527). TWU STAR's *critical transitions* are organized in three domains: scholarships, co-curricular activities, and institutional transformation. TWU STAR seeks to increase STEM (Biology, Biochemistry, Chemistry, Informatics, Mathematics, and Computer Science) engagement, retention, and graduation through three strategies: **STRATEGY 1.** Provide S-STEM scholarships to 15 students annually; **STRATEGY 2.** Provide STAR Scholars with co-curricular supports to include placement in mentoring, Field-Intensive Teams (FITs), research, living learning communities, and/or shadowing; **STRATEGY 3.** Examine factors related to participant science identity and success and disseminate results to expand the impact of TWU STAR to institutional community and beyond.

With well-defined collaborations and roles within TWU, TWU STAR addresses the need for multifaceted, diverse student research to better define the needs of TWU's STEM students and establish a coherent ecosystem of evidenced-based practices. The call from the National Academies for opportunities for authentic research experiences and practices that reinforce student identities as scientists or engineers and peer relationships will be addressed by this project. Another recommendation from the National Academies is for co-curricular supports for STEM students to be improved and expanded. This includes additional efforts for populations who are underrepresented in science to include females, first-generation college students, economically marginalized students, and students who are ethnic/racial minorities [1].

## **C. SIGNIFICANCE and RATIONALE**

**SIGNIFICANCE** - The proposed project design is based on *Charting a Course for Success: America's Strategy for STEM Education* [2]. The following four pathways are the foundation for the national strategic plan: 1) *Developing and Enriching Strategic Partnerships* by developing new and strengthen existing partnerships between educational institutions, communities, and employers; 2) *Engage Students where Disciplines Converge* by making STEM learning more meaningful and encouraging students to develop initiative and creativity through involvement with complex real-world challenges and promoting innovation and entrepreneurship with transdisciplinary activities; 3) *Build Computational Literacy* by advancing computational thinking (in both formal education and workplace) as a critical skill through solving problems with data, innovating teaching and learning with expanded digital platform use, personalized learning, and the use of AI; 4) *Operate with Transparency and Accountability* by facilitating STEM ecosystem development using evidence-based practices and decision-making.

Improving retention and graduation of undergraduates in the fields of science, technology, engineering, and mathematics are critical to the nation's economic competitiveness [3]. Inequalities in STEM education negatively impact poverty gaps in education, a technology-driven economy, national security, and the nation's prominence and ability in scientific research and technology. Access and success in STEM for traditionally underserved student populations, including students who are female, students who are first-generation college, students who are low-income, and students of color, is of utmost importance and necessitates dedicated and focused efforts to increase their presence in the STEM pipeline [4] [5]. Women and minorities comprise 70% of college students, but less than 45% of STEM degrees [6]. The institutions where most traditionally underserved students attend are often under-resourced and their retention and graduation rates are below national averages [7]. Important components of STEM retention and graduation with STEM degrees include role models and mentoring.

**TWU is the largest university primarily for women in the United States and was designated a Hispanic Serving Institution in 2014.** TWU is in a vital area of Texas where to the west, north, and east are populations characterized by rural isolation and poverty, while 35 miles to the south is located the largest metropolitan statistical area in Texas and the fourth largest in the nation. The TWU area is like a significant number of urban and rural areas, to the extent that there is a large, economically disadvantaged population underrepresented in higher education. TWU receives transfer students from 16 two-year institutions and they make up **53%** of TWU's student population.

**RATIONALE for TWU STAR** - To increase STEM retention and graduation, the approach must be multifaceted. Evidence suggests interactions with faculty and/or mentors [8] and experiences such as research and work internships [9] will increase student retention and graduation. Specifically, for women, financial resources and educational and social support help with STEM retention and graduation [10]. Additionally, Espinoza reported, “Women of color who persisted in STEM frequently *engaged with peers to discuss course content, joined STEM-related student organizations, participated in undergraduate research programs, had altruistic ambitions, attended private colleges, and attended institutions with a robust community of STEM students*” [11]. When addressing transfer female STEM students, the success of the adjustment is additionally influenced by faculty, staff, and advisor interactions and the overall transfer process [6]. Important components of STEM retention and graduation with STEM degrees include students’ engagement both within and outside the classroom [12] and role models and mentoring. This development or enhancement of a science identity [13] and social [14] and academic capital [15] (the social processes allowing for the navigation of the pathways necessary for academic, and later, career success) is central to all activities.

With intention, this project is not a deficit model based on barriers to success, but rather it is based on supports to success. The three-pronged approach addressing scholarships, co-curricular activities, and institutional transformation will create a capacity-building mechanism strengthened by the interrelationships of individual components. Stakeholders must invest time and energy in developing cultural or diversity competency and personalizing and integrating experiential practices and solid research skills. Additionally, attention to students’ fears, challenges, and uncertainties will create learners who are equipped to effectively participate in the academic knowledge formation process, will become fully engaged in their learning, and lastly, will graduate and enter the workforce [16].

