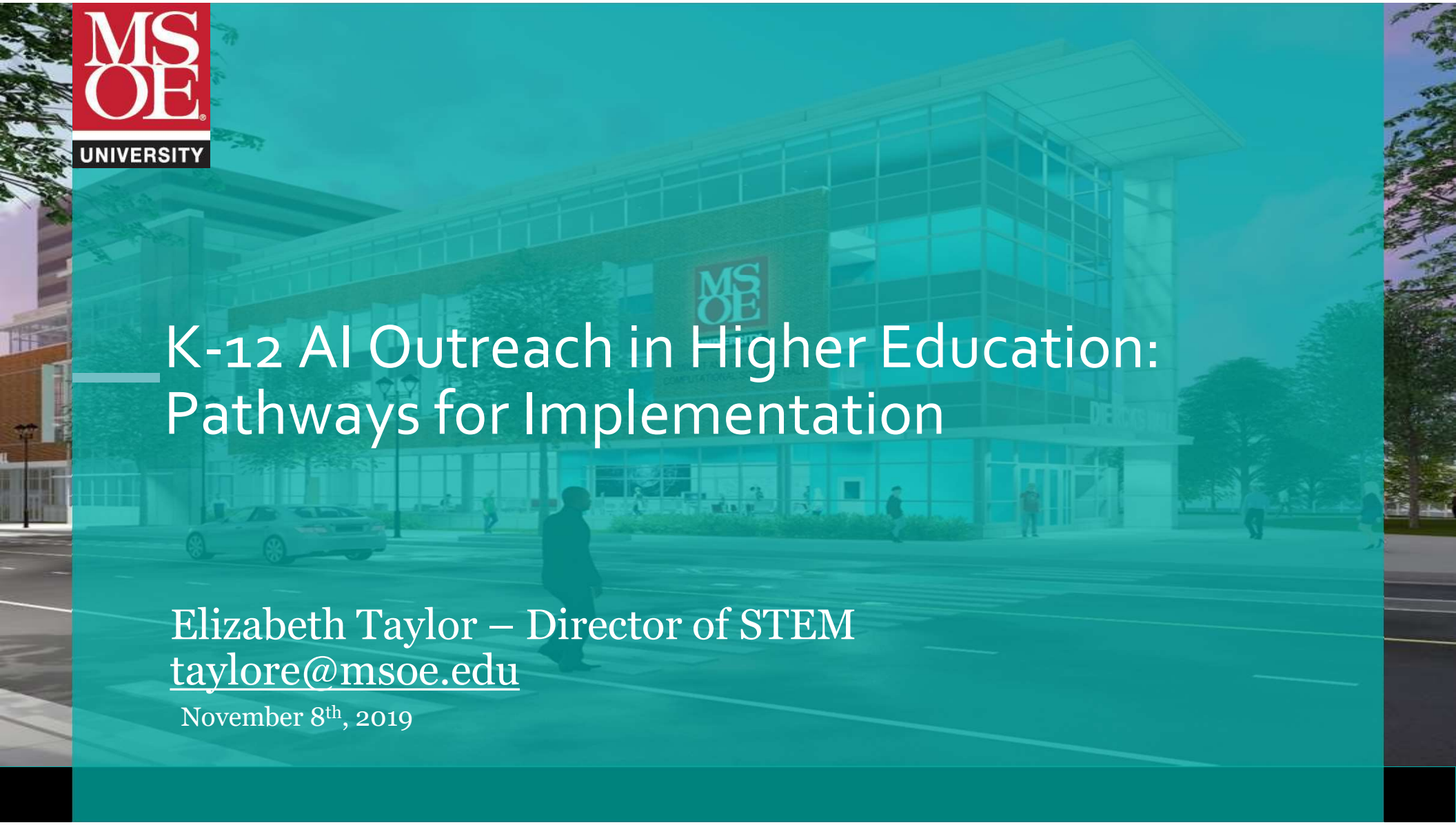


K-12 AI Outreach in Higher Education: Pathways for Implementation

Elizabeth Taylor – Director of STEM
taylore@msoe.edu

November 8th, 2019

Agenda

We'll cover…

- Why MSOE needs K-12 students prepared in AI
- How AI programs were assessed for implementation
- How we're offering AI opportunities currently
- What we've learned so far

For reference: *K-12 AI outreach programs (non-curricular) at MSOE began in August of this year.*

Milwaukee School of Engineering is a private, non-profit university offering bachelor's and master's degrees in engineering, business, and nursing.

