LSU STEM Pathways
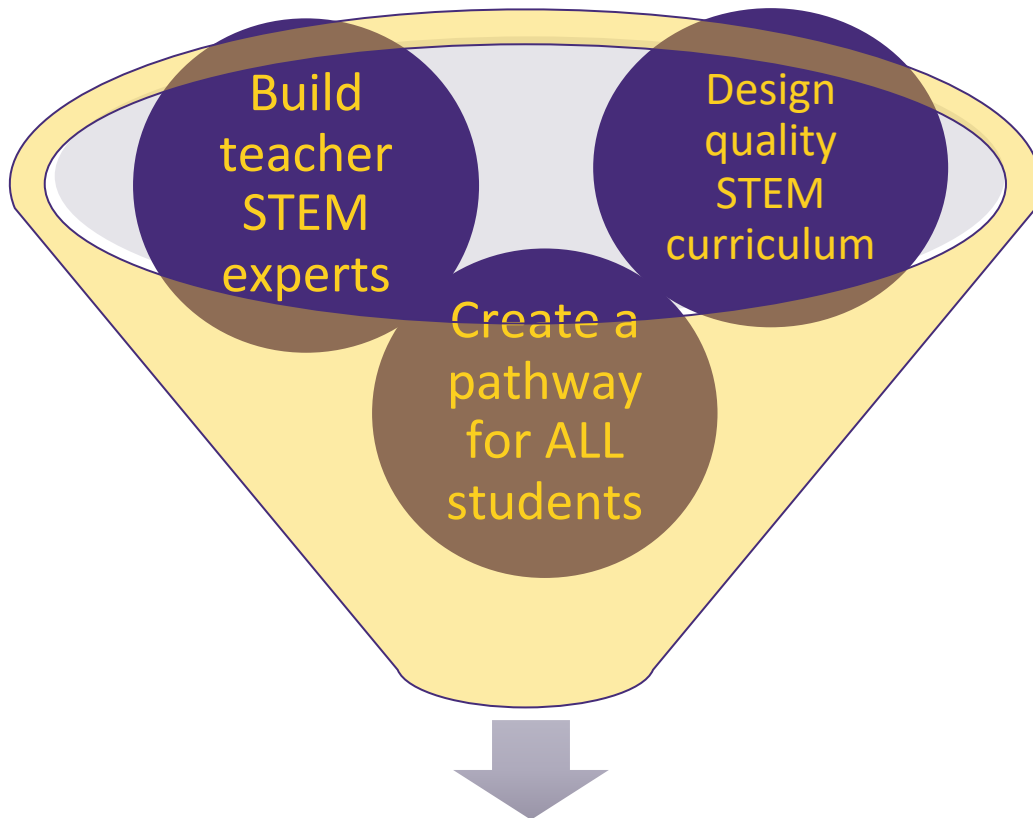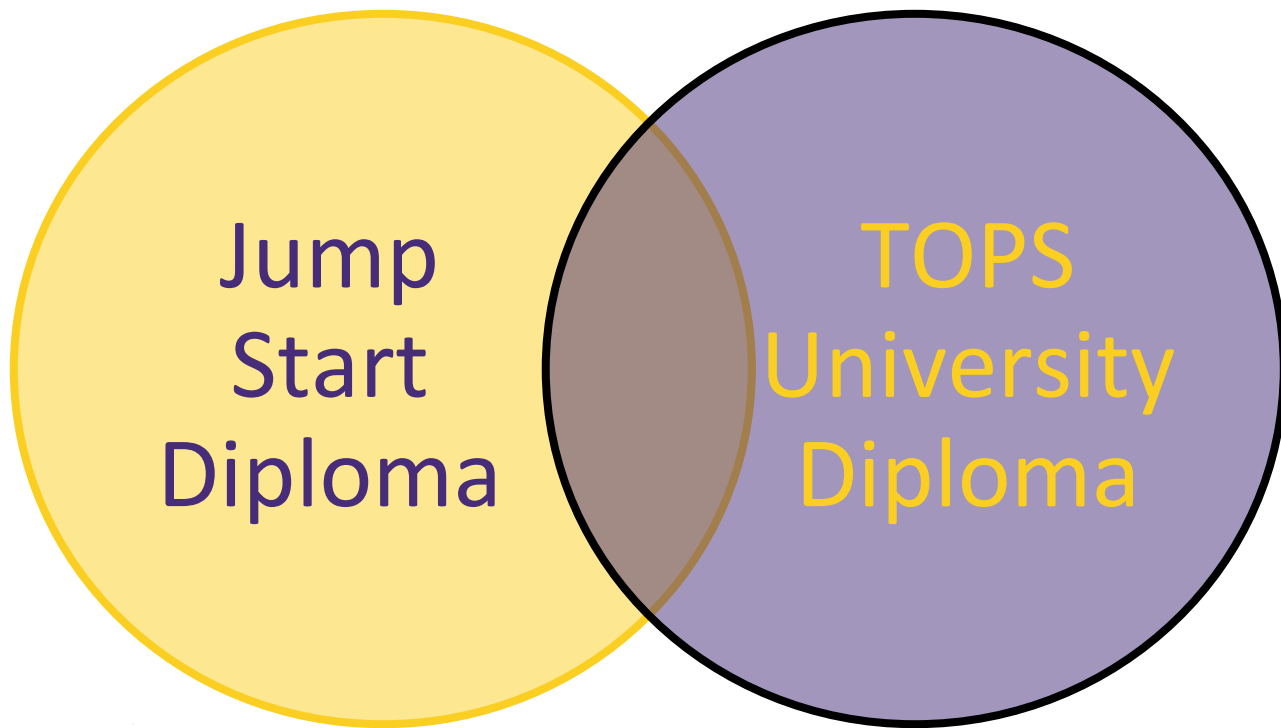
Presenters: Vanessa Begat and Frank Neubrander
Louisiana State University (LSU)

