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EDUCATION SYSTEMS CENTER *at*
NORTHERN ILLINOIS UNIVERSITY

Learning with Robotics

February 27, 2023

PSMA- Phoenix STEM Military Academy

Chicago Public Schools District 299

www.phoenixmilitary.org

Student Presenters: PSMA STEM Ambassadors

Andrea Apolinar (Grade 11)

Andrea Guajardo (Grade 11)

Guidance Henderson (Grade 10)

Marquita Jones- Assistant Principal

PSMA PLTW Course Offerings
Engineering & Computer Science Pathway

Course Title	Grade Level
IED-Introduction to Engineering	Rising 9-11
POE-Principles of Engineering	10-12
Civil Engineering	11-12
Aerospace & Engineering	10-12
Cybersecurity	11-12
Digital Electronics (SY23-24)	11-12
Vex V5 Robotics (Summer 23)	Rising 9-10
Computer Science Essentials or Mobile Applications (SY23-24)	10-12

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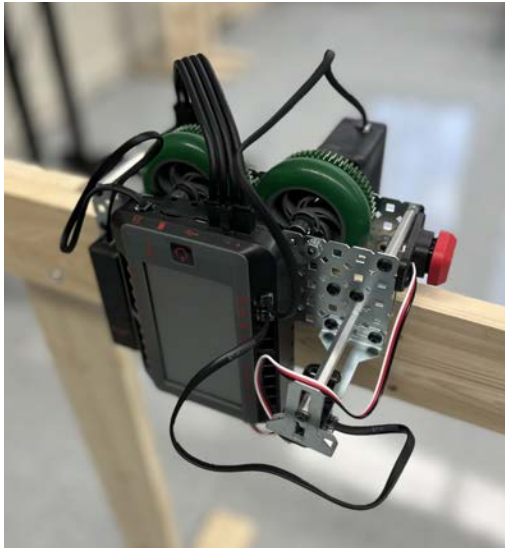
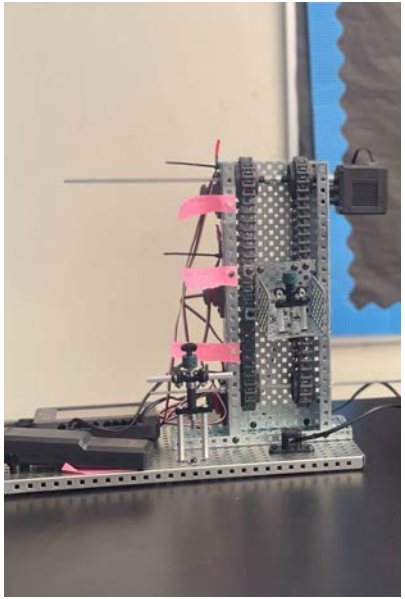
PSMA Robotics

