Bioinformatics and the Healthcare Workforce: Expanding the Scope of AHEC

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Why Bioinformatics & Genomics?

- Bioinformatics is in a period of rapid growth.
- Medical advances in the field of genomics are progressing at an almost unimaginable speed.
- Genomic technologies will transform medical care and deliver a new era of precision medicine.
- Growth has been so rapid that some areas are experiencing shortages of trained researchers and the health professions have been challenged to keep up with developments.
- The US biomedical research workforce does not currently mirror the national's population demographically, despite numerous attempts to increase diversity – which is deeply tied to racial inequalities in health care.
Genomic Career Resource

https://www.genome.gov/genomiccareers
Our Projects

**ITEST**
The Western New York Genetics in Research Partnership: Expanding Exposure, Career Exploration and Interactive Projects in Basic Genome Analysis and Bioinformatics

**National Science Foundation Grant:** Innovative Technology Experiences for Students and Teachers (ITEST)

3 year Award: 2013 - 2016

**SEPA**
Western New York Genetics in Research and Health Care Partnership

**National Institute of Health Grant:** Science Education Partnership Award (SEPA)

5 year Award: 2015-2020
The Western New York Genetics Partnerships are led by researchers at the University of Buffalo and the New York State Area Health Education Center (NYS AHEC) System.

The goal of this project is to create the Genetics in Research in Partnership in Western New York to serve as a pipeline for recruiting students to careers in life science and health care.

It is designed to support career paths for students in scientific research, emphasizing underrepresented and disadvantaged groups.
Purpose of the Projects

This project trains teachers in Genomics Education National Initiative Annotation Collaboration Toolkit (GENI-ACT), an innovative technology experience for students and teachers which includes a “hands-on” cyber-learning approach, to increase knowledge of bioinformatics and allow them to gain experience with bioinformatics software for classroom use.

The project expands student understanding of basic bioinformatics and the scientific process through the use of GENI-ACT, and provides ongoing support to students as they pursue life science and health care-related career plans.

http://www.geni-act.org
AHEC Involvement

NYS AHEC Statewide Office Staff
• .10 FTE - Co-PI
• .30 FTE - Project Manager
• 1.0 FTE - Project Outreach Coordinator (Erie & Niagara Counties)

WNY Rural AHEC (Sub-Contract) Staff
• .16 FTE – CEO
• .25 FTE – Sr. Program Coordinator
• .34 FTE – Program Specialist
AHEC Involvement

Teachers and students in high schools with a significant proportion of disadvantaged students are the target of recruitment in the SEPA & ITEST projects.

Erie-Niagara and Western New York Rural AHEC service areas include 3 counties with urban population centers, 6 predominantly rural counties and 5 rural/suburban counties with a total of 131 schools categorized as disadvantaged based on the percentage of free/reduced lunch and the percent of students entering college.
AHEC Involvement

AHEC Coordinators:

- Make connections with area high schools
- Recruit grade 9 – 12 Biology teachers
- Attend the teachers’ 1 week Gene Annotation Training in the Summer
- In the Fall Semester, run recruitment & career activities with each teachers’ science classes
- Help the teachers recruit students for the Spring Gene Annotation Intervention
- Help guide students with career & college plans: i.e.. filed trips, summer internships & workshops, college tours, etc…
Making Connections with area High Schools

- Create a recruitment strategy for teachers
  - Getting passed the gatekeeper
  - Ensuring teacher commitment
  - Evaluate the process
- Incentives to encourage participation
  - Money/Stipends may not be the answer
- Relationships! Relationships! Relationships!
- Lessons Learned
AHEC - Making It Seem Possible

- Classroom Presentations
- College Visits/Tours
- Career Tours
  - Buffalo Niagara Medical Campus
  - Lessons Learned
In this activity, students mixed various chemicals into ground strawberries that cause the DNA to separate and collect in a test tube. Students see white bundles of DNA strands with the naked eye.
Electrophoresis is a technique used in laboratories in order to separate macromolecules based on size. The technique applies a negative charge so proteins move towards a positive charge. This is used for both DNA and RNA analysis.

Gel electrophoresis can be used for a range of purposes, for example:

- DNA fingerprint for forensic purposes
- DNA fingerprint for paternity testing
- DNA fingerprint so that you can look for evolutionary relationships among organisms
- To test for genes associated with a particular disease.
Group Activity: DNA Fingerprinting & Electrophoresis

Who Stole the PlayStation 4?
• Read Incident Report
• ‘cut’ the Crime Scene DNA sequence
• ‘draw’ DNA band pattern
• Match Suspect DNA to Crime scene DNA

ACTGCCCCAAGGTCCGGGTC
TGACGGGGTTTCGAGGCCCCAG

GTCCCAAGCCGGACCGTAGATCAGCCGGTAGATTTGATAGCCTGGCTATTCTAGGTCGCTATGCACTACAC
IN THE NEWS!