A collaborative effort of the East Baton Rouge Parish School System, LSU Cain Center, LEE Magnet HS, LSU Colleges of Art & Design, Engineering, Music & Dramatic Arts, Science, LSU Center for Computation and Technology, and the Louisiana Biomedical Research Network

STEM Pathways Vision

Build teacher STEM experts

Design quality STEM curriculum

Create a pathway for ALL students

Increase the number of Louisiana students who take quality STEM courses in high school

Pre-Engineering

Digital Design & Emergent Media

Computational Thinking and 21st Century Skills

Computing

Biomedical Sciences

Pre-Engineering:
Arduino & VEXCode (C/C++)

Digital Design & Emergent Media:
Javascript & Arduino

Functional Programming: Haskall (Abstraction, Logic, Effect of Code)

COMPUTING:
Scratch, Python, JavaScript, R, Java, C/C++

Biomedical Sciences: Arduino

LSU Pre-Engineering

Required Core Courses
(Jump Start and TOPS **SILVER** STEM Endorsements)

- ❖ Intro to Engineering (DE optional) (846)
- ❖ Intro to Computational Thinking (668)
- ❖ Intro to Robotics (267)
- ❖ Principles of Engineering (can be substituted for Physical Science) (92)

LSU Engineering Electives
(Jump Start and TOPS **GOLD** STEM Endorsements)

- ❖ Engineering Design and Development
- ❖ Engineering Economy (DE optional)
- ❖ Programming for Engineers
- ❖ Data Manipulation and Analysis

Other Electives
(Jump Start and TOPS **GOLD** STEM Endorsements)

- ❖ AP Calculus, Statistics
- ❖ AP/DE/II: Chem/Bio/Physics
- ❖ AP Computer Science A/P

Electives from other Louisiana STEM Pathways

Other approved Electives (CTEC etc.)

TOPS Choose 4 from either category

LSU

Pre-Engineering Core Courses

Intro to Engineering
Intro to Computational Thinking
Intro to Robotics
Principles of Engineering

Guest Speakers, Hands on Projects, Lab Reports/Presentations

Functional Programming to learn abstraction, logic, effect of code

VEX based hands on building of robots paired with programming sensors for autonomous movement

3 week in-depth study of each engineering discipline through hands on project

LSU Digital Design & Emergent Media

Required Core Courses
(Jump Start and TOPS **SILVER** STEM Endorsements)

- ❖ Digital Storytelling (TOPS Art credit) (413)
- ❖ Intro to Computational Thinking (668)
- ❖ Coding for the Web (36)
- ❖ Programming for Digital Media (DE option) (44)

LSU DDEM Electives
(Jump Start and TOPS **GOLD** STEM Endorsements)

