

Project Lead The Way

Teacher Best Practices in the PLTW Biomedical Science Course

Sally Irwin Director of School Engagement Pennsylvania

Let's Collaborate!

0000

 $\overline{\mathbf{O}}$

D



Assessment Best Practices

What does assessment look like in your classroom?





Assessment Best Practices

- Formative
- Conclusion question quizzes
- Peer formative assessments
- Frequency of Summative Assessments: end of lesson vs end of unit
- Authentic Summative Assessments
- New PLTW Assessment



Assessment Updates

New End of Course (EoC) Assessments: 2018-2019 School Year

Measures what matters most	Creates currency for students	Reflects education and industry needs
 Course specific knowledge Transportable skills Problem solving Critical and creative thinking Collaboration Communication Ethical reasoning and mindset 	Students can share with higher education institutions and employers for consideration in decisions about: admissions, scholarships, dual credit opportunities, campus experiences, internships, apprenticeships, industry certifications, and more.	Designed with the insights and validation from representatives in education and industry

PLTW Frameworks

Frameworks have a new format:

- Knowledge and Skills what students will know and be able to do after they learned the lesson content
- Objectives skills that directly relate to the workplace or academic settings
- Domains in-demand expertise that an employer may seek; key understandings and long-term takeaways
- Competencies general characterizations of the transportable skills that benefits students in various professional and academic pursuits

Framework Example from HBS Lesson 1.3

Unit 1 - Lesson 1.3

Essential Questions

- 1.3 1 What role does DNA play in human identity?
- 1.3 2 How can molecular biology techniques be used to compare the DNA of two individuals?

Competencies (C), Domains (D), Objectives (O), Knowledge and Skills (KS)

C1 Problem Solving and Process Thinking

Strategic and systematic design and inquiry processes guide the development of an effective solution to the problem.

D1 Experimental Design

An experimental design process is a systematic approach to investigate and gain knowledge.

O1.1 Design an experiment that investigates a research question.

KS1.1.6 Select and use appropriate equipment to conduct experiments.

- KS1.1.8 Communicate the findings of the experiment in oral and written (including digital) form.
- O1.2 Collect and analyze data to draw a conclusion

KS1.2.1 Read and follow established protocols and instructions.

KS1.2.2 Display data appropriately and accurately in digital or written form (graphs, tables, diagrams).

KS1.2.4 Draw logical conclusions from experimental data.

Lab Best Practices

How do you manage labs in your classroom?



Lab Best Practices

Organization of labs

- Read "Teacher Resources" in advance particularly "Preparation"
- Labeled tubs with all supplies
- Keep vendor labs in boxes that are dated with name of course
- Create list of labs that need prep and approximate dates



• Date and give course name for all perishables and lab name before storing in either refrigerator or chemical storage (use ziplock baggies and plastic containers)

Lab Prep

- Utilize students: BI and MI can help with PBS or HBS labs
- Allow a rotation of students to help prep labs
- Give opportunities for students to prep their own labs
- Work with administration to optimize the best planning time to allow for lab prep

Lab Best Practices

Student lab skills

- Pipetting activity at the beginning of the year create a pattern "Pipetting by Design"
- Review how to read and use a pipette before each lab
- Require students to teach you how to pipette
- Allow students to make agar and pour plates
- Allow students to pipette lab student lab materials

Lab Journals

- PLTW Lab Journals vs bound composition books
- Use of digital resources Google Classroom



Career Journals and More

What innovative ways have you done career journals in your classroom?

How else have you exposed students to the various biomedical careers?



Career Journals and More

- Key skill Proper documentation of sources
- Curriculum specific for the first three
- Students create an engaging presentation to "sell" the profession
- Student chooses a creative project: class gallery walk
- Guest speakers
- Field trips
- Every student reflects on each career
- STEM Outreach Organizations (STEMnet Maryland Scholars Speakers Bureau and STEM Specialist in the Classroom)



Community Resources and Partnerships

How have you used community resources and partnerships in your classroom?





Community Resources and Partnerships

Program Advisory Committee

• Perkins requirement

Local colleges and universities

- NSA Summer Programs earn college credits and exposure to business and industry
- BI Capstone Project Hagerstown Community College and Tufts University PARE Project Prevalence of Antibiotic Resistance in the Environment

Relevant industry connections

• MedImmune – Biomanufacturing Day

Student internship programs

• Fort Detrick – SIP

Perry Initiative Outreach Program

 Orthopaedic Surgery and Engineering for high school girls UConn Health 11/3/18, (past Tufts - 2/10/18, Yale - 4/6/18)

Recruitment and Retention

What innovative ways have you used to recruit and retain students in your biomedical science program?







Recruitment and Retention

Your current students are the very best recruiting tool

- Open houses and Elementary and middle school outreach
- Community STEM events
- State and Federal Legislators

Lab Coat Ceremonies

Capstone Project Community Event

- Judges from industry and academia
- Invite parents, school board members, District Administrators
- Invite PBS, HBS and MI students

Graduation recognition

- PLTW Stoles and or cords
- Recognition in graduation program





Student Organizations

How do you use student organizations to give students opportunities to apply their knowledge and skills learned in the classroom?



Student Organizations

HOSA

• HOSA- PLTW Partnership – Curriculum Crosswalk

SkillsUSA

Leadership and Professional Competitions

Science/ Biology Olympiad

Intel International Science and Engineering Fair

Numerous opportunities

Medical Interventions Overview

Unit 1: How to Fight Infection

Unit 2: How to Screen What is in Your Genes

Unit 3: How to Conquer Cancer

Unit 4: How to Prevail When Organs Fail





Medical Interventions "Big Labs"



Unit 1: How to Fight Infection

- ELISA
- DNA Sequencing Activity
- Bacterial Conjugation
- Antibiotic Sensitivity

Unit 2: How to Screen What is In your Genes

- PCR Amplification Lab
- PCR PTC Lab
- CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats)

Unit 3: How to Conquer Cancer

- Cancer cell vs normal cell microscopy
- DNA Microarray
- Skin Cancer Protection
- Breast Cancer Marker Analysis

Unit 4: How to Prevail When Organs Fail

- Bacterial transformation with pGLO
- Chromatography protein isolation
- SDS PAGE protein electrophoresis

Biomedical Innovation Overview

Curriculum: Eight Unique and Innovative Problems

Problem 1: Design of an Effective Emergency Room

Problem 2: Exploring Human Physiology

Problem 3: Design of a Medical Innovation

Problem 4: Investigating Environmental Health

Problem 5: Combating a Public Health Issue

Problem 6: Molecular Biology

Problem 7: Forensic Autopsy

Problem 8: Independent Project **Capstone



Biomedical Science Students





Questions