

Inclusive Engineering Consortium

Next Generation Lighting Professionals

Industry
Education
Community

The K-12 to College Pathway

Ken Connor
The Inclusive Engineering Consortium
& Rensselaer Polytechnic Institute
LESA ERC Education Director (Retired)



Inclusive Engineering Consortium

<https://www.iec.org/>

Inclusive Engineering Consortium

A Super-Department Model for Multi-University Collaboration



Vision: More and Better Prepared ECE Graduates

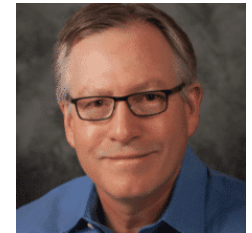
IEC Story

History

- RPI-Howard-Morgan Partners
- ECP:13 HBCU ECE Programs
 - Hands-On Pedagogy
 - Engr. Practice Model
- Can We Expand Beyond Pedagogy, Working as One?
- Created IEC (2019)

Opportunities

- Teaching Focus
- Advising Focus
- Very Large Numbers of Minority Engineering Grads
- Untapped Talent
- Community Identity



IEC Board



IEC

Super Department Model

- Multi-Institutional
- Share Resources/Support
- Improvement Science
- Success Thru Diversity
- Equitable Partnerships
 - Level Playing Field
 - Start At the Table

Profile

- Historically Minority Serving Institutions (HBCU, HSI, TCU)
- 20 Core Members
- 4 Affiliates
- 6 Industry Members
- > 5000 Undergrads
- > 200 Faculty
- Growing

ASEE

BACHELOR'S DEGREES AWARDED TO BLACK OR AFRICAN AMERICANS BY SCHOOL

1.	North Carolina A&T State University	154
2.	Georgia Institute of Technology	137
3.	Morgan State University	89
4.	University of Central Florida	88
5.	University of Maryland, College Park	79
6.	Florida International University	77
6.	University of Maryland, Baltimore County	77
6.	Kennesaw State University	77
9.	Tuskegee University	75
10.	New Jersey Institute of Technology	74
11.	Louisiana State University	70
12.	Howard University	69
13.	University of South Florida	65
14.	Georgia Southern University	64
15.	City College of the City U. of New York	61
16.	Mississippi State University	60
17.	Prairie View A&M University	58
18.	Arizona State University	53
18.	Massachusetts Institute of Technology	53
18.	North Carolina State University	53

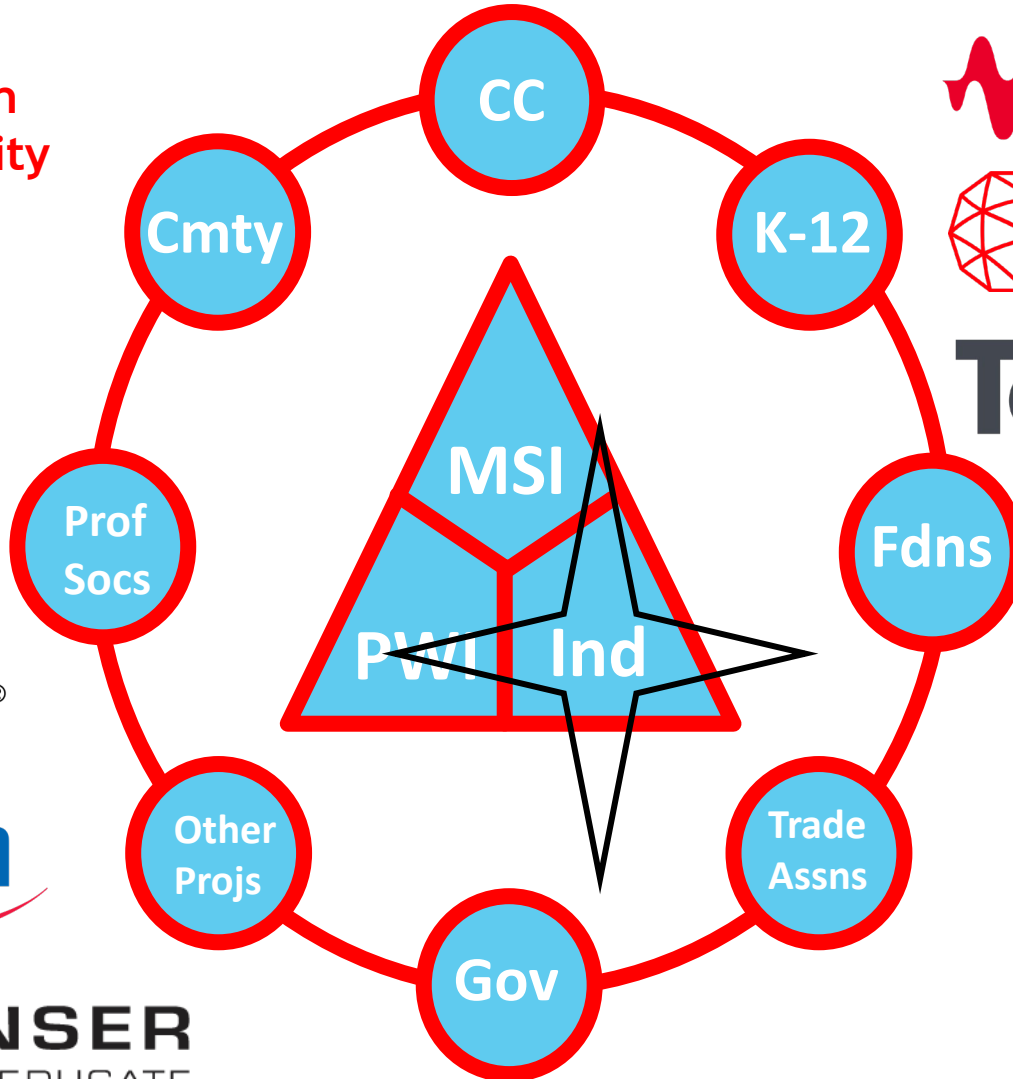
BACHELOR'S DEGREES AWARDED TO HISPANICS BY SCHOOL

1.	Florida International University	661
2.	University of PR, Mayaguez Campus	467
3.	Texas A&M University	401
4.	California State Poly. U., Pomona	363
5.	University of Central Florida	356
6.	The University of Texas at El Paso	343
7.	California State University, Long Beach	308
8.	Arizona State University	277
8.	The Univ. of Texas Rio Grande Valley	277
10.	University of Florida	273
11.	California State University, Northridge	196
12.	Texas Tech University	193
13.	The University of Texas at San Antonio	187
13.	University of Houston	187
15.	California Poly. State U., SLO	175
16.	Texas A&M University - Kingsville	172
17.	California State University, Los Angeles	171
18.	San Diego State University	169
18.	San Jose State University	169
18.	California State University, Fullerton	169



Vision: Engaged Equitable Partnerships

Industry
Education
Community



Overview

- Illumineer Curriculum
 - University Level Examples
- Mentoring Hierarchy
 - Engineering Ambassadors
- Partnerships
- Common Themes
- Model System
- Experiment Centric Pedagogy
 - Adjusted for All Levels
 - USA Science & Engineering Festival
 - Activities