- ❖ Sound Design (DE option)
- ❖ Basic/Advanced Film
- ❖ Film/Television
- ❖ Video Game Design
- ❖ Digital Image & Motion Graphics (DE option)
- ❖ Digital Media Capstone
- ❖ Data Manipulation and Analysis
- ❖ Programming for STEM

Other Electives
(Jump Start and TOPS **GOLD** STEM Endorsements)

- ❖ AP: CS A/P, Art, Calculus, Statistics
- ❖ Photography I & II

Electives from other Louisiana STEM Pathways

Other approved Electives

TOPS Choose 4 from either category

LSU

LSU Biomedical Sciences

Required Core Courses
(Jump Start and TOPS **SILVER** STEM Endorsements)

- ❖ Introduction to Biomedical Sciences (137)
- ❖ Introduction to Computational Thinking (668)
- ❖ Comparative Anatomy & Physiology (42)
- ❖ Senior Capstone (7) **OR** Data Manipulation and Analysis

LSU Biomedical Sciences Electives
(Jump Start and TOPS **GOLD** STEM Endorsements)

- ❖ Data Manipulation and Analysis
- ❖ Bioinformatics
- ❖ Forensic Science
- ❖ Conservation Biology
- ❖ Senior Capstone
- ❖ Genetics

Other Electives
(Jump Start and TOPS **GOLD** STEM Endorsements)

- ❖ (AP/DE/II) Biology, Chemistry,
- ❖ Environmental Science, Statistics, Psychology

Electives from other Louisiana STEM Pathways

Other approved Electives (CTEC etc.)

TOPS Choose 4 from either category

LSU Computing

Required Core Courses
(Jump Start and TOPS **SILVER** STEM Endorsements)

- ❖ Intro to Computational Thinking (668)
- ❖ Data Manipulation & Analysis **OR** Programming for STEM
- ❖ Cybersecurity **OR** AP CS Principles
- ❖ Survey of Computer Science (23) **OR** Interactive Computing

LSU Computing Electives
(Jump Start and TOPS **GOLD** STEM Endorsements)

- ❖ Programming for STEM
- ❖ Data Manipulation & Analysis
- ❖ Cybersecurity
- ❖ Interactive Computing
- ❖ Robotics
- ❖ Coding for the Web
- ❖ Video Game Design
- ❖ Bioinformatics
- ❖ Programming Digital Media

Other Electives
(Jump Start and TOPS GOLD STEM Endorsements)

- ❖ AP: CS A/P, Calculus, Statistics, Physics
- ❖ Computer Science I (DE option)

Electives from other Louisiana STEM Pathways

Other Approved Electives (CTEC etc.)

TOPS Choose 4 from either category

LSU STEM PATHWAYS PROGRAM

Strategies used to bring the Pathways to Louisiana Schools, Districts, and Universities

LSU

2014-2015
- EBRPSS: LEE High Reconstitution
- EBRPSS partners with LSU's Cain Center
- Ohio STEM Learning Network (Battelle)
- LEE HS STEM Academies

