Adopting the Framework for a Cross-Disciplinary STEM Core

A Toolkit for Action

Preparing Technicians for the
FUTURE OF WORK

NSF

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Contents

Adopting the Framework for a Cross-Disciplinary STEM Core: A Toolkit for Action

Introduction

The global workplace is evolving right before our eyes. Advancements driven by technologies such as machine learning, artificial intelligence, the Internet of Things, and robotics are transforming existing industries and creating new ones at an unprecedented pace. These rapidly accelerating advancements in technology require cross-disciplinary workers who are equipped to function within diverse platforms and systems that formerly belonged to single industry sectors but have become increasingly interrelated.

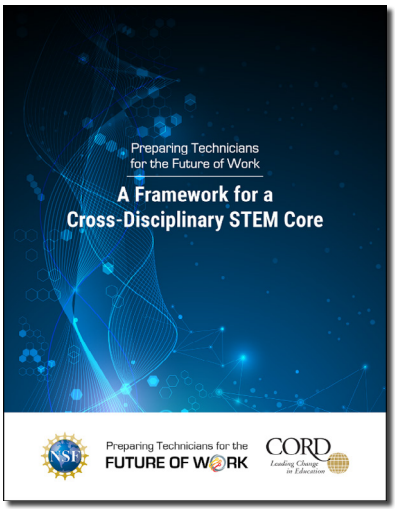
The workplace of the future will require technicians who are able to navigate complex work environments in which jobs are constantly evolving. To ensure technicians are prepared for the challenges of the workplace, community and technical colleges must work together with their employer partners to align and continually update technical programs.

Preparing Technicians for the Future of Work, a project supported by the National Science Foundation's Advanced Technology Education program (NSF-ATE) and led by the Center for Occupational Research and Development (CORD), is focused on the transformation of associate degree programs to prepare technicians for work of the future. Its goals are:

Goal 1	Goal 2	Goal 3	Goal 4
Empower community colleges to prepare technicians for the work of the future.	Promote collaboration between community colleges and industry to determine critical future skills.	Support ATE Regional Networks focused on technician education for the work of the future.	Foster adoption of the Cross-Disciplinary STEM Core to maximize impact on technician education.

Preparing Technicians for the Future of Work conducted a series of research activities designed to identify skill areas that will be essential for future STEM technicians. The project team met with technicians, technician supervisors, and mid-level managers to learn how technology is impacting their jobs. Data was also gathered through national and regional convenings of academic partners and industry leaders representing a wide range of technical fields. Participants served as thought partners in identifying critical future skills and framing strategies that could transform technician education to ensure ongoing regional competitiveness. Those skills and recommendations for including them in technical programs are described in the white paper, *A Framework for a Cross-Disciplinary STEM Core.*

The Framework for a Cross-Disciplinary STEM Core



The Framework for a Cross-Disciplinary STEM Core consists of recommendations for incorporating skill sets within the broader skills areas of Advanced Digital Literacy, Data Knowledge and Analysis, and Business Knowledge and Processes into associate degree technician preparation programs. The skill sets (within these skill areas) have been prioritized by educators and industry as essential to work of the future, across industry sectors. The Framework is suitable for implementation, with regional customization, by any community college technical program such as advanced manufacturing, agriculture and biotech, autonomous technologies, energy, environmental technologies, engineering, geospatial technologies, information and related security technologies, micro- and nano-technologies, and other emerging fields.

Download the Framework • Download the Skill Sets Glossary

DATA KNOWLEDGE AND ANALYSIS	ADVANCED DIGITAL LITERACY	BUSINESS KNOWLEDGE AND PROCESSES
Manipulating and interpreting data to resolve issues and using Excel and other common software proficiently to accomplish tasks	Understanding digital communications and networking, cybersecurity, machine learning, sensors, programming, and robotics at a higher than introductory level	Understanding the value chain and business practices of an enterprise and applying principles of ethical adoption of new technologies
Analytics tools	Artificial intelligence/ machine learning	Business cycles
Computational thinking	Automation/robotics	Blockchain
Data analysis	Basic programming	Communication
Data backup and restoration	Cloud literacy	Continuous process improvement
Databases	Digital fluency	Customer/stakeholder analysis
Data fluency	Digital twins	Entrepreneurship
Data life cycle	Edge computing	Ethics
Data management	Function block diagram programming	Lean processes
Data modeling	Human-Machine Interface (HMI)	Market trends
Data storage	Internet of Things (IoT)	Overall Equipment Efficiency (OEE)
Data visualization	Network architecture	Return on Investment (ROI)
Query languages	Network communication	Risk management
Spreadsheets	Security controls	Supply and demand
Statistics		Supply chains
		Vertical and horizontal integration

