A SEPA HANDBOOK

"Describing the Michigan Experience"

A Collaborative Process used to Plan and Carry-out DNA Focused Community/School Events

- Detroit and Flint, Michigan -

2006-2012

Handbook Contents

The National Science Education Partnership Awards (SEPA) Program

The National Center of Research Resources' National Institute of Health's SEPA program, supported by the Division of Program Coordination, Planning, and Strategic Initiatives for Clinical Research Resources, and the National Institute of Environmental Health Sciences of the National Institutes of Health, is designed to improve life science literacy throughout the nation through innovative educational programs.

SEPA-supported projects create partnerships among biomedical and clinical researchers and K-12 teachers and schools, museums and science centers, media experts, and other educational organizations across the country.

The Michigan SEPA Project

The Michigan SEPA project, entitled **"Education for Community Genomic Awareness"** was centered on a genetics/genomics curriculum designed by the School of Education at the University of Michigan. The curriculum was offered as a unit of study in the Science program of selected high schools in both Flint and Detroit, Michigan. It sought to further student and community understanding of genomics and awareness of the potential applications of genomic research to improve population health and reduce health disparities through the development, enactment, and editing of a new curriculum addressing molecular genetics (single gene focus) and genomics (focus on human genome and its interaction with environment) in several high schools in both Cities.

Background

The Michigan based SEPA project was built upon several years of earlier work and established relationships of the initiating academic partners. The Center for Highly Interactive Classrooms, Curricula & Computing in Education (HI-CE) Team at the **School of Education (SOE)** had developed project-based science curriculum at the middle school level in urban areas for the past decade. These activities included the incorporation of community issues of science, health and the environment in the project components of the curriculum. The Center for Public Health and Community Genomics (CPHCG) Team at the **School of Public Health (SPH)** has a history of engaging multi-cultural communities (i.e., African American and Latino communities) in dialogues involving education in genetics and development of policy recommendations to guide genetic research and applications to maximize societal benefits and reduce health disparities. During the past four years, SPH has also been engaged in projects connecting high school youth with community-based organizations aimed at furthering an understanding of health issues facing their communities and the development of interest in health careers.

The SEPA project not only combined both kinds of activities, but attempted to demonstrate that by connecting a newly created genomics curriculum in high schools with community-based activities

involving parents and other adults in the areas served by the schools, learning can become more relevant to the lives of students and community members, student achievement can be enhanced, and community engagement and education can be furthered. The project thus has potential significance not only for future genomics education and engagement, but for development of community/school relationships that further the goals of both sectors.

Project Overall Goal

The goal of the project was to demonstrate how community/school partnering can strengthen science learning in the schools while at the same time engaging parents in developing knowledge and appreciation for science, and relating what their children learn in school with interests and issues of the communities in which they live.

Specific Aims

1. Stimulate interest and engagement of K-12 students from underrepresented groups in the scientific process through new high school curriculum addressing molecular genetics (single gene focus) and genomics (focus on human genome and its interaction with the environment).
2. Improve student learning of genomics aimed at preparing students to become scientifically literate citizens able to understand genomic research and its implications and to assess critically media-based and web-based information on genetics.
3. Develop university-school-community partnerships connecting university faculty in Science, public health and education with high school teachers and administrators and with parents and other community members, to support, strengthen and share genomics curriculum.
4. Engage community partners in relating genomics curriculum to community concerns and interests, joining with students in activities strengthening student and community engagement and advancing student and community knowledge of genomics.
5. Disseminate the curriculum, professional development and community engagement materials and provide workshops and web-based resources to promote adaptation and enactment throughout the U.S.
6. Conduct forn1ative and summative evaluation measuring the achievement of project aims and maintaining a process of continuous quality improvement throughout project implementation.

Relevance

Strengthening student and community understanding of genomics and its application leads to greater support of these activities by the citizenry, increased interest among youth to enter science careers, and support of programs applying genomics to improve human health and reduce disparities.

Methods

The partners connected the prior bodies of work in the development and dissemination of a linked set of curriculum and community engagement activities, planned for piloting and initial scale-up in

Detroit and Flint, Michigan. Curriculum development for science classes were aimed at developing science literacy in molecular genetics and genomics, reflecting the current understanding of genomics resulting from genetic research. Projects used to engage students incorporated science and health issues relevant to their lives and of interest to their communities.

Parent-teacher organizations (PTOs), local school community organizations (LSCOs), and other local community-based organizations (CBOs) hosted focus group discussions to identify issue areas to incorporate in the curriculum and to help design projects linking student learning with community engagement. Students shared their science learning through project work with the community, joint dialogues and interviews with genetics scientists, and presentations of project findings to the community. Extra-curricular activities to further student interest in science and genomics were identified by the project team and by the engaged communities.

Special emphasis was placed on the need to engage students and community members from underrepresented groups in science learning, in developing an interest in science careers, and in considering the impact of genomics on their communities.

The SEPA Project Partnership(s)/Team

"Partnership" is the distinguishing characteristic of SEPA projects, as compared with other projects previously carried out by our team funded by federal agencies, either to achieve effective K-12 science learning or to promote community engagement and education.

The SEPA project embodied a 6-way partnership: The Schools of Public Health and Education at the University of Michigan, two Michigan school systems, (the Detroit Public Schools and the Flint Community Schools), and community-based organizations in both communities.

The SEPA Project Components

The SEPA Project consisted of three major components (i.e., Project Oversight, Curriculum/ Classroom Instruction, and Community Education/Engagement).

- The CPHCG at the School of Public Health (SPH) - U of M Ann Arbor, directed by Toby Citrin, JD, and Co-directed by Sharon Kardia, PhD, coordinated the Project Oversight.
- The HI-CE at the School of Education – U of M Ann Arbor, directed by Joseph Krajcik, PhD, was responsible for the Curriculum Development and Classroom Instruction as well as developing and facilitating the Professional Development (PD) sessions.
- The Community Education Coordinator at the CPHCG office, hired to bring the community perspective into the discussions, led the Community Education and Engagement activities. This component was charged with: identifying community participants/partners; creating/ identifying the kind(s) of events that would demonstrate the added value of connecting student sharing of what they've learned with community engagement and learning; and creating/identifying opportunities to share relevant and engaging information about genomics in both Detroit and Flint, MI.

While each component had specific roles and responsibilities, those roles and responsibilities were defined and developed in the smaller groups, but further fine-tuned and implemented in relation to the project goals, with input from the full SEPA team which included members from each component.

About The Community Engagement

The Collaborative Process

A collaborative community engaging strategy was designed and utilized to provide information to the planning team as well as to gather feedback from the community participants concerning genetics/genomics in general, the curriculum, the relevance of genetics/genomics to community health and related interests, and possible future community-school activities.

The collaborative process in Detroit was approached and developed using a slightly different method than the process in Flint. The initial participating schools were selected using more of a "Top-down" method, where the Administrator(s) decided which schools would participate. Even though this was a "Top-down" process, it actually grew out of a strong existing relationship established over a period of years between the Detroit Public Schools and the School of Education at the University of Michigan, Ann Arbor, Michigan.

The Flint community has been exposed to and benefits from an inclusive approach introduced and utilized by the Community Based Participatory Research (CBPR) process, a process frequently used in its programming strategies. The initial SEPA discussions in Flint began with conversations drawing on the relationships already established with community area students, to get a feel for their interest. The discussions moved to their Science teachers, their Counselors, their Principals, and then their Administrators. This pattern of discussions led to the recommendation and selection of the first participating schools in Flint. In short, we used the "bottom-up" approach as opposed to the "top-down" approach.

Community/School Partners

The project partners included members from the identified schools and the organizations and groups located in the catchment areas of those schools (i.e., community based organizations, churches, libraries, parent/teacher organizations, alumni associations, and civic organizations and other schools, centers, and educational institutions).

Community/School Activities

Paralleling the curriculum activities in the schools were a series of activities engaging parents and other community members in the catchment areas served by the schools. The community/school activities were guided by the following objectives: engage the community in helping to shape the curriculum enacted in the schools to assure curriculum relevance to the lives of the students and their parents; improve the awareness and appreciation of the community of genomic science and research

and its applications; strengthen student learning and interest in science through joint activities involving students working together with their parents and other community members; and tap into the expertise of community members related to the curriculum.

Our Basic Planning Strategies for Community/School Activities

The SEPA Community/School activities were planned and implemented with a strong reliance on a local collaborative approach. The planning process stemmed from several years of coalition building in one community and a more recent and deliberate use of asset mapping in the other. The project Team understood that drawing from existing relationships could help create sustainable relationship oriented partnerships in those communities. Team members also agreed that the local community would benefits from recognizing and including the community structures already in place while building new and sustaining existing relationships.

The actual on the ground planning process, using the collaborative approach, began with discussions guided by the following basic exploratory considerations:

1. Discuss/decide WHO should be included in the planning.
2. Discuss/decide WHAT is going to be done.
3. Discuss/decide WHY the event should happen.
4. Discuss/decide WHEN the event is going to happen.
5. Discuss/decide WHERE the event should happen.
6. Discuss/decide HOW the event should happen.
7. Discuss/decide HOW MANY people are expected to attend.
8. Discuss/decide HOW the event will be publicized.
9. Discuss/decide HOW MUCH the event will cost.
10. Discuss/decide HOW the event will be funded.
11. Discuss/decide HOW the event will be captured/evaluated.
12. Discuss/decide HOW the results from the event will be used/shared.

We found that having these discussions early in the process provided the time and opportunity to include other concerns to the discussion and resolve them using the collaborative/participatory process. Our planning strategies also required scheduled monthly meetings with the several different groups (i.e., the full Team, project components, identified community/school participants, etc.), well thought out timelines/task assignments, an ever-expanding list of partners/potential partners, as well as the planning flexibility to amend the original ideas and be willing to think outside of the box.

