



# PREPARING THE **FUTURE STEM WORKFORCE**

## **A SYMPOSIUM ON REGIONAL BEST PRACTICES**

Presented by Great Minds in STEM

### **Represented Institutions:**

- Delta College
- Illinois Institute of Technology
- Ivy Tech Community College
- Lawrence Technological University
- Milwaukee School of Engineering
- Minnesota North College
- Rose-Hulman Institute of Technology
- University of Wisconsin - Milwaukee
- Waukesha County Technical College

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# INTRODUCTION

## PURPOSE

In recent years, the importance of inclusivity and accessibility in STEM education has become increasingly evident. While the field holds immense potential for innovation and growth, it is imperative that we ensure equitable access to opportunities for all aspiring students. This conference seeks to explore strategies and initiatives to facilitate a smoother transition for students from high school to community college and onward to pursue STEM degrees at four-year institutions.





## GOALS

The purpose of this symposium was to bring together technical institutions across the Midwest in order to do the following:

- To examine the current preparedness of students entering the STEM workforce, and exchange, and
- To compare strategies of instruction with the intention of learning from other institutions in order to innovate the training of the future members of the STEM workforce.

On a larger scale, the vision is to expand and develop similar conferences across the United States.

# METHODS FROM INSTITUTIONS

Out of the nine institutions that were represented at the symposium, seven of these institutions presented their systems of promoting STEM fields and producing quality candidates ready for the challenges therein.

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## LAWRENCE TECHNOLOGICAL UNIVERSITY

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**Presented by Dr. Richard Heist**

*Provost*

### LAWRENCE TECHNOLOGICAL UNIVERSITY OVERVIEW

Lawrence Technological University (LTU) is one of the 13 U.S. universities focusing on comprehensive, independent, and doctoral education with a technological focus. The institution is committed to providing financial aid to students without means, recognizing the importance of equitable access to education. Although it has faced challenges, LTU has made progress in addressing the STEM workforce. A key initiative is the Innovative Pathways Initiative (IPI), a comprehensive 5-year plan aimed at expanding K-12 programming, post-secondary education, and professional credentialing to increase access to STEM education.

#### ***IPI (Innovative Pathways Initiative)***

The High School Pathway under the IPI includes initiatives such as offering technology summer camps, providing computers to every Dual Enrollment student, and expanding laptop availability. Additionally, LTU is introducing core college courses in high schools and facilitating Associate Degree programs to accelerate entry into the workforce, with a strong emphasis on providing student support services.

A key aspect of the University Pathway has been LTU's efforts to create opportunities for future jobs and integrate with Dual Enrollment programs. LTU has also established a hub for core college courses in high schools and Associate Degree programs to facilitate quicker workforce entry.

#### ***Workforce Talent***

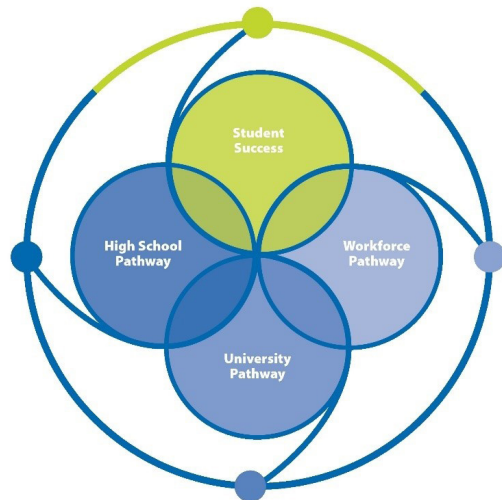
In terms of the Workforce Talent Pathway, LTU is offering Professional Developments to connect with industry and facilitating connections between High School, University, and Workforce Pathways.



The main elements of Lawrence Technological University's Innovative Pathways Initiative (IPI) for preparing the future in STEM include:

- **Expansion of Access:** LTU is focused on expanding access to STEM education by offering a variety of programs and initiatives. This includes technology summer camps for high school students, providing computers to Dual Enrollment students, and introducing core college courses in high schools.
- **Acceleration of Entry into the Workforce:** LTU is facilitating quicker entry into the workforce by offering Associate Degree programs that align with industry needs. These programs provide students with the skills and credentials necessary to succeed in STEM-related careers.
- **Integration with Industry:** The IPI emphasizes collaboration with industry partners to ensure that LTU's programs align with current and future workforce needs. This includes offering Professional Development courses to connect with industry and providing opportunities for students to gain real-world experience.
- **Support Services:** LTU is committed to providing comprehensive support services to students throughout their educational journey. This includes academic support, mentorship, and resources to help students succeed in their STEM studies and careers.