Year 1

Aerospace Engineering

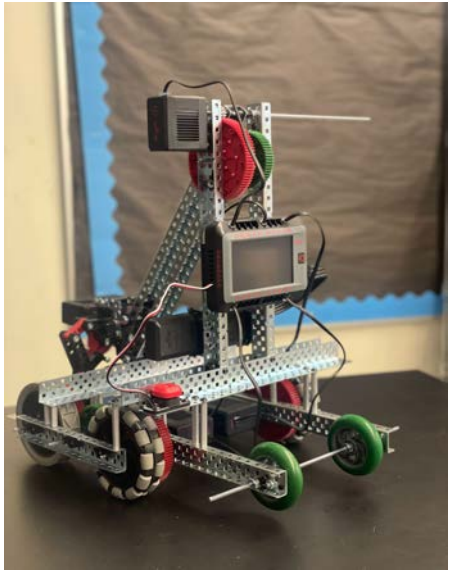
- VEX Satellite





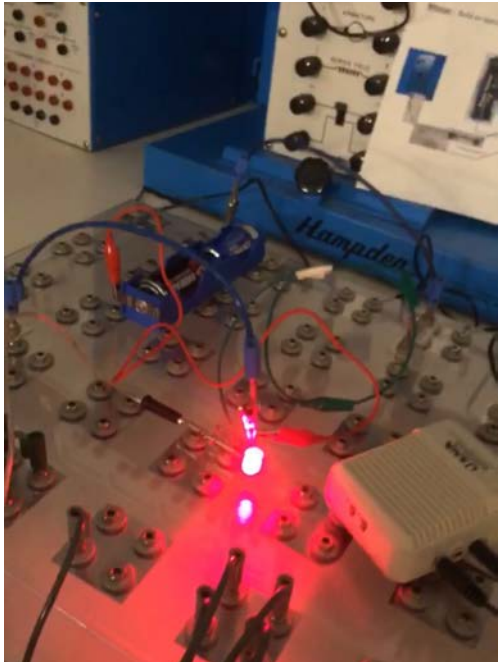
- VEX Elevator

- VEX Rover



U.S.Naval Academy STEM Program

- Ocean Engineering
- Algebra 2
- Computer Science
- Aerospace Engineering
- Robotics (Coding)
- Circuits (Soldering)
- Meteorology
- Paleotempestology



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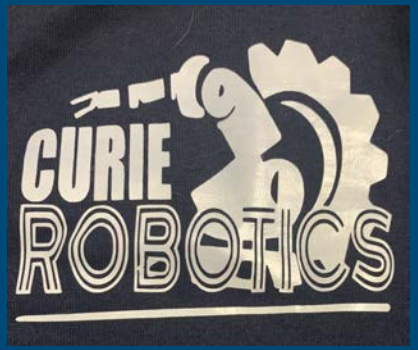


Curie High School

First Illinois Team, FTC: 19646, Phoenix

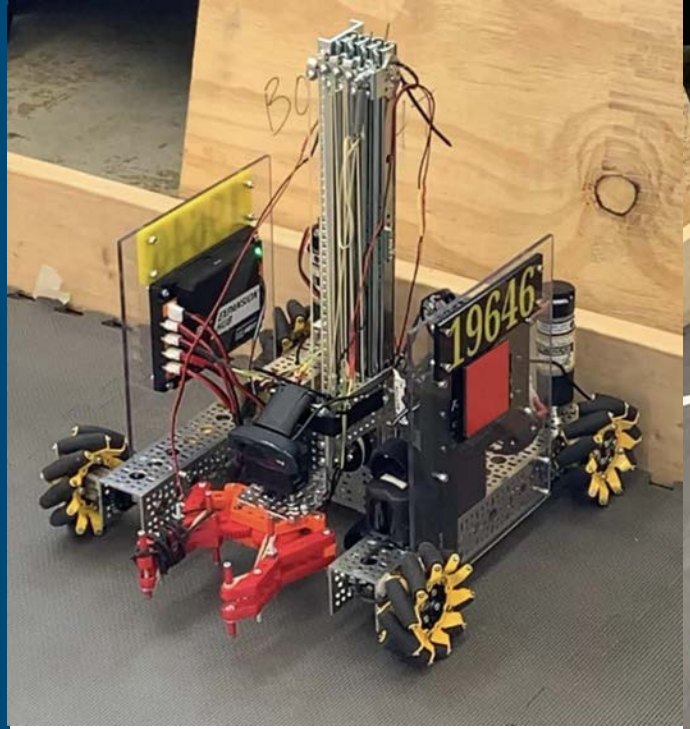
- Dr. Katti (Mentor)
- Natorion Johnson (Student Leader)

- **Student Led:** Natorion asked Dr. Katti to start a robotics club
- Need **Summer Paid Programs** to learn to use tools and understand mechanical structures.
- Robotics **inherently creates a melting pot of friends, cooperation, learning and fun.**
- Robotics builds **people**, not just robots!
- Robotics enables **thinking and creativity**!