Additional information is available through:

- The Center for Highly Interactive Classrooms, Curricula & Computing in Education (HI-CE) at the School of Education (SOE) –University of Michigan –Ann Arbor, MI
- The Center for Public Health and Community Genomics (CPHCG) Team at the School of Public Health (SPH) – University of Michigan – Ann Arbor, MI
- www.ncrr.nih.gov/clinical_research_resources

Appendices Cover Page

List of SEPA Community/School Partners

Detroit, Michigan

1. **Eastside Village Health Workers Partners**
2. **Communities In Schools**
3. **Friends of Parkside**
4. **Wayne State –Genetic Counselors**
5. **Osborn Parent Network**
6. **TWW Employment Solutions**
7. **Detroit Center/Orchestra Place**
8. **Mumford Alumni Association**
9. **Mumford Local School Community Organization (LSCO)**
10. **Public Health Students of African Descent (PHSAD)**
11. **Detroit Public School**
12. **National Human Genome Research Institute**

Flint, Michigan

1. **The Flint Association of Black Social Workers**
2. **The Flint Neighborhood Roundtable**
3. **Flint Community Schools - Administration**
4. **The University of Michigan-Flint (EOIC Office)**
5. **The Flint Public Library**
6. **St. Peter C.M.E Church**
7. **Classical Academy - PTO**
8. **Southwestern Academy - PTO**
9. **Flint Northern High School - PTO**
10. **The Alumni Association at Flint Northwestern High School**
11. **Community Based Organization Partners (CBOP)**
12. **National Human Genome Research Institute**

SEPA Community Planning Team
October 9, 2007
1:00 – 2:30 pm

Agenda

Welcome/Introductions	**Toby Citrin**
Introduction of the 2007/08 group process	**Toby Citrin**
Rationale for the Development of the Framework	**Ella Greene-Moton**
Discussion of the Framework Document	**Toby Citrin**
Brief discussion of 2006 community activities ○ **Accomplishments** ○ **Challenges**	**Ella Greene-moton**
Overview of 2007 Project Goals/Objectives	**Ella Greene-Moton**
Status of current and proposed Schools	**Ella Greene-Moton**
Scheduling 2007/08 Community Meetings/Timeline	**Ella Greene-Moton**
Establishing a Community Advisory Board	**Ella Greene-Moton**
Scheduling Standing Meetings	**Ella Greene-Moton**

Community Engagement Strategies

Center Circle – Participating School

Circle 1 – School Community

(Students, teachers, staff, administrators)

Circle 2 – School Associations

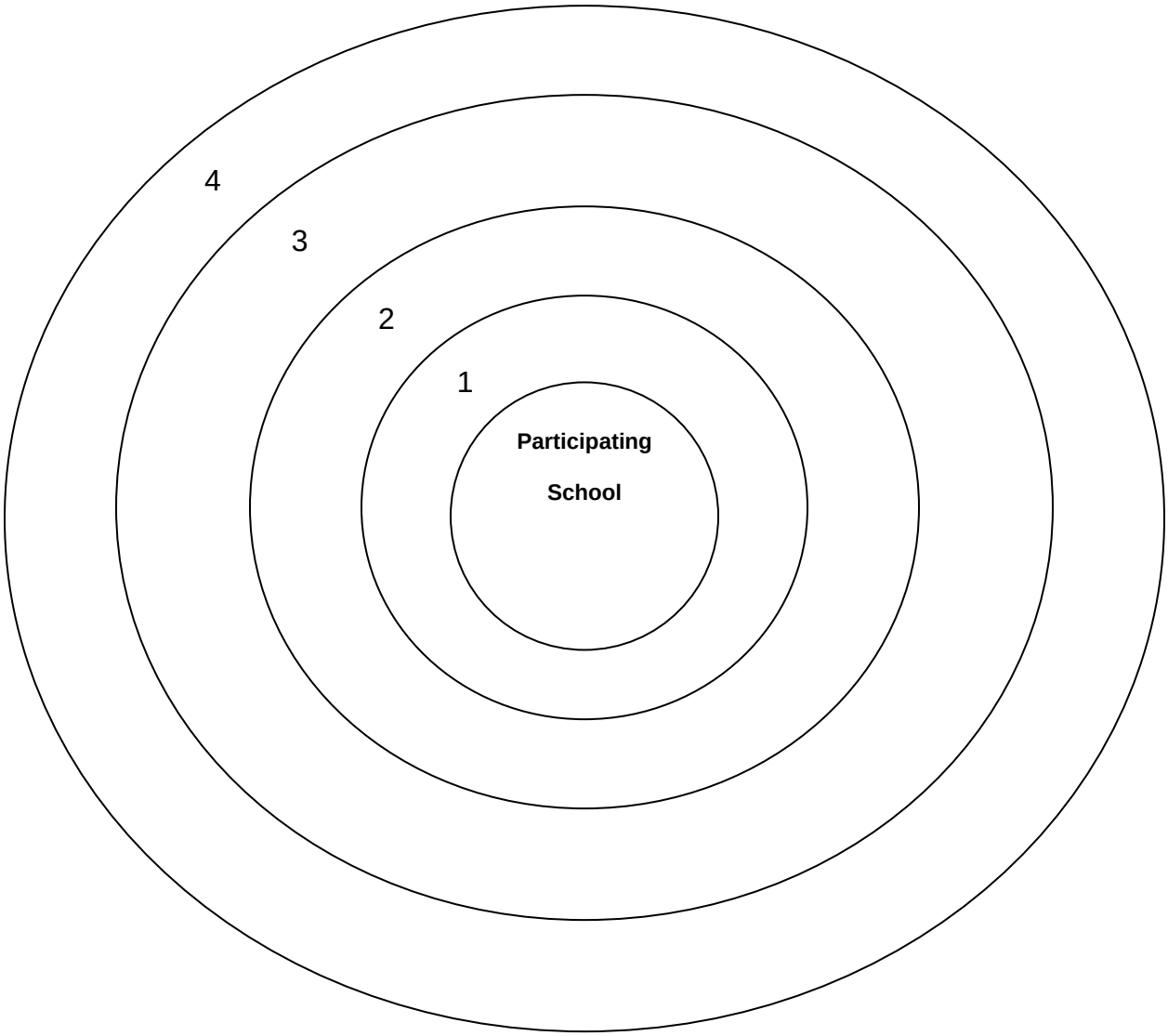
(Parent/teacher Associations, Alumni Associations)

Circle 3 – Community Groups

(CBOs, Churches, Civic Organizations, Block Clubs)

Circle 4 – Community Institutions

(Libraries, Museums, Agencies, Colleges, Universities)



	SEPA Project timeline, Final year, July 2010-Apr 2011 Draft, June 26, 2010	July-Aug	Sept-Oct	Nov-Dec	Jan-Feb	Mar-Apr	Notes
1.	Finalize materials for dissemination including						
a.	curriculum package,						
b.	professional development written materials (possibly videotapes if available),						
c.	community school activities handbook • Sally work with Kirsten/Nora in consultation with Ella on this. See outline on ctools	X	X	X	X	X	Draft by Nov/Dec finalize in Mar
d.	evaluation.						
2.	On-going work (no ramping up)						
a.	Identify which schools, teachers, classrooms will be enacting next year • Ask current teachers – Consuelo in debrief email and on debrief agenda • Discuss with Science Ed. Coordinators-Consuelo/Joe/Toby • Identify other teachers, schools if needed (on July agenda of regular meeting and at debrief) - all	X X X	X				
b.	PD and classroom support – need to discuss what this will entail						
c.	Community events – small-scale events. There is currently no funding for DNA Night. • Discuss community-school strategy (on-going agenda of regular meeting) – all* • Ella identify and contact at least 2 CBO and 2 career resources per city (Flint: CBOP, UMFlint, GASC / Detroit: ?, ? WSU, Marygrove, • Ella will contact and meet with libraries in Detroit and Flint to discuss co-sponsoring a community-school or city-wide activity • Ella meet with contacts to describe SEPA and how organization/career resource can be involved this final year ** • Ella Work with teachers by school to identify time and type of community-school activity • Ella work with teachers to identify and contact at least one school-specific community organization per school to meet with, describe SEPA and discuss how that organization can be involved this final year (e.g. PTO, local church) • SEPA team plan community-school activity – make sure to communicate school-specific organizations and career resources about plans and timeline *** • Ideally before curriculum enactment, conduct one community school event with focus on careers, community health issues discussion. # Highlight a guest speaker with a follow up discussion on a community health issue with students, family, community members. ##	X X X X X X X	X X X X	X X X	X X	X	* Discuss def'n of community, measuring success, teacher expectations. **Ways to be involved: agree to advertise, to get 5 people from their group to attend, agree to introduce, co-facilitate, etc. ***Ella responsible for communicating with the CBOs, career resources, and school-specific organization on an on-going basis: the plans and timeline for community-school activities and arranging role they can play #Can be library sponsored ## If renewed, all funding spent by Mar

	• Incorporate lessons learned into evaluation and handbook • City-wide DNA night IF funding awarded by NHGRI				X X	X X	
3.	SEPA Team						
a.	SPH - Toby, Sally, Ella, Nora, Kirsten	x	x	x	x	x	Nora returns in September
b.	SOE –To be discussed with Joe: plan for staffing and transition • Joe will contact candidates, discuss transition with Consuelo	x					

Education for Community Genomic Awareness

Toby Citrin
Jen Eklund
Ella Greene-Moton
Consuelo Morales

Today's Agenda

Project Goals

Toby Citrin

Curriculum Overview

Jen Eklund

Community Overview

Ella Greene-Moton

DNA-Night in Flint

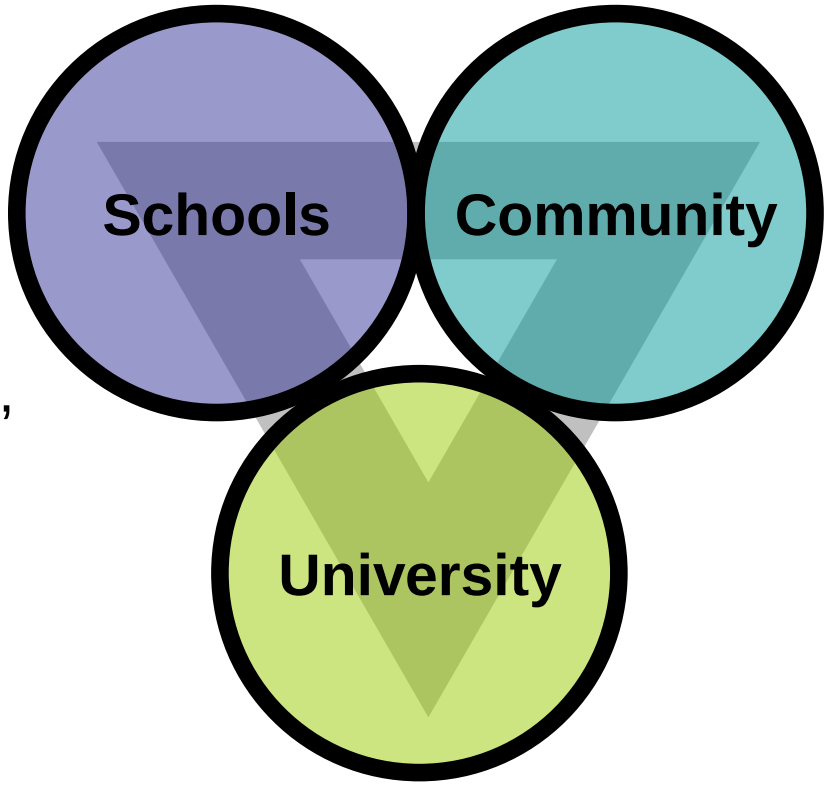
Consuelo Morales

Project Goals

- Develop new genomics unit.
- Improve student learning of genomics.
  - Better awareness of science
  - Genomic literacy
  - Interest in science-related careers
- University-school-community partnership
  - Relating curriculum to community interests
  - School-Community activities advancing student and community knowledge

