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
<table>
<thead>
<tr>
<th>Course Title</th>
<th>Grade Level</th>
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</thead>
<tbody>
<tr>
<td>IED-Introduction to Engineering</td>
<td>Rising 9-11</td>
</tr>
<tr>
<td>POE-Principles of Engineering</td>
<td>10-12</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>11-12</td>
</tr>
<tr>
<td>Aerospace &amp; Engineering</td>
<td>10-12</td>
</tr>
<tr>
<td>Cybersecurity</td>
<td>11-12</td>
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<tr>
<td><em>Digital Electronics (SY23-24)</em></td>
<td>11-12</td>
</tr>
<tr>
<td><em>Vex V5 Robotics (Summer 23)</em></td>
<td>Rising 9-10</td>
</tr>
<tr>
<td><em>Computer Science Essentials or Mobile Applications (SY23-24)</em></td>
<td>10-12</td>
</tr>
</tbody>
</table>
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
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

Bumble Bee Lift and Claw Competition Robot

FTC Robots

https://youtu.be/igR409sJly0
FTC- Curie Ready to Score!

Competition

SHIFTING CHICAGO NARRATIVES

https://vimeo.com/701910232/b645872e63
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
Strategize, Program, Iterate

Programming 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

Autonomous Program
Block Programming
Presentation to Judges

Oral
- Design Approach
- Problems Encountered
- Redesign
- Uniqueness

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

- Tech
  - Sr. Team Captain
  - Jr. Team Captain
  - Design Integration
  - Programming
  - Mechanical
  - Electrical
  - Software Titan
  - Finance
  - Outreach
  - Communications
- Operations
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
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
## 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.

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

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.

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<th>12th</th>
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<tbody>
<tr>
<td>Orientation / Introduction</td>
<td>Skill Development</td>
<td></td>
<td>Capstone / Advanced Courses</td>
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</table>

## ACADEMIC READINESS

Ready for non-remedial coursework in reading and math by high school graduation through criteria defined by district and local community college.
State of Illinois Model Programs of Study Guide: Education
June 2020

State of Illinois Model Programs of Study Guide: Health Sciences and Technology
June 2020

State of Illinois Model Programs of Study Guide: Information Technology
June 2020

State of Illinois Model Programs of Study Guide: Manufacturing and Engineering
June 2020

ICCB
Education Systems Center

ICCB
Education Systems Center

ICCB
Education Systems Center

ICCB
Education Systems Center

EdSystems
Work-Based Learning Continuum

Career Awareness → Career Exploration → Team-Based Challenge → Career Development Experience → Pre-apprenticeship / Youth Apprenticeship → Apprenticeship

Increasing Intensity of Employer Engagement

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
Statewide Team-based Challenge Resource Bank

IDEAS FOR INSPIRATION: TEAM-BASED CHALLENGES

Manufacturing, Engineering, Technology, and Trades

<table>
<thead>
<tr>
<th>Plant Safety</th>
<th>Review the history and current practices for plant safety within an organization and suggest recommendations for improvement.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review Plans/Maps</td>
<td>Inspect plans and/or maps of structures to determine areas in need of troubleshooting and make recommendations for repairs.</td>
</tr>
<tr>
<td>Basic Design</td>
<td>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.</td>
</tr>
<tr>
<td>Cost Estimation</td>
<td>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.</td>
</tr>
<tr>
<td>Build and Test Prototypes</td>
<td>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.</td>
</tr>
</tbody>
</table>

- 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](https://www.i-win.org/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
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
How do Math Badges work?

Students can certify learning from a broad range of sources:

- Coursework
- Independent study
- Summer school
- Work-based learning, etc.
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
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
## Pilot Site Use Cases

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

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