This graphic summarizes the program:



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## IVY TECH COMMUNITY COLLEGE

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**Presented by Dr. Vearyl Turnpaugh  
& Mr. Glen Roberson**

*Assistant VPs for Curriculum*

### IVY TECH OVERVIEW

Ivy Tech Community College is a multi-campus institution, originating in Indiana. The School of Advanced Manufacturing, Engineering, and Applied Science hosts 23 locations, as well as a plethora of online courses for students. The STEM school has 24 certifications and degree curriculum within five programs of interest: Automotive/Diesel Technology, Civil Construction & Heavy Highway Equipment, Precision Agriculture, Electronics & Computer Technology, and Engineering. These programs include approaches to certification and degrees at various levels, incorporating embedded certifications, transfer programs, industry apprenticeships, and contextualized curriculum.

#### **CASCADE**

One approach is the newly added Commons-Accelerated Silicon Crossroads Apprenticeships for Demands in Engineering (CASCADE). CASCADE focuses on the rapidly expanding microelectronics field and populating the workforce with underrepresented communities, such as veterans and minorities. The largest component of CASCADE and other pathway options is meeting students where they are and tailoring the process to student needs. “CASCADE is a program for matching the needs of these students with apprentice solutions academia and industry can offer”.

#### **NLPS & SCMC**

Ivy Tech also works closely with the Indiana Commission for Higher Education on initiatives such as the Next Level Pathways of Study (NLPS) program and Silicon Crossroads Microelectronic Commons (SCMC) project to focus student education on industry needs and improving STEM employment in Indiana. These collaborations can include immersion apprenticeship programs with notable manufacturing firms, such as John Deere. Additionally, the NLPS program works with 4-year institutions (particularly Purdue University) to offer Ivy Tech students a variety of stackable certification and transfer routes. This allows students to have a multitude of options to individualize their educational path to their interests and goals, best preparing them to enter the workforce.





## Dual Credit & Enrollment

Finally, Ivy Tech is making strides to expand their K-12 engagement strategies to not only inform adolescents about career opportunities in the STEM fields, but also provide students the chance to earn college credit while still in high school. These credits are obtainable through Ivy Tech's Dual Credit and Dual Enrollment programs. Dual Credit courses are taught by high school instructors during the standard school day to cover both high school and certification/degree credits. Dual Enrollment, on the other hand, is completed alongside a standard high school diploma, taught by Ivy Tech instructors, either on-site or online.

The main elements of Ivy Tech's methods of preparing the future STEM workforce can be summarized as follows:

- Engaging future STEM workers early through K-12 programs, like Dual Credit/Enrollment opportunities.
- Offering students a personalized accreditation path and opportunities to transfer to higher institutions and apprenticeship programs.
- Meeting students where they are and working with their needs, especially to provide opportunities in the STEM field to members of underrepresented groups, such as minorities and veterans.



Engaging  
Future STEM  
Workers Early



Offering  
Personalized  
Accreditation  
Paths



Meeting  
Diverse  
Student Needs

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# ILLINOIS INSTITUTE OF TECHNOLOGY

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**Presented by Dr. Joseph Orgel**

*Vice Provost, Academic Affairs*

## ILLINOIS INSTITUTE OF TECHNOLOGY OVERVIEW

Illinois Institute of Technology (IIT) has multiple programs for increasing STEM participation and success. These include Dual-Enrollment expansion, summer groups, and after-school internships. The use of mentorship programs and a shift to performance-based admission are also having an impact.

### **STEM Initiative**

IIT witnessed significant growth in Dual-Enrollment, expanding from 1 class to 20 classes within a year. This initiative enhances early exposure to STEM education for high school students. IIT offers 30 summer groups catering to middle and high school students, fostering interest and engagement in STEM fields. Additionally, the institution provides paid internships through programs like After School Matters, focusing on cybersecurity, business, and other STEM-related areas.

