Photonics Leaders II

Evidence of Success: Embedded Assessments in Photonics Leaders II

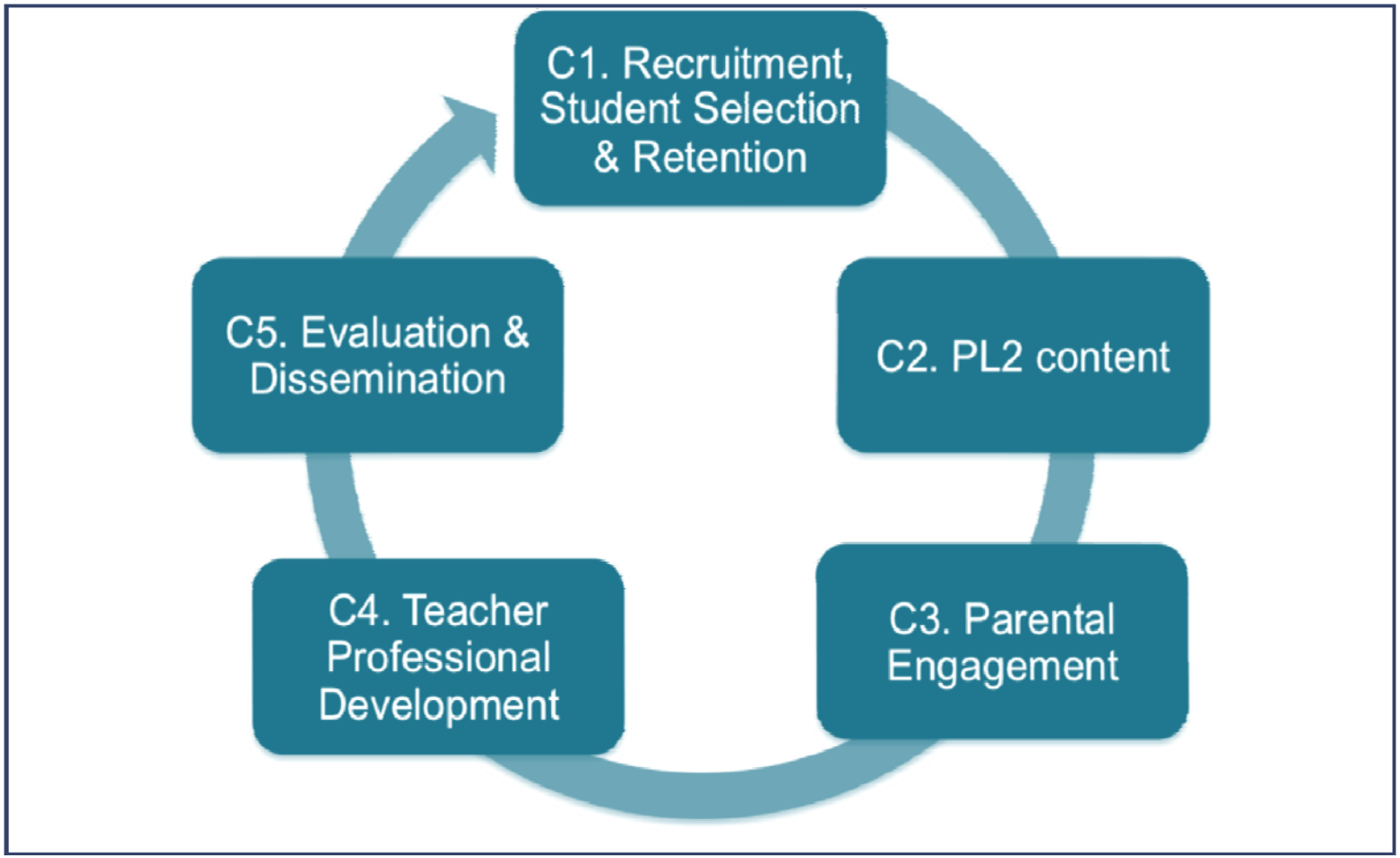
NC STATE UNIVERSITY

THE SCIENCE H-O-U-S-E

Photonics Leaders II

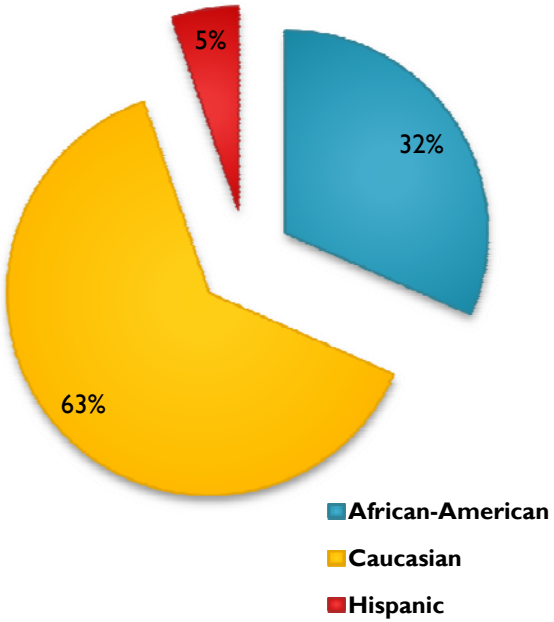
- Hybrid science and technology program
- Students – 164 hours annually
- Teachers – 45 hours annually

PL2 Program Model

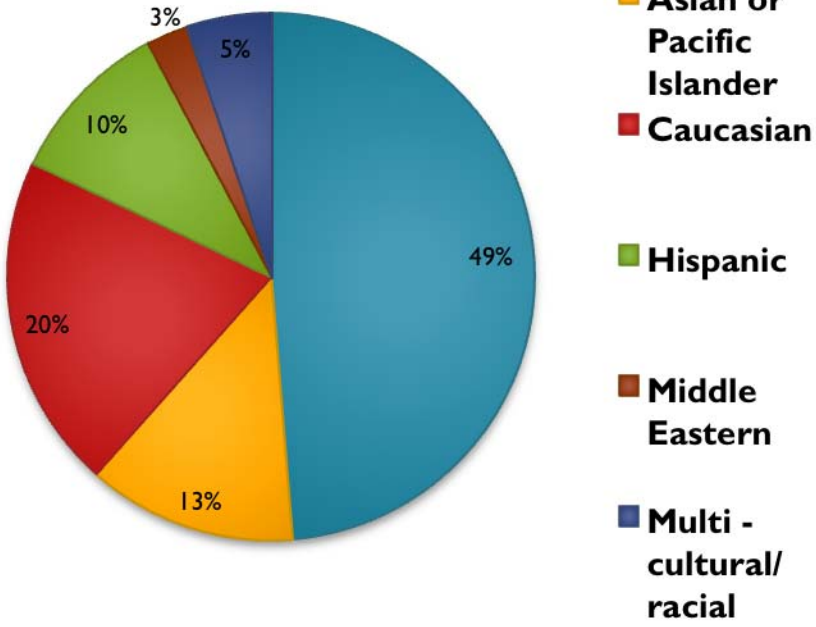


PL2 Participants

Middle and High School Teacher Data (N=19)



High School Students (N=39)



PL2 Student Program Objectives

- Recruit under-represented groups
- Retain 90% of students (for 2 year cycle) with 95% of those applying to college in STEM disciplines
- Increase students' knowledge of photonics and technology
- Develop and refine students' scientific investigation skills
- Develop students' understanding of the practical applications of science and talents, skills, and dispositions needed to succeed in the global workplace.