Lessons Learned From
Its 10 Year History



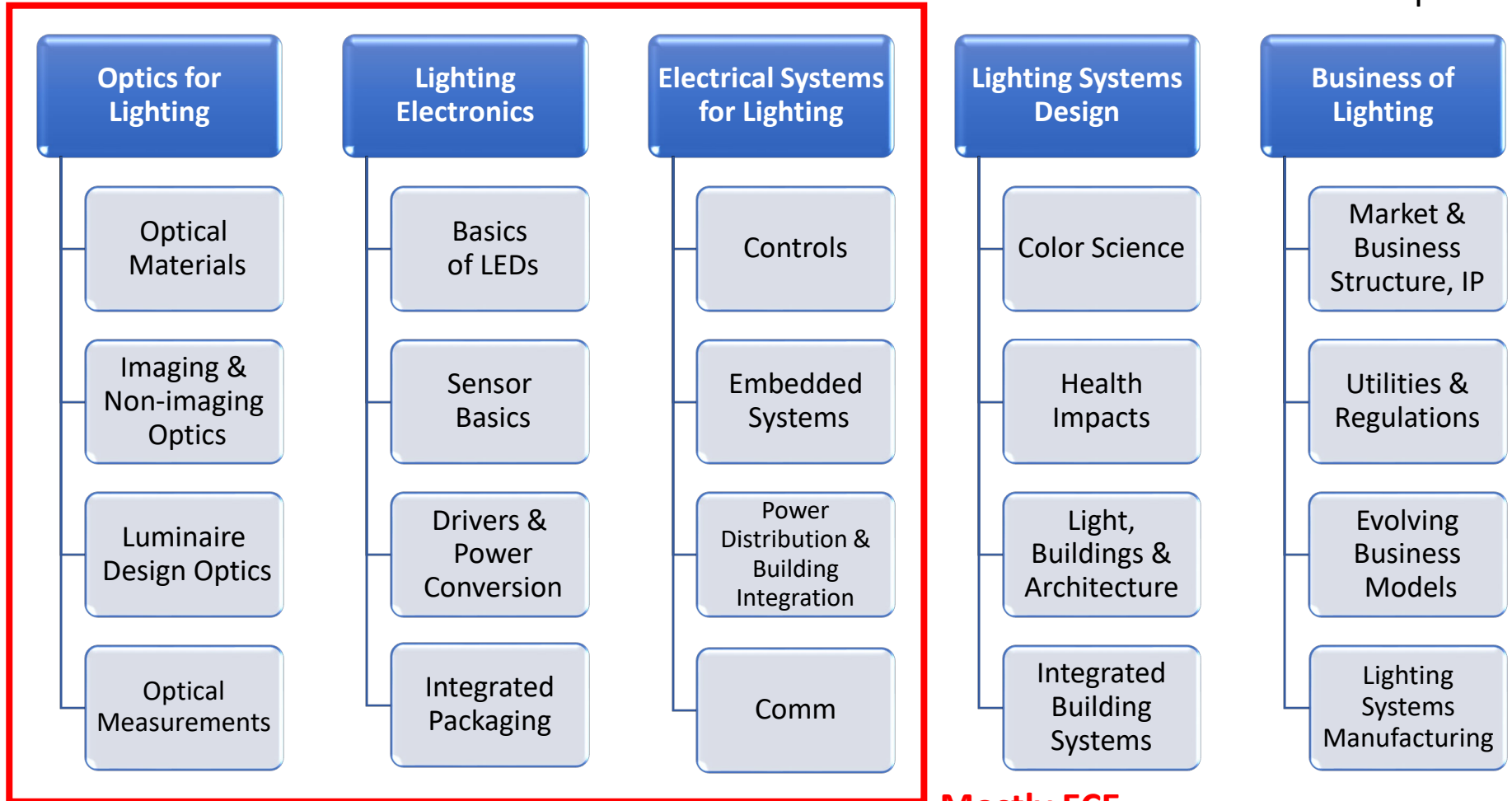
The First EE Program at RPI (1906)

Fourth Year: Structures, Materials of Construction, Hydraulics, Railroads, Alternating Current Machines Laboratory, Electric Railways Theory, **Electric Lighting Theory**, Telegraph and Telephone Systems-Theory, Transmission and Distribution of Electrical Energy-Theory, Central Stations Theory, Electrochemistry-Theory, Electromagnetic-Theory, Mechanical Laboratory, Geology, Law, and Thesis.