<b>Setting</b>	Mid-sized city, Pop. 136,268
<b>Enrollment</b>	10,390 UG, 15,520 total
<b>Student</b>	Hispanic: 31%
<b>Race/</b>	African American: 18%
<b>Ethnicity</b>	Native American: 1%
	Caucasian: 38%
<b>First Generation</b>	54%
<b>Need-based Financial Aid</b>	49%
<b>Transfer</b>	53% of student body
<i>Fall 2018, TWU IRDM 2019</i>	

With a Fall 2018 enrollment of 15,520 (10,390 undergraduates), TWU is the largest university primarily for women in the United States (88% female, TWU Institutional Research and Data Management - IRDM). TWU is accredited by the Southern Association of Colleges and Schools Commission on Colleges to award baccalaureate, masters, and doctoral degrees and has the Carnegie designation of a doctoral research university. Enrollment is expected to increase by over 10% between now and 2025 for all four-year public institutions in Texas [17]. Currently, **many of the undergraduate students at TWU are traditionally underrepresented (African American, Hispanic, and Native American) in higher education (50%), are first-generation (54%), and receive need based financial aid (49%).** Student demographic predictions indicate the percentages of these students will increase at a greater rate than enrollment [17]. TWU has

traditionally attracted high numbers of first-generation, low-income, and underrepresented college students (Table 1).

Enrollment and retention data (Table 2) indicate Biology has the lowest first year to sophomore retention rate (69%) and Math had the highest (100%). Table 3 provides six-year (2012 -2018) graduation rate information for TWU for all students and by FTIC and transfer status and by discipline where the rate is found to range from 20% to 80%. The most extreme example of attrition is for those who declared biology as a major in 2012. *Only 20% of all students who declared biology as a major were retained and graduated.* Additionally, when considering the number of students who are retained in TWU STEM disciplines (Table 2), it is clear there is a disparity in the number who enroll and are retained past the sophomore year to graduation for all STEM disciplines except Computer Science. We suggest retention and completion are hindered by numerous factors, but financial insecurity is paramount as demonstrated by the 49% of TWU students who receive need-based financial aid. To offset financial issues, TWU students enroll part time, work long hours, or both.

Low-income individuals are the fastest-growing segment of Texas’ population and the state is ranked fourteenth in the nation regarding poverty. More than **17% of the Texas’ population is at or below poverty level, and this percentage is expected to increase as the population increases.**

Meanwhile, the overall U.S. poverty rate is 12.3% [18]. TWU is no different from the state of Texas as many students are economically marginalized; they enroll part time, work long hours, or both [19]. TWU students have significant financial need. Of the many scholarship programs at TWU, only two provide full tuition and fees, assisting only a few of the many talented TWU students. Programs providing more robust support give students the financial safety net needed to major in STEM programs. Approximately 85% of first-year students receive financial assistance of which most is scholarships and grants. The average amount of need-based scholarships and grants for those awarded was \$7,381, which indicates a deficit of over \$14,000. Based on recent trends, an estimated 5.0% increase in tuition/fees and other expenses and a 10% increase in housing costs indicate that the cost of attending TWU for the 2020 academic year will be just over \$22,000 for undergraduates. Awards will be based on scores and ranking from the selection process (see Section F). If selected students do not require the maximum award, additional qualified, ranked students will be awarded. The goal is to provide enough monetary support to allow TWU STAR students to engage in full-time study with minimal or no outside employment. The proposed scholarship amount is based on an analysis of the total cost of attending TWU (**15 X \$10,000 = \$150,000 annually**) (Table 4).

**EXPECTED OUTCOMES** - It is expected all STEM enrollment will increase by approximately 10% from present to 2025 (739 to 814) with a larger percentage of low-income, first generation, and underrepresented students. With the addition of TWU STAR scholarships and co-curricular activities for 35 students in six disciplines over five years, retention rates are expected be higher for STAR Scholars. The attrition between sophomore year and graduation will decrease and graduation rates will be higher (>30%) for STAR Scholars.

#### **D. PROJECT ACTIVITIES**

**STRATEGY 1: PROVIDE S-STEM SCHOLARSHIPS TO 15 STUDENTS ANNUALLY** - This strategy aims to ameliorate a portion of the financial burden of attending TWU for fifteen high achieving, under-resourced STEM students as a major barrier to women’s success in STEM is financial [20]. In the first year of the award period, 15 undergraduate students (five of each sophomores, juniors, and seniors) will be recruited into the TWU STAR cohort and will receive renewable scholarships of \$5,000 per semester (\$10,000 per academic year, **\$150,000 annually**). In successive years, all eligible students will continue to be supported with scholarship funds until they complete their degrees or reach six semesters of support. See Section F for process.