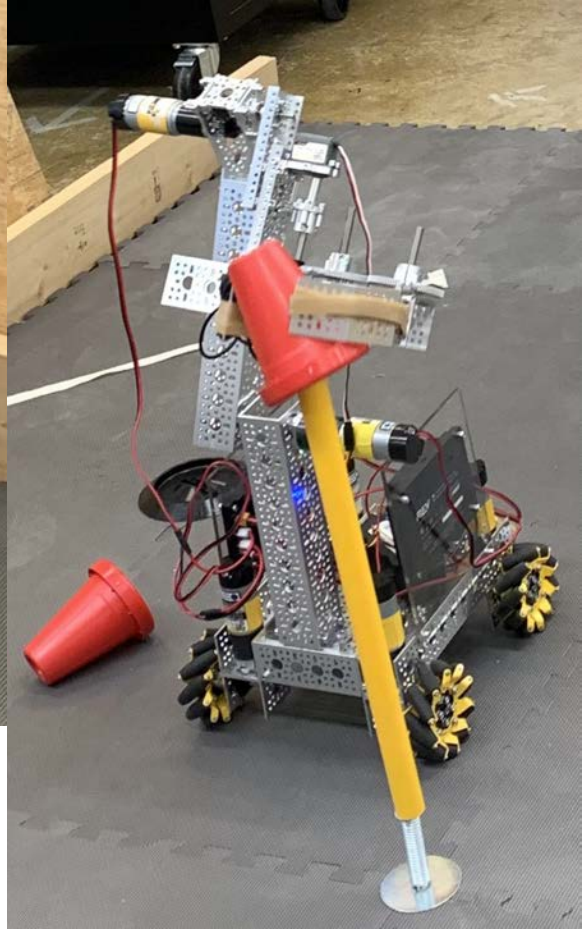
Competition*

- First Illinois
  - FTC
- Everyone is Invited
  - Artists
  - Graphic Design
  - Communicators for fundraising.
  - Organizers
  - Builders
  - Programmers
  - CAD Designers

https://youtu.be/igR409sJly0



Bumble Bee Lift and Claw Competition Robot



First Iteration Robot-BB1

FTC Robots

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FTC- Curie Ready to Score!

Competition

SHIFTING CHICAGO NARRATIVES

https://vimeo.com/701910232/b645872e63

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Building, Collaboration and Troubleshooting*

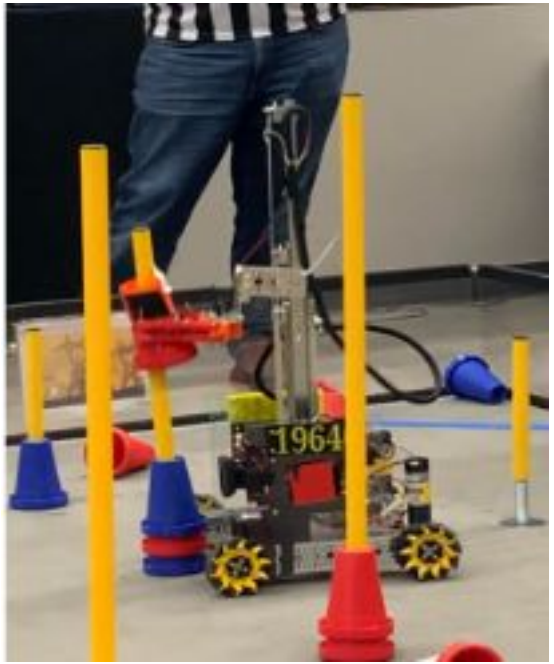
How to Install a Wheel on an Axle

How to use Gears

How to connect a motor

How to lift, turn and rotate

YouTube is your Friend



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Strategize, Program, Iterate*