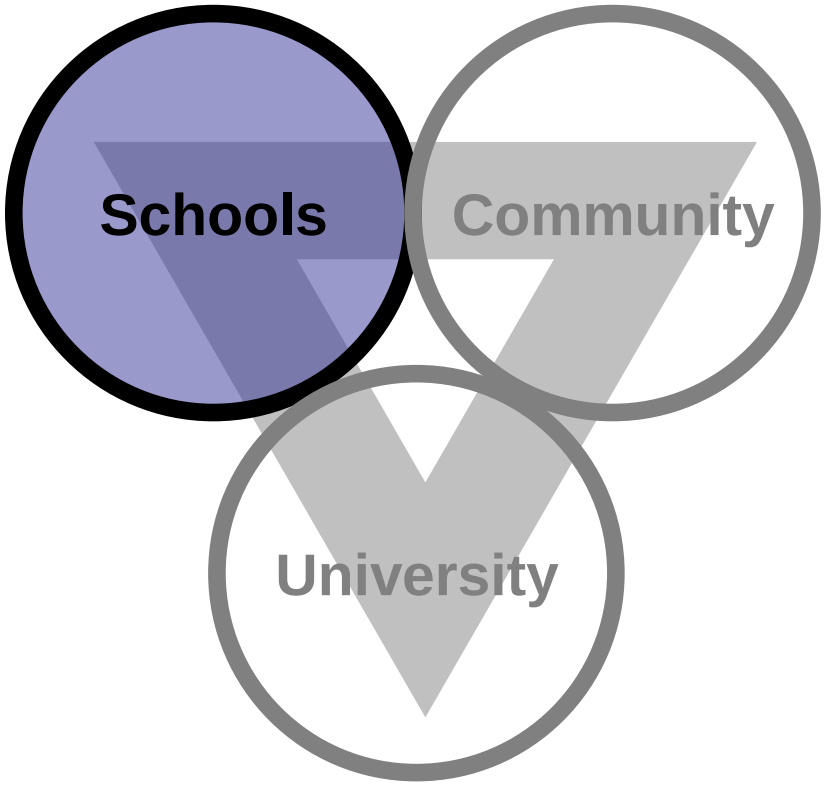
Participants

- Schools
  - Detroit and Flint
- Community
  - Detroit and Flint
  - Community organizations, parents, teachers
- University of Michigan
  - School of Education
  - School of Public Health



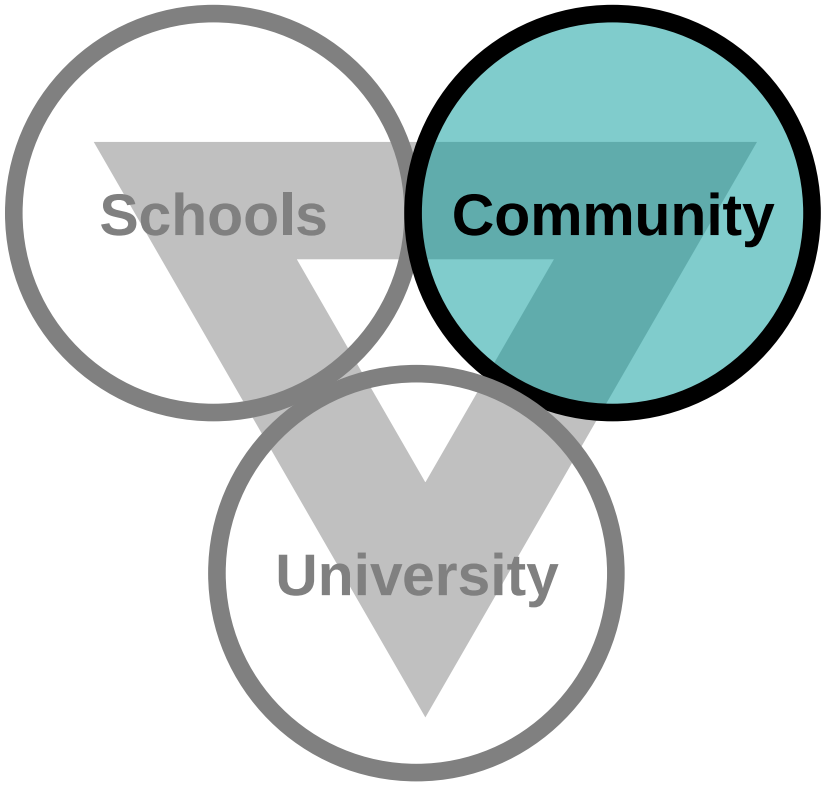
School Participation

- Genomics unit used in the schools
  - Covers traditional topics of DNA structure, translation, and transcription in addition to modern genomics
  - Teachers use materials in regular classroom after participating in professional development workshops
- Unit feedback by teachers and students



Community Participation

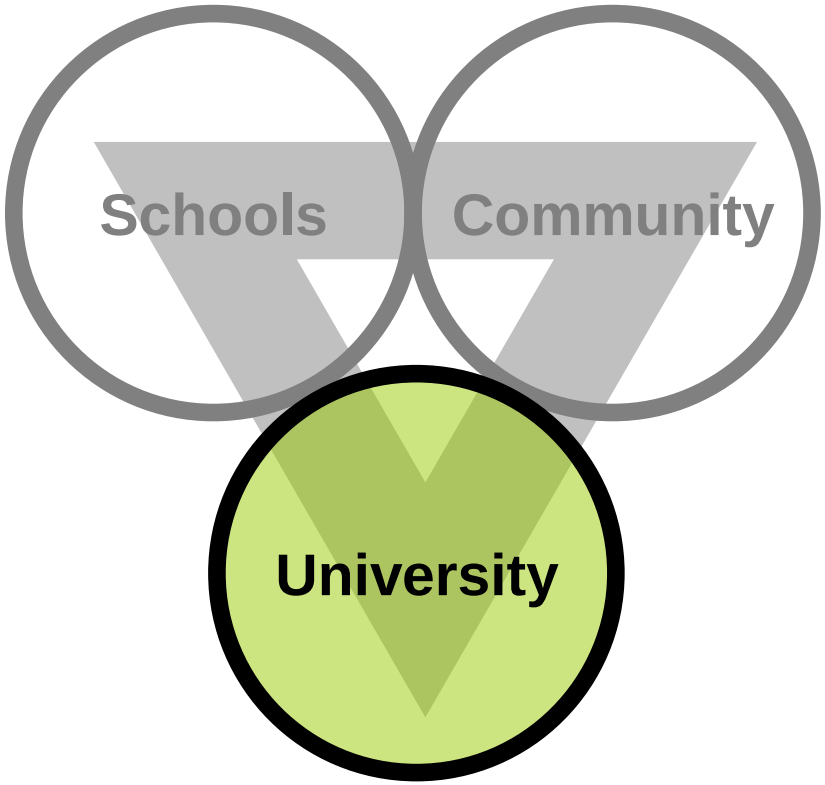
- Genomic Awareness events for Community
- Genomics Unit relevance to Community Issues



University Participation

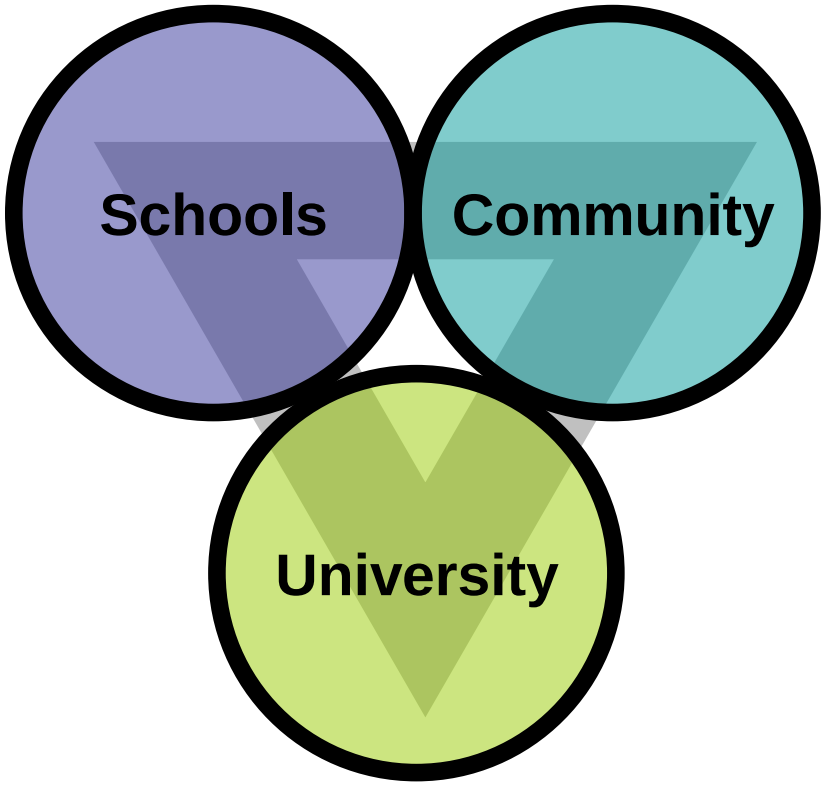
- Developed Genomics Unit

- Incorporate Community issues into Genomics Unit and Activities



Partnership Participation

- Student-Community Events
- Co-learning about Genomics and Community Issues
- University Support in Organizing and Facilitating



How SIMILAR or DIFFERENT are we from each other?

