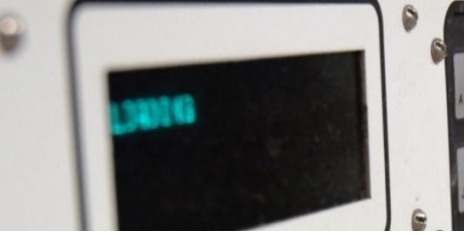
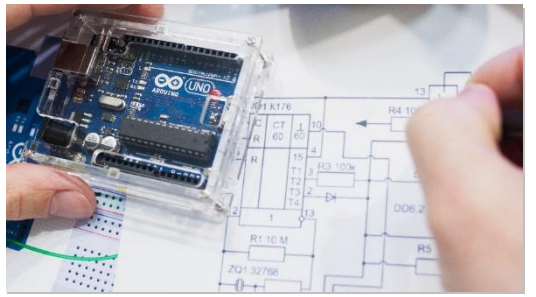






COMPLETE

pathways to engineering technology employment

Virtual PD Workshop 7/22/20

LOUISIANA DELTA COMMUNITY COLLEGE

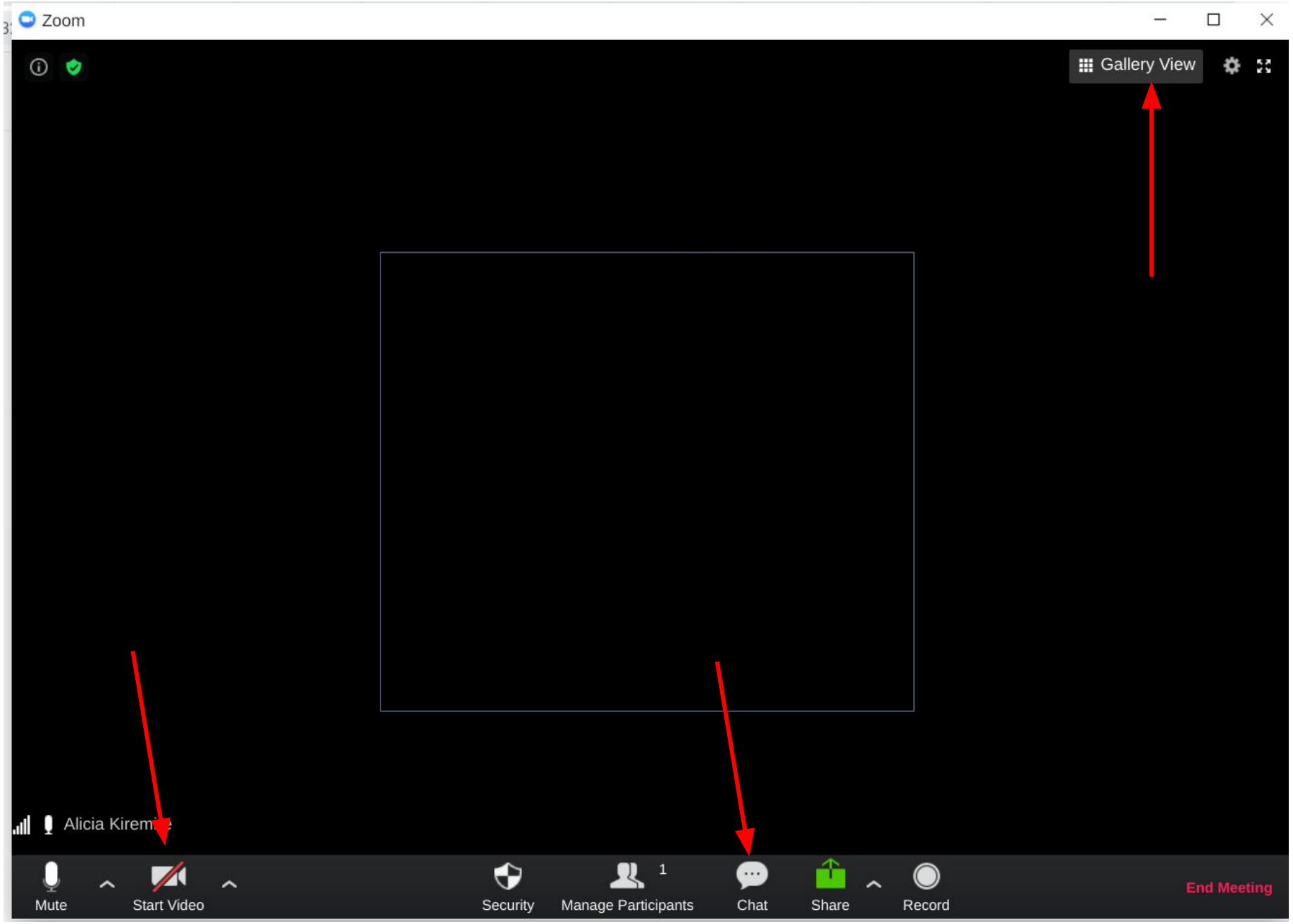
NSF

Please "sign in" with your name and school in the Chat Box! (click Chat at the bottom of your zoom window)

DISCLAIMER & USAGE

- This material is based upon work supported by the National Science Foundation's Advanced Technological Education Program under Grant No. 1801177.

- Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.


Zoom
Gallery View
Alicia Kirem
Mute
Start Video
Security
Manage Participants
1
Chat
Share
Record
End Meeting

- Mr. Gerry Caskey, Grant PI, LDCC
- Ms. Alicia Kiremire, Program Manager
- Mr. Marvin Nelson, BPSTIL Partner Teacher
- Dr. Mikey Swanbom, Curriculum Team, LA Tech
- Ms. Wendi Plants, Bossier Parish CTE Coordinator

- Project COMPLETE Overview
- What's in Your Kit?
- Implementing at Your School
- Q&A

Project COMPLETE Overview

What is instrumentation?

Measures a physical characteristic like temperature

Controlling the characteristic using a setpoint

Instrumentation + Control = Automation

Complete system with no* human interaction

More examples of automation in your home or everyday life?

The Four Industrial Revolutions

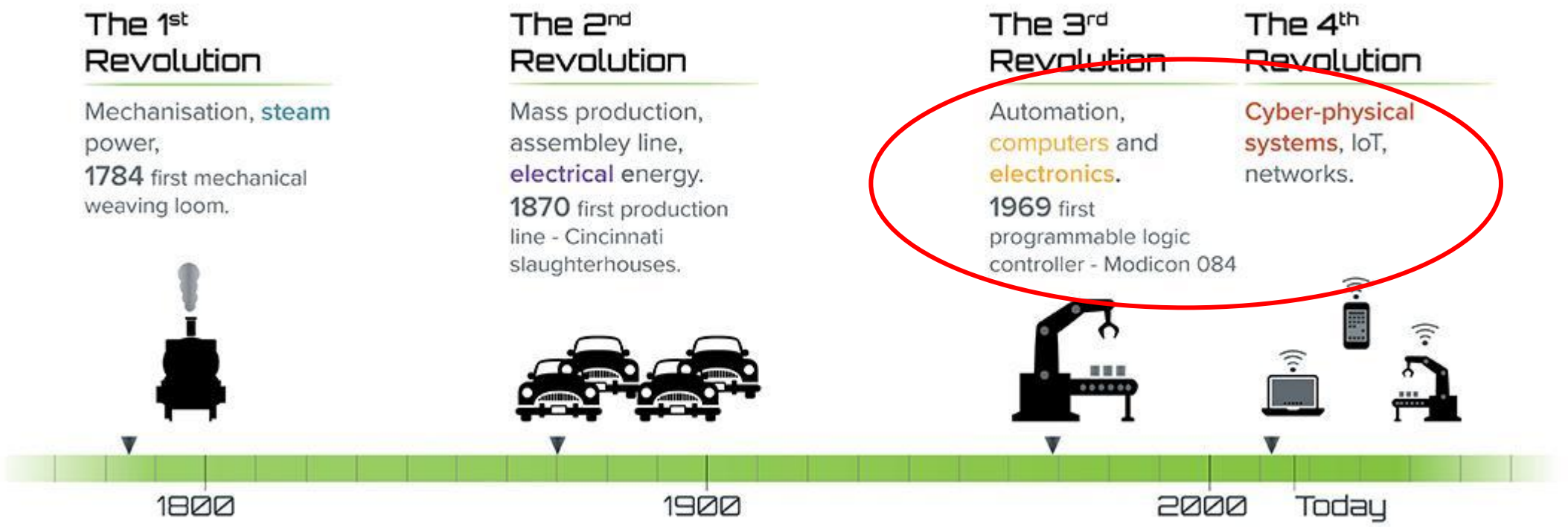
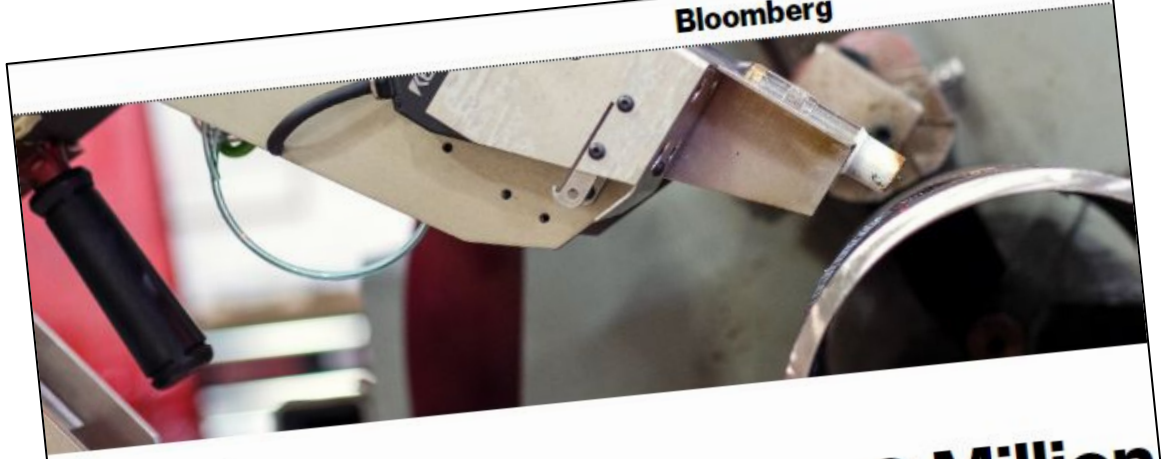