2016-2017
- Pre-Engineering Pathway approved
- Pilot at LEE HS
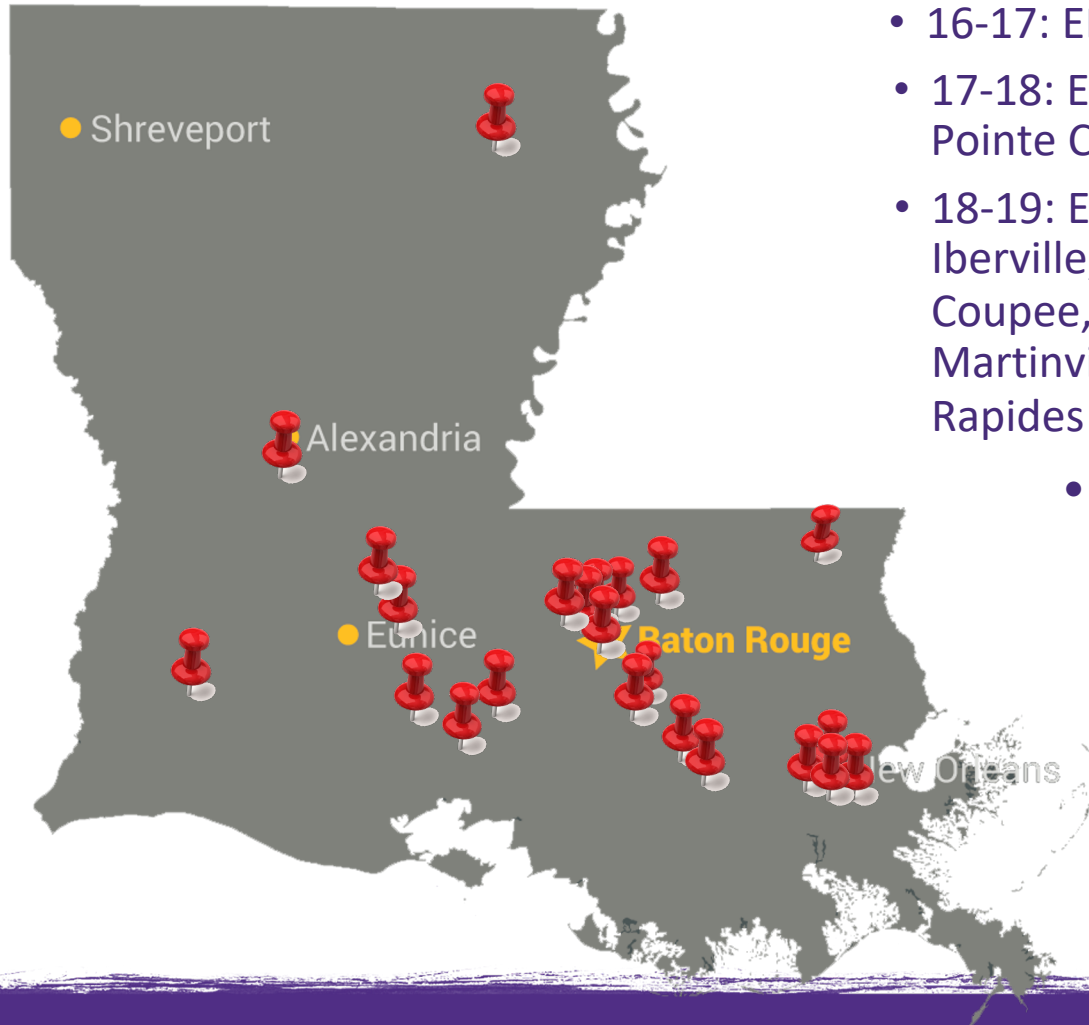- **Total:**
  1 school
  < 100 students

2017-2018
- Intro to Engineering
- Intro to Computational Thinking
- **Total:**
  7 Schools
  5 Districts
  299 Students

2018-2019
- DDEM Pathway approved and piloted
- Pre-Engineering Expansion
- **Total:**
  24 Schools
  13 Districts
  1676 Students

2019-2020
- Biomedical Sciences and Computing Pathways approved
- **Total:**
  35 Schools
  20 Districts
  2800+ Students

2018-19: 72 % "high-needs" students (as defined by US DoE) and 60 % Black or Hispanic students.

- 16-17: EBR (1), Lee High

- 17-18: EBR (3), Central, Iberville, Jefferson, Pointe Coupee, West Feliciana

- 18-19: EBR (8), Ascension (4), Baker, Central, Iberville, Jefferson (2) , Lafayette, Pointe Coupee, St. James, St. John the Baptist, St. Martinville, Washington, West Feliciana, Rapides (1), Charter (1), Private (3)

- 19-20: EBR (8), Ascension (4), Baker, Calcasieu, Central, Evangeline, Iberville (2), Jefferson (2), Lafayette, Livingston, Orleans, Pointe Coupee, St. James, St. John the Baptist, St. Landry, St. Martin, Washington, West Feliciana, Rapides, Richland, Charter (2), Private (3)

LSU STEM Pathways Franchises

☐ **UL Monroe:** Starting in Summer 2020, the LSU Biomedical Sciences Pathway and the LSU Computing Pathway will be offered in North Louisiana by ULM (identical format, identical courses, but certification and teacher training provided regionally by ULM).

☐ **McNeese State University** will be offering the LSU Pre-Engineering Pathway starting in 2020 (identical format, identical courses, but certification and teacher training provided regionally by McNeese).

☐ **LSU Shreveport** will be offering Virtual Math Institute training in Summer 2020.

Shreveport

Alexandria

Eunice ● ★ **Baton Rouge**

● New Orleans

LSU

WHY DO A STEM PATHWAY?

