Community-Based Participatory Research (CBPR) By Youth: A Boomerang Model of Learning For STEM Teachers

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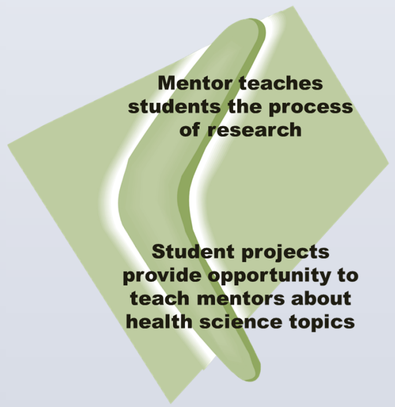
ABSTRACT

A core principle in Community-Based Participatory Research (CBPR) is a bidirectional flow of information between investigators and community. We have extended this paradigm to include a team of Clinical Research Knowledge Brokers, (trained in CBPR and Health Sciences), to high-school **STEM** teachers/club mentors and to youth in health science clubs. Each student club member conducts CBPR projects on relevant health issues in their neighborhoods. In principle, diffusion of knowledge occurs at each step between each team member's science and cultural perception. Each study uses a series of **experiential processes** to consider evidence based knowledge, identify gaps, pose testable questions , design research project, conduct, organize analyze, interpret, and present the study with attention to the disconnect between the science and cultural perception, because the work is being done by the most non-threatening team member – the high school student. We now report on an unexpected consequence of this model. **STEM** teachers, essentially lay educators without prior formal training in Health Sciences, have little experience of teaching content of these topics chosen by the students. New changes mandated in **STEM** education now emphasize experiential education. CBPR provides such an opportunity by teaching new concepts, not only for the student but their teacher/mentors. We illustrate this process where a club teacher, initially hesitant to go beyond their prior level of comfort, has been encouraged to learn and mentor new concepts. At designated times, sharing of the project with the program team, provides for teacher mentoring in new fields. In **a bi-directional** flow of information, the teacher leads the student through the process of a project. In return, the student leads the teacher to new fields and skills. This **boomerang** flight of learning is an interesting inversion of classical education. It is proving highly attractive to participating teachers.

CHANGES TO BOTH THE STUDENT AND THE TEACHER

The concept of a **boomerang**, where the teacher teaches students and then in the process the student teaches the teacher, fosters bidirectional flow of information to lead to a behavior change in both the student and the teacher. This powerful model being developed in Pittsburgh was first envisioned during a collaborative initiative with The **Health Science and Technology Academy (HSTA)** in West (WV) and is heavily dependent on the involvement of the **Allegheny Intermediate Unit** and their influence and expertise in the Pittsburgh Public Schools.



Health Science Clubs for Minority & Disadvantaged Students *(10 Students/Club)*		
	Health Science Technology Academy	**Pitt-Bridge Program**
Location	Rural Statewide West Virginia	Urban Pittsburgh Pennsylvania
Counties	26	Allegheny County
Number of Clubs	78	5 (in development)
% Minorities in Communities	3%	14%
% Minorities in Clubs	34%	100%
Number of Mentors in Clubs	1	2

COMMUNITY BASED PARTICIPATORY RESEARCH LEARNING PARADIGM (CPL)

The Problem

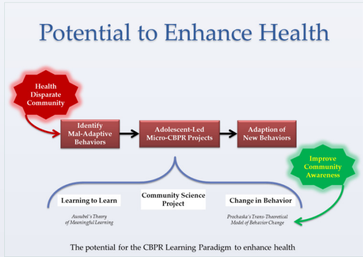
- In Disadvantaged Communities
  - Low Education
    - Minimal College Tradition
  - Healthcare Disparities
    - Obesity and Its Complications

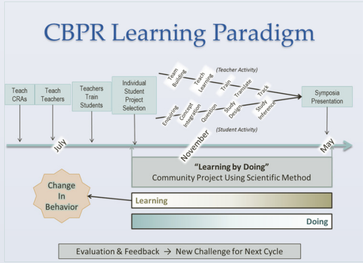
The Premise

- Self-help is preferred to outside help.
- Clash between culture and science.
- Learning by doing in order to create change.
- Adolescents are more flexible than adults.
- Adolescent potential is underused.