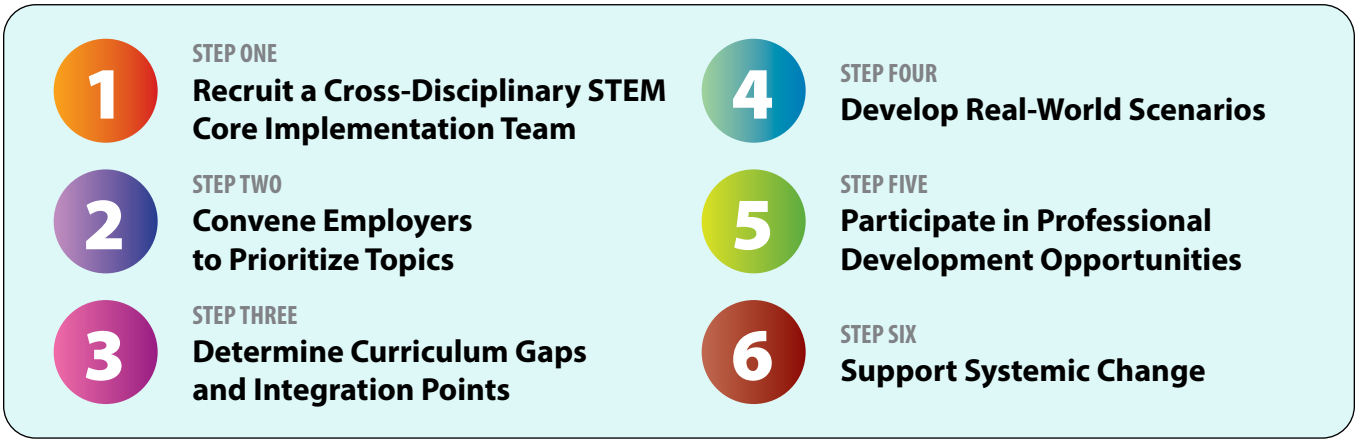
Why It's Important

The Framework represents a paradigm shift for institutions that provide technician education. Faculty must be empowered to integrate multiple disciplines into existing programs and develop new programs that support emerging and converging disciplines and occupations. This process cannot happen in an isolated context but instead requires faculty collaboration and ideally, a systemic approach supported by college leadership.

How to Use This Toolkit

This Toolkit provides colleges with actionable steps and practical tools which can be adapted to facilitate the adoption of the Cross-Disciplinary STEM Core Framework in a local context. Each step begins with an introduction and a checklist. The checklist helps colleges assess their readiness for action. Each step offers a series of recommended actions supported by tools and templates for colleges to use.

Steps for Adopting the Framework



1 STEP ONE
Recruit a Cross-Disciplinary STEM Core Implementation Team

The first step to implementing *A Framework for a Cross-Disciplinary STEM Core* is to recruit a team that spans technical specializations across the college. First, meet with faculty across program areas to introduce the Framework. At this meeting, solicit volunteers to serve on the team. Next, host a team meeting to review the toolkit, lay out a timeline for adopting the steps and elect a team lead or chair to help shepherd the implementation of the Framework and facilitate future meetings.

The Implementation Team should include the following members:

- *College President*: The President (or their designee) serves as the Executive Sponsor and can drive the necessary changes throughout the institution and engage external stakeholders.
- *Instructional Leaders and Faculty Across Disciplines*: The individuals that will be doing the legwork on the ground are the instructional leaders and faculty of technician education programs.

Step 1 Checklist

Are the college president and technical program instructional leaders and faculty aware of the *Preparing Technicians for the Future of Work* project and the Cross-Disciplinary STEM Core?

☐ Yes ☐ No ☐ Don't Know

How familiar are instructional leaders and faculty from technical programs with the skill sets outside their disciplines?

☐ Very Familiar ☐ Somewhat Familiar ☐ Not Familiar

Are there other initiatives or efforts at the college focused on the future of work, cross-disciplinary STEM skills, and/or transforming technician education?

☐ Yes ☐ No ☐ Don't Know

Has a cross-disciplinary team approach been implemented in the past?

☐ Yes ☐ No ☐ Don't Know

Action 1.1

Build interest in the Cross-Disciplinary STEM Core among faculty that will be part of the Implementation Team.

Meet with faculty across technician specializations to present the Framework. Ask for volunteers to serve on the Implementation Team.

TOOL: *Framework Presentation for Faculty*

Action 1.2

Introduce the toolkit.

At the first planning meeting of the Implementation Team, introduce this toolkit to build a collective understanding of the steps ahead.