Image from: www.betasolutions.co.nz

Bloomberg



Economics

Robots May Displace 20 Million Manufacturing Jobs by 2030

By Catherine Bosley
June 25, 2019, 6:00 PM CDT

- Lower-income areas in developed nations are most at risk
- Services jobs for displaced workers are also being taken over

LISTEN TO ARTICLE

▶ 2:27

Robots are on track to wipe out almost a tenth of the world's manufacturing jobs with the brunt borne by lower-income areas in developed nations, Oxford Economics says.

Forbes

Billionaires Innovation Leadership Money Consumer Industry Life

28,215 views | Sep 18, 2018, 08:05am

Artificial Intelligence To Create 58 Million New Jobs By 2022, Says Report

Amit Chowdhry Contributor
Consumer Tech
Tech enthusiast, born in Ann Arbor and educated at Michigan State

Machines and algorithms in the workplace are expected to create 133 million new roles, but cause 75 million jobs to be displaced by 2022 according to a new report from the World Economic Forum (WEF) called "The Future of Jobs 2018." This means that the growth of artificial intelligence could create 58 million net new jobs in the next few years.

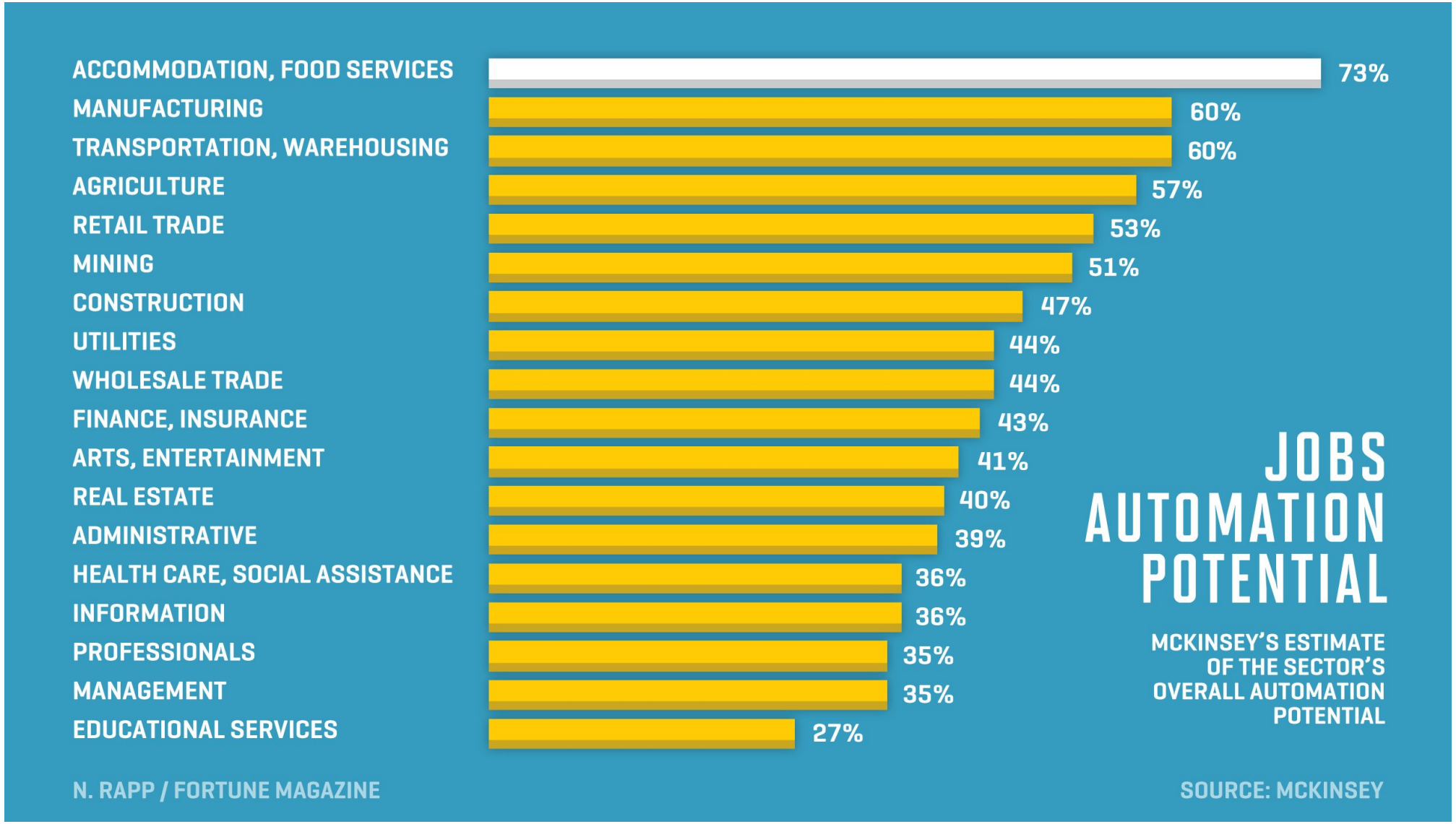
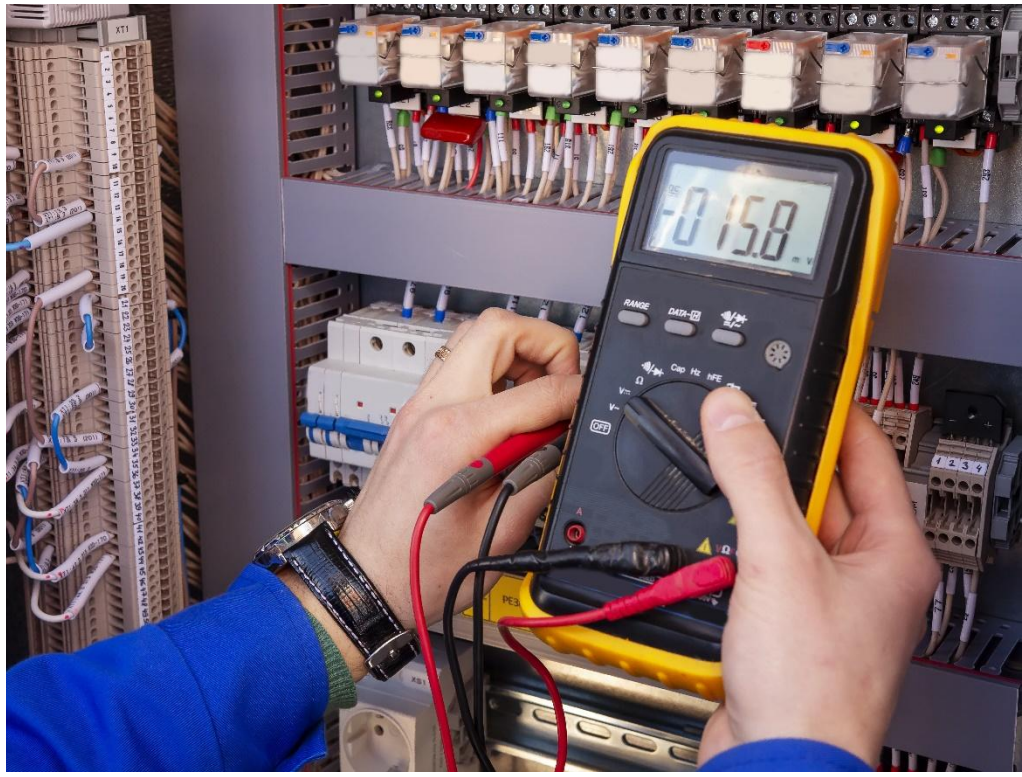


Image from: www.fortune.com

Routine jobs are at risk!