- ~2,600 undergraduate students; 138 faculty
- Average class size of 20 students
- New computer science program (2018) that is grounded in the understanding and utilization of Artificial Intelligence
- Programs in software engineering & computer engineering that also enable students to experience AI

Dierks Hall

- 68k ft2 of labs, classrooms, collaboration spaces, and hubs used by all students at MSOE
- NVIDIA GPU-accelerated AI supercomputer (Rosie)
- Dedicated lab spaces for:
  - Data analytics
  - Virtual & augmented reality
  - Human machine interface laboratories, including an Anatomage Table
  - Cyber security

Why is MSOE actively investing in AI outreach for K-12?

Our Vision Challenges Us.

MSOE will set the standard for preparing leaders to solve the diverse technical challenges of the 21st century.

…we cannot realize our vision without it!

STEM outreach in AI is critical to Milwaukee & MSOE:

- Wisconsin is facing a shortage of CS educators; we need ways to get students exposed to opportunities they will not see in their classrooms
- MSOE is the only institution in Milwaukee with a supercomputer that can support high powered AI operations; we need to empower students to be able to leverage this technology by equipping them with core AI concepts
- AI curriculum and components can be cost prohibitive; we need to ensure every student has the ability to experience AI core concepts

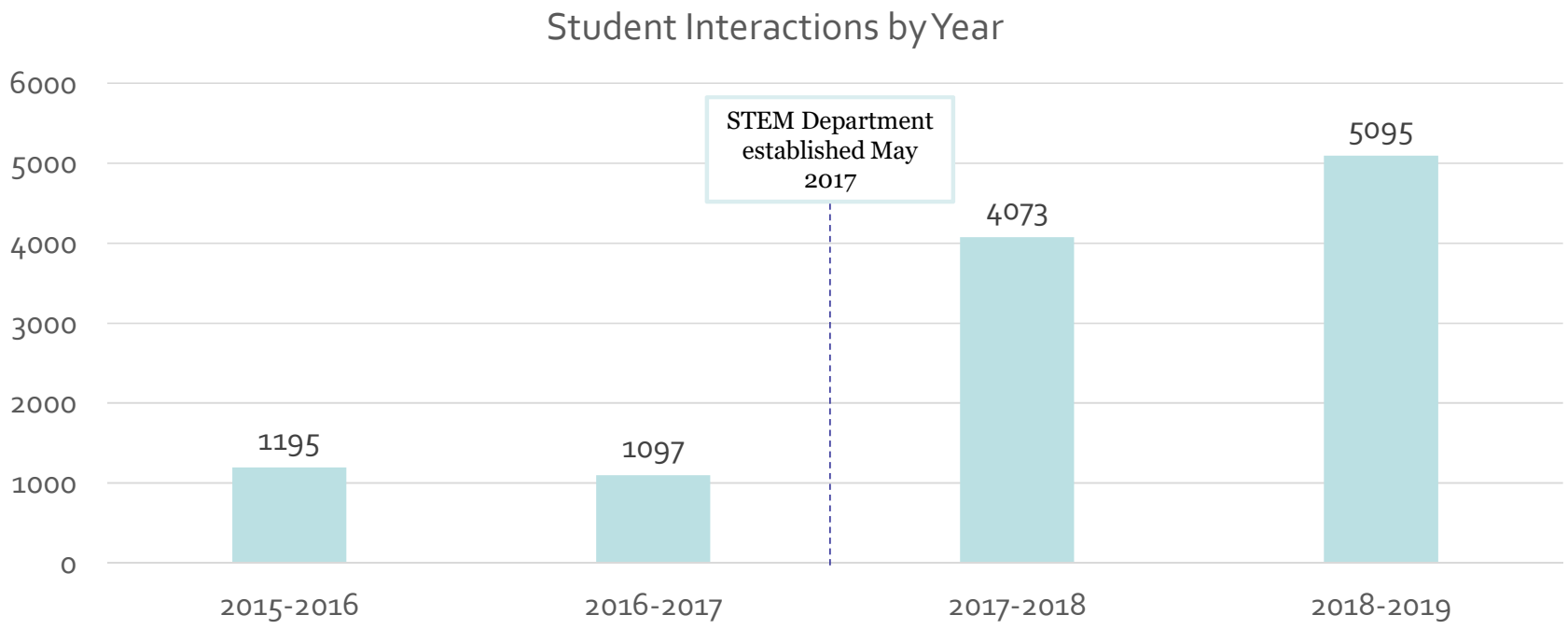
When assessing how to implement AI outreach at the University, we…