School/District

- $482/student in additional **CDF/CTE funding**
- **Accountability points** for IBC and DE courses

Teachers

- **Graduate credit** opportunity (LSU Colleges of Engineering and Sciences)
- Teaching cutting-edge STEM courses, **no EOC tests**
- **Micro-Credentials** for Teachers (BloomBoard, RAND Corporation, LDoE, LSU)
- Math Praxis Preparation (**Math Teacher Shortage**)

Students

- High quality and **engaging** STEM courses
- Project-based learning, highlighting **21st century skills**
- High School Diploma **Silver/Gold STEM Seals**

Universities

- **Recruiting & Retention & Federal Funding**
- School districts pay a $96 administrative fee for each student receiving a university-issued STEM Pathway Certificate. Funds received are fully re-invested in the program and its **open source curricula**

WHY DO A STEM PATHWAY?

Districts & Universities

Federal Funding for Districts and Universities

From 2020 on, supported by $5M in federal funding, LSU and the East Baton Rouge Parish School System will be expanding the LSU Computing Pathway to **middle schools** and will expand the reach of **Introduction to Computational Thinking**, a foundational core course in all four LSU STEM Pathways, to schools across the state.

"Our team is committed to promoting equity and to attracting more students from historically disadvantaged groups into computing fields."

Lori L. Martin, LSU Sociology, Co-PI

WHY DO A STEM PATHWAY?

Universities & State

Federal Funding for Universities and State:

From 2020 on, supported by $4M in federal funding, a collaborative effort of the Louisiana Department of Education, the RAND Corporation, BloomBoard, and LSU will be rolling out **Micro-Credentials** for STEM Pathway teachers

Core Skills for All STEM Pathway Educators

- Facilitating Project-Based Learning
- Developing Technical Reading, Writing & Presentation Skills
- Understanding Computational Thinking

Pre-Engineering Pathway

- The Engineering Design Process
- Foundational Concepts of Robotics
- Technical Drafting in 2D and 3D
- Electrical Circuitry and Programming
- Engineering Economics and Program Management
- Engineering Ethics and Safety

WHO MAY FACILITATE THE **LSU** PATHWAY COURSES?

- Any teacher can learn how to facilitate a LSU STEM Pathways course. Main prerequisite: must have a passion to learn!
- Experienced teachers, technical or non-technical, from all fields
- Novice teachers, certified and uncertified
- Optional Math Praxis Preparation

2019-20:
90+ trained LSU STEM Pathways teachers,
40 high schools, 22 districts

Teachers

LSU

LEE HS teacher Katy Ullrich teaches Intro to Computational Thinking

LSU STEM PATHWAYS TEACHER

SUMMER TRAINING INSTITUTE

- Mandatory 3 or 6 weeks intensive summer training; monthly Saturday follow-up workshops

- Registration fee of $1,920 or $3,840 per teacher

- Can be taken for LSU graduate credit (LSU Colleges of Engineering and Science)

- Starting in 2020: micro-credentials

- District responsible for stipend, dorm, tuition, fees

- 1 student = $482 - $96 = $386;
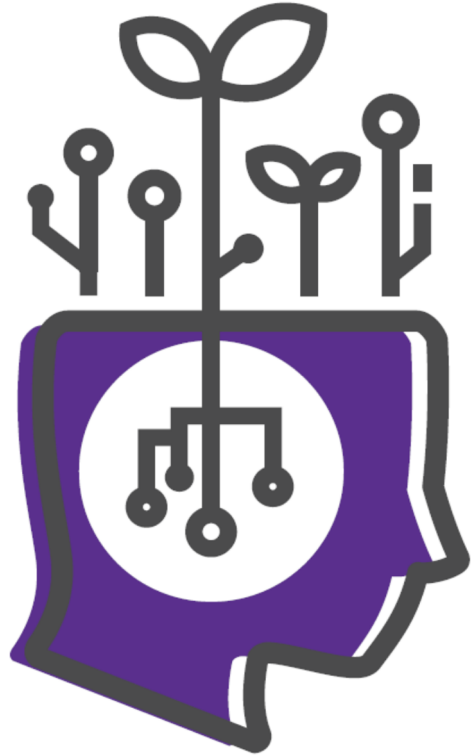
20 students * $386 = $7,720 return to district

LSU STEM PATHWAYS PROGRAM

Students Win, Parents Win, Teachers Win, Schools Win, Districts Win, Universities Win, the State's STEM Workforce Wins

Contest Information

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