Why a career in instrumentation?

- In the future of work, automation creates instrumentation jobs!
- Multiple pathways (Certificate, 2-year, or 4-year degrees)
- Your skills are transferrable to different industries in different locations. If you get bored, you can move!



Why a career in instrumentation?

- You are the one who “knows” the equipment. People who used to “know” are retiring!
- You bring value to your company
  - Example – in automotive manufacturing, **1 minute of downtime costs $22,000!** You will make up your annual salary if you get the equipment running within 3 minutes!
- Median salary is $27.78 per hour (compared to $19.71 for welding).

Image: www.autonews.com

Grant Program Highlights

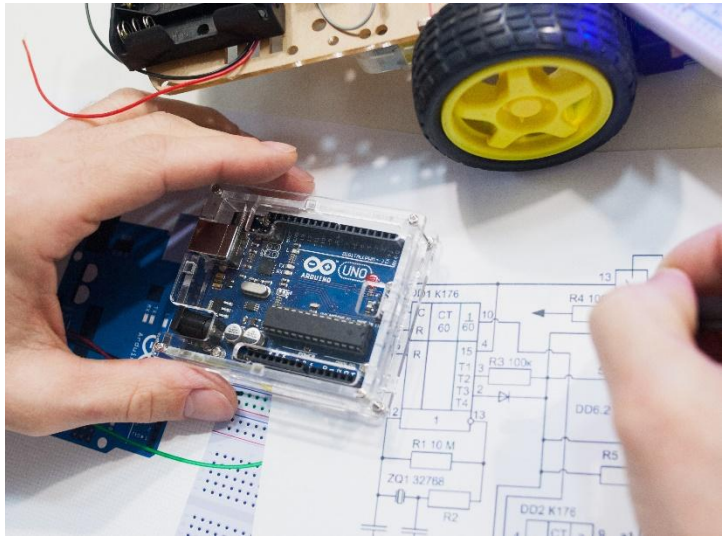
- Controlling, Operating, and Measuring: Pathways for Learners to Engineering Technology Employment (Project COMPLETE)
- Goal to expand instrumentation workforce pathways for 500 North Louisiana high school students over 3 years
- Collaboration between Louisiana Delta Community College and Louisiana Tech University

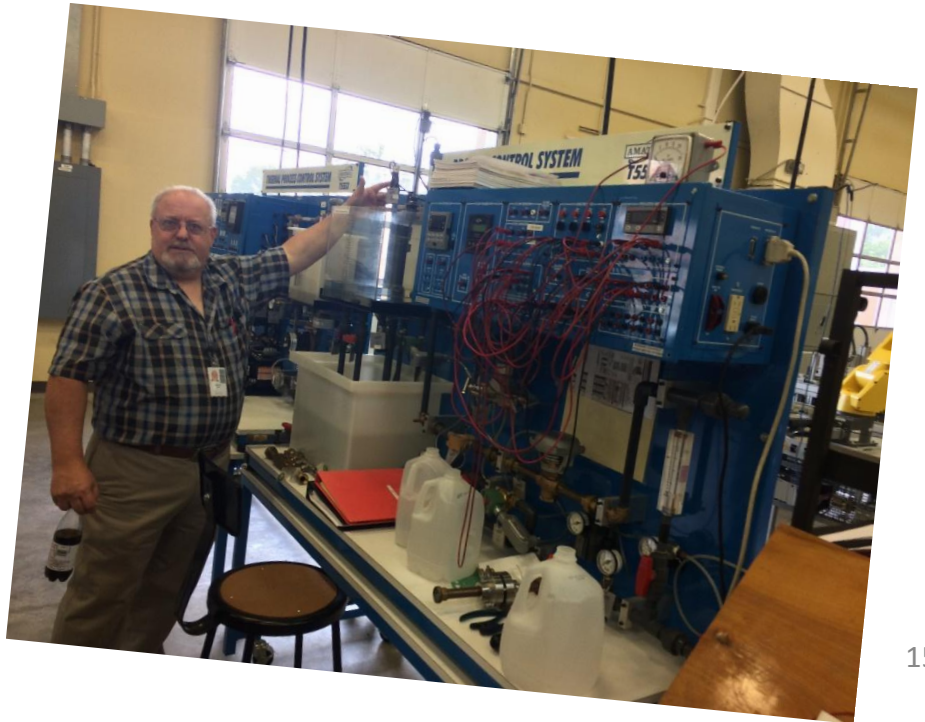
LOUISIANA DELTA COMMUNITY COLLEGE

COMPLETE

Grant Program Components

- Workshops twice a year for teachers/counselors
- Lesson materials
  - Math requirement Algebra I
  - Hands-on, project-based “basic electricity and instrumentation”
- Hands-on project kits
- Industry field trips and speakers (virtual?)
- Scholarships
- Full course implementation
  - Jump Start / pair with IBC?
  - Dual enrollment?
  - Pathways to LDCC and/or LA Tech University

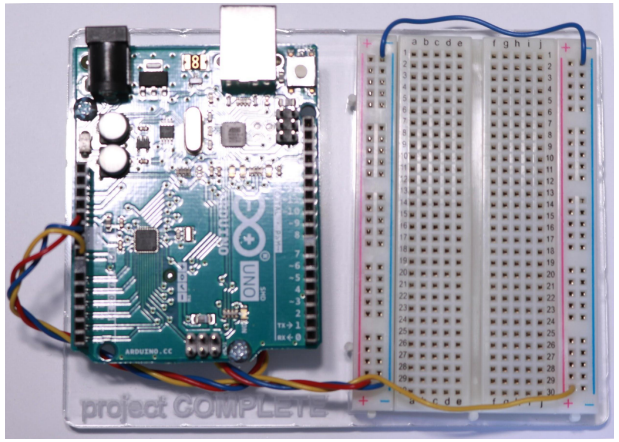




What’s in Your Kit?

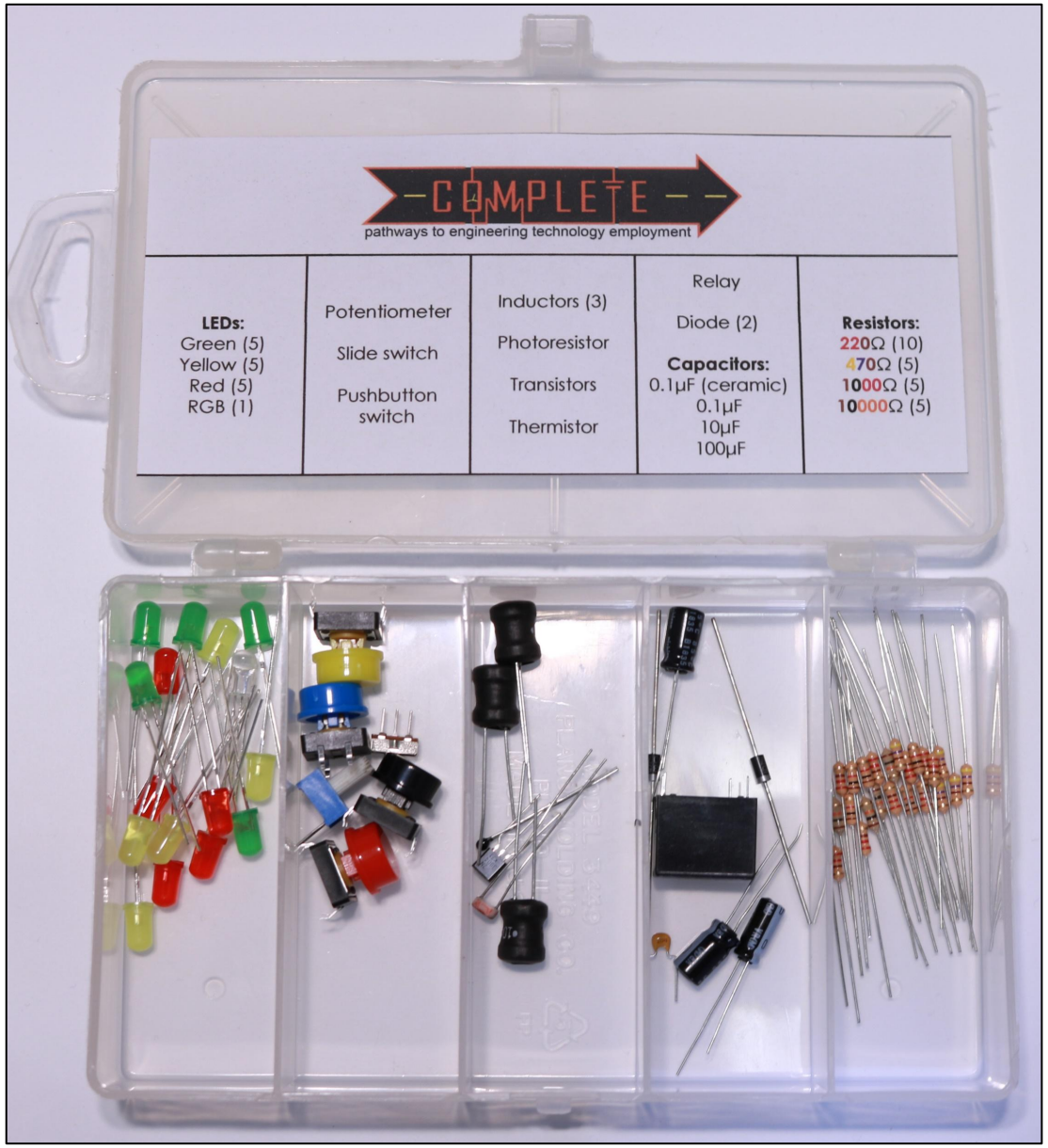
What's in Your Kit.