Curriculum features

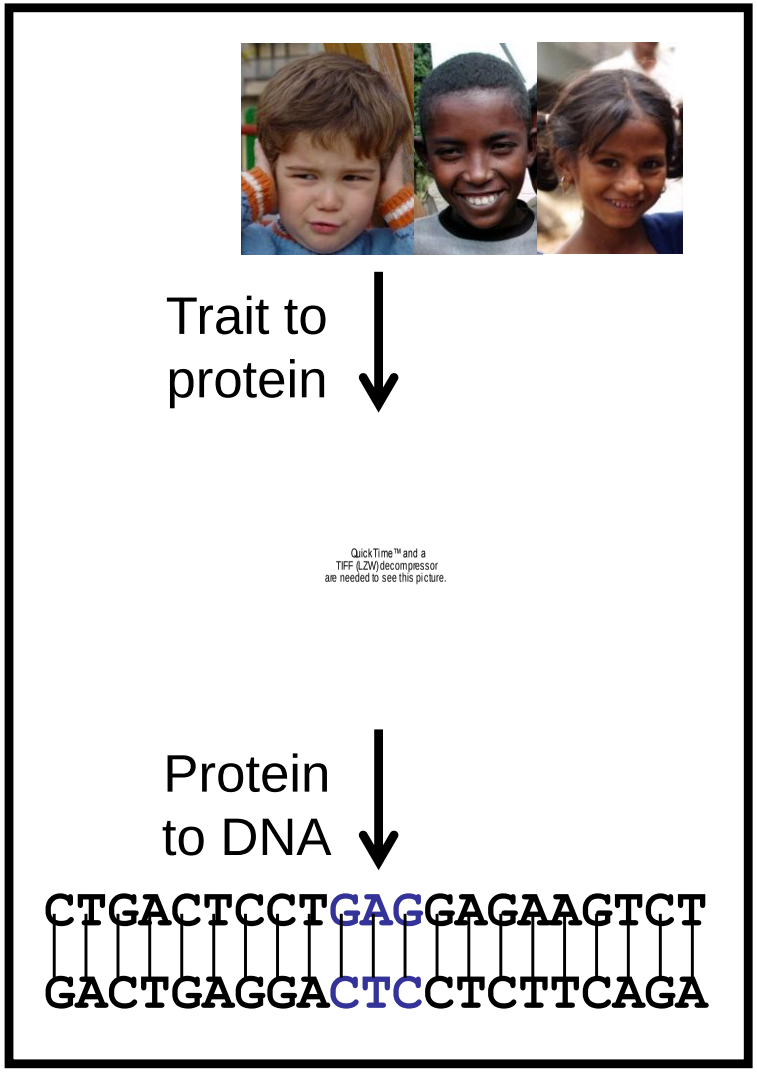
- Driven by learning goals
- Contextualized by important questions
- Grounded in relevant phenomena
- Represented in multiple formats
- Instructed using an inquiry approach

Learning Goals

- Proteins
  - Nature and function of proteins
  - Biochemical basis of traits
- Genes
  - Nature and function of DNA
  - Genes are instructions for making proteins
  - Molecular nature of genes and mutations
  - Genes can be turned on or off
- Constituents of a genome

Unit Summary

1. How similar or different are we from each other?
2. What is going on inside us to generate our traits?
3. How do genes work?
4. How does my environment affect my genes?
5. What is a genome and how does it work?
6. How do genes cause diseases?



Phenomena

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

skin color

sickle cell disease

QuickTime™
TIFF (LZW) dec
are needed to see

cholesterol metabolism
(Familial hyper-cholesterolemia)

athletic endurance (erythropoietin)

lactose intolerance

Ethical dilemma activities

Students:

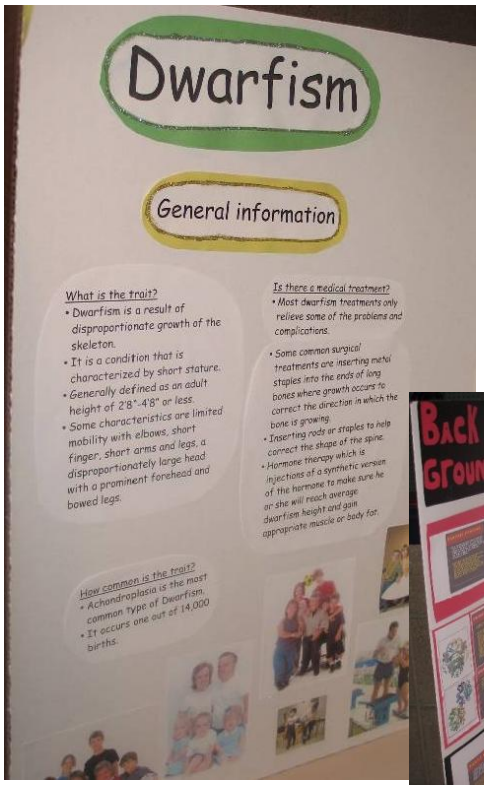
- Consider “What is ethics?”
- Use a decision making framework*
- Discuss other points of view
- Incorporate learned material and real world experiences

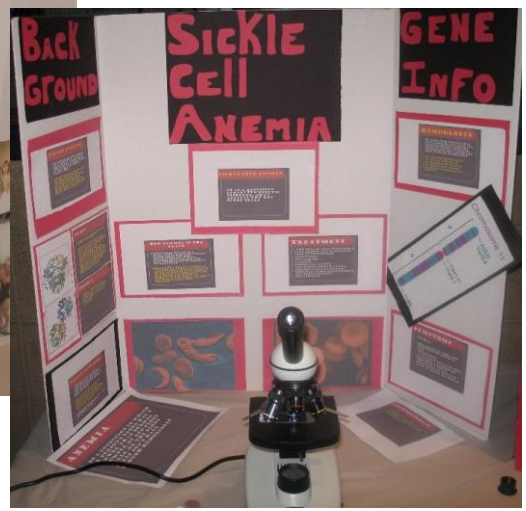
* Adapted from “An Ethics Primer”, NWABR 2007

Research Project

Students pick a specific genetic trait or career related to genetics

Students research the trait or career and generate a poster or brochure





Students share what they have learned with their peers and the community

Community Overview

- The goal of the Community Component of the SEPA Project is to demonstrate how learning in the school stimulates community learning and engagement, and conversely, how community engagement strengthens learning in the schools.

Specific Aims Include:

- Developing university-school-community partnerships supporting and sharing curriculum
- Engaging the communities in the school's catchment areas in identifying curriculum components addressing:
  a) community concerns and interests
  b) sharing the knowledge incorporated in the curriculum, and
  c) engaging in joint activities with students advancing student and community knowledge

"**Engagement is an investment in lasting relationships with communities. These relationships influence, shape, and promote the success of both the institution and the community**"

(adapted from the CCPH definition of Engaged Institutions)

Who constitutes the community

- Those who live in the geographic area served by the school

- Community-based organizations (CBOs) such as churches, community-based health or social service organizations, block clubs, or other community groups

Community-Level Participation

- Identifying community structures
- Identifying community leaders
- Understanding the community culture(s)
- Developing relationships
- Developing partnerships
- Creating opportunities
- Sharing resources

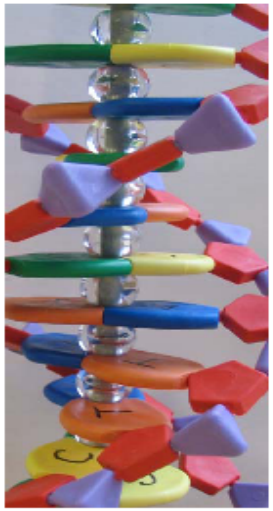
Community-Level Participation

Over the past two years, the Science Education Partnership Award Project (SEPA) has:

- Engaged parents of students enrolled in the Genomics Curriculum Unit, community residents, as well as representatives of local organizations in community meetings, small group discussions, and community dialogue.
- Began the creation of the Community Advisory Committee (CAC)
- Facilitated a school visit for a Genomic Scientist
- Encouraged participation in DNA Day Activities
- Hosted DNA Night Activities

DNA Night Flint

COME JOIN
NORTHERN, NORTHWESTERN, AND WHITTIER
IN CELEBRATING DNA NIGHT
TUESDAY APRIL 29, 2008 5:30 PM-8:30 PM



This event will be held at:
University of Michigan-Flint University Center
303 E. Kearsley St.
Flint, MI 48502

Do you know what a toober is? Ask your child—they've been using them in science class this year to learn about DNA. Come to DNA Night to learn about DNA and see your child show of his or her hard work!

DNA Night will include:

- A special presentation by a genetic scientist
- Student led demonstrations of the activities they've been doing this
- semester in the genetics curriculum
- A gallery walk featuring cartoons and posters about DNA that were made by students

Parents, students, families, and community members are invited! A buffet dinner will be provided, starting at 5:30p.m.! Free parking is available in the visitors area in the parking ramp located on the corner of Kearsley Street and southbound Chavez. Contact 734-972-5648 for more information.

AMAZING DNA FACTS!!! Did you know.....

- If all the DNA in your body was put end to end, it would reach to the sun and back over 600 times
- It would take a person typing 60 words per minute, eight hours a day, around 50 years to type the human genome
- We all have the same sequences for over 99% of our DNA

Come see what your child has been learning about DNA!

The Center for Public Health and Community Genomics, School of Public Health, University of Michigan is sponsoring this event in collaboration with the Center for Highly Interactive Computing in Education, School of Education, University of Michigan and the National Human Genome Research Institute, National Institutes of Health. Funding was made possible (in part) by 5 R25 RR022703 from the National Center for Research Resources, National Institutes of Health.

UNIVERSITY OF MICHIGAN SCHOOL OF EDUCATION

CENTER FOR Public Health and Community Genomics

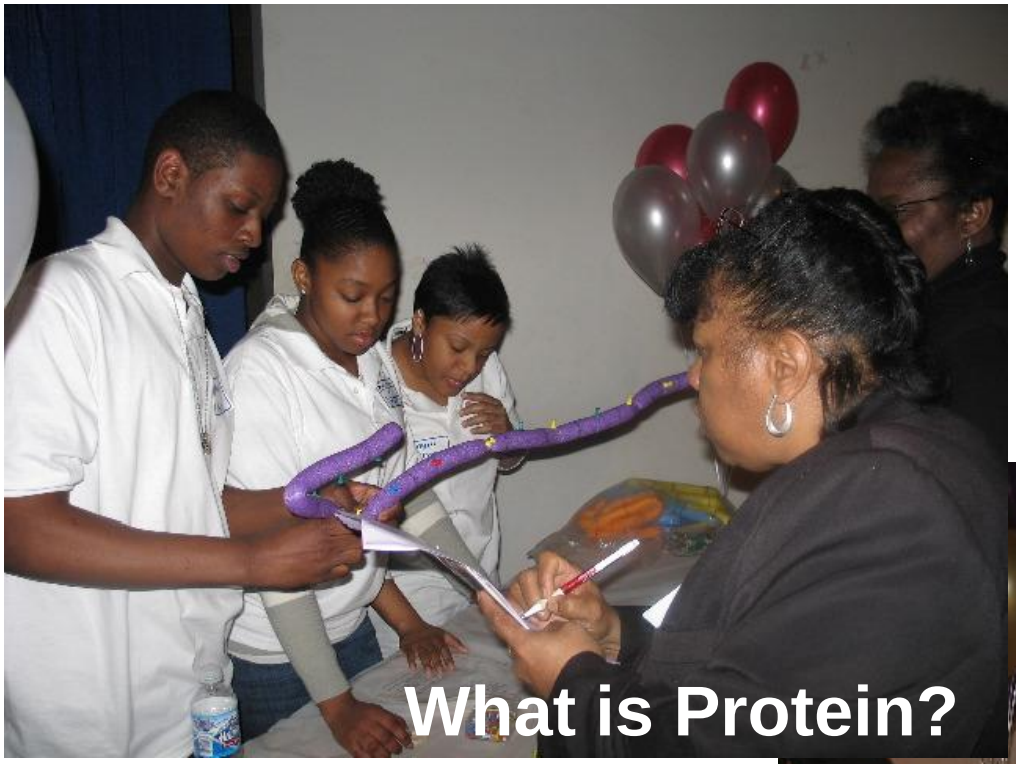
SEPA SCIENCE EDUCATION PARTNERSHIP AWARD

Students, Parents, Community Together

Carla Easter
Guest Speaker

See Your
Own DNA!