Programing Robot

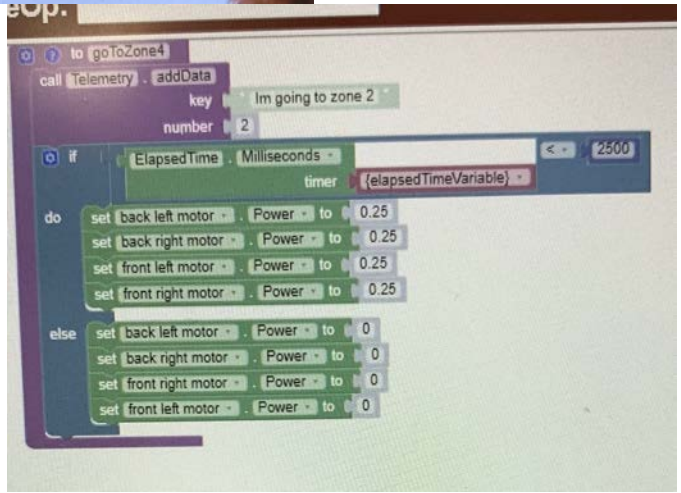
- Turn the motors Forward and Backwards
- Adjust the Speed
- Program a Servo to turn
- Link Motors to Sensors

Strategize

- Understand the rules
- How to play
- Understand what to document

FIELD

Autonomous Program Block Programming



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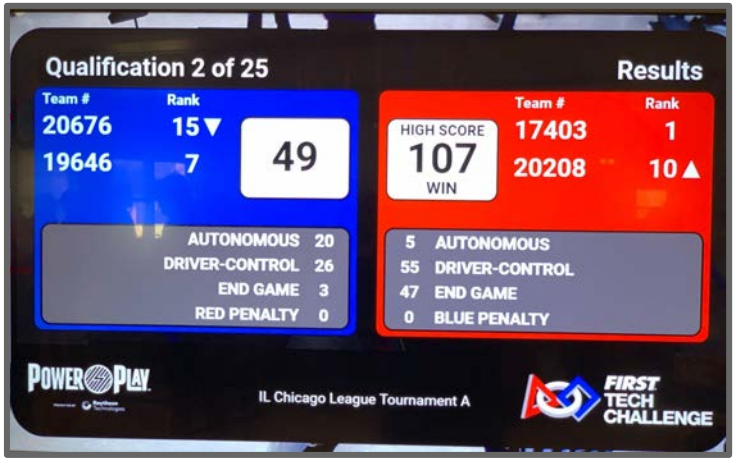
Presentation to Judges

Oral

- Design Approach
- Problems Encountered
- Redesign
- Uniqueness

Written

- Document Daily Work
- Draw Illustrations
- Outreach Outcome
- Social Media/Website
- Fund Raising



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Gracious Professionalism

… Strong competition … mutual respect … appreciation of your opponents.

***Giving back to assist your competitors produce their highest quality work*

- *When your opponent has a bent hub, you give them a hub you have and they win state! It's our win too.*
- *When a team forgets to bring the wires you need, you give them a wire.*

Illinois Mathematics and Science Academy (IMSA)

“Titan Robotics”

https://titanrobotics2022.com/

https://www.facebook.com/TitanRobotics2022/

https://www.instagram.com/titanrobotics2022/?hl=en

First Robotics Competition team
(FRC - big robots and team size)
And
First Tech Challenge Team
(FTC - small robots & team size)

- Established Fall 2006
- 2007 Inaugural Competition Season
- 2-3 competitions per year based on budget and fundraising