**STRATEGY 2: PROVIDE STAR SCHOLARS WITH CO-CURRICULAR SUPPORT** - STAR Scholars will be mentored, placed in mini-cohorts called FITS (Field-Intensive Teams) based on their interests and career goals, and will be provided opportunities for research, living learning communities, and shadowing. All STAR Scholars will be encouraged to participate in as many of these interwoven support opportunities as possible. Each is designed such that they can stand alone or work in concert. The TWU STAR program mentoring model is unique, dimensional, and the driver for all co-curricular activities; through this framework, it is envisioned all STAR Scholars will have multifaceted mentoring experiences. These opportunities will develop or enhance both social and science identity and increase academic capital, each of which, in turn, will increase engagement in STEM, thus increase the STEM retention, graduation, and eventually, entering careers in STEM.

**Mentoring** – All STAR Scholars will be exposed to multifaceted mentoring by peers, near-peers, staff, administrators, faculty, and alumni - socially, professionally, and academically through FITs and research activities (see below). Culturally or diversity competent mentoring training will be provided for all mentors and potential mentors. Training of mentors will address the diversity, equity, and inclusion goal of the national STEM education plan [2]. Chun and Evans define culture or diversity competence as “The awareness, knowledge, and skills needed to effectively communicate, collaborate, and engage with others who are different from oneself in meaningful ways through interactions characterized by reciprocity, mutual understanding, and respect [21].” Training will be facilitated by the TWU Office of Diversity, Inclusion, and Outreach and by the Center for Faculty Excellence. Recent studies indicate that one characteristic of successful college and university educators is the respect

<b>Classification</b>	<b># Awards</b>	<b>Amount/Year/Student</b>	<b>Total</b>
<b>Sophomores</b>	5	\$10,000	\$50,000
<b>Juniors</b>	5	\$10,000	\$50,000
<b>Seniors</b>	5	\$10,000	\$50,000
<b>Total</b>	15		<b>\$150,000</b> (75% of \$200,000)

and recognition given to students' social identities and lived experiences. The goal is to create environments and skills leading to instructors becoming invested in creating teaching and learning that not only encourages "fear-free" STEM education in a community of openness, elements at the very center of the college experience. It is of the utmost importance for educators to continuously promote the integrated use of all higher education's resources in the education and preparation of the whole student. Learning and development are intertwined, inseparable elements of the student experience [22]. Social identity and a sense of belonging, regardless of race, ethnicity, gender identity, or socioeconomic status, are motives for achievement [14] and must be strengthened so the effectiveness and permanence of interventions are preserved [23]. This is even more important at Texas Woman's University, an HSI with a high percentage of first-generation and economically marginalized students.

It is proposed that expanded culturally or diversity competent mentoring will decrease the number of students who are not retained, and retention and graduation rates will increase. One characteristic of successful institutions is the respect and recognition given to students' social identities and lived experiences. Stakeholders must invest time and energy into personalizing and integrating experiential practices and solid research skills. Additionally, this attention to students' fears, challenges, and uncertainties will create learners who are equipped to effectively participate in the academic knowledge formation process, will become fully engaged in their learning, and lastly, will graduate and enter the workforce [16]. The Management Team with the assistance of the Program Coordinator (PC) and the Advisory Board, will guide the development of this mentoring model. All individuals who fall under the category of "mentor" will undergo in-person or on-line training led by the TWU Center for Faculty Excellence and TWU Office of Diversity, Inclusion, and Outreach. TWU alumni who are employed in specific field positions will be recruited to be part of this layering model. The TWU Office of Advancement-Alumni relations will assist in identifying alumni. The Management Team will facilitate and monitor this process and the PC will track participation. Annually, **\$1,500** is budgeted for possible expenses.

**Field Intensive Teams (FITs)** - Field Intensive Teams will be developed for all STAR Scholars based on their career goals, disciplines, and/or areas of interest. It is proposed an estimated five FITs will include three to four participants, both undergraduate and graduate students, and will be guided by a faculty or staff member within the area of interest. Additionally, a non-institutional FIT member will come from the community and will be employed in the field. Informatics, Biotechnology, Civic Engagement, Pollinator Gardens, and Graduate School Preparation are a few of the diverse teams envisioned. This cooperative activity is related to constructivism and the contributions of social interactions [24] and the socio-cultural theory of development where students learn effectively when they go beyond their knowledge level [25]. It also promotes student engagement and academic performance in STEM [26] which will increase science identity [13] [27]. Cooperative learning is perceived by students as a positive interdependence opportunity where the positive performance by the entire group is supported by the performance of the individual. Social integration through peer interaction has proven to be significant in predicting retention [28]. The purpose of FITs is the development of both community and engagement. It is envisioned each FIT will meet monthly and engage in a capacity-building activity. Examples of FIT activities include the following: The Pollinator Sustainability FIT could attend a Native Plant Society Meeting, and/or the Biotechnology FIT could visit a commercial laboratory. The Management Team, with the assistance of the PC, will facilitate this process. The PC will track activities and participation. A portion of the budget, **\$3,750** has been set aside for these activities.