Students, Parents and Community Together



Student Demonstrations

First DNA Night! But more to come…

Education for Community Genomic Awareness
DNA Night In Transition

The Project

The Center for Public Health and Community Genomics (CPHCG) at the University of Michigan School of Public Health received a National Center for Research Resources (NIH) Science Education Partnership Award to further student and community understanding of genomics and awareness of the potential applications of genomic research to improve population health and reduce health disparities. The grant, entitled Education for Community Genomic Awareness, allowed CPHCG to expand its activities related to integrating information on genomics and public health into K-12 education. A new curriculum addressing molecular genetics (single gene focus) and genomics (focus on human genome and its interaction with environment) has been developed and enacted in high schools in Detroit and in Flint. The curriculum has been revised based on teacher and student feedback and teacher professional education materials have been developed.

Paralleling the curriculum activities in the schools are a series of activities engaging parents and other community members in the catchment areas served by the schools. The objectives of the community activities are to: engage the community in helping to shape the curriculum enacted in the schools to assure curriculum relevance to the lives of the students and their parents; improve the awareness and appreciation of the community of genomic science and research and its applications; strengthen student learning and interest in science through joint activities involving students working together with their parents and other community members; and tap into the expertise of community members related to the curriculum.

DNA Night

The culminating community-school activity of the year is DNA Night. Both Detroit and Flint have a DNA Night that pulls together the students, parents, teachers, schools, and community members who have been a part of the SEPA Project in each city over the course of the year. This event gives the students an opportunity to show what they have learned by being a part of the SEPA Project. DNA Night involves a dinner; a guest speaker; student-created poster presentations; student-led demonstrations from the genomics curriculum unit; and student-led performing arts. Judges evaluate the students' work and prizes are awarded for the best posters; demonstrations; and performing arts. This event has always been quite popular with the students; teachers; and school administrators.

DNA Night Transition

The Science Education Partnership Award ends on March 31, 2012. The curriculum is currently being enacted. DNA Nights for this year are scheduled for December 8, 2011 at Orchestra Place in Detroit, Michigan and for December 20, 2011 at the University of Michigan-Flint in Flint, Michigan. Since our goal is for the DNA Night events to continue beyond the end of the SEPA project, we are seeking Local Community Hosts that can take the lead, with our support, in planning and organizing these events.

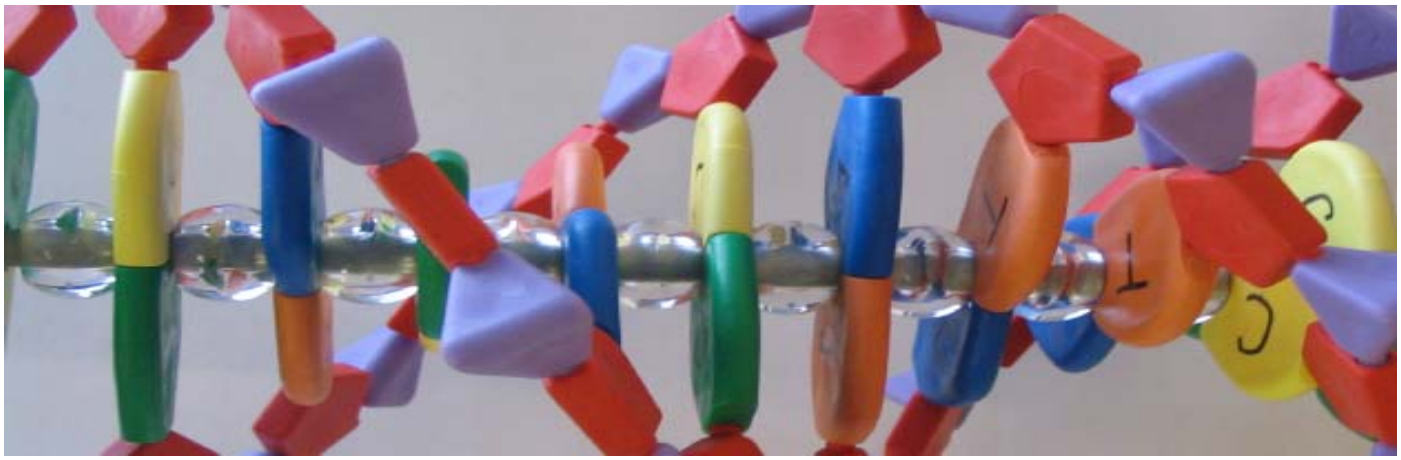
Our Role

During the transition period, we will do as much as we can to support the community hosts in planning and organizing the DNA Nights. In order to facilitate this process, we will provide the following resources:

1) Staff time---Staff at the School of Public Health will be available to assist you in planning and carrying out the DNA Nights.
2) SEPA handbook---Portions of this handbook were designed specifically for Local Community Hosts. The handbook includes information about the SEPA program; information about how to plan events and develop budgets; templates of various documents that community groups can use in hosting school-community events such as agendas, presentations, evaluation tools, marketing materials, press release kits, work plans and timetables, sign-in sheets, programs, science and career handouts, directional signs, judge forms, certificates of appreciation, etc.
3) Contact lists---We will also provide information about how to identify a DNA Night host/site, speaker, and DNA Night judges (please see attached).

Local Community Host's Role

1) Develop a plan for hosting DNA Night either individually or in collaboration with other community groups and individuals.
2) Utilize the tools in the SEPA handbook and let us know what we can do to adapt and/or improve these materials for use in future years.
3) Utilize the contact lists and let us know if you would like us to make additional contacts in support of DNA Night.
4) Contact us for help in planning and carrying out DNA Night.
5) Carry out DNA Night.



YOU ARE INVITED
TO JOIN
THREE FLINT AREA SCHOOLS
(NORTHERN, NORTHWESTERN, AND WHITTIER)
AS THEY
CELEBRATE DNA NIGHT
APRIL 29, 2008
5:30 PM – 8:30 PM

SAVE the DATE!
More information to follow!

University of Michigan-Flint University Center
Kiva Room
303 E. Kearsley St.
Flint, MI 48502

The Center for Public Health and Community Genomics, School of Public Health, University of Michigan is sponsoring this event in collaboration with the Center for Highly Interactive Computing in Education, School of Education, University of Michigan and the National Human Genome Research Institute, National Institutes of Health. Funding was made possible (in part) by 5 R25 RR022703 from the National Center for Research Resources, National Institutes of Health.

UNIVERSITY OF MICHIGAN
SCHOOL OF EDUCATION

CENTER FOR Public Health and Community Genomics

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
Supported by the National Center for Research Resources, a part of the National Institutes of Health

January 2, 2008

Rev. Jimmy Womack, MD, President
Detroit Board of Education
7322 Second Avenue, Suite 485
Detroit, Michigan 48202-2711

Dear Dr. Womack

Thank you for your expressed interest in the Science Education Partnership Award (SEPA) Research Project/Study sponsored by the University of Michigan's Center for Public Health and Community Genomics, in partnership with the School of Education. This letter is in reference to a conversation between Detroit Board of Education Member Ida Short and SEPA Team Member Apryl Renee Brown concerning the community component of this project.

The SEPA project is centered on a genetics/genomics curriculum component designed by the School of Education at the University of Michigan. The curriculum is being offered as a unit of study in the Science program of selected high schools in both Flint and Detroit (i.e., Cass Tech, Mumford, Kettering, Cody, and Western).

As a community engaging strategy, community discussions/focus groups are occurring among parents of students enrolled in the classes as well as community residents living and/or working in the catchment areas of the identified schools. These discussions/ dialogues are designed to provide information and to gather feedback from the participants concerning genetics/genomics in general, the curriculum, the relevance of genetics/genomics to community health and related interests, and possible future community-school activities.

I am requesting that the Detroit Board of Education provide 10-15 minutes to hear a brief presentation on the SEPA Project during the January 10, 2008 board meeting.

Thank you for your time and consideration. I look forward to meeting you and hopefully developing an ongoing three-way partnership between the schools, the community, and the university. Should the need arise; please contact me at (734) 972-5648 or at emgree@umich.edu.

Sincerely

Ella Greene-Moton
Community Education Coordinator

Dear Genomics Teachers,

It is once again that genomics project time of year (or getting close) and the genomics project team would like to update you and get some feedback from you on some ideas that we shared at a meeting regarding the student/community connection portion of the program.

The following are ideas currently being discussed by the genomics project team:

- Connection with the PTO, high school alumni association, community-based organization or similar entity within or working with the school that might have a parent and community contact.
- DNA Day http://www.genome.gov/10506367 activity as a culminating activity for the curriculum
- One weekday evening with all participating schools attending
    - Date for event needs to be discussed
    - Genome Project Scientist(s) as guest speakers
    - Students present final project posters and comics in a "Gallery Walk"
    - Students have one or two demonstrations from the genomics project curriculum to show parents and community members.
    - Demonstrate the DNA kits to extract their own DNA
    - DNA Day T-shirt design contest
    - Refreshments (of course)
    - All 5 participating Detroit (3 Flint) high schools would join in on one big event
    - Teachers would be encouraged to help us plan and promote the project in their classrooms
- DNA Day live chat with scientists as a possible classroom activity
    - April 25th from 8am to 6pm EST
    - Opportunity for students to talk to real live scientists working on genomic topics
    - Great teachable moment
- Blog Creation

Teachers you are a vital part of this curriculum and it could not be taught without you. Your comments regarding the above mentioned activities are important to us. We realize that you have a busy schedule but if we could get your feedback on these points, (or if you would like to help us in organizing any of these activities), the genomics project team can get to work on the community aspect and thus help support your efforts in the classroom. As well, we hope you will be able to help us support the success of the genomics project by encouraging your students and their families to participate in the activities.