Sponsors:
Direct dollars and In-Kind

IMSA
Illinois Mathematics and Science Academy

MSOE
UNIVERSITY

MSP
Machine Solution Providers

CAT

SOLIDWORKS

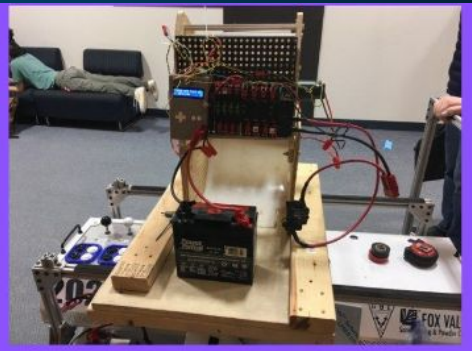
INTUITIVE
Foundation™

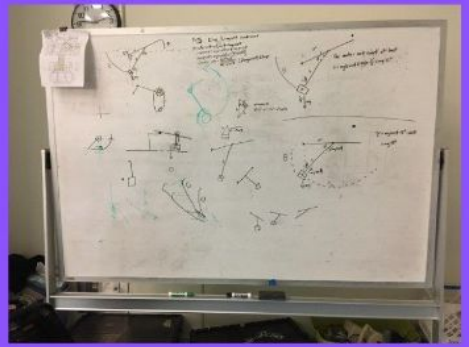
Share Machine Inc.

TE connectivity
FOUNDATION

Student Leadership Development

The Organizational Structure



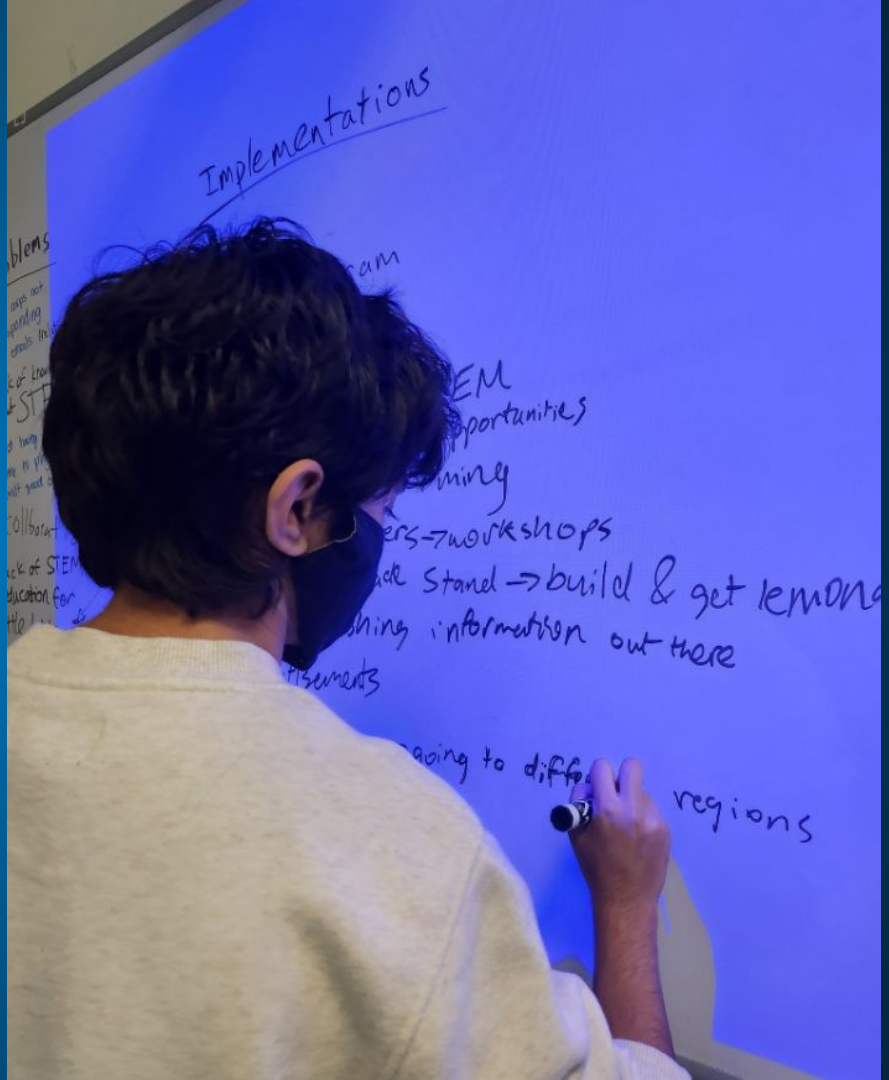


Titans teaching Titans

- Finance subteam
  - Student led
  - Budgeting & Ordering
  - Donations & Requests
  - Travel Planning $$