Assessment Assumptions for PL2

- Look beyond "testing" to fully illustrate the impact of PL2
- Align with instruction
- Provide quality (reliable and valid) evidence of program impact

Embedded Assessment

- Gathers data in a way that is indistinguishable (somewhat) from routine activities
- Provides framework for describing and reporting a progression of student achievement
- Gathers information on multiple indicators through various methods
- Builds in quality control
- Serves to educate
- Adheres to evaluation model of "empowerment evaluations"

(Wilson, 1995; Fetterman, 1996; Greene, 2006; Wilson & Adams, 2006)

PL2 Student Assessment Model

Variables to Measure	Embedded Assessment	Point in Time Assessments
Understanding of Concepts (Objective 1C)	Daily review quizzes (summer program); teacher reflections of "what worked well"	Observations; Pre/Post Knowledge Tests
Designing and Conducting Investigations (Objective 1E)	Written design of experiments with real-time feedback from instructors	Ratings of Culminating Projects
Communicating Scientific Information (Objective 1D)	On-going writing prompts	Incorporation of writing prompts into larger PL2 Student Performance Scale
Functioning in a Hybrid Learning Environment (Objective 1C)	Group and individual presentations virtual environment	Pre/Post Knowledge Tests; "Observations"
Better preparation for STEM careers (Objectives 1C-E)	Internship reflections	Student Feedback Survey

So….what role do embedded assessments play in our student assessment model?

PL2 Student Program Assessment Model (Evaluation Plan)

Variables to Measure	Embedded Assessment (Example of Evidence)	Point in Time Assessments (Evidence)
Understanding of Concepts (Objective 1C)	Daily quizzes reveal gaps in mathematics knowledge—instructor works one-on-one with students who need help	9.25 point increase (0-42 points total) from pre to post test group mean
Designing and Conducting Investigations (Objective 1E)	Students are required to post information about their science fair projects on "Moodle"—instructors review and give immediate feedback	78.9% of students score "proficient" or "expert" on their summer culminating project.
Communicating Scientific Information (Objective 1D)	Writing prompt data reveals that some students need to work on technical writing skills	(post data for Cohort 1 will be collected March 2010)

PL2 Student Program Assessment Model (contd.)

Variables to Measure	Embedded Assessment (Example of Evidence)	Point in Time Assessments (Evidence)
Functioning in a Hybrid Learning Environment (Objective 1C)	Elluminate (virtual classroom) observations show students' increased ability to work within a technology environment	Pre-survey revealed that 77% of students were NOT familiar with the virtual classroom environment. 100% of PL2 students use Elluminate (virtual classroom) and Moodle (wiki) to communicate with teachers and peers
Better Preparation for STEM careers (Objectives 1C-1E)	Internship reflections demonstrate that students have a general understanding of STEM career skills but need more guidance in developing a career pathway.	65% of students indicated on a follow-up survey that they are "more interested in a career in science" as a result of participating in PL2.

Embedded Assessment Example: Writing Prompt Data

Summer 2009 (nature of science prompt)	Spring 2010 (telescope prompt)
I would make [the] scientists figure out want the problem is and fix it accordingly. (Score = 1; Novice)	*---A telescope is an amazing device that has the ability- to make faraway objects appear much closer. The telescope's magnification, its ability to enlarge an image, depends on the combination of lenses used. The eyepiece performs the magnification. Since any magnification can be achieved by almost any telescope by using different eyepieces, aperture is a more important feature than magnification. A big lens gathers the light and directs it to a focal point and a small lens brings the image to your eye. You can make telescopes in your own home. (Score = 3; Proficient)*

Embedded Assessments-Opportunities

- Formative feedback tool for program administrators and instructors
- Formative feedback for students
- Creates a complete "picture" of program impact
- Assists in refining program components
- Identifies measurement issues so they can be resolved quickly.

Embedded Assessments—The Challenges

- How do we ensure that assessments align with instruction?
- Data, data everywhere…how do we package it?
- How do we involve stakeholders (PIs, instructors/teachers, students, parents, evaluators)?
- How do we focus on formative uses of embedded assessments while attempting to address summative questions?

Questions/Comments?

Project PI's:
Dr. Joyce Hilliard-Clark, PI
Pamela Gilchrist, Co-PI
The Science House
North Carolina State University
919-515-6118
www.science-house.org

External Evaluator:
Pam Van Dyk, Ph.D.
Evaluation Resources
Raleigh, North Carolina
919-839-1778; pvandyk@evaluationresources.org