Illumineer Curriculum

Used for **Education & Outreach** –
Note the Breadth of the Topics



Mostly ECE



Courses Developed at LESA

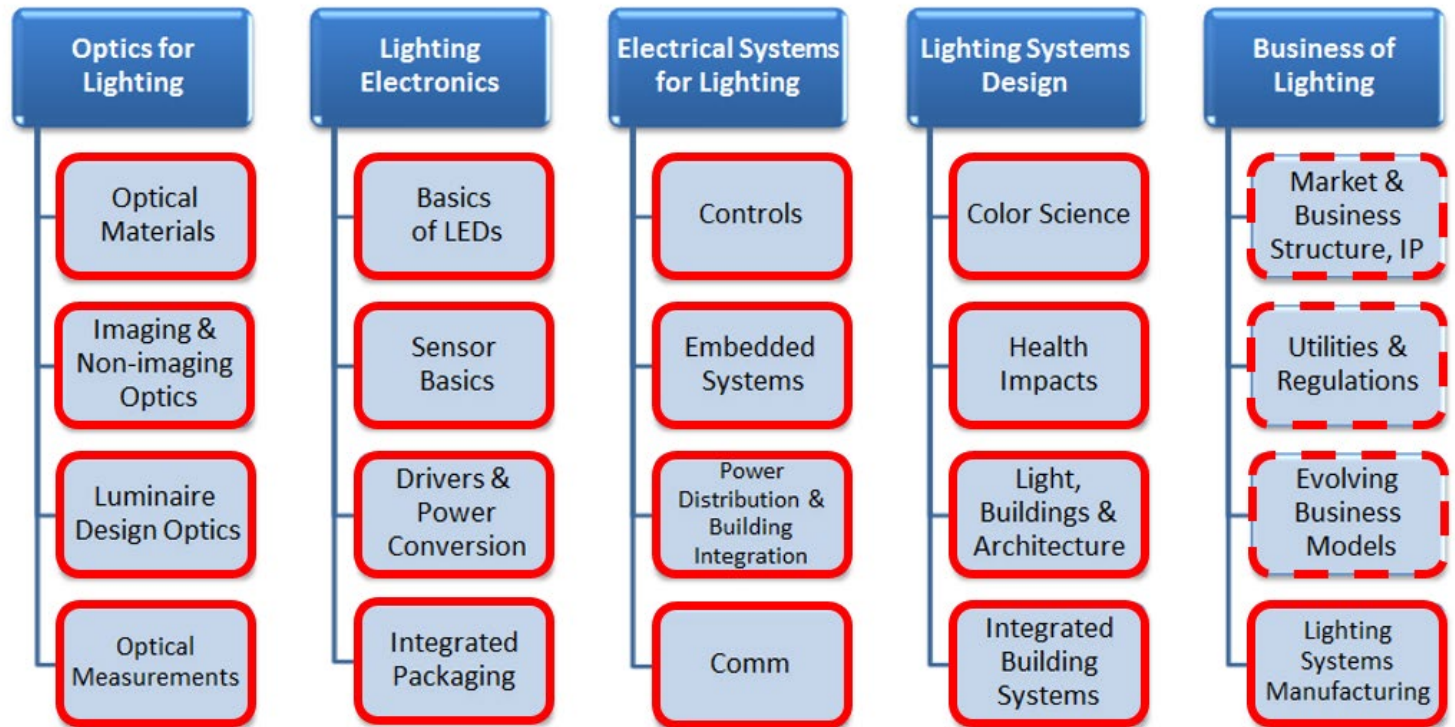
Examples

- **Fundamentals of Solid-State Lighting Systems (Karlicek)**
 - Elective course for seniors and grad students in many disciplines
 - Goal: Provide complete coverage of Illumineer Curriculum
- **Non-Imaging Optics: Lighting & Illumination (Bunch)**
 - Elective course addressing lighting, illumination and solar concentration systems for optical and other engineering majors
 - Goal: Provide introduction to lighting design
- **Introduction to Electrical, Computer, and Systems Engineering (Connor) Intro-ece.org**
 - Required 1st year course for EE and CSE students
 - Goal: Provide the core skillset for ECSE (ECE) students building on Experiment Centric Pedagogy and be totally accessible online



Courses Developed at LESA

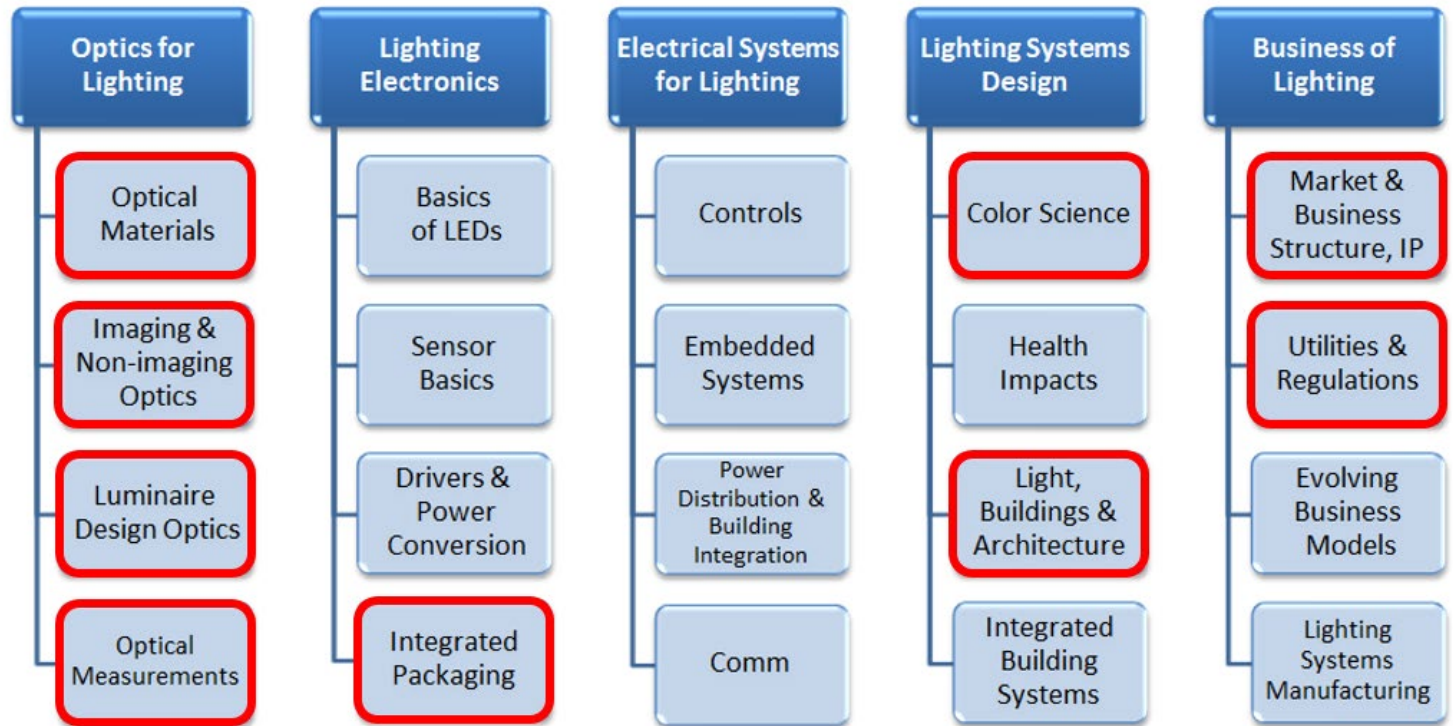
- Fundamentals of Solid-State Lighting Systems (Karlicek)
 - Complete coverage of Illumineer Curriculum



Courses Developed at LESA

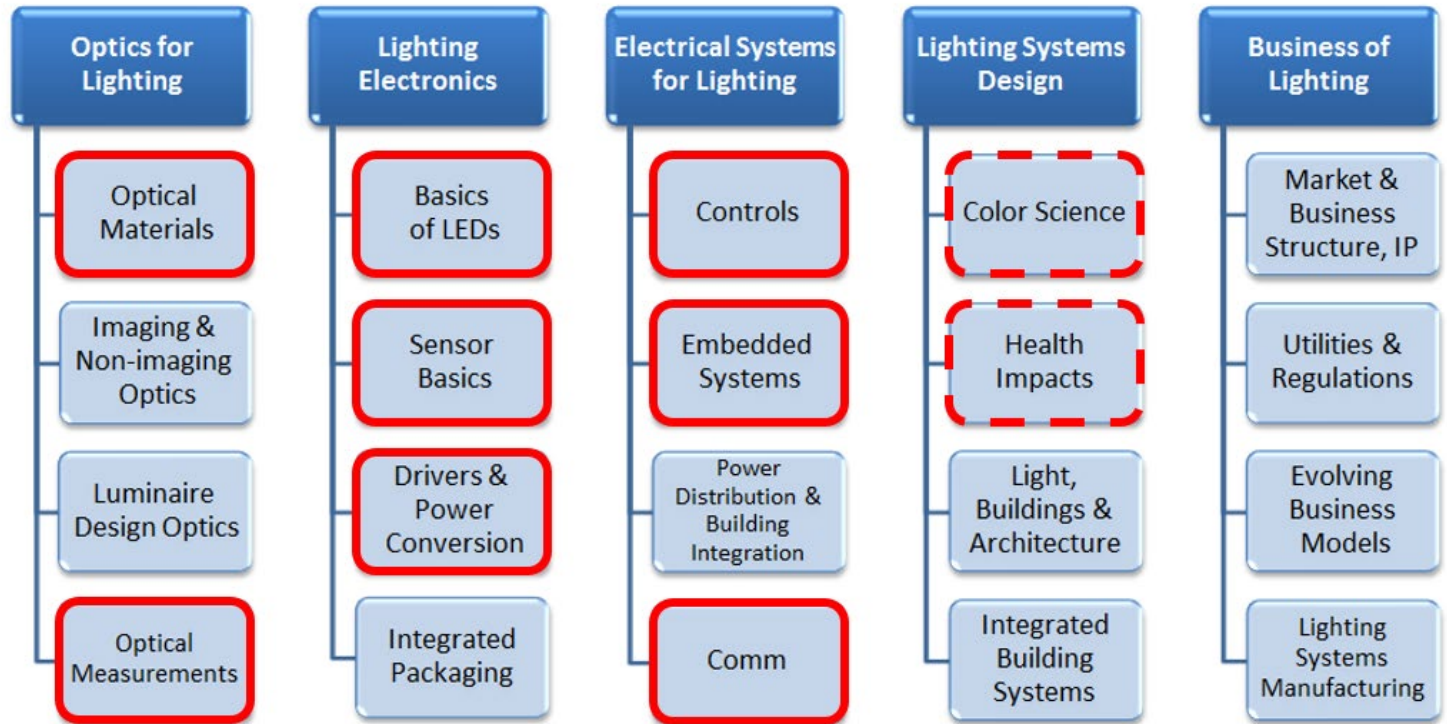
- Non-Imaging Optics: Lighting & Illumination (Bunch)
 - Full introduction to lighting design