## **F. STUDENT SELECTION PROCESS and CRITERIA**

### **STRATEGY 1. PROVIDE S-STEM SCHOLARSHIPS TO 15 STUDENTS ANNUALLY -**

**Recruitment** - Recruitment will be year-round and coordinated by the PC with the guidance of the Management Team. Broad-based awareness strategies will be implemented to yield the most competitive pool of potential candidates. Materials will be prepared (web site with electronic applications; informational communications and visits to upper administration, deans, and chairs; social media, press releases, newsletters, flyers, and brochures). Recruitment materials will be provided to faculty, students, directors, deans, chairs, teaching assistants, and other possible recruiters. Promotional materials will also be placed on university bulletin boards, in the Office of

Financial Aid, and in the Student Union and other heavily traveled areas. Additionally, every September, the PC and Management Team will request TWU faculty allow time to speak to classes with the purpose of providing information about the program. Members of the administration, deans, chairs, faculty, and student programs personnel are committed to identifying and recruiting new STAR Scholars. The Assistant Provost for Research and Sponsored Programs, the Executive Director of the Pioneer Center for Student Excellence, the directors of the Honors Program and Internships and Experiential Learning, and other administrators will assist in recruiting quality students for the TWU STAR program. In addition, the PC will establish excellent working relationships with such organizations as Tri-Beta, Phi Kappa Phi Student Organization, the Black Student Organization, League of United Latin American Citizens, Multicultural Student Network, NAACP, and the Native American Cultural Awareness Society to aid in recruitment.

**Selection** – Fifteen students will be served each year by the TWU STAR program. The number of students selected each year will be equal to the number who graduated that year to maintain the maximum number to be served. Applications will be issued throughout the year, with application deadlines each April (for selection in May and scholarship awarding in August). The PC and PI will determine the eligibility of applicants. Selection interviews of eligible students will be scheduled with the Advisory Board and Management Team. After applicants are interviewed and ranked, new STAR Scholars will be selected according to their status as academically talented, low-income, and overall ranking. Selection will follow the detailed guidelines provided in the solicitation. To be selected, students must: 1) Be a citizen of the United States, a national of the United States, an alien admitted as a refugee, or an alien lawfully admitted to the United States for permanent residence; 2) Be enrolled full time in a TWU program leading to a baccalaureate (12+ hours) in one of the following disciplines for each term for which a student receives a scholarship: Biological sciences (except medicine and other clinical fields); physical sciences; mathematical sciences; computer and information sciences; geosciences; engineering; or technology areas associated with the preceding fields; 3) Have demonstrated academic ability or potential as indicated by a grade point average of 3.2 or above; 4) Be low-income and demonstrate financial need, defined for undergraduate students by the U.S. Department of Education rules for need-based Federal financial aid Free Application for Federal Student Aid (FAFSA); 5) Submit two letters of recommendation from college or university faculty; 6) Submit a personal statement of goals and career plans; and 7) Address questions to determine interest in science field and career trajectories (e.g. to identify those with solely clinical aspirations). Potential TWU STAR scholars will be ranked and scholarships awarded according to rank order and financial need. If some awardees do not have full financial need, decline their scholarships, and/or cannot maintain their scholarships based on the criteria, rankings will determine the next eligible recipient. All awardees will be evaluated by the PC and PI at the end of each semester to determine their continued eligibility for the program.

**Retention** – Within three weeks of award notification, individual meetings will be conducted by the PC and members of the Management Team with each participant to discuss long- and short-term goals and co-curricular supports. STAR Scholars will be required to meet with the PC monthly thereafter. All information will be documented in a dedicated database, and documents will be kept electronically. The PC will assess academic progress by reviewing transcripts once each fall, spring, and summer. Program participants will be required to meet with their academic advisors once annually and have degree plans on file no later than the end of their first full semester in the program. Each scholarship recipient will be allowed one “recovery semester” or grace period with continued funding if their GPA falls below a 3.0. Determination of allowance for a recovery semester will be on a case-by-case basis. The Management Team will make all decisions regarding this option. The student and members of the Management Team will determine an action plan and the student will check-in with the PC weekly during the recovery semester. Scholarship recipients may apply for the scholarship each year for renewal.