- Project COMPLETE Kits come with everything you need implement the curriculum.
- The Arduino IDE is available free online and runs on Windows PCs and Chromebooks

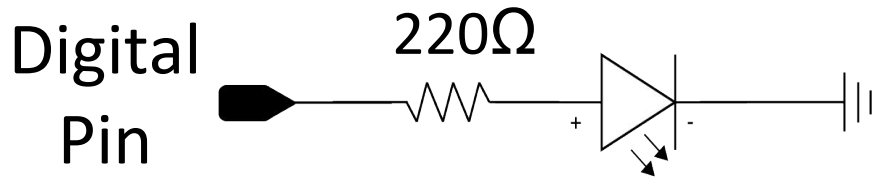


Student will work with fundamental electronic components including:

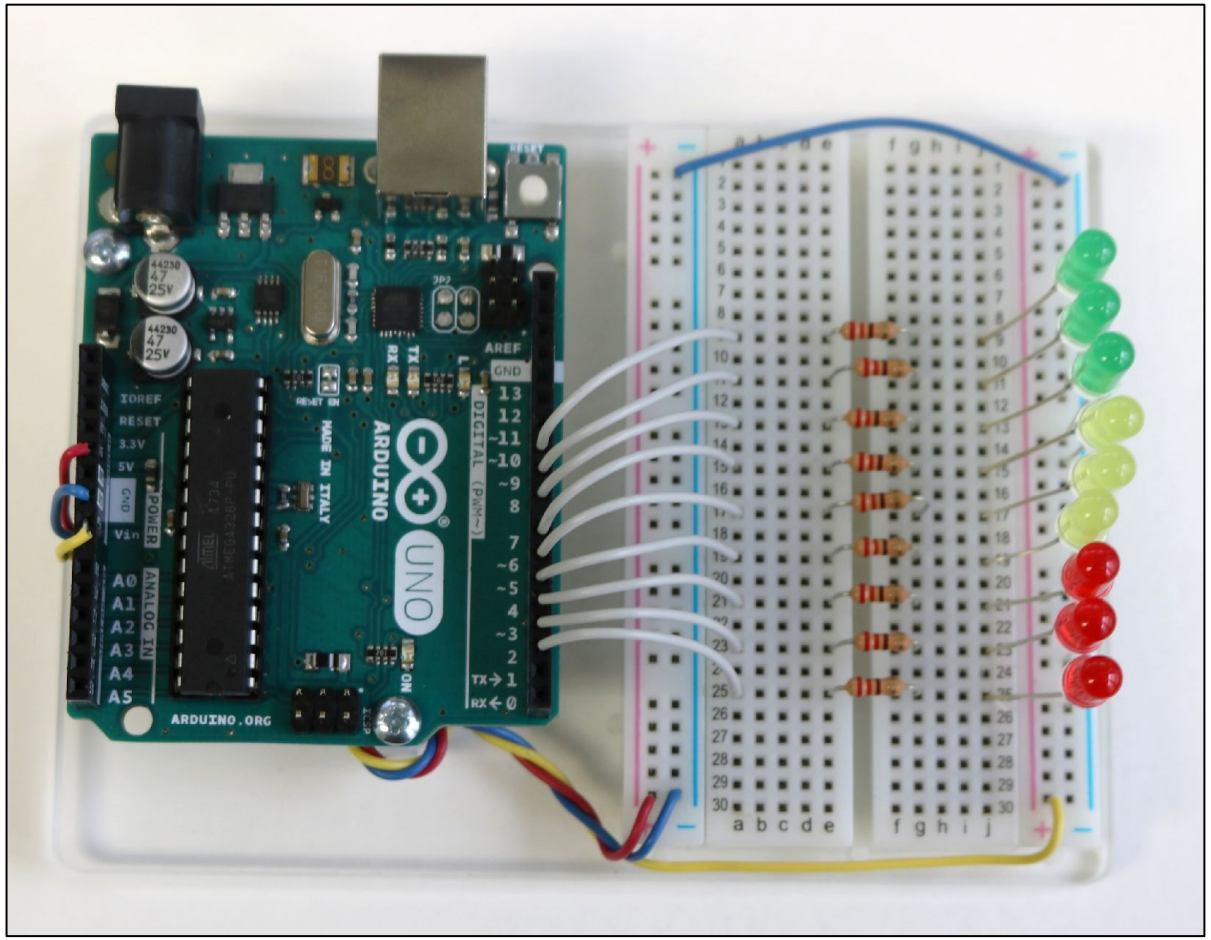
- Resistors
- Photoresistors
- LEDs
- Switches
- Transistors
- Diodes
- Capacitors
- Relays



Wiring Circuits

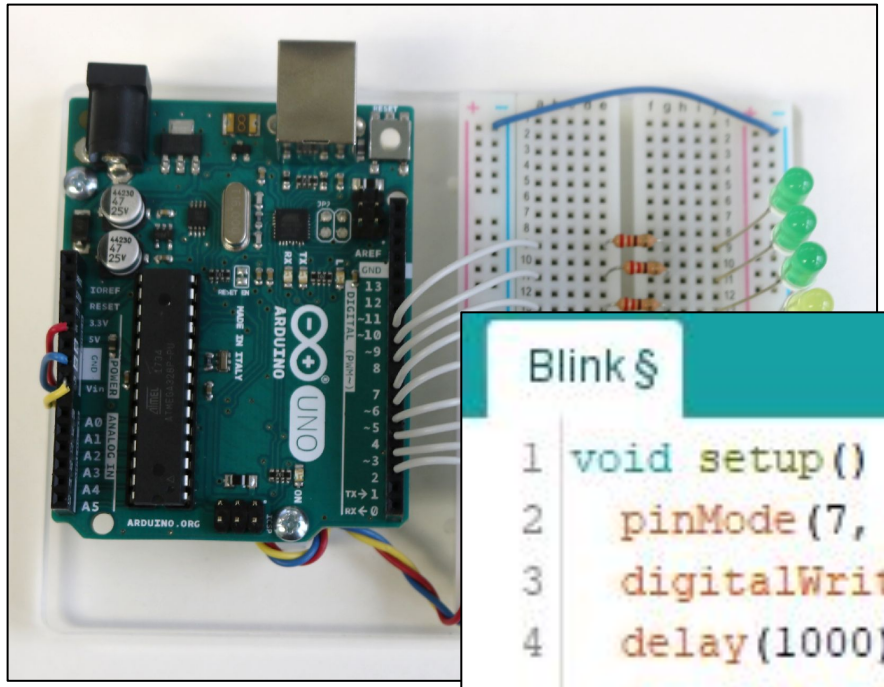


Students learn to read schematic diagrams and wire circuits on a breadboard.



Programmable Logic

Students learn to write simple programs and are then challenged to extend what they have learned to complete more complex programming tasks.