Rose-
Hulman &
Norfolk
State
Optical
Engineering



Courses Developed at LESA

- Introduction to ECSE (Connor)
 - Core ECE skillset based on Experiment Centric Pedagogy



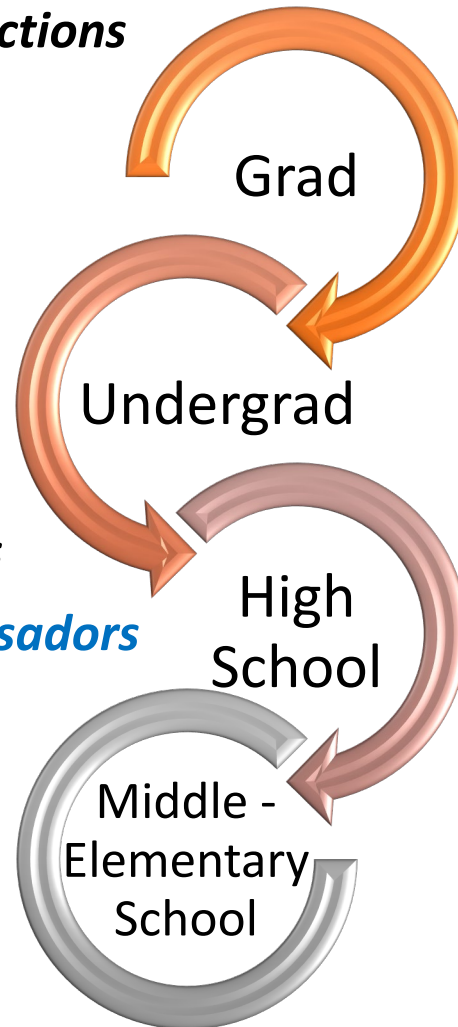
Mentoring Hierarchy & Partnerships

Internal & External Connections

Industry

Professional Societies

ERC E&O



Leverage Common Agendas, Personnel & Resources

**Puerto Rico & HBCU ECP
Sub Saharan Africa
SIPI & Other CC**

Leverage Common Agendas

Ambassadors

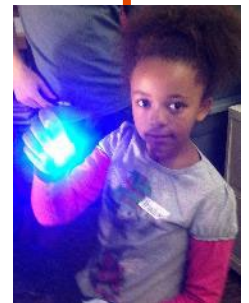
New Visions

**Mountain View
Watervliet**