The Solution

- Health science clubs for after-hours high school students to conduct CBPR on self-selected projects in their neighborhoods.





EVOLUTION OF PROCESS

Local Descriptive Projects

- Bi-directional knowledge diffusion between teacher and student
  - Diabetes: Protect and Defend Survey Instrument
- Assessed prevalence of Type II Diabetes
- Student used descriptive analysis
- Projects focused on local prevalence with little connection or correlation to other data sets
- Local translation of student research findings only

Statewide Descriptive Projects

- Multi-directional knowledge diffusion between teacher, student and knowledge broker
- Student constructed instrument to asses risk factors and lifestyle choices
  - Assessed prevalence of Type II Diabetes as well as risk factors of MetS
  - Student used as a measure of individual project intervention effectiveness
- Publications began to emerge from PI collection of statewide student data
- Local and national translation of student research findings

Collaborative Statewide Intervention Projects

- Multi-directional knowledge diffusion between teacher, student, knowledge broker and PI
- Cross PI collaborative use of student derived survey tool
  - Used in connection with multiple research projects
  - Data shared between research projects
  - Inferential statistics used to evaluate relationships

Cross State Community Adaptation

- Boomerang model of learning
  - Mentor teaches students the process of research
  - Student projects provide opportunity to teach mentors about obesity
- Urban (Pittsburgh) vs. Rural (HSTA WV)
  - more school-based
  - teacher teaching is the starting center piec
  - Heavy mentorship from the Academic Medical Centers (AMC)
  - students will be more involved as the conduits to local neighborhoods.

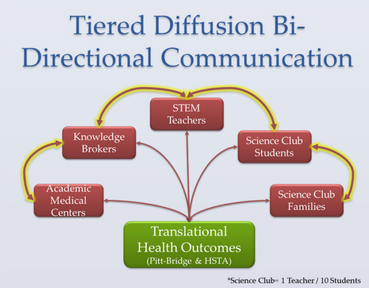
TIERD DIFFUSION MODEL OF LEARNING

The CPL was designed to provide a structured process to foster a self-help solution to the clinical problem of obesity in a dispersed rural community. Our current contention is that these same principles will also work in an urban setting (Pitt Bridge Project) that share the features of being ethnic minorities, being poor, or coming from a family without a tradition of having members with higher education.

CPL is a fundamental inversion of traditional approaches to learning. Conventionally, the adult teaches the child. Our goal is for the adolescent to teach the adult. This is achieved by exciting adolescents to learn how to solve a problem such as obesity and then share their knowledge with their friends and family. This is done in an experiential way of **'learning by doing'**, so that actual behavior is changed. The challenge is to build infrastructure that introduces new concepts, excite them to 'learn how to learn' and then become teachers in changing patterns of behavior.

Adolescents become more invested in an activity if they are involved in the identification of the research question even if it is around a designated topic like obesity. Thus, each student is encouraged to work within a small group structure that applies the full complement of the principles and structure of CBPR. In order to guide this process, we have adopted a Tiered Diffusion Model for **Bi-Directional** Sharing of Information and Culture.

CPL involves interactive learning where **STEM** Teachers teach the process of science, and reciprocally the Students teach the **STEM** Teachers health science. **This premise is extendable and adaptable to multiple communities and neighborhoods wanting to engage their youth in self-help mentorship.**



ACKNOWLEDGEMENTS

Allegheny Intermediate Unit 3's (AIU) guidance and development and implementation of their mission to maximizing educational opportunities for all learners by responding to the needs of our community with leading-edge, high-quality, cost-effective programs and services. Through the AIU Vision that educational excellence is a hallmark of our region with all learners having access to the best services, enriching their lives and enabling their contribution to a vibrant economy.

The Health Sciences and Technology Academy (HSTA) along with their governing body known as the **Joint Governing Board** and their mission to increases the number of African American and underrepresented students in West Virginia, who pursue degrees in Health Sciences and Science, Technology, Engineering, and Mathematics (STEM) majors, thereby increasing the number of health practitioners and advocates in the medically underserved communities of West Virginia.

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