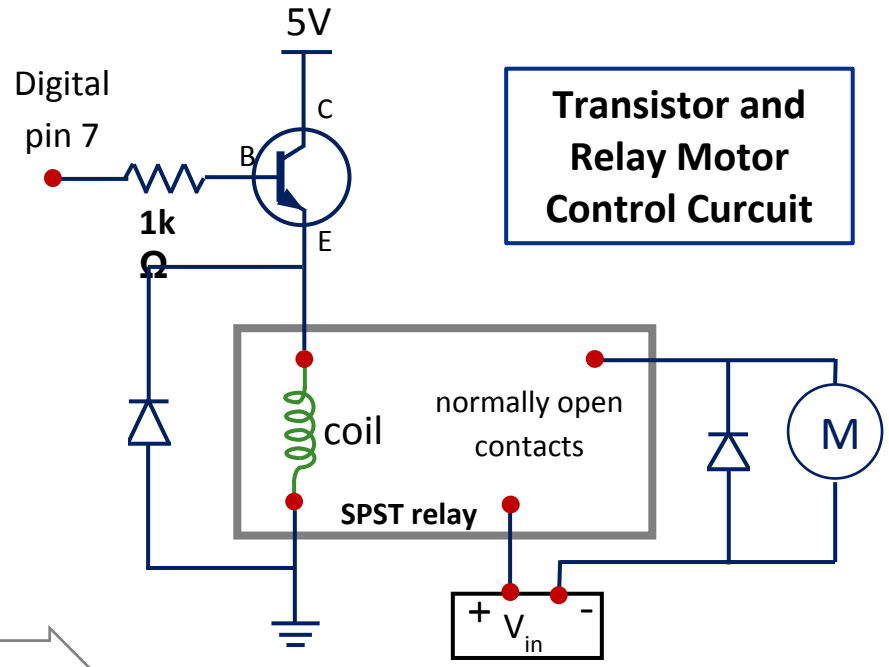


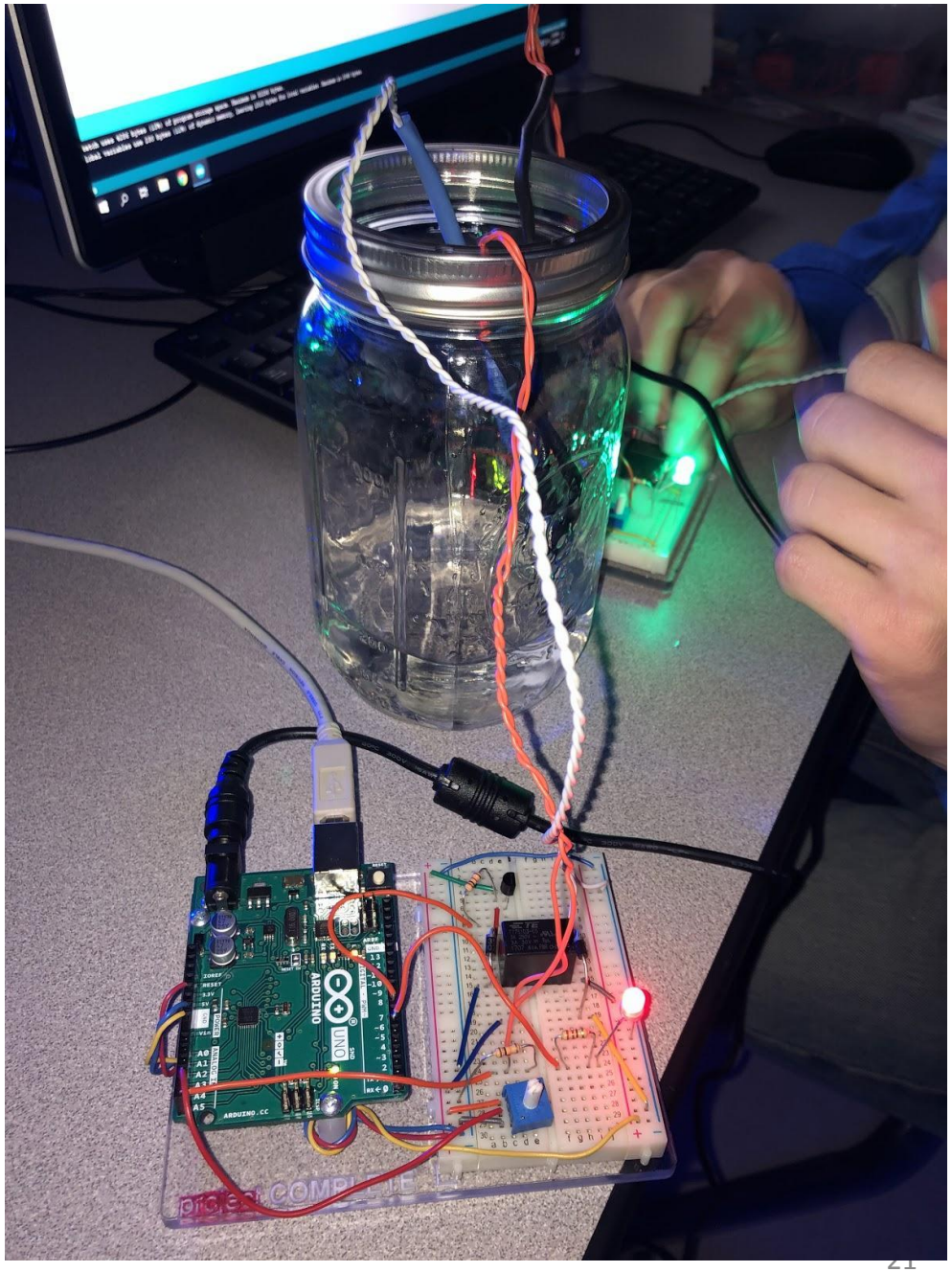
```
Blink §
1  void setup() {
2    pinMode(7, OUTPUT);
3    digitalWrite(7, HIGH);
4    delay(1000);
5    digitalWrite(7, LOW);
6    delay(1000);
7  }

   loop() {
```

```
void loop()  {
for (int i = 2; i<11; i++);
digitalWrite (i, HIGH);
delay(1000);
digitalWrite (i, LOW);
}
```

Process Control System

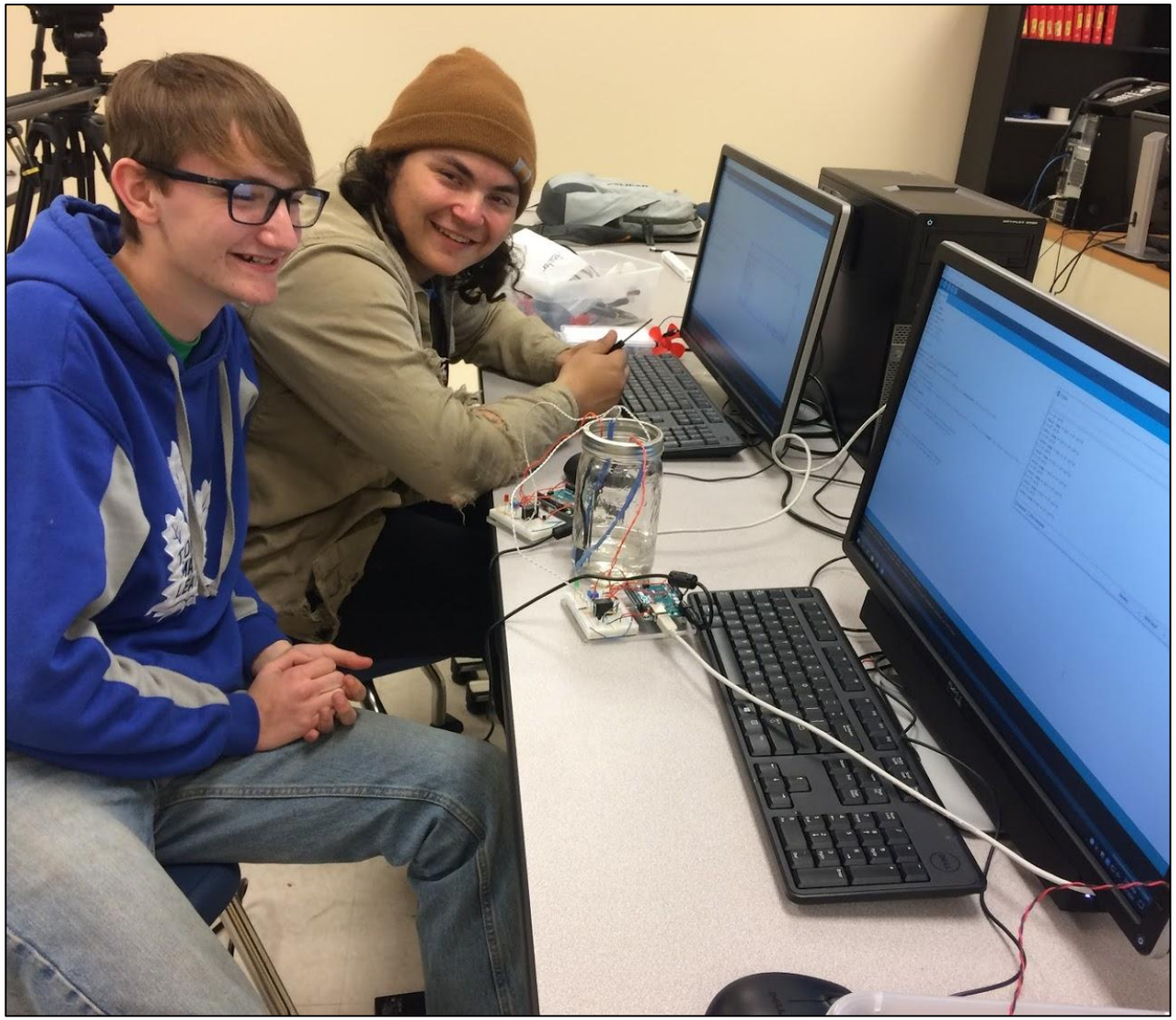
The course culminates with the Sous Vide project, when students build a full process control system.





Two students with working process control systems!

One is now an electrician’s apprentice and the other is headed to Tech for ICET.