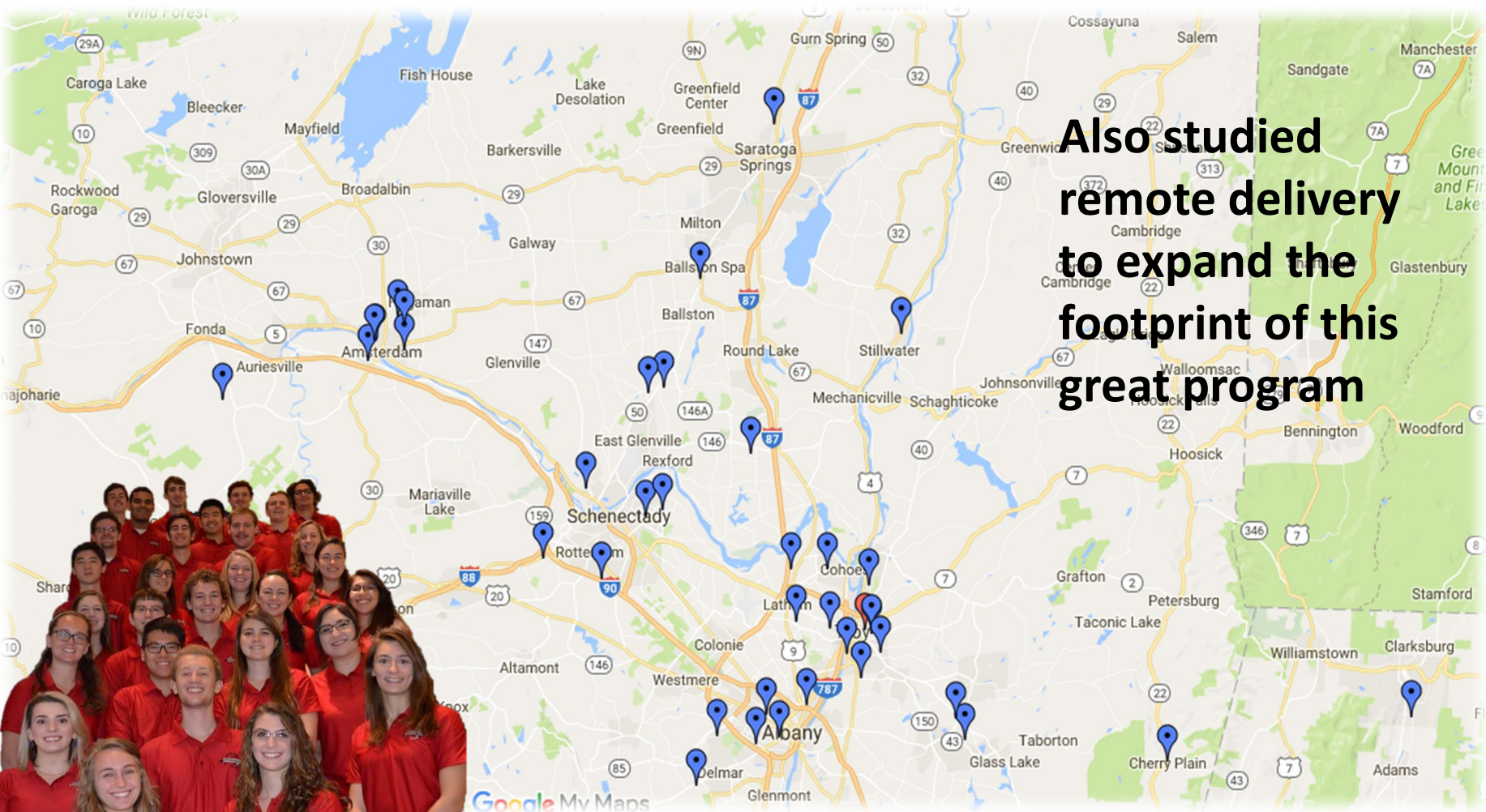
**Arlington,
School 14**

Faculty at All Levels

Student-To-Student



Engineering Ambassadors



**Also studied
remote delivery
to expand the
footprint of this
great program**

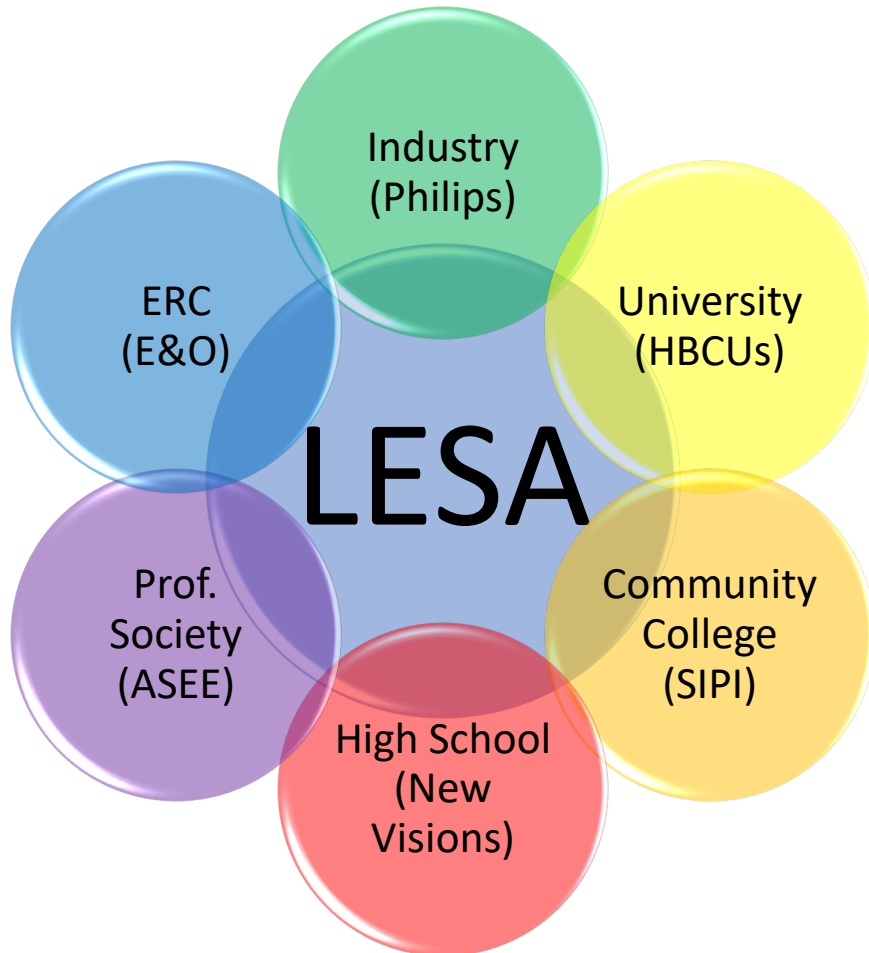


Inclusive Engineering Consortium

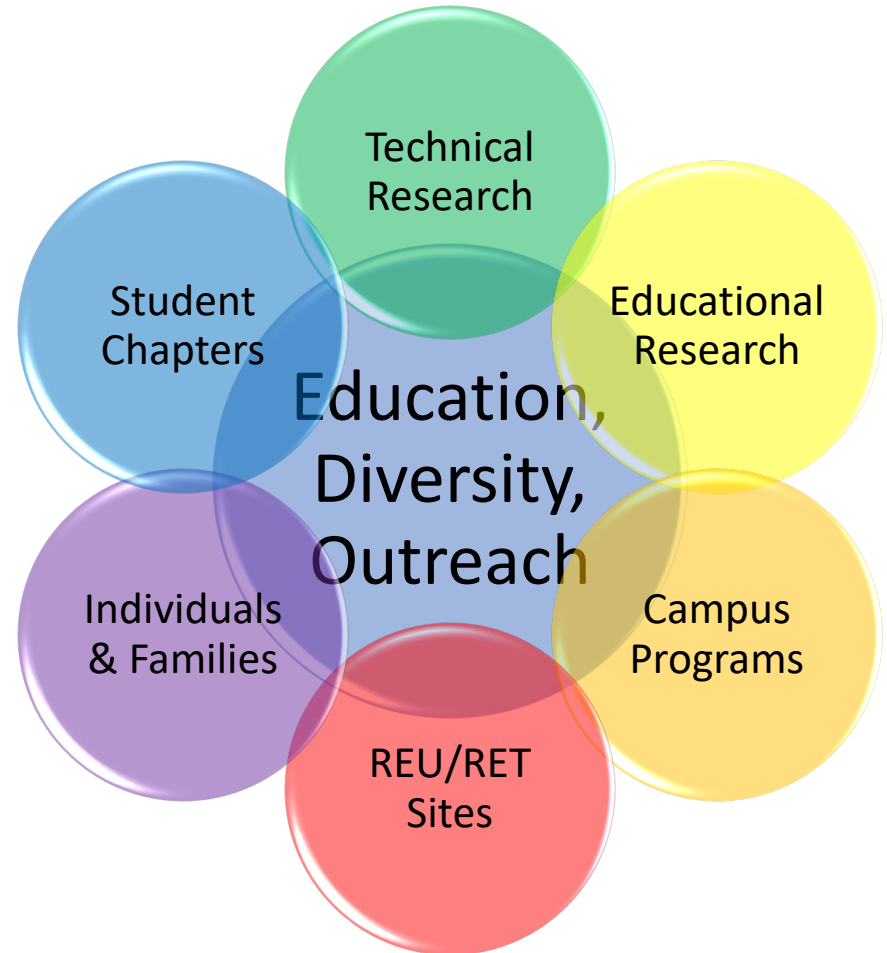
www.iec.org

Partnerships

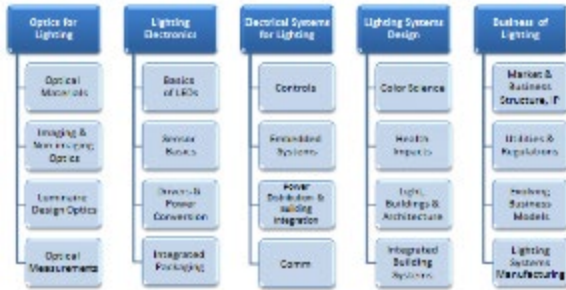
External



Internal



Common Themes



Illumineer Curriculum

Structure for all Activities



Mentoring Chain

*Everyone Learns,
Everyone Teaches*



Partnerships

*Everyone Benefits,