- Evaluated existing structures in STEM outreach
  - Who are we serving?
  - Where are we serving them?
- Reviewed AI4K12 5 Big Ideas to ensure programs selected were in alignment
- Assessed staff expertise (and lack thereof) to understand sustainable implementation models
- Assessed K-12 professional development opportunities

Teacher Professional Development

- **Sharing resources with educators** – both those teaching CS and those who are not – has been our first point of engagement
- Inviting educators & community volunteers to observe our programs enables informal PD
- Formal PD in AI - how can we empower educators to leverage programs (vs leaning on mobile programs from MSOE) in their own classrooms? How do we ensure accessibility in low-tech & high need classrooms?

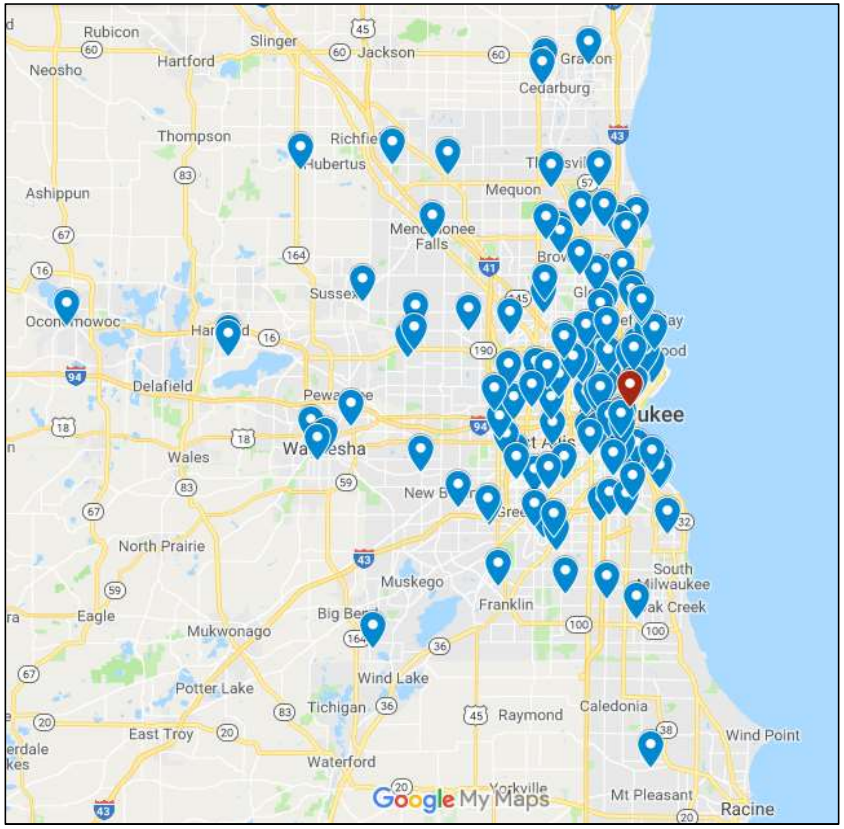
STEM outreach at MSOE has been consistently growing, and AI outreach enables us to expose students to topics they will likely not see in their classrooms