I will be talking to you about these activities in more detail at the February 2 professional development and I will be contacting you by phone/e-mail to see if it would be possible to schedule an after-school meeting at your school to discuss the above mentioned ideas and to get more feedback from each of you. I would be asking for about 1 hour of your time after school.

As a side note: The information contained in this letter is being passed to your principals for their study and feedback as well.

Looking forward to seeing you soon.
Kind regards,

Consuelo J. Morales, MAEd
Candidate Master's of Public Health
University of Michigan School of Public Health
109 Observatory Drive, Suite 4605
Ann Arbor, MI 48109-2029

JOIN CLASSICAL ACADEMY AND SOUTHWESTERN ACADEMY
IN CELEBRATING
(DEOXYRIBONUCLEIC ACID)

DNA NIGHT

HOSTED BY

THE COMMUNITY BASED ORGANIZATION PARTNERS (CBOP) OF FLINT, MI

TUESDAY DECEMBER 20, 2011
5:30—9:00 PM

This event will be held at:
The University of Michigan—Flint
Michigan Rooms A-D
303 E. Kearsley St.
Flint, MI 48502

Come Enjoy:

* Complementary buffet dinner begins at 6:00 PM
* Special presentation by Dr. David Gordon, Dean
  School of Health Professions and Studies
  University of Michigan—Flint
* Student-led demonstrations of the activities they've been doing this semester in the genetics curriculum
* Performing arts presentations by students
* A gallery walk featuring posters about DNA created by students

Who is invited? *You are!*
A Family/Community-friendly Event

FAMILY! See what your child has been learning about DNA!

(for more information contact)
The Community Based Organization Partners (CBOP)
810-767-1157

The Center for Public Health and Community Genomics, School of Public Health, University of Michigan is sponsoring this event in collaboration with the Center for Highly Interactive Computing in Education, School of Education. Funding was made possible (in part) by R25 RR022703 from the National Center for Research Resources, National Institutes of Health.

UNIVERSITY OF MICHIGAN
SCHOOL OF EDUCATION

CENTER FOR
Public Health and
Community Genomics

SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
Supported by the National Center for Research Resources, a part of the National Institutes of Health

How to Write a Press Release

From: How to Write a Press Release by eHow Careers & Work Editor found at http://www.ehow.com

Step One
Decide why you are writing a press release and determine your focus.

Step Two
Keep it short and to the point. Usually, press releases are no more than one page.

Step Three
Print the words "FOR IMMEDIATE RELEASE" in the top left-hand margin in all caps. Follow this line with relevant contact information: name, title, address, phone number, e-mail address.

Step Four
Create a headline and center it in bold type just above the first line of the body of the press release. Headlines typically highlight the most important or significant fact in the release.

Step Five
Create a dateline- the first line of the body of your press release- that includes the city where the release is generated and the date (i.e. LOS ANGELES, CALIF.- January 1, 2000).

Step Six
Make certain the first paragraph includes all the vital information: the where, when, why, what and who.

Step Seven
Include some tantalizing peripheral details or facts to spark curiosity in following paragraphs. A good press release not only informs but also teases.

Step Eight
Wrap up the last paragraph with a "for additional information" line, a place to find more details. An annual report or a Web site can be great sources of information.

Step Nine
Center these marks,"###" or "-30-", at the bottom of the page to indicate the end of your release.

Step Ten
Print your release on high quality paper using a good laser or inkjet printer.

Tips

- Press releases are written in block style, so no paragraph indentation is necessary.
- Have an objective person read your press release and tell you whether he or she would be interested enough to read a newspaper story about it. If not, consider going back to the drawing board for a rewrite.
- Send your press release to the reporter that covers the area you are targeting instead of a managing or senior editor. Often, this will tum into a story much faster.

Press Release Template for Community Events

<Insert event name>

<Insert city, state> -- <Insert date>

On <Insert date>,< Insert host organization name> will host a <Insert type of event> entitled <Insert event name>. Members of the community are invited to attend the <Insert type of event>, which will be an opportunity to participate in a dialogue about issues in genomics. The <Insert type of event> will be held at <Insert site location> from <Insert time>.

<Insert event description>

Following <Insert event name>, an interactive website will allow <Insert type of event> participants and those who could not attend the <Insert type of event> to participate in a continuing dialogue on genomics issues through blogs, web-conferencing, webcastings and/or webinars. The website will also provide additional educational materials for individuals and communities, provided by experts at the University of Michigan. For more information, please visit www.GenoCommunity.org.

<Insert funding organization information if applicable>. For more information contact <Insert contact information>

Flint DNA Night Registration Sheet December 20, 2011

Please print your name and check the appropriate boxes. Thank you!

	** I am a…**					
Name	**Student**	**Parent or Guardian**	**Other Community Member**	**Teacher or other school staff member**	**The Classical Academy**	**Southwestern Academy**

Education for Community Genomic Awareness

In Partnership With

Center for Public Health and Community Genomics/School of Education
University of Michigan-Ann-Arbor

Ella Greene-Moton - Community Education Coordinator

Host

St. Peter Christian Methodist Episcopal Church
771 E. Pierson Road, Flint, Michigan 48505

The Reverend William H. Bell, Jr., Pastor

October 14, 2009; 6:00 p.m.- 8:30 p.m.

Welcome/Introduction	6:00 p.m. -6:10 p.m.	(Pastor Bell/Ella)
Consent Forms	6:10 p.m. - 6:25 p.m.	(CPHCG Staff)
Community Check-In	6:25 p.m. - 6:40 pm	(Ella)
Project Overview	6:40 p.m. – 6:55 p.m.	(Toby)
Curriculum Overview	6:55 p.m. - 7:10 p.m.	(Consuelo)
Community Connections	7:10 p.m. - 7:25 p.m.	(Ella)
Student Reflections	7:25 p.m. - 7:55 p.m.	(Pastor Bell)
Questions and Period	7:55 p.m. - 8:20 p.m.	(Open to Community)
Evaluation Survey	8:20 p.m. - 8:30 p.m.	(CPHCG Staff)
Closing	8:30 pm	Pastor Bell

Osborn Academy of Mathematics, Science, and Technology
Principal: Tanya F. Bowman
Teacher: Ramona C. Patton

Participating Students

The XP in Me (Poem & Brochure)
Jacqueline Udoroh

Lactose Intolerance (Demonstration &Infomercial)
Keinole Stevens
Dejon Ward
Curtis Wilcox

Familial Hypercholesterolemia (PowerPoint)
Da'Marquse Jackson
Dejon Johnson
Donald Leflore
Deandre May

Lactose Intolerance (PowerPoint)
Keith Hawkins
Thaddeus Mcintyre

Xeroderma Pigmentosum (PowerPoint & Infomercial)
Bea Chang
Erica Mitchell
Candace West

Sickle Cell Anemia (PowerPoint & Artwork)
Ajhane Moran
Jayla Myles
Amanda Wilson

Usher Syndrome (PowerPoint, Poster, and Brochure)
Lettie Ann Miller
T'Asia Moore
YazMyne Roberts

Thank you for coming!

About the Hosts

TWW Employment Solutions
...In addition to academic and vocational preparation, TWW Employment Solutions provide job placement, human resource training and educational enrichment Programs.

Angel Land Child Care and Parent Institute
Angel Land Child Care & Parent Institute is a non-profit child organization offering quality child care and early education to children, as well as support to parents in skill development.

The Center for Public Health and Community Genomics, School of Public Health, University of Michigan is sponsoring this event in collaboration with the Center for Highly Interactive Computing in Education, School of Education, University of Michigan. Funding was made possible (in part) by 5 R25 RR022703 from the National Center for Research Resources, National Institutes of Health.

UNIVERSITY OF MICHIGAN SCHOOL OF EDUCATION
CENTER FOR Public Health and
SEPA SCIENCE EDUCATION PARTNERSHIP AWARD
Supported by the National Center for Research Resources, a part of the National Institutes of Health

Welcome to DNA Night!

taking a closer look at
"DEOXYRIBONUCLEIC ACID"
(DNA)
Participating Detroit Schools:

Osborn High School Academy of Mathematics, Science, & Technology
and
West Side Academy Alt. Education

Hosted by
TWW Employment Solutions
and
Angel Land Child Care and Parent Institute

Thursday, January 26, 2012
5:30 p.m.—8:30 p.m.

TWW Employment Solutions
151 W. Fort Street
Detroit, MI

About our speaker

Victoria M. Raymond, MS, is a Genetic Counselor in the Department of Internal Medicine at the University of Michigan where her clinical and research focuses are in Hereditary Cancer Syndromes. Ms. Raymond received a Bachelor of Science degree in biology/chemistry from Xavier University, Cincinnati, Ohio, and a Master of Science degree in medical genetics from the University of Cincinnati. Certified by the American Board of Genetic Counselors, Ms. Raymond is the author of several publications, including, most recently, articles on genetic counseling and genetic testing in hereditary gastrointestinal cancer syndromes, calculation of risk of colorectal and endometrial cancer among patients with Lynch syndrome, and risk of pancreatic cancer in families with Lynch syndrome.

Agenda

4:30-5:30 pm	**Students Set-Up** **Demonstrations and Posters**
	Program Co-Facilitators **Ada Clay—TWW Employment Solutions** **Ella Greene-Moton—SEPA Staff Support**
6:00-7:30 pm	**Buffet Dinner**
6:30-6:45 pm	**Welcome /Introductions**
6:45-6:50 pm	**Event Process/Instructions** **Deborah Peek-Brown** **SEPA Staff Support**
6:50-7:00 pm	**Introduction of Keynote Speaker** **Everett Hodge** **Osborn Parent Resource Center**
7:00-7:15 pm	**Keynote Speaker** **Victoria Raymond**
7:15-8:00 pm	**Demonstrations and** **Poster Exhibitions**
8:00-8:15 pm	**Awards/Acknowledgements**
8:15-8:25 pm	**Evaluation**
8:25-8:30 pm	**Closing Remarks**

West Side Academy Alternative Ed.
Principal: Andrea Ford-Ayler
Teacher: Daydawn Butler

Participating Students

Breast Cancer (BrCA1)-Poster Board
Clay Sculpture
Kiera Allen
Reionna Winchester

Diabetes-Power Point /Rap
DeAngelo Bert
Michael Pulley

Parkinson's Disease-Power Point
Protein Synthesis Demo
Justin Moss

Sickle Cell Anemia-Pedigree Demonstration
Lea Rogers

Thalassemia-Brochure
Justin Poole

Tay-Sach Disease-Poster Board
Danielle Brown-Miller

Observing Tyrosinase/Sammy Sosa (Lab Activity)
Davon Watson
Victor Wiley

Hemophilia Blood Simulation
Ty'Ron Stephens

University of Michigan
School of Public Health
1415 Washington Heights, Suite 4605
Ann Arbor, MI 48109
Phone 734-615-3412
Fax 734-998-6798

Photograph Release

Name_____

Address_____

City_____ State_____ Zip_____

Phone_____

I give permission to the University of Michigan to release U-M-owned photographs in UMSPH advertising, marketing or promotional materials or to any television, internet or print media and to use it for educational or promotional purposes. This information may be used by the Center for Public Health and Community Genomics and the media indefinitely. I can revoke this permission at any time by calling the Center for Public Health and Community Genomics at 734-615-3412. I understand this is voluntary and will not affect any relationship that I may have with the University of Michigan.