Common Agendas*

Model System

*Lighting Enabled System
Block Diagram*

E & O Delivery Platform

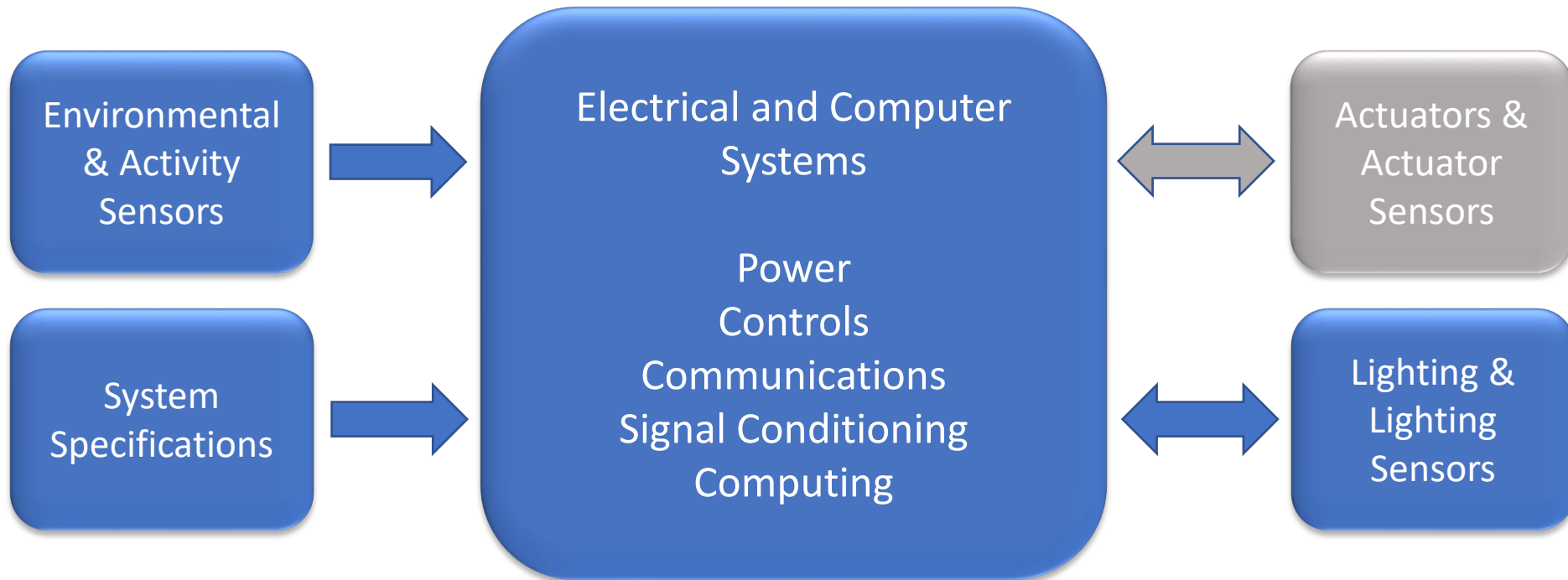
*Mobile, Cheap
Hands-On*

Experiment Centric Pedagogy

*Program Delivery Anytime
& Anywhere*



Model System

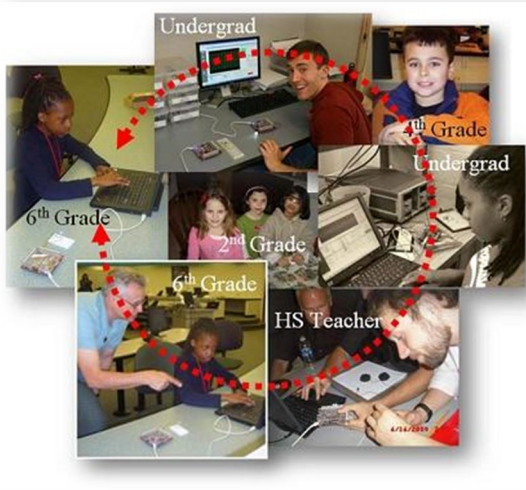


*Electrical & Computer
Engineering View*

*Provides Context
for Students*

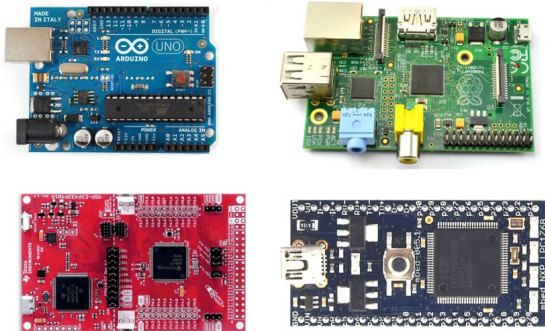


Experiment Centric Pedagogy

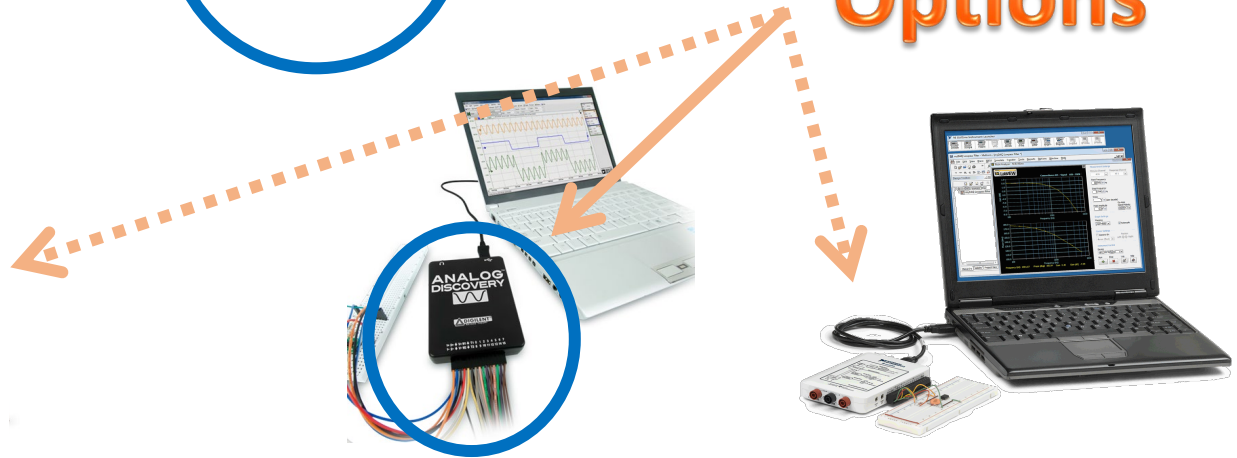


Anywhere ... Anytime

Also Processors Etc



Commercial Options



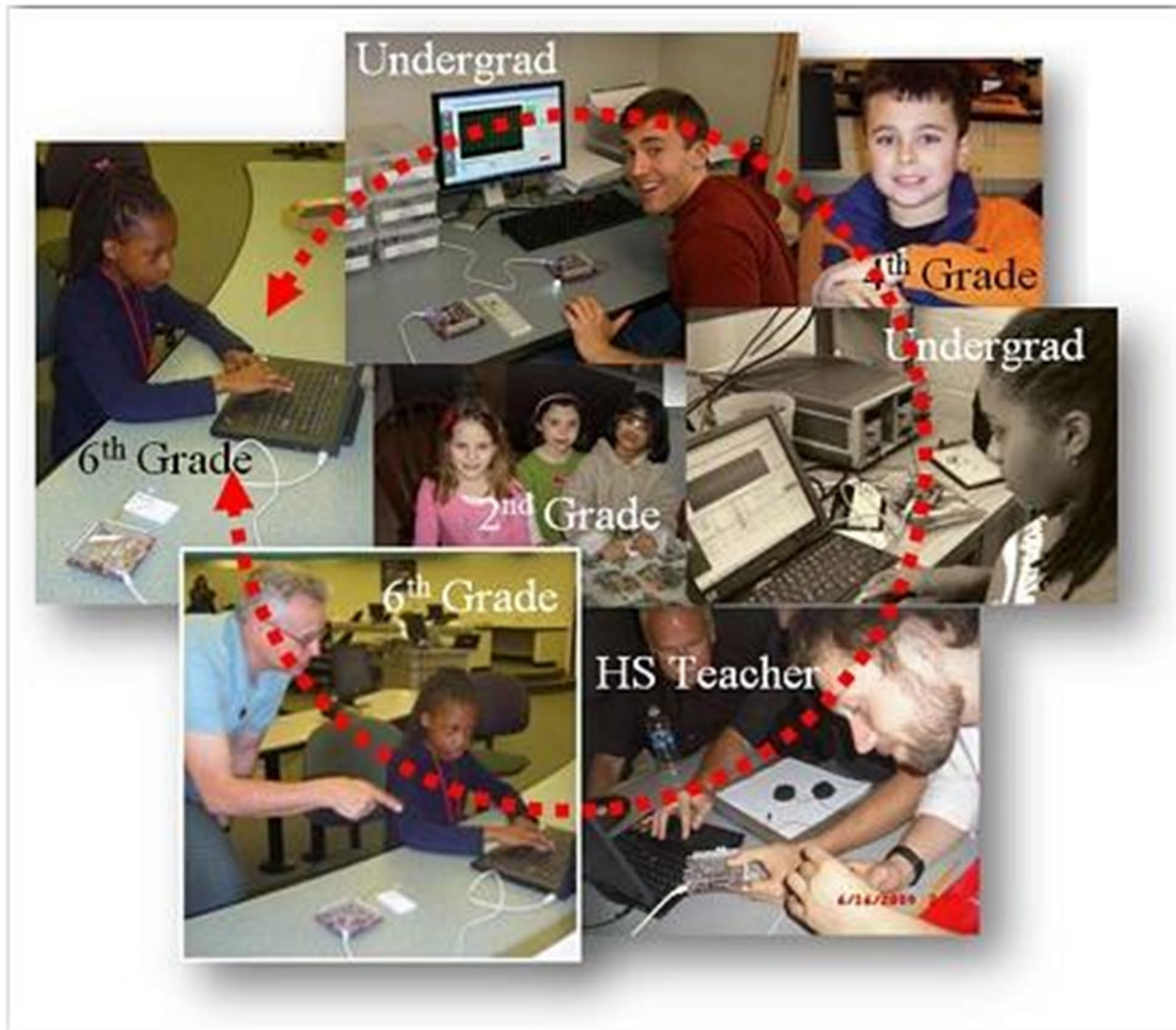
