Problem-Based Learning in Technology Education

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HI-TEC 2009

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Agenda

- What is Problem Based Learning?
- The PHOTON PBL Three-Level Model
- A Tour of the PHOTON PBL Challenges
- Life Support and Sustainable Living (LSSL) – Modular Rescue Pod

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What is Problem- Based Learning?

What is Problem-Based Learning?

- *Originally developed for medical school education in the 1970s.*
- *PBL teaches students both content and problem solving skills through engagement with authentic real-world problems.*

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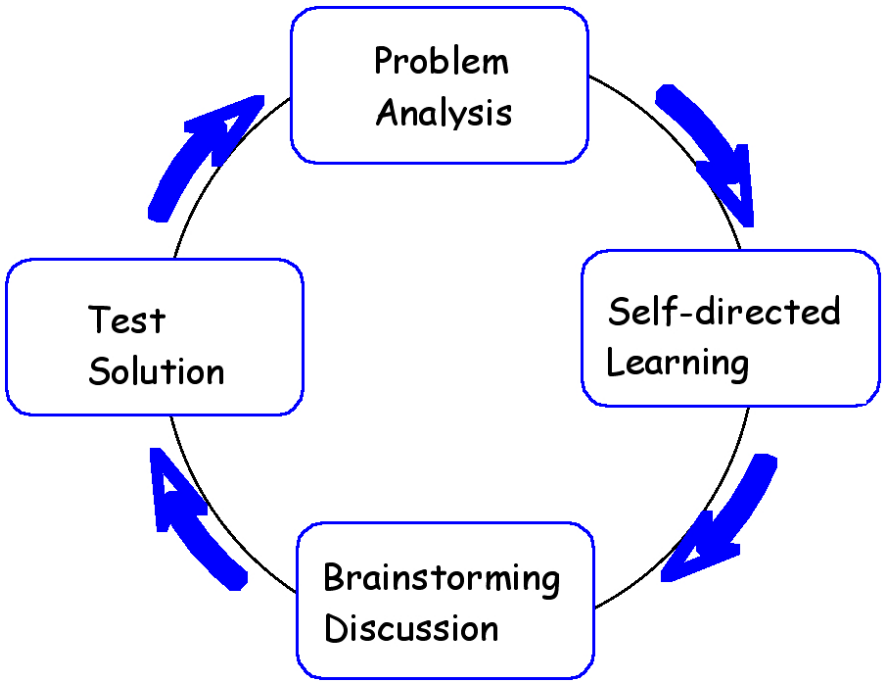
What is Problem- Based Learning?

Characteristics of PBL

- Students learn that problem solving is a process



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What is Problem- Based Learning?

Benefits of PBL

- Improves students' understanding and retention
- Promotes a "deep approach" to learning
- Improves critical thinking and problem solving skills
- Improves motivation for learning
- Improves students' ability to transfer skills and knowledge to new situations

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What is Problem- Based Learning?

Characteristics of PBL

- Learning occurs collaboratively in small groups
- Problems are presented *before* any formal preparation has occurred - the problem itself drives the learning
- New information is acquired via self-directed learning
- Instructor acts as a facilitator providing focused instruction and guidance on an “as needed” basis

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The Photon PBL Project

Three-year NSF-ATE Project

Project goals:

- Create 8 multimedia PBL “Challenges” in photonics technology in collaboration with photonics industry and university partners
- Recruit and train 28 (now over 50) HS & college STEM educators to field test PBL Challenges in their classrooms
- Create a comprehensive teacher’s guide for implementing PBL Challenges in STEM classrooms
- Conduct research on the efficacy of PBL in STEM education

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Creating the Challenges

Finding good PBL problems

- Open-ended with more than one possible solution
- Ill-structured with insufficient information to facilitate inquiry
- Based on real-world issues that engage students' interests
- Require cooperation and teamwork
- Builds on prior knowledge
- PHOTON PBL problems have been solved by partner organization to allow students to compare and contrast their own solutions

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PBL Challenge Structure

PHOTON PBL Three-level Model

Designed to acclimate students to the PBL method

1. Structured Challenge

- Instructor led, least student autonomy

2. Guided Challenge

- Instructor guided

3. Open-ended Challenge

- Instructor as facilitator, most student autonomy

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Accessing the Challenges

The Photon PBL Challenge Website

www.pblprojects.org

For PBL Implementation Guide contact:

Fenna Hanes
New England Board of Higher Education
Boston, MA
fhanes@nebhe.org

For Additional Resources:

http://www.photonprojects.org

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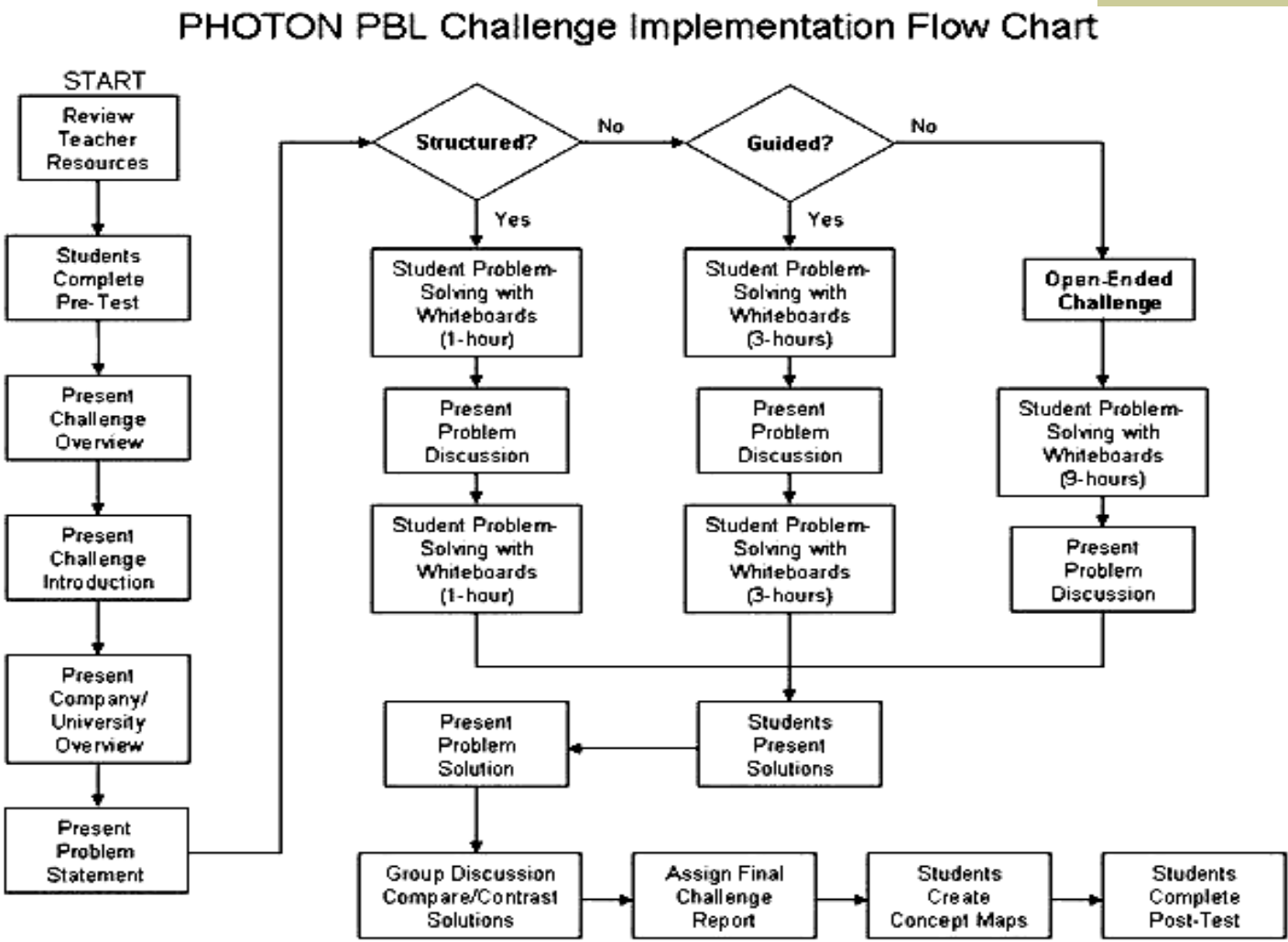
Implementing the Challenges