### **Runway 606**

IIT just launched Runway 606, a collaboration with City Colleges of Chicago (CCC) and Chicago Public Schools (CPS) to provide local students a clear high

school-to-master's degree track to reduce the time to degree in high demand fields, such as the pilot program in Cybersecurity

Runway 606 aims to expand to other technical fields, giving students an array of "on ramps" to STEM career paths, and giving them the opportunity to graduate with Associate's degrees, certificates, and a Master's degree under their belt, not to mention notable experience for resume building.



## ***Empowerment, Leadership & Mentorship***

IIT has implemented robust mentorship programs, such as the Empowerment, Leadership, and Mentorship (ELM) program aimed at scaling up instruction and supporting students throughout their educational journey. Emphasizing positivity and peer mentorship, IIT fosters a culture of support and engagement among its students. Moreover, the institution promotes a study culture, recognizing its significance in connecting students to their education and enhancing their academic achievement

The main elements of Illinois Institute of Technology's methods of preparing the future STEM workforce can be summarized as follows:

- Early Exposure and Engagement.
- Equitable Access and Support.
- Peer Mentorship and Positive Culture.



**Initiatives to  
spark interest  
in STEM from  
an early age**



**Ensuring all  
students have  
access to  
resources and  
opportunities**



**Fostering a  
supportive and  
collaborative  
environment**

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# MINNESOTA NORTH COLLEGE

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**Presented by Dr. Bart Johnson & Ms. Claire Peterlin**

*VP for Student and Academic Affairs, and AspireNorth Director*

## MINNESOTA NORTH COLLEGE OVERVIEW

The newly founded Minnesota North College consists of six campuses that were previously five separate institutions in northern Minnesota. With this merger, their campuses now span nearly 4000 square miles, ensuring students have accessibility to a fitting education a top priority. The institution's enrollment consists primarily of first generation college students and adult learners, so outreach to these demographics and representation is also essential.

Access



Connections



Support

### ***NEXT Career Pathways***

Next Career Pathways is a partnership with 11 local schools in the Itasca Area Schools Collaborative (IASC). The program gives 7-12th grade students the opportunity to explore a variety of career pathways, such as computer science, construction, or manufacturing. Students take pathway-related courses to gain career experience, with the goal of students finding local employment with NEXT industry partners.

### ***Iron Range Engineering Pathways***

Iron Range Engineering Pathways (IRE) is a hands-on program where students combine community college curriculum and industry internships/co-ops through Bell Academy to gain a B.S. in Engineering from Minnesota State University Mankato.

### ***AspireNorth***

AspireNorth is a new initiative to strengthen the support and education of underrepresented students. It focuses on the "5 -Ates": Locate, Advocate, Educate, Elevate, and Recalibrate. AspireNorth aims to intentionally reach out to underrepresented students. It focuses on the "5 -Ates": Locate, Advocate, Educate, Elevate, and Recalibrate. AspireNorth aims to intentionally reach out to underrepresented parties, meet them where they are, offer mentorship and support throughout their education, and maintain a genuine relationship with the students to uplift them beyond graduation.



## ***Applied Learning Institute***

Minnesota North is in collaboration with the Applied Learning Institute (ALI), a state-sponsored project to innovate technical training and education in Minnesota. This includes frequent “touch points” with students, common curriculum among higher-ed institutions, as well as industry participation and development

The main elements of Minnesota North’s methods of preparing the future STEM workforce can be summarized as follows:

- Student centric focus & personalized path options.
- Innovation at the system and programs level.
- Project-based learning.
- Representation for students to see their future in STEM.



Tailoring educational paths to meet each student's unique needs and goals



Implementing innovative strategies and programs to enhance STEM education



Emphasizing hands-on, project-based learning to provide practical experience



Ensuring diverse representation so students can envision their future in STEM fields

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# MILWAUKEE SCHOOL OF ENGINEERING

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Presented by Dr. Eric T. Baumgartner

*Executive VP of Academics*

## MILWAUKEE SCHOOL OF ENGINEERING OVERVIEW

With a student body of 2,700, Milwaukee School of Engineering (MSOE) focuses solely on bachelor's and master's degree programs that leverage corporate partnerships to enrich educational opportunities. The institution's commitment to K-12 STEM outreach, high school summer programs, and pre-college initiatives reflects its dedication to fostering STEM interest and success from an early age. Furthermore, MSOE supports student success through various bridge programs, including those in Computer Science and Applied AI Education, along with the Center for Professional Education.