## **G. TWU STAR STUDENT SUPPORT SERVICES and PROGRAMS**

### **STRATEGY 2. PROVIDE STAR SCHOLARS WITH CO-CURRICULAR SUPPORTS -**

The philosophy of the TWU STAR program is to create as many opportunities as possible for co-curricular supports for STAR Scholars. All co-curricular activities fall under the umbrella of mentoring as all activities have mentoring components, whether peer, near-peer, faculty, or other. TWU STAR will complement other existing programs without limiting Star Scholars' involvement in these activities.



In fact, we will encourage students to participate in appropriate programs, as they provide excellent opportunities for developing academic capital. Representatives from some of these programs will serve on the Advisory Board or are key personnel. Below are examples of programs providing supportive services and programming.

**Honors Scholars Program** - This program provides a mechanism for eligible students to work toward graduating with honors from TWU. To be eligible for the Honors Scholars Program, students must have received a combined verbal and quantitative SAT score of 1220 or an ACT score of 28 or higher, graduated in the top 5% of their high school class, achieved a minimum grade point average of 3.5 (4.0 scale) after 24 hours of college coursework, or have completed an honors program at a two-year college. This program provides an excellent recruiting source for the TWU STAR program, and we anticipate that many S-STEM scholars will also be involved in the Honors Scholars Program.

**Leadership Institute** - This program, headed by Major General Mary Saunders (ret.), is designed to prepare selected TWU students as future leaders. To be eligible for this program, students must be a junior, senior, or graduate student with at least a 3.25 grade point average (4.0 scale). Selected students receive a small scholarship to purchase textbooks; attend regular meetings and leadership conferences; and are mentored by community, business, and educational leaders. This program will provide an excellent opportunity for TWU STAR participants to develop leadership skills and capital.

**Pioneer Center** – The Pioneer Center for Student Excellence supports academic achievement, assists in the development of professional skills, and contributes to the holistic student experience. The center is home to multiple programs and services that enhance the academic experience of all TWU students. Services include intensive writing support programs, academic coaching, academic enhancement programming, academic advising coordination, internships, and collaborative learning spaces. The Executive Director of the center, Dr. Adams, is key personnel for this project, and Mr. Kurt Krause, Director of Internships and Experiential Learning is a member of the Advisory Board.

**Center for Student Research (CSR)** – The CSR promotes enhanced educational experiences for students by providing opportunities for meaningful interaction between faculty and students through support, education, and programming in research and creative activities. The goals of CSR are to provide opportunities for students to participate in all phases of research and creative activity, from design through dissemination; facilitate research partnerships between TWU students and faculty promoting faculty-mentored research opportunities for students; facilitate scholarly/creative partnerships between students and faculty; facilitate research collaboration between graduate and undergraduate students; enhance the students' knowledge of all phases of research; and promote a national presence for TWU students (i.e., National Council on Undergraduate Research). The director of the CSR is the PI on this project, the Coordinator of STEM Initiatives, and is a faculty member in Biology. **The Center for Research Design and Analysis** – The CRDA is an academically-based, multidisciplinary research support and service center and houses its own statistical and qualitative research consulting lab and survey lab, with qualitative and quantitative research analysts and statisticians. They provide consulting expertise in survey design, needs assessment, program evaluation, sampling, research design, statistical analysis, qualitative research and coding, mixed methods, and report writing. The CRDA not only provides qualitative, statistical and research design consulting to faculty and students working on proposals, research projects, or dissertations and theses, but also offers many research resources and training to expand the knowledge and confidence in research skills. The executive director of the CRDA is key personnel on this project. **The**

**Center for Women in Business** – This Center is the first of its kind in the state and provides leadership opportunities to encourage and support women's business ownership and success and will provide students and entrepreneurs access to education in business creation and ownership, engagement and mentorship with role models who own their businesses, and opportunities to engage in a learning lab that explores the intersection of gender and entrepreneurial leadership. Through mentoring, establishing networks, dissemination of information and hands-on learning opportunities for students and others, TWU will further the goal of spurring economic growth and small business development by women in Texas. The Director is on the Advisory Board.

## **H. QUALITY EDUCATIONAL PROGRAMS**

TWU has degree programs in Biology, Biochemistry, Chemistry, Informatics, Mathematics, and Computer Science, and they are accredited by the Southern Association of Colleges and Schools Commission on Colleges to award baccalaureate (Biology, Biochemistry, Chemistry, Informatics,

Mathematics, and Computer Science), masters (Biology, Biochemistry, Chemistry, Mathematics, and Computer Science), and doctoral degrees (Biology). TWU has the Carnegie designation of a Doctoral/Research University. The Department of Chemistry and Biochemistry is accredited by the American Chemical Society (ACS).