FIRST Team 2022: Titan Robotics
September 22, 2022 ·

Want to learn about how FRC Titan Robotics finances our 20 thousand dollar robot as well as overnight competition trips and team dinners? Then swing by room E121 today from 4:30 to 5:15pm to take part in the Finance subteam's lesson! **#FRC #rapidreact #FirstRobotics #FRC2022 #FTC**



Titans teaching Titans

- Operations subteam
  - Student led
  - Education & Outreach
  - Social Media
  - Relationships
  -

FIRST Team 2022: Titan Robotics
September 14, 2022 ·

Interested in learning about connecting with local communities to spread STEM opportunities? Then come to FRC's educational seminar on Outreach to get involved with Titan Robotics' Operations Team for future application news! (No experience needed) We'll be teaching in E121 (Blue Room) from 4:30pm to 5:15pm, so come right after 8th mod! If you have any questions on the material or Operations team as a whole, then contact titanrobotics2022@imsa.edu. **#FTC #FirstRobotics #rapidreact #FRC2022**

Statewide Frameworks & Resources

Team-Based Challenge

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College and Career Pathway Endorsement Framework

INDIVIDUAL PLAN

Each student completing an endorsement must have an individualized plan, which includes college planning linked to early understanding of career goals, financial aid, resume, and personal statement.

PROFESSIONAL LEARNING

Awareness, exploration, and preparation activities that provide opportunities for students to interact with adults in their workplace

9th	10th	11th	12th
At least 2 career exploration activities or 1 intensive experience		60 cumulative hours of paid or credit supervised career development experience with a professional skills assessment	
At least 2 team-based challenges with adult mentoring			

Through these experiences, a student gains essential employability and technical competencies in their identified sector.

CAREER-FOCUSED INSTRUCTIONAL SEQUENCE

Two years of secondary coursework, or equivalent competencies, that articulate to a postsecondary credential with labor market value. Must include at least 6 hours of early college credit.

9th	10th	11th	12th
Orientation / Introduction			
	Skill Development		
			Capstone / Advanced Courses

ACADEMIC READINESS

Ready for non-remedial coursework in reading and math by high school graduation through criteria defined by district and local community college