### **K - 12 STEM Outreach**

The K-12 STEM outreach program is instrumental in serving a substantial number of students, spanning from kindergarten to eighth grade, with an annual participation ranging between 5,000 to 6,000 students. This initiative aims to ignite and nurture interest in STEM disciplines from an early age, fostering a pipeline of future STEM professionals. MSOE offers engaging high school summer programs designed to provide students with immersive experiences in STEM fields. These programs are tailored to provide participants with hands-on learning opportunities, allowing them to explore various aspects of STEM disciplines in depth.



### ***Project Lead the Way***

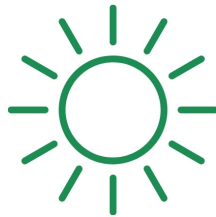
Milwaukee School of Engineering (MSOE) actively participates in PROJECT LEAD THE WAY (PLTW) and offers pre-college programs aimed at introducing students to STEM disciplines and preparing them for higher education. Implementation of multiple bridge programs tailored to specific areas such as Computer Science and Applied AI Education. These bridge programs provide additional support and resources to students, helping them overcome academic challenges and achieve their goals in STEM disciplines. MSOE also houses a Center for Professional Education, which offers additional opportunities for students to enhance their skills and knowledge in their chosen fields.

The main elements of Milwaukee School of Engineering methods of preparing the future STEM workforce can be summarized as follows:

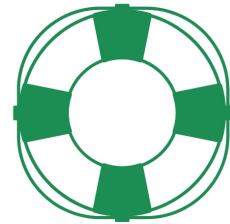
- Partnerships and Outreach.
- Summer Programs and Pre-College Initiatives.
- Support Programs.



**Collaborating  
with industry,  
schools, and  
community  
organizations**



**Providing early  
exposure to  
STEM fields  
through hands-  
on experiences**



**Offering  
resources and  
assistance to  
ensure student  
success**

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# ROSE-HULMAN INSTITUTE OF TECHNOLOGY

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## Presented by Dr. Craig Downing

*Assoc. Dean of Lifelong Learning and  
Head of the Dept. of Engineering Mgmt*

### ROSE-HULMAN INSTITUTE OF TECHNOLOGY OVERVIEW

Rose-Hulman Institute of Technology (RHIT) is a nationally ranked engineering institution located in Terra Haute, Indiana. The institute boasts a 90%+ job placement rate for its graduates, through academic rigor and selective admittance allowing individualized attention for its students.

#### **Rose Accelerate**

RHIT offers online summer courses through its Rose Accelerate program, giving high school students a head start on earning college credits. These credits then can be used toward Rose-Hulman's Rose Squared Program.

#### **Rose Prime**

Rose Prime is a two-week preparation camp for incoming first-year students to ensure a successful college transition. This includes strengthening calculus fundamentals, effective study habits coaching, and familiarizing students with various academic and personal resources on campus.

#### **Rose <sup>2</sup>**

Rose-Hulman additionally offers students the opportunity to earn a graduate degree while attending RHIT. Rose Squared allows high-achieving students to utilize credits earned in high school (such as Advanced Placement, International Baccalaureate, etc) toward graduating from Rose-Hulman with a Bachelor's and Master's degree. Students in Rose Squared take graduate-level courses alongside their undergraduate engineering courses, and can graduate with a Master of Engineering Management in only four years.



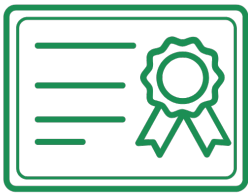


## ***Rose-Hulman Ventures***

Rose-Hulman encourages industry partnerships and hands-on learning for students through programs like Rose-Hulman Ventures. Ventures works with industry partners to give students the opportunity to gain experience in the field through projects requested by companies in the industry. This mutually-beneficial program can lead to full time employment for students.

The main elements of RHIT's methods of preparing the future STEM workforce can be summarized as follows:

- Partnerships and Outreach.
- Summer Programs and Pre-College Initiatives.
- Support Programs.