### **I. GENERATION of KNOWLEDGE**

#### **STRATEGY 3. EXAMINE FACTORS RELATED TO PARTICIPANTS' SCIENCE IDENTITY AND SUCCESS, DISSEMINATE RESULTS TO EXPAND THE IMPACT OF TWU STAR TO INSTITUTIONAL COMMUNITY AND BEYOND –**

TWU STAR will generate new knowledge, intended to not only increase learning, retention, and STEM graduation rates at TWU, but also to inform the greater higher education community, centers around the factors contributing to building a positive science identity. This development or enhancement of science identity [13] and social [14] and academic capital [15] is central to all activities. Table 5 outlines the framework for TWU STAR new knowledge generation. Each question will be also analyzed for potential differences in underrepresented populations to better equip institutions of higher education with strategies for assisting/retaining those who traditionally have not had access or preparation for STEM programs.

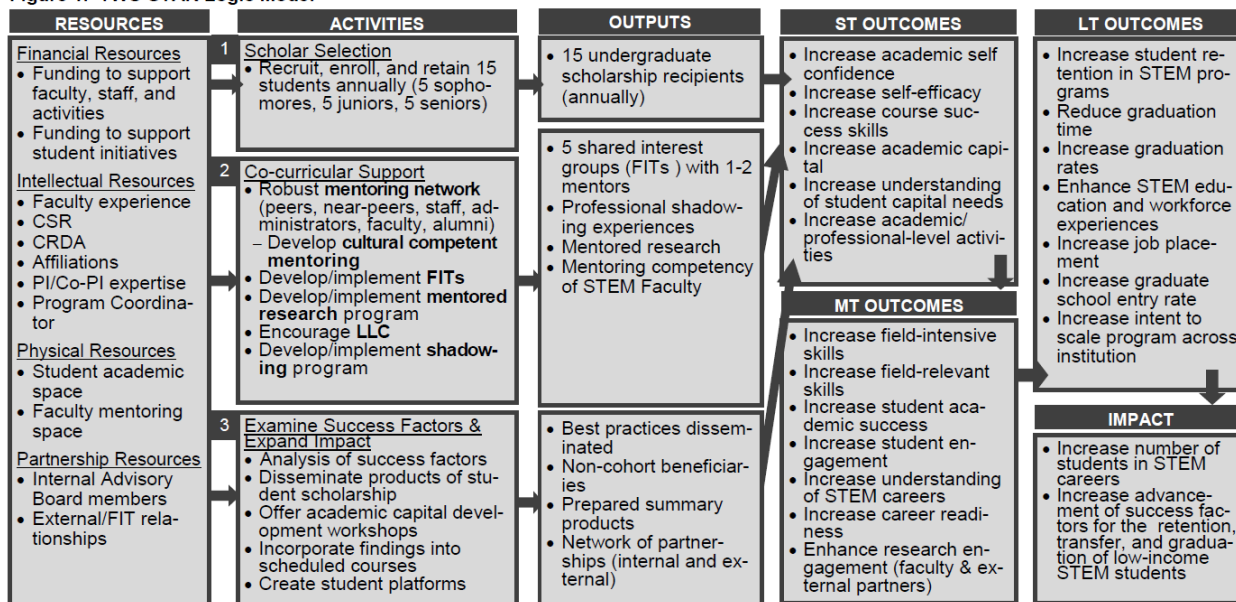
<b>Table 5. Research Study Framework</b>		
<b>Program Component</b>	<b>Research Question</b>	<b>Research</b>
<b>Scholarship</b>	<b>1. How does the scholarship program strengthen students' science identity?</b> <i>Areas to assess include students' sense of belonging, engagement in community and science practice, and social identity [Interviews]</i>	Study 1
<b>Mentoring Network</b>	<b>2. Does a cultural and diverse mentoring component impact students' science identity?</b> <i>Areas to assess include students' sense of belonging, communication, collaboration, engagement in community and/or science practice, efficacy in science related skills, expanding research skills, and social identity [Academic Student Capital Survey, Student Assessment Survey]</i>	Study 2, 3
<b>Field Intensive Teams (FITs)</b>	<b>3. Does participation in FITs impact (a) research scholarship and (b) science identity?</b> <i>Areas to assess include research skill development and academic performance. [Academic Student Capital Survey, Student Assessment Survey]</i>	Study 2, 3
<b>Mentored Research</b>	<b>4. Does participation in mentored research impact (a) research scholarship and (b) science identity?</b> <i>Areas to assess include research skill development and academic performance. [Academic Student Capital Survey, Student Assessment Survey]</i>	Study 2, 3
<b>Living Learning Communities (LLC)</b>	<b>5. Does participation in LLCs impact or increase (a) research scholarship and (b) science identity?</b> <i>Areas to assess include research skill development and academic performance. [Academic Student Capital Survey, Student Assessment Survey]</i>	Study 2, 3
<b>Shadowing</b>	<b>6. Does participation in professional shadowing programs impact or increase (a) research scholarship and (b) science identity?</b> <i>Areas to assess include research skill development and academic performance. [Academic Student Capital Survey, Student Assessment Survey]</i>	Study 2, 3