Platforms of Choice



Inclusive Engineering Consortium

www.iec.org

ECP Adjusted for All Levels



USA Science & Engineering Festival



Students from RPI, Howard & Morgan State helped with demos, hands-on activities ...

The LESA booth *Thinking and Tinkering* had 4000+ visitors in 20 hrs/ 3 days



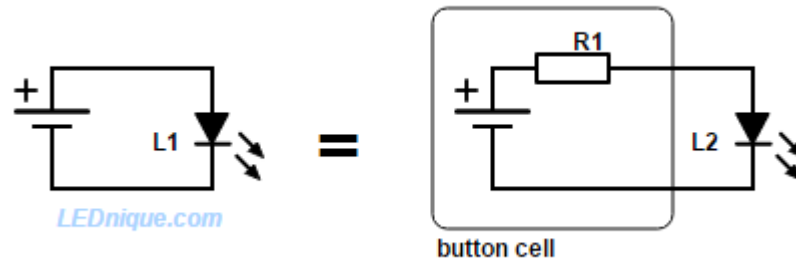
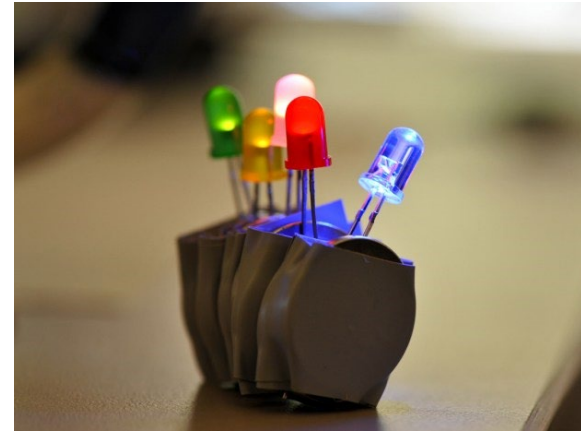
2000 batteries, 4000 LEDs, 3000 diffraction grating slides given away in hands-on activities



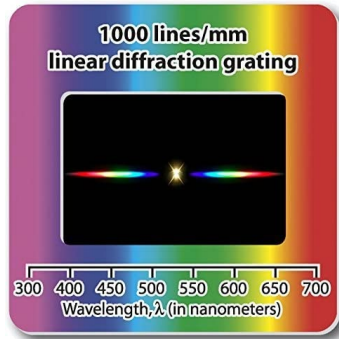
Video of Smart Conference Room & Some Giveaways.