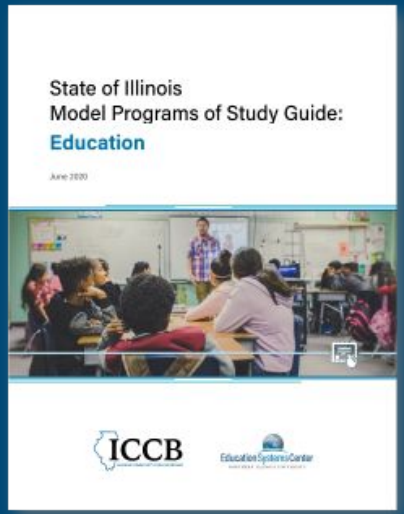
IDENTIFY HIGH-PRIORITY OCCUPATIONS

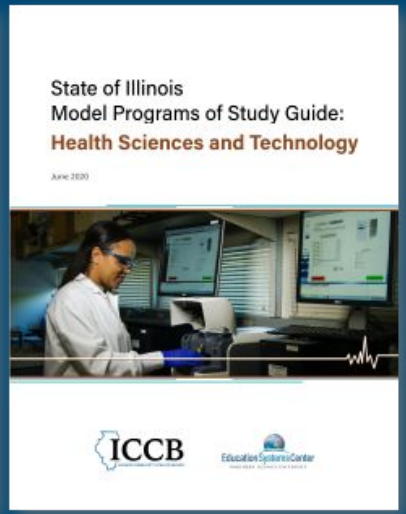
DETERMINE PROMISING CREDENTIALS & MAP STACKABLE DEGREES/ CERTIFICATES

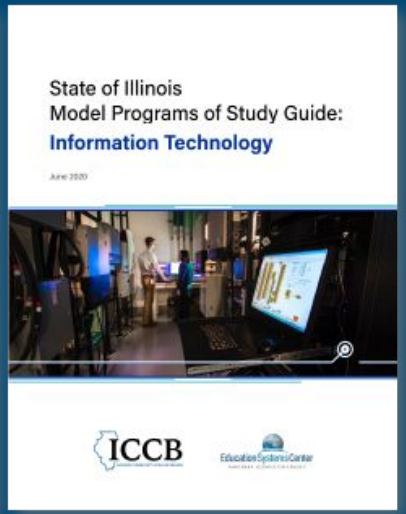
IDENTIFY STRATEGIC COMMUNITY COLLEGE COURSES

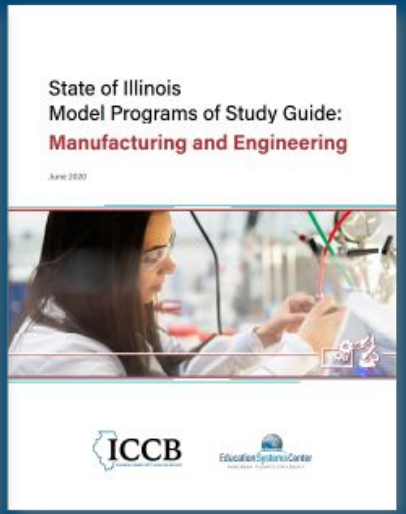
MAP SECONDARY TO POSTSECONDARY SEQUENCE

DEFINE RELATED TECHNICAL COMPETENCIES









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Work-Based Learning Continuum

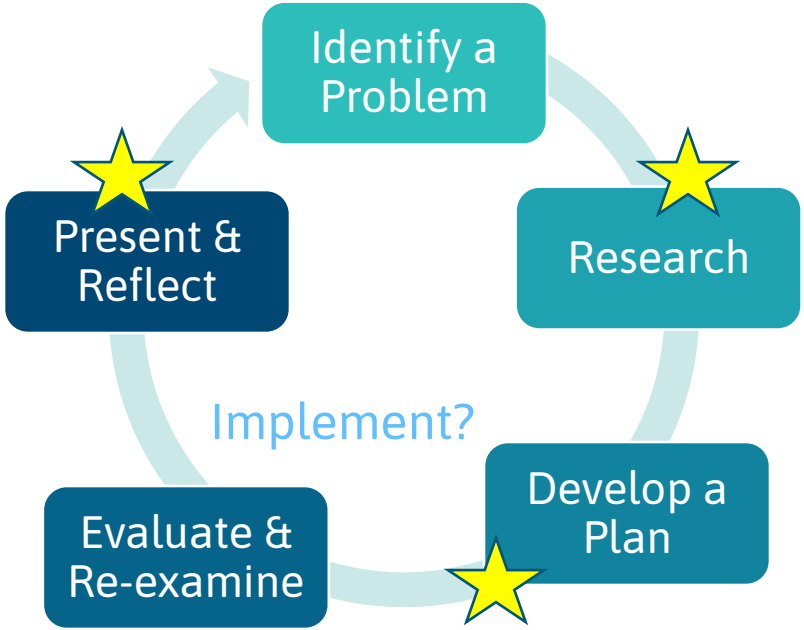
Definitions: *Illinois Career Pathways Dictionary*

Components of a Team-Based Challenge

- ❏ Authentic problem or challenge identified from and/or in collaboration with a community or business partner
- ❏ Students interact in a meaningful way with an adult mentor with expertise in a field related to the Team-Based Challenge that is someone other than their assigned classroom teacher
- ❏ Students demonstrate at least one Pathway-specific Technical Competency
- ❏ Students demonstrate at least one Cross-Sector Essential Employability Competency (Essential Skill)
- ❏ Students work in collaborative groups to solve the problem
- ❏ Final product or a final presentation on the outcome of the Team-Based Challenge

