Biomedical Sciences Program
States Funding Development of Biomedical Sciences Program:

- Connecticut
- Indiana
- Maryland
- Missouri
- Ohio
- Oklahoma
- South Carolina
PLTW Biomedical Sciences Program

- Address impending critical shortage of qualified science and health professionals.
- Prepare students for rigorous post-secondary education at two and four-year colleges or universities.
Biomedical Careers

--- some examples ---

- Physician
- Nurse
- Dentist
- Veterinarian
- Pharmacist
- Paramedic
- Dietician
- Surgeon
- Research Scientist
- Health Information Manager
- Medical Technologist
- Radiologist
- Medical Technical Writer
- Physicians’ Assistant
- Biomedical Engineer
Sequence of Courses

- Principles of the Biomedical Sciences™
- Human Body Systems™
- Medical Interventions™
- BMS Capstone Course
Standards-Based

- National Science Education Standards
- National Health Care Cluster Foundation Standards
- Principles and Standards of School Mathematics
- Standards for English Language Arts
- Standards for Technological Literacy
- National Content Standards for Engineering and Engineering Technology*

* Once finalized
The Four Courses
Course #1: Principles of the Biomedical Sciences™

Student work involves the study of human medicine, research processes and an introduction to bioinformatics.

Students investigate the human body systems and various health conditions including: heart disease, diabetes, sickle-cell disease, hypercholesterolemia, and infectious diseases.
Course #2: Human Body Systems™

Students study basic human physiology, especially in relationship to human health. A central theme is how the body systems work together to maintain internal balance and good health.

Students use data acquisition software to monitor body functions and use the Anatomy with Clay® Manikens™ to study body structure.
Course #3: Medical Interventions™

Student projects will investigate various medical interventions that extend and improve the quality of life including: diagnostics, surgery, bio-nanotechnology, pharmacology, prosthetics, rehabilitation, and life style choices.
Course #4: BMS Capstone Course

In this capstone course, students will design and conduct experiments related to the diagnosis, treatment, and prevention of disease or illness. They will apply their knowledge and skills to answer questions or to solve problems related to the biomedical sciences.
Student Schedule

 entrevy
\[\text{Take college-preparatory science and mathematics courses concurrent with each Biomedical Science course}\]

\[\text{Choice of the science and mathematics courses is up to the school and the student}\]
Attributes of Graduates

- Think creatively and critically.
- Able to problem-solve.
- Communicate effectively.
- Have professional conduct.
- Able to work in teams.
- Understand how scientific research is conducted, applied, and funded.
Key Biological Concepts:

- Cellular basis of life
- Homeostasis
- Metabolism
- Cellular communication
- Transport of substances
- Inheritance of traits
- Defense and protection
Principles of the Biomedical Sciences Course
Examples of Student Activities from PBS Unit 2: Heart Attack

- Build a simple pump
- Dissect a sheep heart
- Use data acquisition software and sensors to measure EKG, heart rate, and blood pressure
- Examine blood cells
Examples of Student Activities from PBS Unit 4: Sickle Cell Disease

- Make a chromosome spread
- Isolate DNA from cells
- Analyze karyotypes
- Build models of DNA and proteins
- Read a genetic map
- Use computer simulation software to build a designer protein
Examples of Student Activities from HBS Unit 2: Communication

- Use data acquisition software and sensors to compare the response times of voluntary and reflex actions
- Create a map of regions of the brain
- Build a model of the endocrine system
- Dissect a sheep’s eye and experiment with lens
Examples of Student Activities from HBS Unit 4: Movement

- Build muscles groups on a skeletal manikin
- Design experiments to determine the energy requirements for muscle contraction
- Use data acquisition software to evaluate muscle function
- Measure pulses to monitor blood flow
- Design a training plan for an athlete
Curriculum Review
Reviewers:

- **Sarah Davis**: Middle school science teacher and consultant for Education Development Corporation
- **James Potter**: Research Associate in Hepatology, School of Medicine, Johns Hopkins University
- **Meredith Durmowicz, Ph.D.**: Chairperson, Department of Biology, Stevenson University
- **Barbara Houtz**: Director of Outreach, Eberly College of Science, The Pennsylvania State University
Curriculum Review Scoring Tool

- Scored 93 separate characteristics from 1 (inadequate) to 4 (no revision necessary)
  - Rigor and relevance
  - Alignment of Key Concepts, Essential Questions, National Standards, Performance Objectives, and actual student work
  - Vertical alignment to post-secondary educational requirements
Reviewer’s Scores:

- For the Principles of the Biomedical Sciences™, the average total score of the ratings from the reviewers was 3.5.

- For Human Body Systems™, the average total score was 3.7.
Reviewers Comments:

Jim Potter commenting on Principles of the Biomedical Sciences™: “The curriculum is very well designed and certainly provides rigor for a 9th grade curriculum. I was extremely impressed with the scope of the document. It is unusual for a 9th grade science curriculum.”
Reviewers Comments:

Meredith Durmowicz commenting on Human Body Systems™: “All of the projects do a very nice job of asking students to use and apply information in real situations, in order to generate a deeper understanding of important concepts.”
Curriculum Contents

- Teacher Notes
- Assessment
- National Standards
- Day-by-day Lesson Plans
- Student Activities
- Rubrics
- Resources
Teaching to the Curriculum

- Four specific courses
- Courses to be taught in sequence
- All four courses must be offered
Counselor & Teacher Training

- Counselor Conference (usually with pre-engineering)
- Teacher must have two semesters of college biology
- Two Week Summer Training Institute (STI)
- Three STI Sites
  - Stevenson University (Maryland)
  - IUPUI (Indiana)
  - Missouri University of Science & Technology
Professional Development

Self-Assessment and Pre-Core Training

Core Training

- Principles of Biomedical Sciences
- Human Body Systems
- Medical Interventions (summer 09)
- BMS Capstone Course (summer 10)

Summer Institute

Continuous Training

Virtual Academy

Master Teacher

Ready for core training

Ready for teaching

PLTW® 2008
Partnership Team

- Created by the end of the second year
- Consist of scientific, medical, technology community advisors along with school district teacher
- Goal is to provide optimal support for teachers & students & facilitate the operation of the program
Certification Process

- Same process as pre-engineering program
- Goal is to start certifications in 2010
Purchasing Manual

- Purchasing Manual is on the Project Lead The Way® website www.pltw.org
- Current manual has best prices found (no bid)
- National bid process will begin in 3rd year
  - Principles of Biomedical Sciences (PBS) bid list will be posted in December
  - Human Body Systems (HBS) next summer
End of Course Assessments (ECA) for Principles of Biomedical Sciences (PBS) will be field tested this winter.

ECA for PBS will be available for all sites this spring (spring 2009).
End of Course Assessments

- ECA for Human Body Systems (HBS) will be field tested next winter
- ECA for HBS will be available for all sites next spring (spring 2010)
- Two parts- Part A (online) & Part B
Data Collection

- All teachers must register themselves & their students on True Outcomes
Key differences

- Participation fee
- Courses are specific, taught in sequence & all four must be offered
- Students must be enrolled in four years of college math & science
- Teacher must have two semesters of college biology
QUESTIONS???
For More Information

Project Lead The Way® Website
www.pltw.org