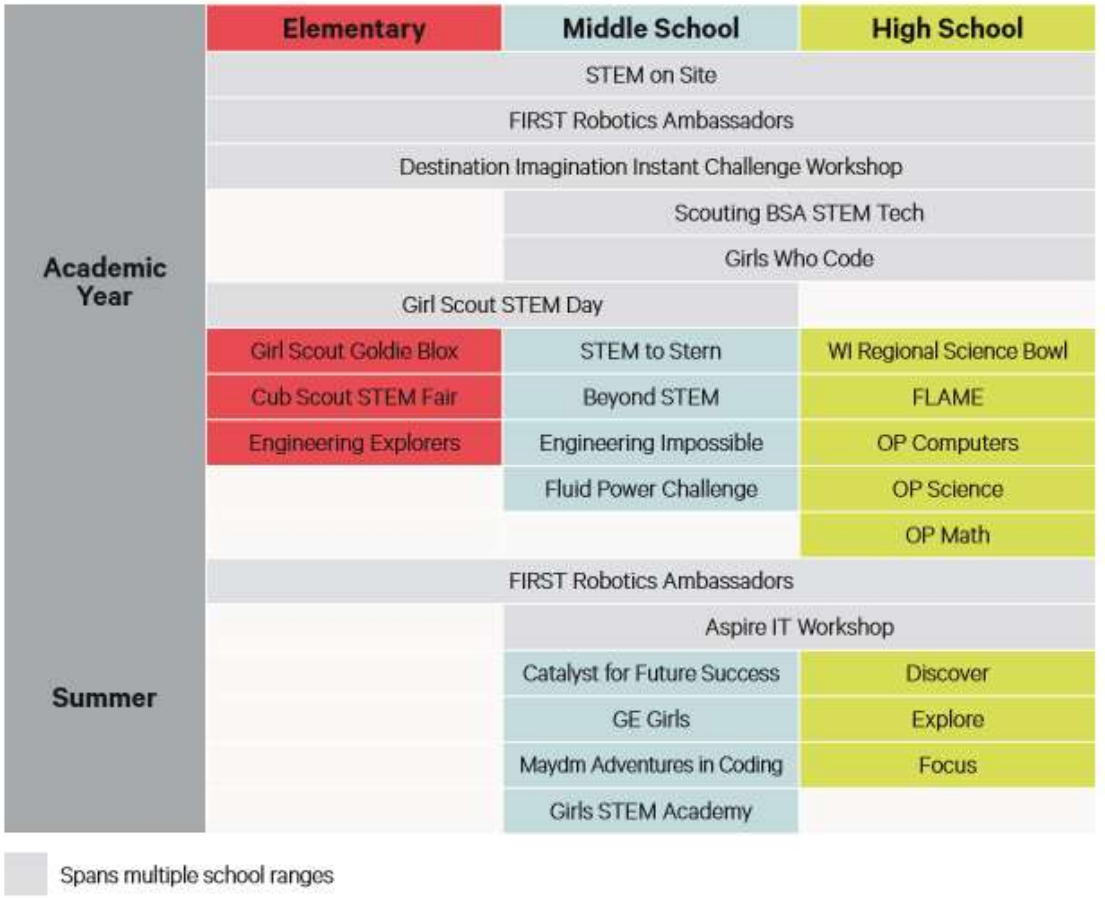
AI Outreach @ MSOE

Who are we serving and where are we serving them?

Opportunities that don't always require our campus resources are critical!



Evaluating existing structures at MSOE – where can we match AI competencies with programs that already are successful and in place?



	Elementary	Middle School	High School
Academic Year	STEM on Site		
	FIRST Robotics Ambassadors		
	Destination Imagination Instant Challenge Workshop		
		Scouting BSA STEM Tech	
		Girls Who Code	
	Girl Scout STEM Day		
	Girl Scout Goldie Blox	STEM to Stern	WI Regional Science Bowl
	Cub Scout STEM Fair	Beyond STEM	FLAME
	Engineering Explorers	Engineering Impossible	OP Computers
		Fluid Power Challenge	OP Science
			OP Math
Summer	FIRST Robotics Ambassadors		
		Aspire IT Workshop	
		Catalyst for Future Success	Discover
		GE Girls	Explore
		Maydm Adventures in Coding	Focus
		Girls STEM Academy	