Student Experience

- Learning is driven by challenging, open-ended problems with no one “right” answer
- Students work as self-directed, active investigators and problem-solvers in small collaborative groups
- A key problem is identified and a solution is agreed upon and implemented
- Teachers adopt the role as facilitators of learning, guiding the learning process and promoting an environment of inquiry



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Statewide Team-based Challenge Resource Bank

IDEAS FOR INSPIRATION: TEAM-BASED CHALLENGES

Manufacturing, Engineering, Technology, and Trades

Plant Safety	Review the history and current practices for plant safety within an organization and suggest recommendations for improvement.
Review Plans/Maps	Inspect plans and/or maps of structures to determine areas in need of troubleshooting and make recommendations for repairs.
Basic Design	Given a design need, create basic detail and assembly drawings for products and equipment that address concepts in layout, print reading, measurement, and quality assurance.
Cost Estimation	Given an authentic need from a customer, research vendors and apply cost estimation principles to create a project timeline and estimate labor and material costs.
Build and Test Prototypes	Given a need to address, develop and test prototypes as potential solutions — document results as able to build and test prototype for quality control to make recommendations for improvement to prototype.

- Organized by College and Career Pathway Endorsement Area
- Includes ideas for inspiration and detailed models, along with a template for designing your own
- Resource bank and materials available on I-WIN resource hub

Resources for Design

Chicago Public Schools WBL Toolkit for Team-based Challenges

- Includes checklists, tip and fact sheets, and implementation tools

Team-based Challenge Template

- Template to design and scope out the challenge

Design Questions for Team-based Challenges

- Questions to reflect on as designing

Opportunities

STEM Ambassadors

IMBI

Illinois Math Badging Initiative

What are Math Badges?

An Alternative Credentialing Mechanism

- Aligned to:
  - Illinois Learning Standards (incorporating CCSS)
  - Transitional Math competencies
- Stackable
- Translate into credit for:
  - Transitional Math
  - High school math courses
  - Early college credit

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Illinois Math
Badging Initiative

How do Math Badges work?

Students can certify learning from a broad range of sources:

- Coursework
- Independent study
- Summer school
- Work-based learning, etc.

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Illinois Math Badging Initiative

Why Math Badges?

Improve math outcomes and advance racial equity through:

- Stronger **alignment** to math needed for secondary, postsecondary, and career success
- Students **demonstrate knowledge** not captured by grades
- Opportunities to **develop and reinforce** math knowledge and skills
- **Validate learning** outside of the classroom through work-based and other applied learning.
- **Customization** engages students with math directly related to college and career interests

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Illinois Math
Badging Initiative

It’s not just about badges!

Badges are a **tool** to:

- Solve a problem
- Rework a system
- Change a structure
- Transform teaching
- Focus on learning

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Pilot Site Use Cases

IMSA	***Ridgewood***	***Round Lake***	***PSMA***	***Charleston***
Pipeline and Bridge programs Historically underrepresented 7th-9th grade students Interest and talent in math May come from a district that lacks opportunities for enrichment.	*Transitional Math* Set Badges students must complete and optional Badges based on career pathway. Students can earn credit in multiple Transitional Math courses (stackable Badges) *Core math* Set Badges students must complete and optional Badges based on career pathway. Students can earn Honors Credit	Prep Classes (double block) Possibly Foundations/single block Bringing math into the 21st century Meaningful interdisciplinary connections Math in context Portfolio options Students see themselves as mathematicians	Math badging will be integrated into: Aerospace & Engineering (Rising 10th) Introduction to Engineering (Rising 9th) Robotics & Computer Science (Rising 9th)	Geometry in Construction Solidify and demonstrate rigor Aligning to Algebra I and II

Next Steps

Please let us know if you'd like to continue the conversation here: https://forms.gle/WyzgBSKZYNMKYhAGA