Tailoring learning experiences to meet each student's unique needs and goals



Providing practical, real-world experiences to complement academic learning



Fostering a strong alumni network and ongoing professional relationships

# RESULTS AND THEMES

Overall, the combined efforts of these universities demonstrate a holistic approach to preparing the future STEM workforce, focusing on early engagement, equitable access, partnerships, personalized pathways, hands-on learning, and continued support. By implementing similar strategies and initiatives, institutions can effectively address the challenges and opportunities in STEM education and contribute to building a diverse and skilled workforce for the future.

## BUILDING INCLUSIVE LEARNING ECOSYSTEMS

### *Flexible Education Paths*

Universities recognize the importance of providing personalized pathways for students to pursue STEM education and careers. This includes offering a variety of certification and degree options, as well as opportunities for transfer to higher institutions or entry into the workforce at different stages of education.

### *Meeting Students Where They Are*

Each university emphasized providing equitable access to STEM education and support services, particularly for underrepresented groups such as minorities, veterans, and first-generation college students. Efforts include offering financial aid, mentorship programs, and tailored support services to ensure all students have the resources they need to succeed in STEM fields.

### *Ecosystems Diagram*

The diagram below illustrates the three themes of effective learning ecosystems: student support, leveraging time, and partnerships for implementation. The goals of building these ecosystems are to boost retention and graduation rates by keeping the burden off of students in the subcategories.



# Learning Ecosystems → STEM Inclusion

STUDENT SUPPORT	LEVERAGING TIME	PARTNERSHIPS FOR IMPLEMENTATION
Financial	Time to certificates	Financial
Social		Social
Intellectual	Time to degrees	Intellectual
Emotional		Emotional

## FOSTERING PARTNERSHIPS

### ***K-12 Programs***

Several institutions indicated the importance of early exposure and engagement of the STEM field through programs such as summer camps, dual credit options, and other pre-college initiatives. These programs introduce the STEM disciplines and help fuel a curiosity and vision of students' future within the STEM workforce at a younger age.

### ***Local Communities/Governments***

States such as Indiana and Minnesota have initiatives in place to expand the local STEM workforce. It is therefore essential that institutions work with their local leaderships to not only work within these initiative requirements, but also find the most mutually beneficial outcomes and build or innovate programs to gain them.

### ***2 & 4 year Institutions***

It is within institutions' best interests to collaborate with other institution levels in order to build strong educational pathways for the variety of student interests. This includes easing the transfer process, expanding educational "on/off ramps" for students, and finding a common curriculum between institutions to ease the financial burden of students in retaking courses.

### ***Industry***

Most of institutions made note of their industry partnerships and industry-relevant opportunities available to students. It is imperative and in students' best interest that these opportunities and partnerships are reinforced and maintained so the future STEM workforce is given the best chance possible to be fully prepared for their careers.

# CONCLUSIONS AND FURTHER WORK

## FURTHER WORK

As stated in the goals, this project hopes to expand to reach other STEM institutions outside the Midwest. Some ways this can be accomplished is through the spread of this and future conference reports, applications for grants to ease the financial burden of hosting and attending these conferences, and the feedback and collaboration from institutions in attendance. Additionally, it is important to include institutions of different levels and diversity, while aiming to focus on the similarities between higher education institutes. Finally, future conferences should have current scholars in attendance to ensure that student interests and perspectives are included in discussions that directly affect themselves and future students.

## CONCLUSION

The insights shared by Lawrence Technological University, Ivy Tech Community College, Illinois Institute of Technology, Minnesota North College, Milwaukee School of Engineering, and Rose-Hulman Institute of Technology underscore the multifaceted approach needed to prepare the future STEM workforce effectively. While these presentations offer a wealth of innovative strategies and initiatives, it's evident that this is just the beginning of a broader conversation. There's still much to explore and implement in the realm of STEM education and workforce development.

We are grateful that the participating institutions regarded the symposium as useful. In an anonymous post-Symposium. All 16 respondents indicated in the affirmative that

- The symposium was useful, was a good use of their time, and stimulated actions they would take upon returning to their campus, and attendance at a similar symposium was something they would recommend to colleagues, and
- They appreciated the intimate setting with ample time for open discussions with colleagues from a variety of institutions within a defined region.

We extend our appreciation to all the institutions for their valuable contributions and participation in the Great Minds in STEM Symposium on Regional Best Practices, with special thanks to Lawrence Technological University for hosting this inaugural event. Together, we can continue to collaborate and innovate, ensuring a brighter future for STEM education and the workforce.





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