Implementing Project COMPLETE

Project COMPETE Instrumentation & Control Units (Dual Enrollment: LDCC INST1010 and INST1000)

BPSTIL Pilot

1	2	3	4a	4b	5
Intro to Electrical Circuits	**Basic Circuits**	**Working with Arduino**	**Programming and Data Collection**	**Control System Elements / Project**	**Industrial Inst. & Control Elements and Documentation**
• Intro to Electricity, Conductors & Insulators • Voltage, Current and Resistance • How to use a Multimeter • Ohm's Law • Breadboards • Power (P = VI)	• Series and Parallel Circuits • Equivalent Resistance • KVL & KCL • Solve Circuits	• Arduino • Control LEDs Circuit • FOR Statements • LEDs • Switches • Bridge Circuits • Photoresistors	• Analog & Digital I/O. • Intro to Excel Spreadsheets • Linear Regression • Thermistors • Programming Fundamentals	• Transistors • Relays • Cascading Switches • Potentiometers • Sous Vide Project • Capacitors & RC Circuits	• Industrial Instrumentation • Industry Organizations • Industry Standards • Process Variables • Control Loops • Piping & Inst. Drawings

NCCER Electrical Level 1 Modules [*Helper IBC*]

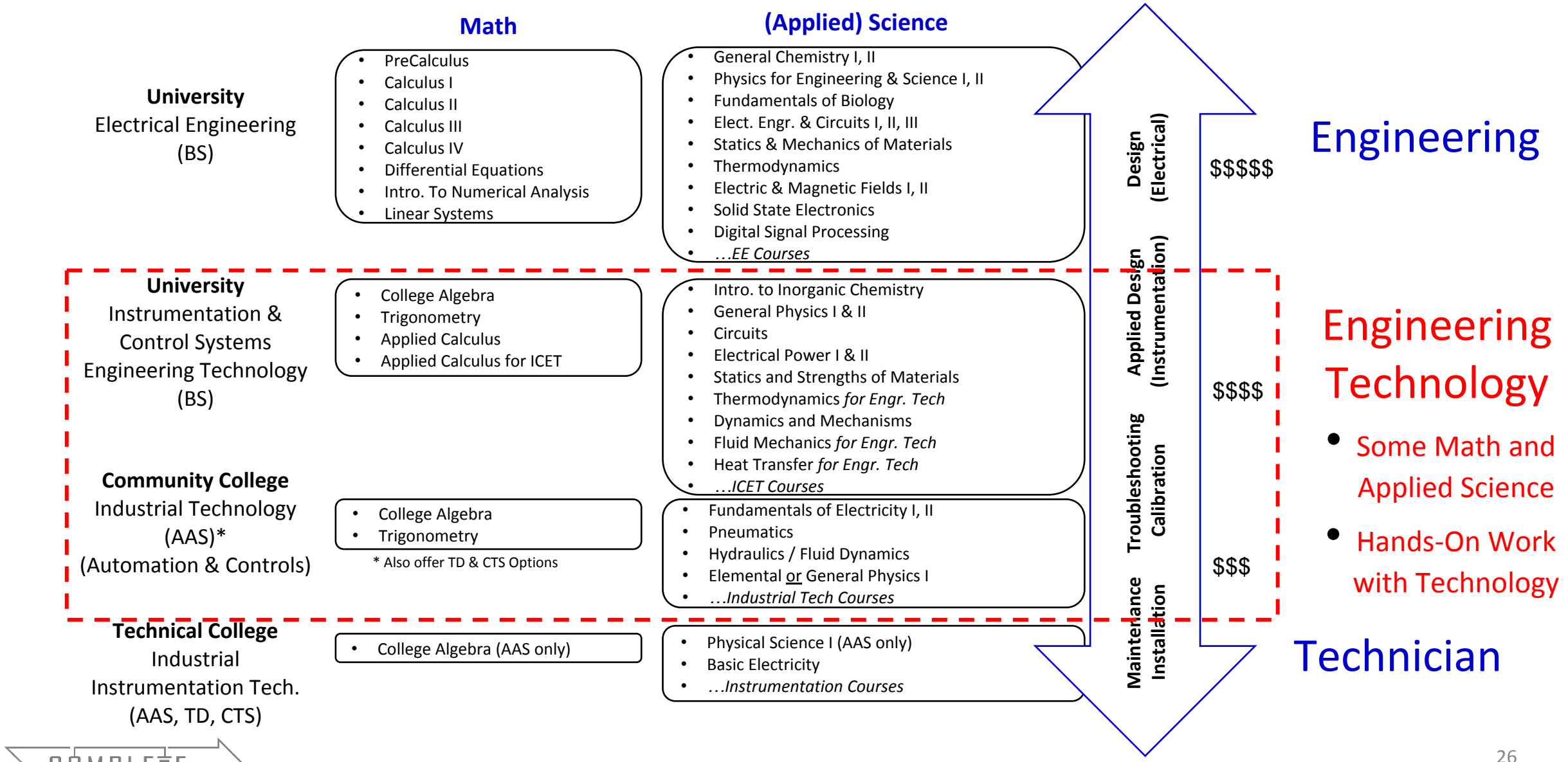
1	2	3	4	5	6	7	8	9	10	11	12
Orient. To Electrical Trade	***Electrical Safety***	***Intro to Circuits***	**Electrical Theory**	**Intro to the NEC**	***Device Boxes***	***Hand Bending***	***Raceways & Fittings***	**Conduct. & Cables**	**Basic Electrical Drawings**	**Resid. Electrical Services**	***Electrical Test Equip.***
• Sectors • Apprentice /Training • Employ. Responsibl e • Key Ind. Standards	• Hazards • PPE • Standards • Tool Safety	• Charge • Conduc-tor s • Voltage… • Ohm's Law • Power • Multimeter	• Series / Parallel • Equivalent Resistance • Multimeter • KVL & KCL	• Chapters • Definitions • Articles • Tables • Specific Reqts.	• Types of boxes • Installation • Sizing	• 90⁰ Bends • Offset • Saddle • Cut, Ream, Thread	• Select & install • Fasteners & anchors • Wireways.. • Cable Trays	• Types • Sizes • Materials • Ampacities • Install conductors	• Construct. Drawings • Symbols • Material Takeoff	• Sizing • Grounding • Installation • Panel Bd • Branch Ct • Devices	• Voltmeter • Ohmmeter • Ammeter

*Shaded modules overlap significantly.

Which students are a good fit for recruiting?

- Students who have successfully completed Algebra I
- Juniors and Seniors (preferably)
- Students who will qualify for College Algebra (Math ACT ≥ 19) upon college admission
- Students in the “middle” – not interested in full trades or full engineering route
- Robotics teams, Cyber Lit classes
- Special recruiting efforts for underrepresented student populations.

Range of Technical Career Options Targeted



Talking with Students about Pursuing a Career in Applied Science / Technology

- Engineering / Computer Science
  - Continue to take math through AP Calculus if you can; or at least MASTER Algebra 2 and Advanced Math – Trig.
  - Consider Intro. to Electrical & Instrumentation Technologies (IEIT). We use the Arduino microcontroller in this course; which is what Tech uses for the its first 3 engineering courses.
  - If you are interested in programming, take Computer Programming 1 (Amazon Future Engineers Curriculum – Python)
- Technology with Good Pay and Less Math
  - Continue to take math through Algebra 2 (and Advanced Math – Trig if you want to go the Instrumentation & Control route).
  - Electrical & Instrumentation Technologies (IEIT) will prepare you for a program like Tech's Instrumentation and Control Systems Engineering Technology degree, or a 2 year program at LDCC, BPCC…
  - Electricians make really good money and spend more time doing hands-on work. At BPSTIL you can start with Core Maintenance paired with an Electrical 1 and/or take Electrical 2. Both will earn you Industry Based Certifications.
  - Also, take a look at the programs offered at our local Community Colleges and Technical Schools.

Local Tech School Programs Targeted

- Inst. and Control Systems Engineering Technology
- Construction Engr. Tech.
- Mechanical Engr.
- Electrical Engr.
- Industrial Engr.
- Computer Science
- Biomedical Engr.
- Civil Engr.
- Nanosystems Engr.
- Cyber Engr.
- Chemical Engr.

- Engineering (AS)
- Industrial Technology (Advanced Manufacturing and Mechatronics)
- Industrial Technology (Automation and Controls)
- Oil and Gas Production Technology
- Industrial Technology (Industrial Maintenance)
- Oil and Gas Production Technology
- Oil and Gas Technology (Process Technology)

- Industrial Instrumentation Technology
- Industrial Manufacturing Technology
- Air Conditioning and Refrigeration
- Automotive Technology
- Electrician – Commercial Wiring II
- Electrician- Industrial Electrician

- Industrial Instrumentation Technology
- Process Technology
- AC & Refrigeration Technology
- Automotive Technology
- Electrician
- Industrial Maintenance Technology

- IBEW/etA Apprenticeship Program (Local IBEW)
- Benteler Steel Apprenticeship Program (BPCC)
- …

What does implementation of this course look like on your campus?