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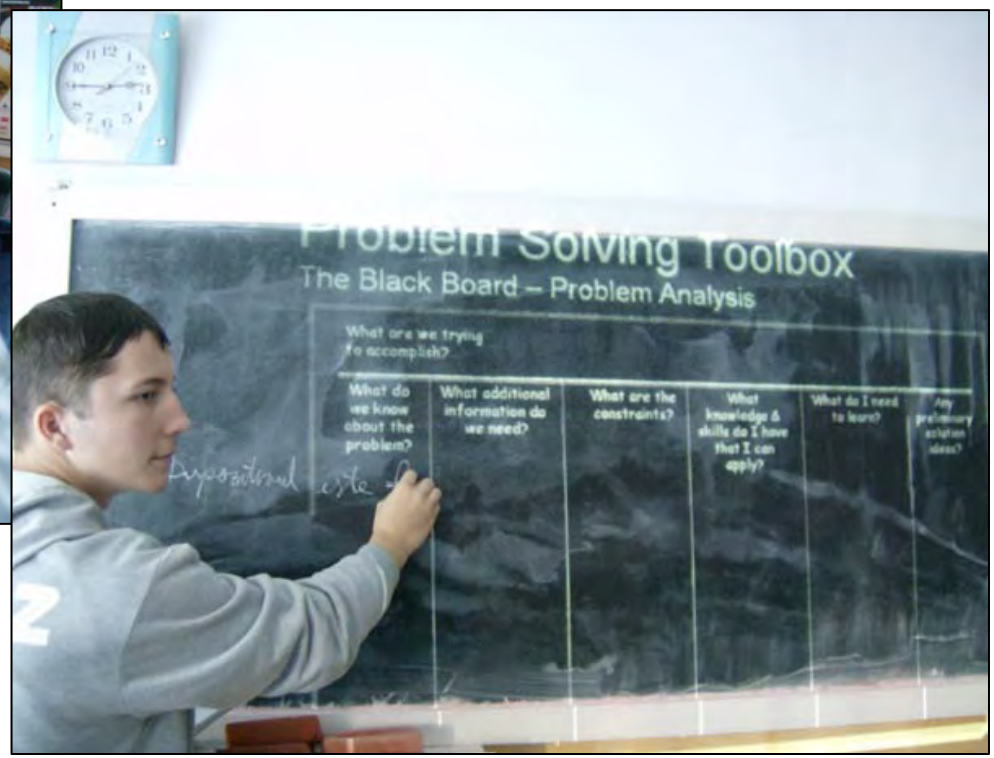
Engaging Students



Romanian HS Students using Photon PBL "Whiteboards"

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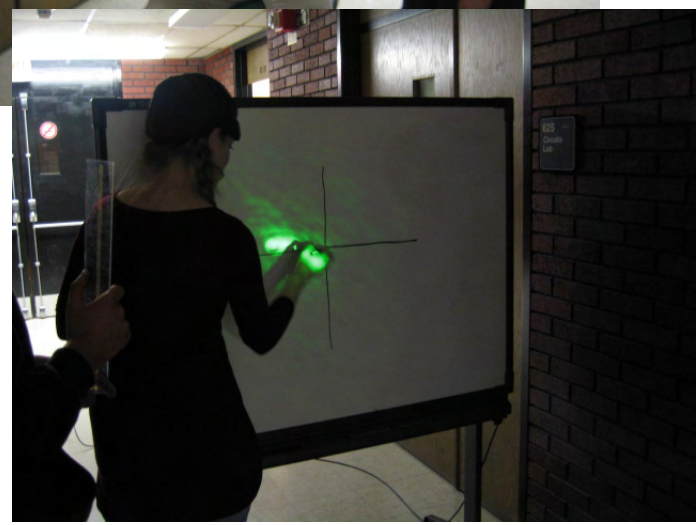
Engaging Students

STCC LEOT students using Photon PBL "Whiteboards"



STCC LEOT Students testing problem solution

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Engaging Students

STCC Students Build Integrating Sphere

Boston public HS Students Build Integrating Sphere

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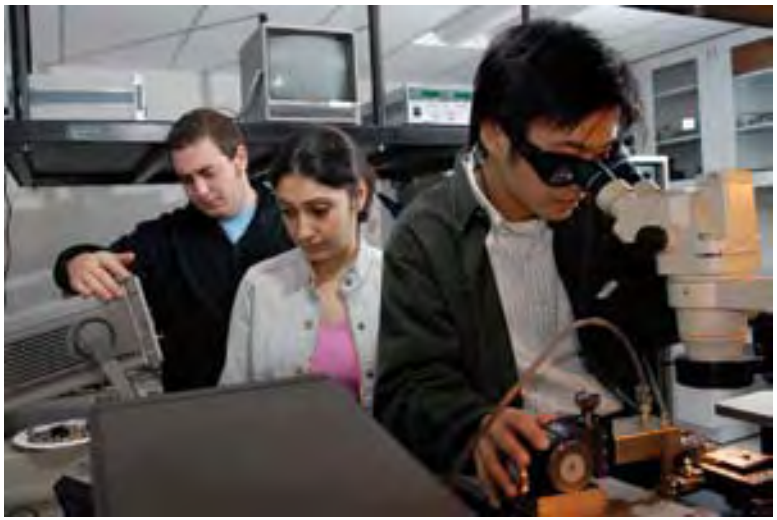
Engaging Students



Drexel University students work on a PBL Challenge.

STCC LEOT students building a prototype system for treating infant jaundice

"The Challenge opened my eyes to a whole new world... I wonder how much more I could have learned if this method had been an integral part of the core curriculum of STCC "

Porfirio Creque – STCC Class of 2008

Concluding Remark

An educational experience that emulates the world in which students will apply their knowledge and skills will produce proficient individuals capable of adapting to the ever-changing workplace of the 21st century