**OVERVIEW.** The development of a science identity is an implicit goal of TWU STAR's co-curricular support strategies and as such, the research questions focus on how each of these strategies impact students' science identity. **Study 1** will focus on qualitative research at the end of Year 1 to identify student experiences to inform program design. **Study 2** will assess each of the co-curricular strategies' impacts on outcomes identified in the **logic model** (Figure 1), and **Study 3** will be a longitudinal assessment of the program components of the outcome measures.

**Study 1: Qualitative Assessment of Student Experiences.** This qualitative study will focus on scholars' experiences throughout the first year of the TWU STAR program to understand the *why* behind their choice of STEM fields, determine their experiences with each of the mentoring components (culturally competent mentoring network, FITs, mentored research, LLC, and shadowing), and obtain suggestions for improvement to each. Such rich information will enable the PI and co-PIs to better tailor the STAR program towards the needs of students. **Procedure.** Qualitative questions to assess students' sense of belonging, engagement in community and science practice, and social identity will be designed by the PI and External Evaluator in Quarter 2 of Year 1. Individual interviews will be set up with STAR Scholars in Quarter 3 of Year 1. Analysis findings will be

conducted by the External Evaluator, along with recommendations of programmatic improvement. **Implications.** Enhancements will be made early in the program to ensure it is effectively and efficiently addressing student need.

Figure 1. TWU STAR Logic Model



**Study 2. Co-curricular Strategies' Impacts on Outcomes.** This quantitative study focuses on the impacts of each of the activities' (culturally competent mentoring network, FITs, mentored research, LLC, and shadowing) impacts on the six short-term and seven medium-term outcomes stated in the logic model (Figure 1). Outcomes focus predominantly on engagement and performance.

**Procedure.** Pre and post data will be collected from the *Academic Student Capital Survey* and *Student Assessment Survey* every year of the program from STAR Scholars and a control group of 15 with similar demographics and academic interests. The PI and PC will collect pre (baseline) data in Quarter 1 of each year for each outcome; post data will be collected in Quarter 4 of each year to quantitatively determine programmatic impact on each outcome. The External Evaluator and CRDA will evaluate the findings. Where impact may be lower than anticipated, the Evaluator will set up interviews with one-third of STAR Scholars (five students) to identify, where possible, areas for improvement. **Implications.** This data will provide information as to how well the project co-curricular support strategies are impacting the programmatic outcomes around engagement and performance by comparing data from those in the program to the control group. Based on assessments, effective activities will be expanded to include non-project participants. These activities may include academic capital development workshops for all STEM students (with cohort members as facilitators), incorporated FITs activities or work products (such as case studies, rubrics, or informational texts), scholars' peer mentoring and/or campus leadership, etc. Developing this ecosystem with the goal of providing best practices to more of the institutional community will develop a community of practice for both the students and faculty.

**Study 3. Longitudinal Assessment of Program Components on Outcomes.** This quantitative study will track the impact of the overall program on reaching the long-term outcomes stated in the logic model. **Procedure.** Comparison of student data for assessment will be conducted through two methods. First, TWU STAR scholars' rates of entering the workforce and/or enrolling in graduate programs, persisting in graduate school, and earning graduate degrees in STEM fields will be compared to TWU institution rates of the same graduating classes reported in the Student and Adult Learner Follow Up Institution reports provided by the Texas Higher Education Coordinating Board. Second, investigators will work with TWU's CRDA and IRDM to identify comparable non-participants who will be surveyed about their career and graduate school. Comparison non-participants will be matched on characteristics such as race, ethnicity, SES, gender, age, major and transfer status. **Implications.** Bayesian analysis and regression modelling techniques will be conducted to examine the factors predicting success in the program. The resulting data will describe and predict successful

completion of student academic and career pathways in STEM programs. Findings will be disseminated to the broader academic community via conferences and journal publications.

The External Evaluator, CRDA, and IRDM staff will work with PI to collect and analyze data differences that may exist for underrepresented students regarding enrollment, graduation, and retention rates, etc. Differences (such as the type of support used, type of activities engaged, etc.) between FITs and cohort groups will also be examined in efforts to understand factors that may influence the successful retention and graduation of scholarship recipients. Statistically analyzing the data of STAR Scholars will allow the investigators to identify the factors and their combined moderating or mediating nature on the program outcomes. These findings will be disseminated to the broader academic community to better inform other institutions. Products developed based on findings, along with student scholarship, may also be shared in research training workshops, research/work internships, publication, and results-reporting platforms.