THINGS TO CONSIDER

- Full course vs partial course implementation
- Teacher certification
- CDF Course Code
- Industry Based Credential

Full Course v/s Partial Course

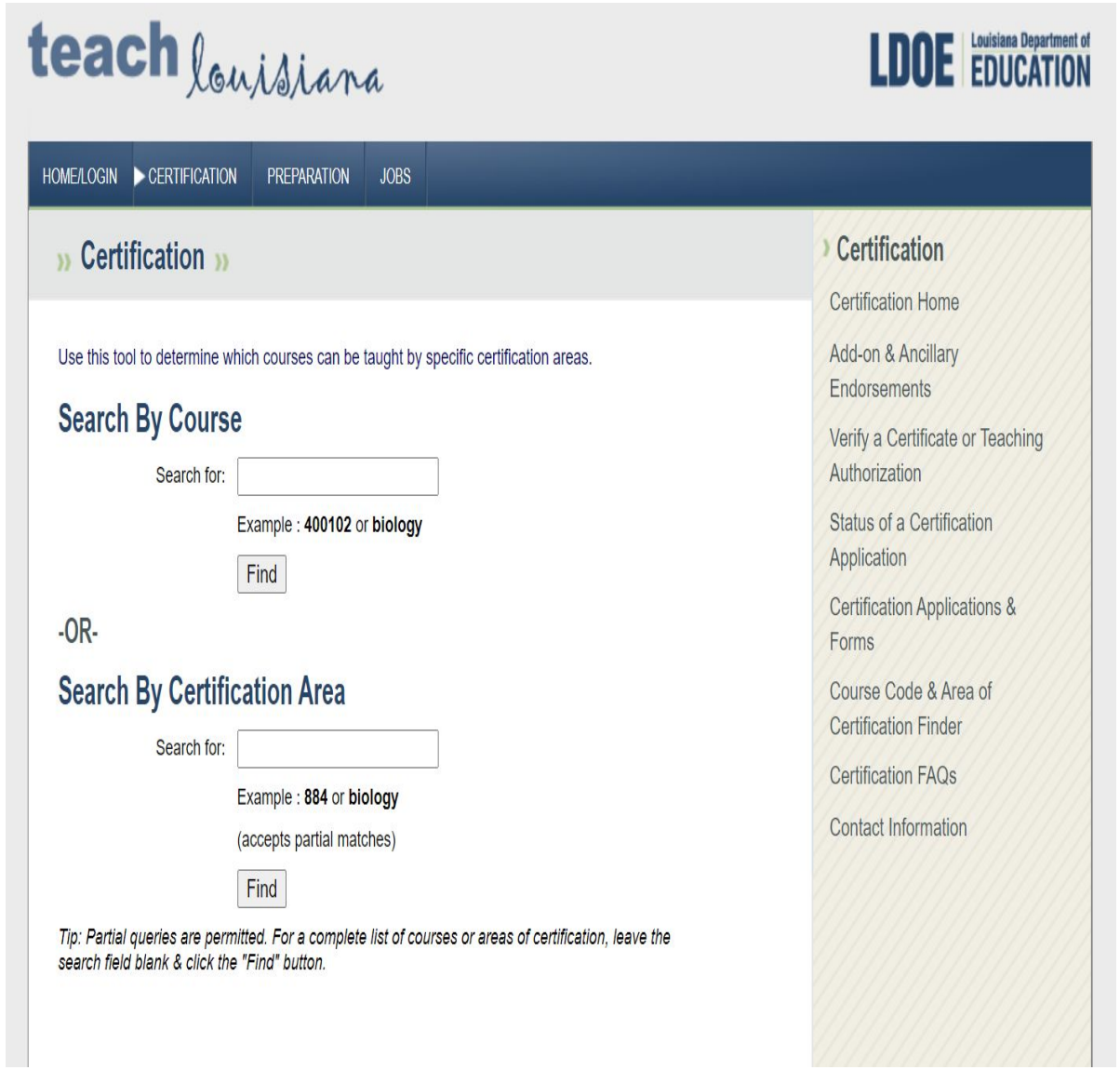
FULL COURSE IMPLEMENTATION

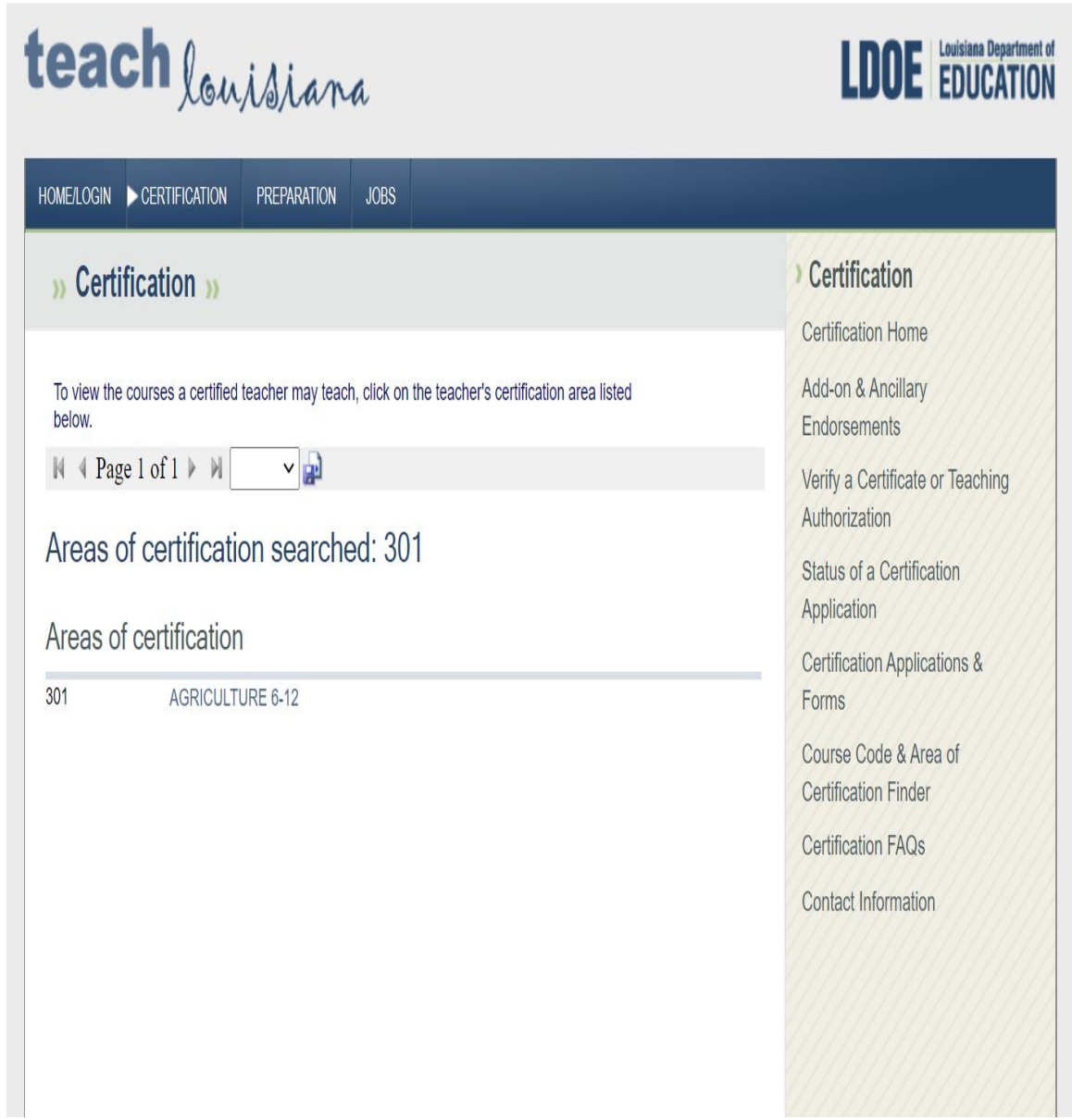
- Students could receive an IBC
- Will it fit into the master schedule
- Is the teacher certified to teach the course

PARTIAL COURSE IMPLEMENTATION

- Embed lessons into other courses
  - Physical Science
  - Physics
  - Career Exploration
  - Ag
  - Automotive
  - Computer Science