Spans multiple school ranges

How our organization supports AI opportunities:

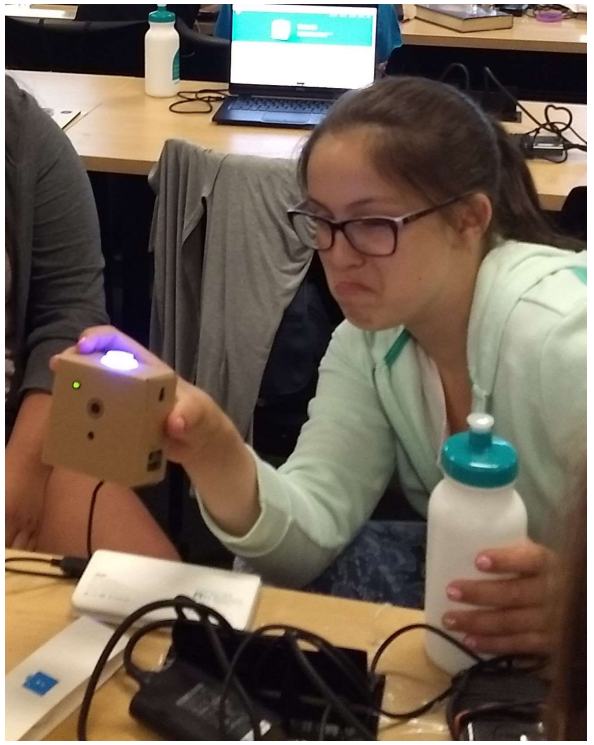
- Partnerships with national organizations such as NCWIT
- Scaling existing AI competencies and activities to K-12
- Investing in proven curriculum and equipment to enable MSOE students to easily learn and execute programming
- Ensuring alignment to national models – such as AI4K12 Big Ideas – to provide cohesion to other AI opportunities

Our biggest takeaway? Without hands-on integration with AI, activities are not as impactful to students. Enabling and empowering students to make real world connections is even better!