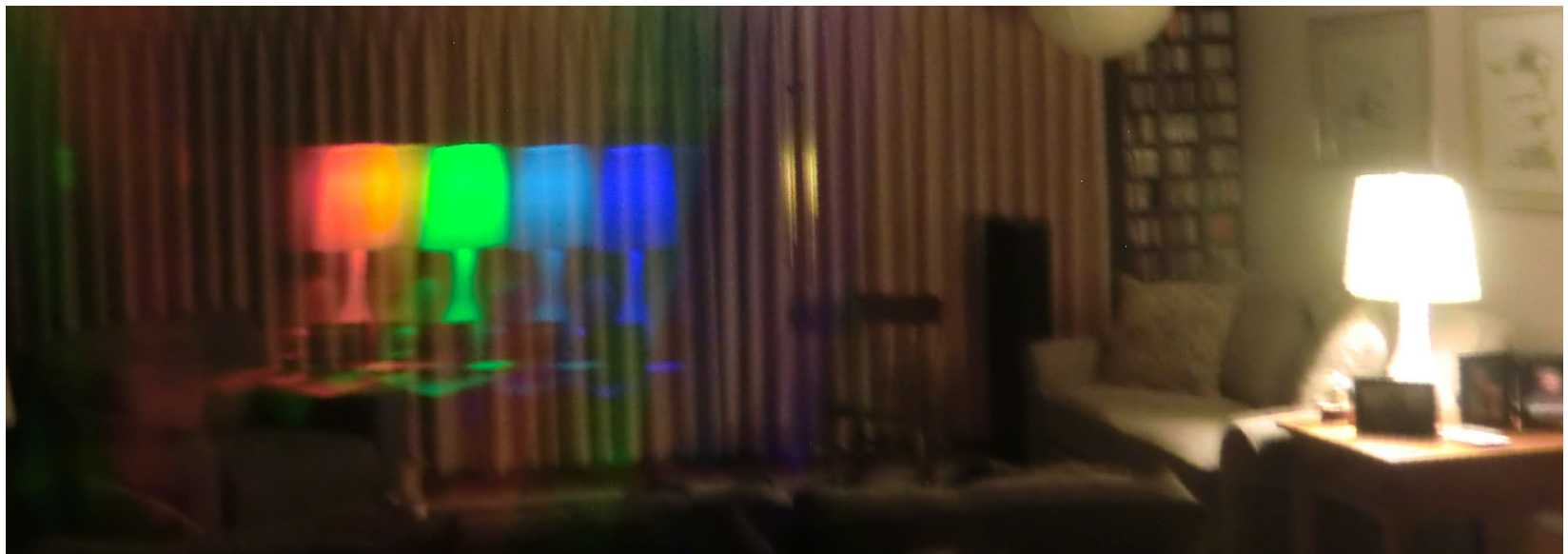
Activity – LED + Coin Battery



Activity – Diffraction Grating



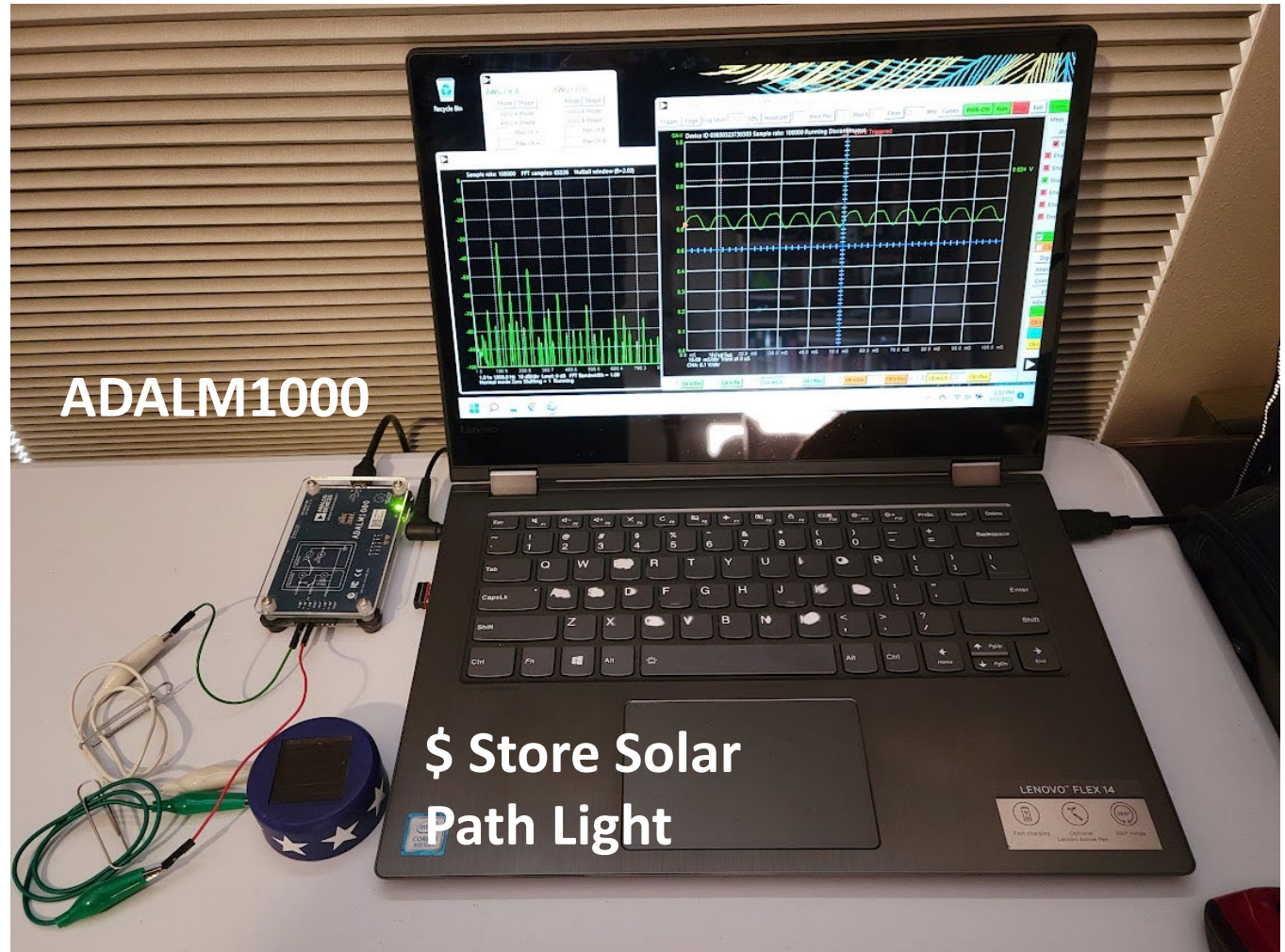
What Kind of Lightbulb?



Activity – Solar Cell Light Detector

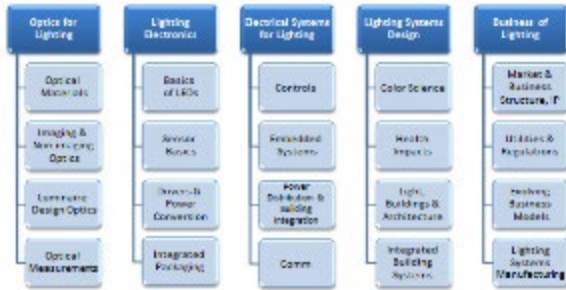
4 LED Bulbs
3 Laptops
1 32" TV

60Hz Noise
120Hz Light
Ripple
TV Light



Common Themes

Always Engaging



Illumineer Curriculum

Structure for all Activities

Mentoring Chain

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Everyone Teaches*

Partnerships

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& Anywhere*



Questions?



Summer HS Program



RPI Master Instructor

RPI URP

UNM REU

Howard HS

UNM HS