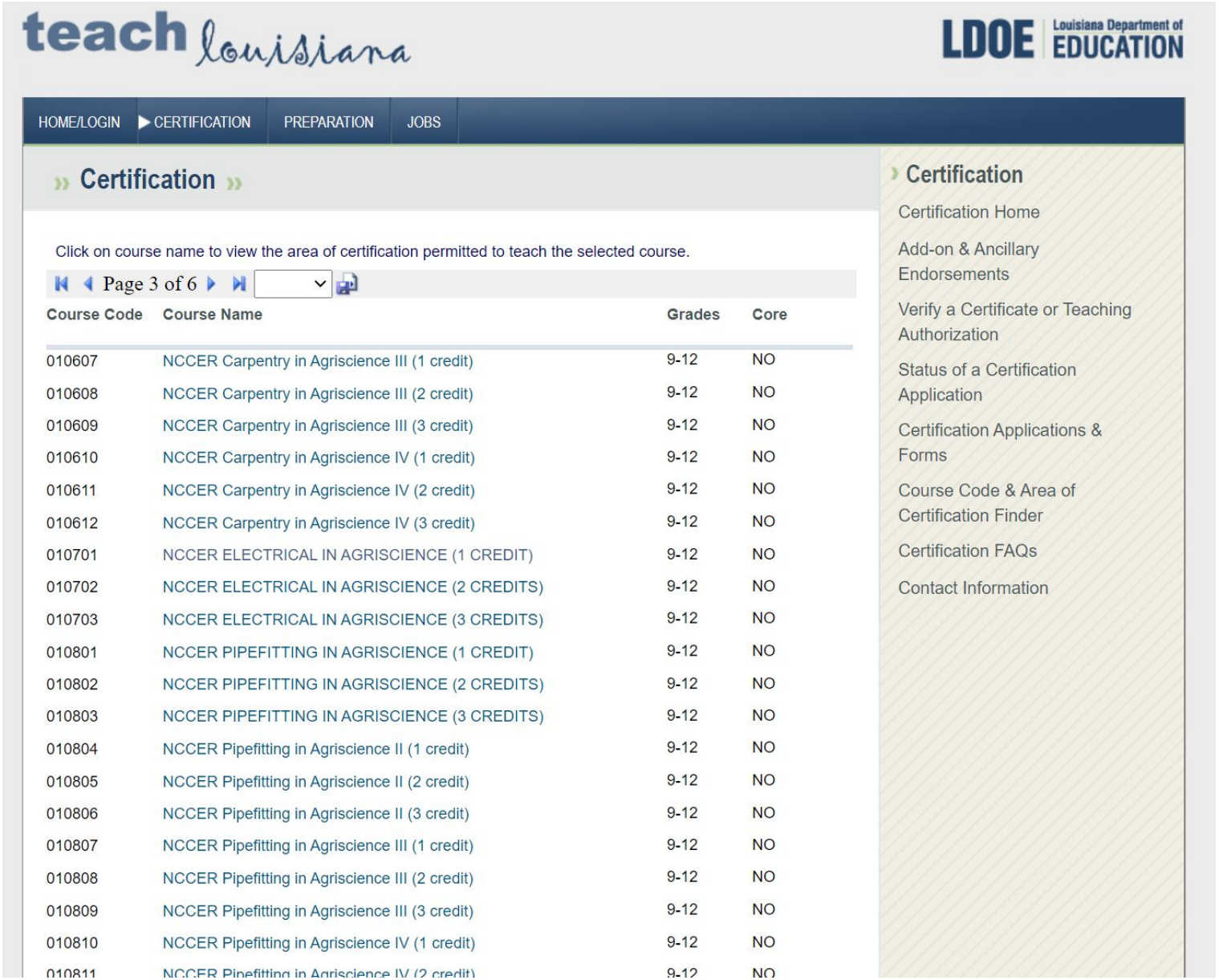
TEACHER CERTIFICATION



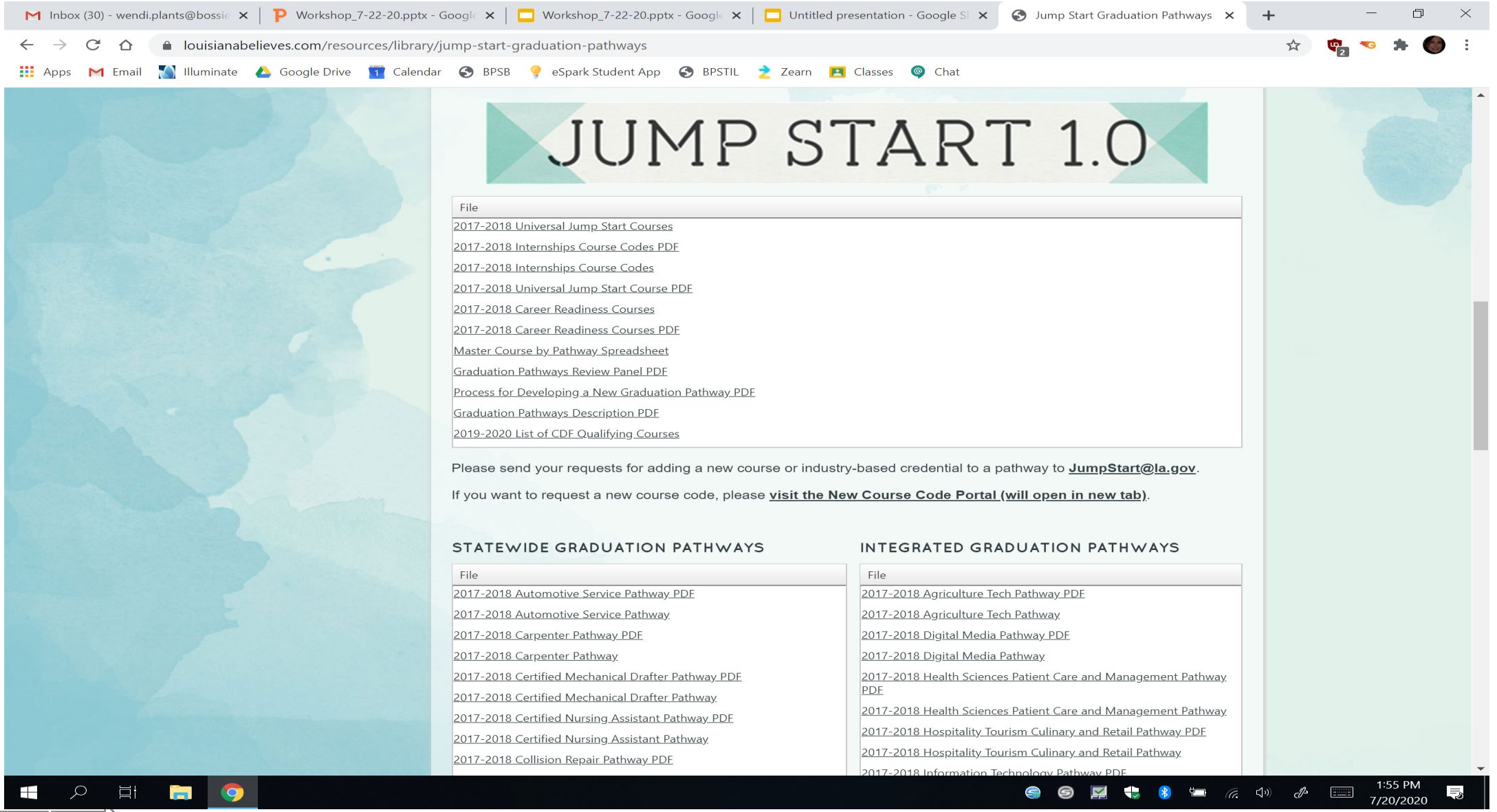


COMPLETE

TEACHER CERTIFICATION



COURSE SELECTION



COMPLETE

2019-2020 Jump Start CDF-Qualifying Courses

Course Description	Course Code
NCCER Carpentry IV (3 Credits)	110714
NCCER Construction Technology	110110
NCCER Core	311720
NCCER Electrical I (1 Credit)	110711
NCCER Electrical I (1 Credit)	313400
NCCER Electrical I (2 Credits)	110712
NCCER Electrical I (2 Credits)	313402
NCCER Electrical I (3 Credits)	110713
NCCER Electrical I (3 Credits)	313403
NCCER Electrical II (1 Credit)	110716
NCCER Electrical II (1 Credit)	313405
NCCER Electrical II (2 Credits)	110717
NCCER Electrical II (2 Credits)	313412
NCCER Electrical II (3 Credits)	110718
NCCER Electrical II (3 Credits)	313413
NCCER Electrical III (1 Credit)	313417
NCCER Electrical III (2 Credits)	313418
NCCER Electrical III (3 Credits)	313419
NCCER Electrical in Agriscience (1 Credit)	010701
NCCER Electrical in Agriscience (2 Credits)	010702
NCCER Electrical IN AGRISCIENCE (3 Credits)	010703
NCCER Electrical in Agriscience II (1CR)	010704
NCCER Electrical in Agriscience II (2CR)	010705
NCCER Electrical in Agriscience II (3CR)	010706
NCCER Electrical in Agriscience III (1CR)	010707
NCCER Electrical in Agriscience III (2CR)	010708
NCCER Electrical in Agriscience III (3CR)	010709

Q & A

(and quick group photo!)

Thank you for joining us today!

To get your stipend, make sure you:

- “Sign in” in the chat box
- Submit your forms (informed consent, W9, photo release, survey) - check your email!

Stipends will be processed during the month of September for videos and workshop participation.

References

- “Key Industries.” Louisiana Economic Development. https://www.opportunitylouisiana.com/key-industries.
- Advanced Technology Services, Inc. “Downtime Costs Auto Industry $22k/Minute – Survey.” *Thomas*, 2006. https://news.thomasnet.com/companystory/downtime-costs-auto-industry-22k-minute-survey-481017.
- “Occupational Employment Statistics.” Electro-Mechanical Technicians and Welding, Soldering, and Brazing Workers. Bureau of Labor Statistics, 2018. https://www.bls.gov/oes/current/oes_nat.htm.