**NIH award will prepare WNY high school students for careers in genomics**

Local New York State Area Health Education Centers (AHECs) are integral to the project, as they recruit teachers and students, and provide support to students who want to pursue health-related careers. Area AHECs will identify internship opportunities across the region and provide education and career advisement.

“The AHEC system’s mission is to increase diversity in health professions, devoting special attention to underserved urban and rural locales, ensuring that each community gets the help it needs,” said Shannon Carlin-Menter, co-principal investigator and director of evaluation for the NYS AHEC system, based in the UB Department of Family Medicine.”
AHEC Recruitment - Success in Numbers!

**ITEST: (Year 3 of 3 year grant)**

- AHEC’s presented at a total of 45 schools and worked with 56 teachers to recruit students to participate in the GENI-ACT (Genomics Education National Initiative Annotation Collaboration Toolkit) research study.

- The AHEC’s successfully reached a total of 1,463 students and helped the teachers recruit 667 students to participate in the research study: 324 were randomized into the control group and 343 were randomized into the Intervention (GENI-ACT) group.
# AHEC Recruitment - Success in Numbers!

<table>
<thead>
<tr>
<th>SEPA Recruitment</th>
<th>Year 1 2015-16</th>
<th>Year 2 2016-17</th>
<th>Y3 2017-18</th>
<th>Y4 2018-19</th>
<th>Y5 2019-20</th>
<th>Target Goal Totals over 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td># Students exposed to Bioinformatics/Genomics Career Activities</td>
<td>272</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,720</td>
</tr>
<tr>
<td># New Teachers Recruited</td>
<td>9</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td>90</td>
</tr>
<tr>
<td># Returning Teachers from previous year</td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>32</td>
</tr>
<tr>
<td># Students Recruited</td>
<td>109</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1,260</td>
</tr>
<tr>
<td># Students Randomized into Gene Annotation Group</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>630</td>
</tr>
</tbody>
</table>
The Capstone Symposium takes place each May. It allows students and teachers from different schools to interact with one another and UB faculty and reinforces student and teacher recognition as members of the research community.

SEPA Participants & High School Students from the Olmstead Science Club; May 2016
SEPA Capstone Event – Student Poster Session

The Capstone is attended by UB faculty, Partnership staff, teachers, students and parents/guardians.

The second part of the Capstone is a bioinformatics-related research talk given by a member of the COE. An awards ceremony concludes the event.
SEPA Capstone Event – Student Poster Session

At the Capstone event, regional academic programs and biotechnology industry representatives are invited to display/distribute materials about opportunities for college-level study and STEM careers.

*ITEST Participant, Poster Session May 2016*
ITEST & SEPA Capstone Event

University at Buffalo
May 2016
Creating Internship Opportunities for High School Students

- Utilizing Community Partnerships
- Existing Internships
- Creating an additional summer experience
- Lessons Learned
Homegrown Faculty – Buffalo Public Schools

Norma J. Nowak PhD
University at Buffalo
Department of Biochemistry
Professor

Executive Director of the New York State Center of Excellence in Bioinformatics & Life Sciences

Co-investigator on ITEST & SEPA projects

Keynote Speaker @ the Capstone Events

“For us to be successful, we need to create the environment where children not only want to get involved, but want to stay in Buffalo. This needs to be the spark that lights the fire.”
Success Story

When a pilot version of this project was brought to Westfield High School in 2011 in Westfield, New York, a rural community in Chautauqua County, the project exposed students to careers they had never considered. At the time, Alec Freyn, a junior at Westfield High, wasn’t sure what he wanted to pursue after high school. One option he was considering was sheep farming.

“The gene annotation I did in high school provided me with practical experience that helped with my labs.”

Alec is now headed to the Icahn School of Medicine at Mount Sinai in New York City to pursue a doctorate in biomedical sciences.
Funding Resources

Please Attend the General Session – NAO Business Meeting:
on Thursday, June 30 • 9:30am - 11:00am • Grand Ballroom North

Anthony Beck, PhD, who is in the Office of Science Education at the National Institutes of Health, will provide a brief presentation on how NAO might apply for a 5-year, $13M pre-college STEM grant from the NIH to improve workforce diversity and public health literacy. Based on the emphasis over the last decade on interagency communication and coordination, e.g., the STEM Consolidation plan from OMB in the FY14 Budget, this will begin a discussion on a long term partnering opportunity.
Links

Western New York in Research and Health Care Partnership (SEPA)
http://wpdev.acsu.buffalo.edu/wnygirahcp

Western New York Genetics in Research Partnership (ITEST)
http://ubwp.buffalo.edu/wnygirp

NSF 2016 Video Showcase:
http://stemforall2016.videohall.com/presentations/709

Western New York Genetics in Research Partnership Facebook Group:
https://www.facebook.com/WNYGIRP

Genomic Careers:
http://www.genome.gov/genomiccareers/