#### **J. ASSESSMENT AND EVALUATION**

The project will measure progression and success through a multi-pronged research and evaluation approach to answer the overarching questions: *Are we achieving our objectives?* and *What is the impact or change as a result of these interventions?* While the three research studies contribute to this second question, evaluation focuses on the first. The logic model outcomes will serve as the basis for the project evaluation, although outputs will also be monitored. Formative assessments, such as interviews and modifications to surveys based on programmatic findings, will be used to enhance the program and positively affect short-term outcomes. Summative assessments will address how well the program achieved its long-term outcomes of increased retention, reduced graduation time, increased graduate rates, increased job placement, increased graduate school entry rate, and enhanced STEM education and workforce experience. This data will determine the program's impact on departments, disciplines, and the institution itself. The PI and PC will be responsible for carrying out data collection of the research and evaluation plan, which is aligned with the logic model. TWU STAR will work with the National Science Foundation to report any measures required by the Government Performance and Results Act of 2010 (GPRA).

The evaluation *process* is supervised by the External Evaluator in a close working relationship with the investigators. The **External Evaluator**, Mindy Chandler, **Research & Evaluation Consultant with Dallas-based Elite Research, LLC**, has worked extensively with TWU in this capacity. The External Evaluator will help fine tune the evaluation plan, help develop the documents necessary for formative and summative evaluations, develop targets for outcomes, and then annually meet with the PI and Management Team to examine program adherence to the funded proposal regarding finances, personnel, and participant services and progress (checking in throughout the year via telephone and/or email). The evaluation methodology utilized will provide formative as well as summative information while focusing on the outcomes of the project and how to make project modifications, when they are needed. Collecting data from multiple sources, multiple intervals, using multiple methods will enhance the breadth and quality of the data while decreasing the responsibility of any individual to provide objective data measures. The project's evaluation will provide guidance about effective strategies suitable for replication or testing in other settings.

**PROPOSED MEASURES.** The measures listed will address both formative and summative evaluations. Measures such as the *Interviews* and the *Cultural Competence Survey* will be used to monitor project activity and enable program improvements, while the *Student Assessment Survey* will be used to assess the quality and success of the project in reaching its goals and outcomes. All measures used in the research and evaluation studies will be validated before baseline measures are collected and demographic questions added for analysis:

- **Cultural Competency Survey** is a pre/post survey given to mentors. The survey will be developed from questions based off the *Individual Questionnaire School Self-Assessment for Culturally Responsive Practice* developed by the National Center for Culturally Responsive Education Systems (NCCRES) [38] [39], self-assessment resources from Georgetown's National Center for Cultural Competence (NCCC) [40] [41], and clinical, training, and organizational self-assessment tools from *Improving Cultural Competence* (SAMHSA).
- **Academic Student Capital Survey** is a pre/post survey that will be given to participants at the beginning and end of each annual cohort. It will be adapted from the school/academic dimension of the Social Capital Instrument, as well as the Academic Capital Scale – measuring how knowledge

changes their understanding of academic capital. Investigators will adjust content based on this formative assessment.

- The **Student Assessment Survey** [42] is a pre/post survey that will be given to participants at the beginning and at Year 2, 3, 4, and 5 to assess areas of research skill level, social capital, student achievement, student engagement, research engagement, career readiness, and understanding of careers in STEM, and course-based research experiences. Potential existing instruments from which questions would may be adapted include: *Alumni Perceptions Used to Assess Undergraduate Research Experience* [43], *Academic Capital Scale (Academic Capital)* [44], *GPA (Student Achievement)*, *National Survey of Student Engagement (Student Engagement)*, *STEM Career Interest Survey (measuring students' Understanding of STEM Careers)* [45], *McGraw-Hill Education Workforce Readiness Survey (Career Readiness)* [46], *Student Experience in the Research University Survey (Research Engagement)* [47], and the *Persistence in Sciences (PITS)* [48] .
- **Institutional & Program Data** will be collected throughout the year, every year, to determine whether TWU STAR has met its stated goals, objectives, and outcomes.

#### **K. DISSEMINATION PLAN**

TWU STAR investigators present at annual meetings of their respective professional societies. The results from this project will be of interest to peer reviewed journals and professional conferences. Additional target audiences for dissemination will include TWU and other venues where faculty (STEM and non-STEM, with interest in education- and diversity-related pursuits varying from minimal to extensive), administrators, policymakers, higher education, and corporate/industry entities might attend. Preliminary results and dissemination efforts will begin early. Perhaps just as important are student-led venues and partner educational pipeline and recruitment platforms such as the Council on Undergraduate Research (CUR), the Society for Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), and the Annual Biomedical Research Conference for Minority Students (ABRCMS).