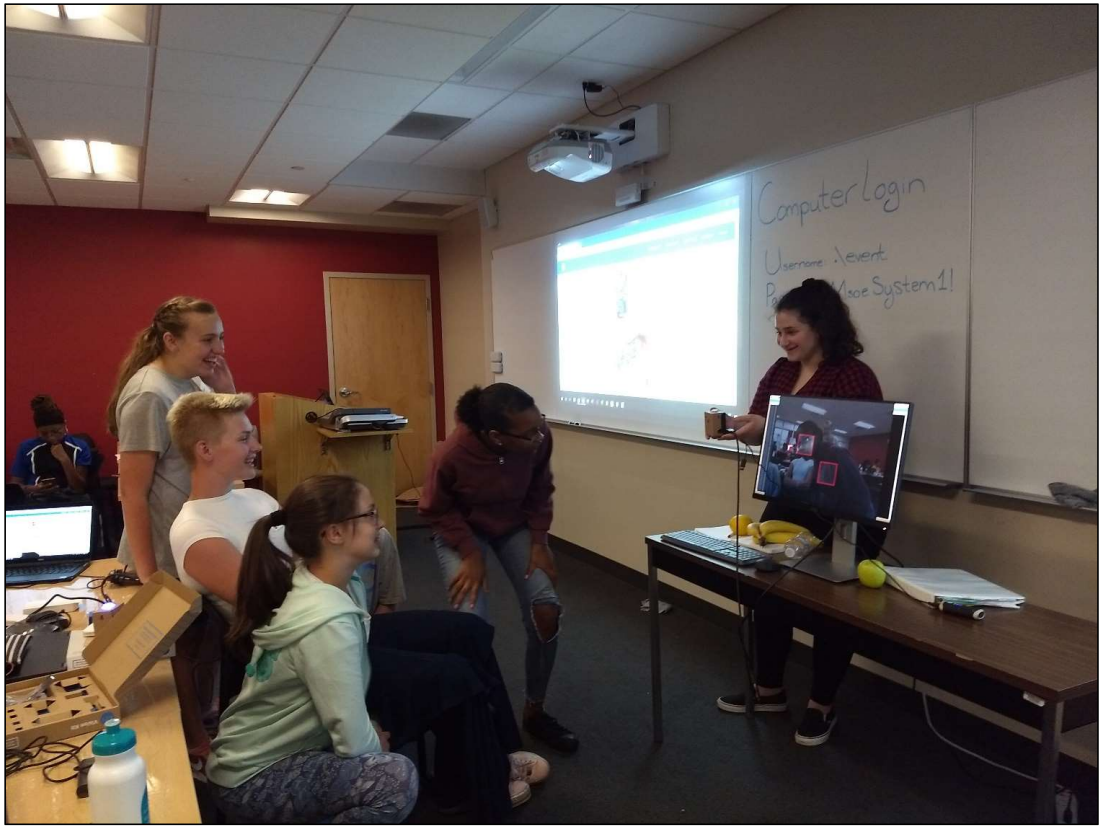
NCWIT Partnership via AspireIT

- NCWIT AspireIT is designed to teach K-12 girls programming fundamentals and computational thinking in fun, creative, and hands-on environments
- MSOE is a partner organization in the Academic Alliance
- Partnered with AspireIT awardee & MSOE CS department to offer a two-day AI covering computer vision, machine learning, deep learning, and neural networks

Hands On Application: Students utilized Google AIY vision kits to build their own intelligent camera to see & recognize objects using machine learning.



AI Outreach @ MSOE

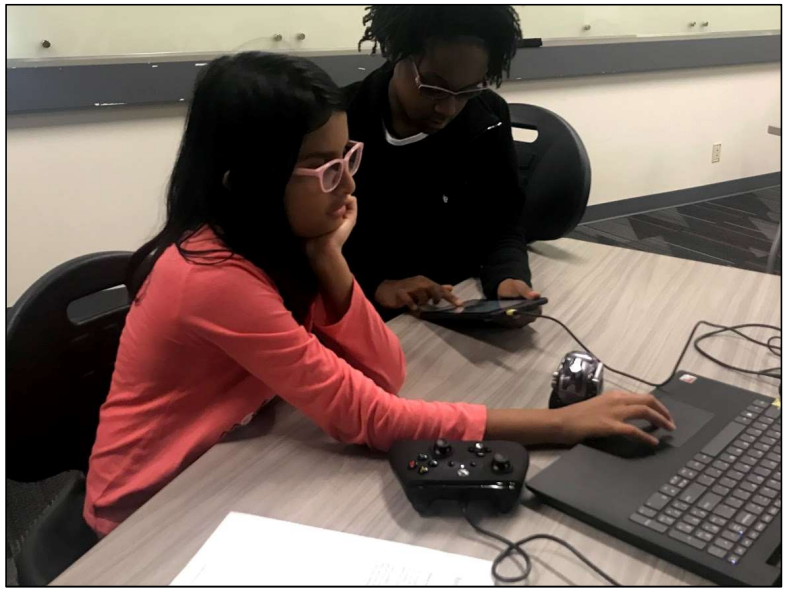


Girls Who Code – Intro to Artificial Intelligence

Utilizing ReadyAI's middle school intermediate premade curriculum, MSOE students in computer science, software engineering or computer engineering are able to lead classes of 15 students in Intro to AI coursework leveraging Cozmo robots

Topics covered over 8 weeks include:

- Object recognition
- Facial & speech recognition and speech generation
- Landmark-based navigation
- Moving & manipulation of the Cozmo robot



Girls Who Code – Intro to Artificial Intelligence

Participant feedback on this program has been immensely positive:

- Students are able to discuss and try out real world applications of AI using Cozmo
- Students are empowered to try their own solutions through project-based learning after knowledge of core principles is gained
- Feedback is immediate – within an hour session students are able to learn, apply, and try out what they learned and see if it works