I understand these photographs may be released to the public. Once released, these photographs are no longer protected and may be used by the public. I release the University of Michigan, its agents, employees and any other persons involved with taking or producing these photographs from any and all liability which may or could arise therefrom.

Name (printed) _____

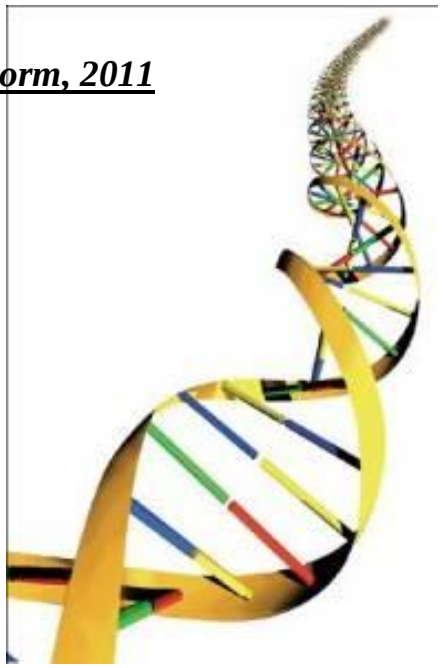
Signature _____

Date _____

Parent/legal guardian name if applicable (printed)
_____

Parent/legal guardian signature _____

Date_____



DNA Night Project & Presentation Student Feedback Form, 2011

Please give this form to the student

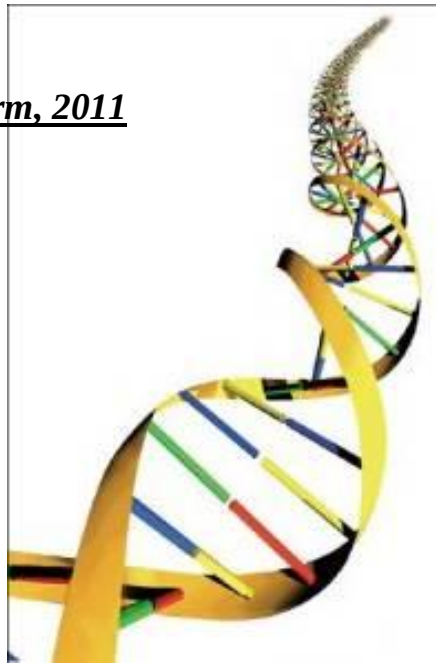
Reviewer: _____

Student: _____

What went well with the project?

How could the project be improved?

Thought provoking questions or suggestions for future science projects:



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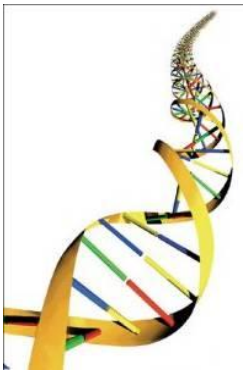

People's Choice Award

Pick the 3 presentations that you like the best and rank them #1-3

#1- first choice…… #3 last choice

PROJECT NUMBER	RANK	COMMENTS
	1	
	2	
	3	

Flint DNA Night
December 20, 2011
Questionnaire

I am affiliated with:

___The Classical Academy ___Southwestern Academy ___No School Affiliation

	Strongly **Disagree**	Somewhat **Disagree**	Neither agree nor disagree	Somewhat **Agree**	Strongly **Agree**
1. The DNA Night activities made me want to learn more about genomics.					
2. The DNA Night activities made me want to attend other events to learn more about genomics.					
3. The DNA Night activities were beneficial to me.					
4. In my opinion, the DNA Night activities were beneficial to the students.					
5. I enjoyed the guest speaker's presentation.					
6. I enjoyed the student presentations.					
7. Student presentations on genomics increased my knowledge of what affects my own health.					
8. Student presentations showed me how genes affect similarities and differences between people and groups.					

9. What was the best part of the session?

10. How could DNA Night be made better?

I am a (please circle one):

High school student studying genetics Teacher/school personnel

Other student Community resident

Parent Other: _____

Quick Tips for "Success"

Mentorship

- Identify a mentor. Someone who you look up to, either personally or professionally, who can offer direction and advice. Become a mentor to even younger students.

- Ask questions. Nobody is going to expect you to know everything, so don't be ashamed to ask about what you do not know. Ask for help if you need it. Pride goes before a fall.

- Surround yourselfwith like-minded people, those interested in doing well.

Being in the Right Place at the Right Time

- Shadow. If you think you are interested in a type of job, try to spend time with someone who does that and see what it's really like. People are usually very open to this, so ask.

- Volunteer to support the programs of select professional organizations. The relationships you form from these experiences are essential.

- Participate in community-based services, such as tutoring. This may offer networking opportunities and the like.

Prepare to Make it Happen

- Develop good study habits! Complete all homework and class assignments. Preview the assignments/lectures before class, read and then review.

- Prepare early. Take the ACT & SAT in enough time to retake if not satisfied with your score.

- Don't get frustrated with one bad grade-it won't ruin your future, but you might have to explain what happened in job/graduate school interviews.

- Plan ahead, especially for summer internships and jobs. Finding a perfect fellowship, scholarship, or internship and having it be past the deadline is not fun.

Keep Your Options Open

- Be open-minded. Your dream job today may be different in a year or five years.

- Set goals for yourself and create a plan to reach each goal. Remember to allow a little room for adjustments along the way.

- Don't compare yourself to others. Everyone's path is different and each person will be successful in her/his own way.

- Put your everyday life in a larger perspective. Sometimes you may feel like you have no other choice but to do something. But when you look at a larger picture, there are always other options.

Summer Science Programs for High School Students

University of Michigan Ann Arbor

- Michigan Math and Science Scholars 2010

A program designed to expose high school students to current developments and research in the sciences and to encourage

the next generation of researchers to develop and retain a love of mathematics and science.

Website: http://www.math.lsa.umich.edu/rnmss/index.html

Phone number: (734) 647-4466

Application: http://www.math.lsa.umich.edu/rnmss/2010/Apply.html

Application must also include a letter of recommendation, a school transcript, and a personal statement.

Application Deadline: No "official" deadline, but send application in ASAP to reserve a spot

Cost: $1700 for each two week session.

Financial aid is available: http://www.math.lsa.umich.edu/mmss/2010/Fees.html

Michigan Technological University

- Michigan Tech 2010

Explorations are lead by Michigan Tech faculty members, graduate students, and local specialists. Students spend

approximately 32 hours exploring their areas of interest through hands-on laboratory, classroom, and field experiences.

Website: http://youthprograms.mtu.edu/index.php

Phone Number: (888) 773-2655

Application: http://youthprograms.mtu.edu/students-enrolled-applications.php

Must also send a school transcript and a letter of recommendation.

Application Deadline: First come, first serve. Apply early to reserve your spot!

Cost: $750 per week

(check http://youthprograms.mtu.edu/students-enrolled-applications.php for scholarship opportunities)

Michigan State University

- High School Honors Science/Math/Engineering Program

The HSHSP provides its participants with a unique opportunity to "live and breathe" research in a university environment. Its goals are to educate about the research process and provide the social context for knowledge & expertise to flourish.

Website: https://www.msu.edu/ hshsp/index.htm Application: https://www.msu.edu/ hshsp/apps.htm Application Deadline: April1, 2010

Cost: $3200, Financial aid application available at:

https://www.msu.edu/ hshsp/apps.htm

Get Involved in Science For High School Students

University of Michigan Flint

- Saturday Morning Academy

Apply for next year: http://www.umflint.edu/hcop/Pre-College/SaturdayMomingAcademy.htm

Wayne State University

- Information Sessions on the College of Pharmacy and Health Sciences

Date: First Tuesday of March and April

Time: 6:00pm

Where: Eugene Applebaum College of Pharmacy and Health Sciences building, 259 Mack Avenue, Detroit, MI

48201

Questions: 313-577-1716

Genetics Related Careers

Clinical Geneticist: Clinical geneticists are physicians who specialize in diagnosing and providing the medical management for patients who have genetic conditions. Clinical geneticists also plan and coordinate large scale screening programs for a

variety of inherited conditions including certain birth defects and diseases detectable during the newborn period

of life.

- Median Income: $166,000-181,000 per year (2007)

Varies based on multiple variable including practice setting and whether the clinician is working in the public or private sector.

- Recommended High School Courses: Biology, Chemistry, Mathematics, Physics
- College Majors: Biology, Microbiology, Molecular Biology, Chemistry, Mathematics, Physics
- Minimum Education Requirements: MD or DO degree.

Genetic Counselor: Genetic counselors are health care professionals who complete a Masters degree program which prepares them academically and clinically to provide genetic counseling services to individuals and families seeking information about the occurrence, or risk of occurrence, of a genetic condition or birth defect.

- Average Income: $62,948 per year (2008)
- Recommended High School Courses: Biology, Chemistry, Physics, Mathematics, Communications, Psychology, and Health.
- College Major: Biology, Molecular Biology, Chemistry, Biopsychology, Psychology, Genetics. Applicants must have core course work in biological sciences, biochemistry, inorganic and organic chemistry, genetics,

psychology and statistics.

- Minimal Education Requirement: Master's Degree in Genetic Counseling from an Accredited Program.

Public Health Geneticist: Public health genetics is an emerging field that applies advances in human genetics, genomics, and molecular biotechnology to improve public health and prevent disease.

- Median Income: $62,748 per year (2002)
- Recommended High School Courses: Biology, Mathematics, English, Government, History
- College Majors: Biology, Chemistry, Anatomy, Genetics, Physiology
- Minimal Education Requirement: Bachelor's Degree for some positions. Students with career interests in

genetics and public health should enroll in a program leading to a Master's and ultimately a Ph.D.

Explore More Careers and Programs in Genetics

The American Society of Human Genetics

http://www.ashg.org/education/careers.shtml

American Institute of Biological Sciences

http://www.aibs.org/careers/

Careers in Genetics and the Biosciences

http://www.oml.govIsci/techresources/Human Genome/education/careers-6new.pdf

EcoTek- a science research organization made up of future scientists and engineers from major urban centers. There's one in Detroit!

http://www.ecotek-us.com/index.html

Genetics-Related Science Careers

Behavioral Researcher: Behavioral researchers develop improved methods to communicate to lay populations genetic risks; establish best practices to be used in genetic counseling; investigate approaches to successfully integrate genetics into primary care settings; and study broad issues relating to the meaningful dissemination of genetic advances to the general public.