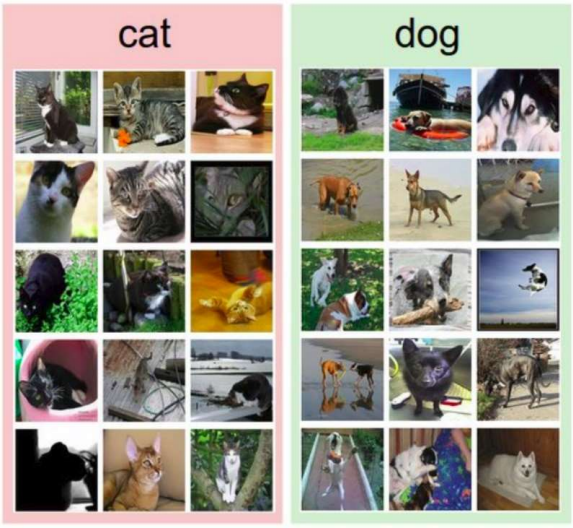
Hands On Application: Utilization of Cozmo robots for every AI concept

ASSOCIATE PROFESSOR/PROGRAM DIRECTOR
Dr. Derek Riley
Department: Electrical Engineering and Computer Science
(414) 277-2269 – Diercks Hall: DH420 – riley@msoe.edu

Girls STEM Academy

- Modified Nvidia Deep Learning Institute Computer Vision Workshop. Normally delivered to corporate and undergraduate audiences
- MSOE Faculty modified and facilitated for 30 MPS students from low performing, high need schools. No prerequisite knowledge required
- Training a neural network to recognize dogs and cats in 3-hour workshop
- Learning the basics of deep learning, including strengths and weaknesses

NVIDIA DEEP LEARNING INSTITUTE

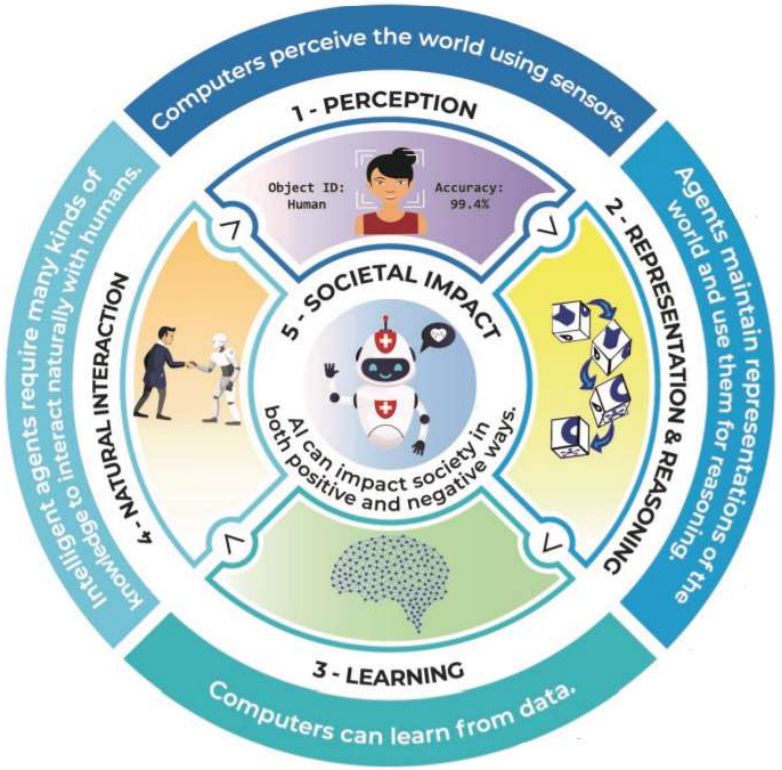


AI Outreach @ MSOE

Using the Big Five Ideas in AI

All programs currently employ all of these concepts in some form. Many programs will focus on one area and then bring it back into context with the other 4.

However, **societal impact** is one area our K-12 programs tend to be most interested in. Our Intro to AI wraps up most classes talking about the applications of the AI skill they learned into society, and is a high point for attendees



What We've Learned

- A students leading students model is better received by participants and provides valuable leadership opportunities
- Hands-on integration is essential, and real-time feedback is the next best thing
- Without talking about AI in the context of societal impact, we fail to engage **all** students
- Knowledge of CS will always be helpful, but isn't required to take the first step