- Median Income: $44,00 per year in 2006
- Recommended High School Courses: Social Sciences, Psychology, English, Biology, Chemistry, Mathematics
- College Majors: Psychology, Sociology, Anthropology, Biology
- Related Jobs: Bioethicist, Clinical Ethicist, Public Health Geneticist, Genetic Counselor, public Health State Administrator, Genetic Community Advocate, Health Educator
- Minimal Education Requirement: A Bachelors degree is the minimum degree required while conduction independent research requires a Ph.D.

Bioethicist: Bioethicists deal with the philosophical and practical ethical dilemmas that confront health care providers, researchers, policy makers and society. With the completion of the Human Genome Project and in the wake of continuing genetics research, new bioethical issues have emerged related to genetic research that includes human subjects and applying emerging genetic knowledge to diagnosing, treating and preventing diseases. A Bioethicist's job may include the analysis of the impact of genomics on concepts of race, ethnicity, kinship, individual and group identity, health and disease.

- Median Income: $62,000 (2004)
- Recommended High School Courses: Biology, History, Physics, Communications, Psychology and Health
- College Major: Philosophy, Psychology, Counseling, Biology, Chemistry, Health
- Related Jobs: Policy Maker, Clinical Ethicist, Genetic Counselor, Genetic Community

Advocate

- Minimal Education Requirement: Master's Degree

Biologist: Biologists utilizing genomics/genetics in relation to flora and fauna, study plans and small animals and their environment. Some study different types of plant life, including algae, fungi, lichens, mosses, ferns, conifers, and flowering plants; others specialize in areas such as the identification of plants, their structure and function, plant biochemistry, the causes and curs of plant diseases, the interaction of plants with other organisms and the environment, and the geological record of plant life.

- Median Income: $60,190 per year (2005)

- Recommended High School Courses: Biology, Chemistry, Mathematics, Physics
- College Majors: Biology, Botany, Genetics, Bacteriology, Chemistry, Mathematics, Physics.
- Related Jobs: Environmental Geneticist, Molecular Geneticist, Comparative Genomicist, Evolutionary Geneticist, Bacterial Geneticist, and Biologists working with endangered species
- Minimal Education Requirement: Bachelor's Degree

Genetics-Related Science Careers

Biomedical Engineer: Biomedical Engineers have been responsible for many innovations in biomedicine. They apply engineering principles to analyze and solve problems in biology and medicine. They have also been instrumental in developing genetically engineered organs and tissues for use in research and treatment.

- Median Income: $48,503 per year (2004)
- Recommended High School Courses: Biology, mathematics, English, chemistry, physics
- College Major: Mechanical engineering, Biomedical engineering, mathematics, biology, chemistry, physics, Business Administration, financial management
- Related Jobs: Nanotechnologist, Robotic Engineer, Genetic Engineer and for foreign language

teachers.

- Minimal Education Requirement: Bachelor's Degree; Many students obtain valuable biomedical research experience at the Masters or Doctoral level.

Clinical Cytogeneticist: Clinical Cytogenetics combines the study chromosome morphology with the study of congenital, genetic and inherited disease. Clinical cytogeneticists analyze biological samples- blood, bone marrow, fetal tissue, and other body fluids or tissues- to detect an congenital abnormalities, including hereditary diseases, learning disorders, infertility or reproductive complications, developmental problems, chromosomal anomalies, or blood diseases, such as leukemia.

- Median Income $63,000 per year (2004
- Recommended High School Courses: Biology, Chemistry, Mathematics, Physics
- College Majors: Biology, Microbiology, Molecular Biology, Cytology, Chemistry, Mathematics, Physics
- Related Jobs: Biomedical Scientist, Clinical Psychologist, Medical Physicist, Microbiologist, Molecular Geneticist, Toxicologist
- Minimum Education Requirement: Entry-level positions for clinical cytogeneticsts require only a Bachelor's degree. Advancement, teaching and research require a Master's degree, Ph.D., M.D. or D.O.

Genetic Epidemiologist: Genetic Epidemiology is that discipline that studies the causes and spread of disease in human populations as opposed to in individuals. Genetic epidemiologists are specifically concerned with the genetic factors involved in disease origination, proliferation, and prevention. They analyze DNA sequences in an effort to establish relationships between genetic make-up and environmental factors.

- Median Income: $52,000 per year (2005)
- Recommended High School Courses: Biology, Chemistry, Mathematics, Physics, Computer Science
- College Majors: Biology, Biochemistry, Molecular Biology, Chemistry, Genetics, Physics, Statistics
- Related Jobs: Comparative Geneticist, Epidemiologist, Evolutionary Geneticist, Population Geneticist
- Minimal Education Requirement: While some genetic epidemiologists work with only a Master's degree, most positions in the field require a Ph.D., an M.D. or a D.O.

Genetics-Related Science Careers

Genetic Counselor: Genetic counselors are health care professionals who complete a Masters degree program which prepares them academically and clinically to provide genetic counseling services to individuals and families seeking information about the occurrence, or risk of occurrence, of a genetic condition or birth defect. A majority of genetic counselors achieve certification in genetic counseling. In an increasing number of states, genetic counselors are licensed as well. Genetic counselors work in a variety of clinical settings, including pediatric, prenatal, cancer, cardiovascular disease, and psychiatric genetics as well as neurogenetics and pre-implantation genetic diagnosis. There are also a growing number of opportunities to work in industry settings such as molecular diagnostic laboratories and pharmaceutical companies, and in public policy or public health positions.

Average Income: $63,057per year (2008)

- Recommended High School Courses: Biology, Chemistry, Physics, Communications, Psychology, and Health.
- College Major: Biology, Chemistry, Bio-psychology, Psychology, Genetics. Applicants must have core course work in biological sciences, biochemistry, inorganic and organic chemistry, genetics, psychology and statistics.

Related Jobs: Genetic Nurse, Public Health Geneticist,

Minimal Education Requirement: Master's Degree in Genetic Counseling from an Accredited

Program

Genetic Nurse: Genetic nurses are licensed providers of specialized nursing care who integrate knowledge of clinical genetics into their practice. They work in a range of clinical settings from

(primary to tertiary care as well as specialized care. Genetic nurse specialists perform or assist genetic tests and utilize the findings of such testing. Nurses who have an expertise in genetics, in

addition to working in clinical facilities, work in genetic testing laboratories, biotechnical companies and medical research centers.

- Median Income: $54,670 per year (2005)
- Recommended High School Courses: Biology, Chemistry, Physics, Communications, Psychology, and Health.
- College Major: Completion of a Bachelor's in Nursing. Elective should include English Language, Sociology and Anthropology as well as courses in Mathematics, Therapy and Counseling.
- Related Jobs: Genetic Counselor, Primary Care Physician, Public Health Geneticist, Nurse
- Minimal Education Requirement: Master's Degree in Nursing (American Association of

Colleges ofNursing).

Medical Illustrator/Photographer: Medical illustrators are professional artists with extensive training in the medicine and the biological sciences, including genetics. They create visual media to help record and disseminate medical, biological and related healthcare information to professional and lay audiences. They create graphic representations for textbooks, pamphlets, exhibits, instructional films and various business publications.

- Median Income: $59,000 (2004)
- Recommended High School Courses: Biology, Computer Science, Design, Fine Arts
- College Major: Biology, Anatomy, Design, Fine Arts; Computer Graphics

- Related Jobs: Graphic Designer, Technical Illustrator, Medical Web Designer, Instructional

Support Developer

- Minimum Education Requirement: Bachelor's Degree

Nanotechnologist: Nanotechnology is the study of structures roughly on the same scale as individual atom (1 x 1o-6 rnrn). At this size, materials behave differently and can be mad

into new structures such as quantum dots, which are small devices tht behave like artificial atoms and can be used to tag sequences of DNA.

- Median Income: $78,467 (2004)
- Recommended High School Courses: Biology, chemistry, physics, algebra, geometry, pre-calculus, English, computing, keyboarding, accounting
- College Majors: Biology, molecular biology, quantum physics, microbiology, chemistry
- Related Jobs: Biological Scientist, medical scientist, engineer, chemist, computer programmer, operations research analyst, biophysicist, teacher, microbiologist.
- Minimal Education Requirement: While a bachelor's degree is the basic entry-level requirement, increasingly positions require a master's degree. Typically, a Ph.D. is required to conduct independent research.

Pharmacogenomicist: Pharrnacogenomicists combine knowledge of pharmacology and genomics to study how genetics determines or influences a person's response to drugs. The promise of pharrnacogenomics is safer, more efficacious drugs and vaccines.

- Median Income: $108,000 per year (2004)
- Recommended High School Courses: Biology, Chemistry, Mathematics, Physics
- College Majors: Biology, Chemistry, Mathematics, Physics
- Related Jobs: Biochemical Geneticist, Geneticist, Pharmacologist
- Minimal Education Requirement: Ph.D., M.D., D.O., Pharrn.D.

Population Geneticist: Population geneticists study the genetic composition of biological populations and the changes in genetic composition that result from the operation of various factors, including natural selection. Population Geneticists are concerned with the dynamics of inheritance within whole populations of organisms. They seek to explain the origin and nature of natural variations, their relationship to their environment, and ultimately, the process of evolution.

- Median Income: $63,000 per year (2005)
- Recommended High School Courses: Biology, Chemistry, English, Mathematics, Physics
- College Majors: Biology, Genetics, Genomics, Chemistry, Molecular Biology, Computer Science, Physics
- Related Jobs: Evolutionary Geneticist, Environmental Geneticist

- Minimal Education Requirement: Ph.D. Degree

Public Health Geneticist: Public health genetics is an emerging field that applies advances in human genetics, genomics, and molecular biotechnology to improve public health and prevent

disease. Public Health Geneticists apply the knowledge of inheritance, including basic \cellular and molecular mechanisms, to understand a variety of rare and common health conditions.

- Median Income: $62,748 per year (2002)
- Recommended High School Courses: Biology, Mathematics, English, Government, History, Speech
- College Majors: Biology, Chemistry, Anatomy, Genetics, Physiology
- Related Jobs: Genetic Counselor, Health Educator, Genetic Community Advocate, Genetic

Epidemiologist, and Policy Maker

- Minimal Education Requirement: Bachelor's Degree for some positions. Students with career interests in genetics and public health should enroll in a program leading to a Master's and ultimately a Ph.D.