Action 1.3

Appoint a lead or chair.

Establish the team lead or chair, whose role is to help ensure team meetings are productive and tasks get completed between meetings. This individual should be someone that is skilled at project management, facilitation, and building consensus.

Action 1.4

Develop a preliminary timeline for completing the actions in the toolkit.

As a team, set milestones to complete the actions outlined in the toolkit. In the Step 1 Checklist, were related initiatives (across the college) whose goals intersect with the Framework identified? Can the requirements of multiple initiatives support each other?

TOOL: *Adoption Timeline*

2 STEP TWO
Convene Employers to Prioritize Topics

The second step focuses on soliciting input from regional employers to prioritize the Cross-Disciplinary STEM Core skill sets. This starts with selecting the employers, sharing the Framework and working definitions, and inviting them to participate in an in-person convening, phone interviews, virtual focus groups, or other type of "listening session" conducted by members of the Implementation Team. Based on priorities gleaned from these employer engagement activities, the Implementation Team comes to consensus on the region's highest priority skill sets.

Step 2 Checklist

Has the college asked regional employers how technology is impacting their companies and the skill sets needed by technicians?

☐ Yes ☐ No ☐ Don't Know

Has the college engaged regional employers to determine the need for technicians with skills in Advanced Digital Literacy, Data Knowledge and Analysis, and Business Knowledge and Processes?

☐ Yes ☐ No ☐ Don't Know

Has the college identified skill sets in Advanced Digital Literacy, Data Knowledge and Analysis, and Business Knowledge and Processes for integration into STEM technician programs?

☐ Yes ☐ No ☐ Don't Know

Action 2.1

Identify employers.

The adoption of the Framework for a Cross-Disciplinary STEM Core is based on prioritizing the skill sets that comprise it to meet regional needs. This requires seeking direct input from employers by tapping into existing relationships and potentially developing new ones. Team members should compile a list of existing employer advisors and partners and determine whether there are additional industries that need to be represented. While all technical programs have advisors that can be invited to participate, other organizations (e.g., regional industry associations, the Chamber of Commerce, the workforce system, or the regional economic development council) can provide industry contacts as well.

Action 2.2

Engage regional employers to determine the need for future technicians equipped with skill sets within the Cross-Disciplinary STEM Core.

The goals for employer engagement are to hear directly from them about the impact of technological advancements on technician roles and to prioritize the Cross-Disciplinary STEM Core skill sets they most need. This would be completed outside of regular advisory committee or program review meetings since this is cross-disciplinary in nature. The format for engaging employers is flexible and can be adapted to each college's specific needs and the availability of employers in the region. It can be done through an in-person or virtual convening (with one or more sessions), small focus groups, and/or individual phone interviews.

TOOL: *Employer Email Template*

How to Conduct a Regional Convening

In a regional convening, employers from a variety of sectors attend an in-person or virtual meeting. For Session 1, the college facilitates discussions with the employers about the technology changes they have witnessed the past 12 months, how these have affected the company and the skills needed by technicians, and the gaps they are witnessing with entry-level technicians. They are also introduced to the Framework. For Session 2, employers are asked to rate the importance of each cross-disciplinary skill set to their company and its future workforce. An electronic Skill Set Prioritization form that will automatically tally the responses is provided. The college reviews the rating solicited by employers and facilitates a discussion around the insights and potential priorities for technician education.

TOOLS: *Regional Convening Internal Agenda*
Regional Convening External Agenda
Regional Convening Presentation
Regional Convening Discussion Questions Template
Employer Skill Set Prioritization Form (Download a copy of this form into your own Google drive for use with regional employers. Rename the copy by opening the form and inserting your college name.)

How to Conduct Small Focus Groups

Another way to gather feedback on future skills is to invite a focus group of employers (3–5 is recommended) to participate in a 60-minute videoconference. Begin the focus group by having facilitators and employers introduce themselves, then transition to the cross-disciplinary skill sets where employers indicate which ones technicians at their companies will need in the future.

TOOL: *Focus Group Facilitator's Guide*

How to Conduct Phone Interviews

If hosting a regional convening or focus group is not feasible, consider conducting one-on-one phone interviews (30–45 minutes) with employers. The interview focuses on the cross-disciplinary skill sets, which should be sent to the employer in advance. The employer indicates which of the skill sets technicians at their company will need 12–24 months in the future. Suggestion: Conduct the interview via web conference, record the meeting, and generate a transcript.

TOOL: *Phone Interview Guide*

Action 2.3

As a team, identify the prioritized cross-disciplinary STEM skill sets that will be addressed.

The last action in Step 2 calls for the Implementation Team to meet and refine the list of priority skill sets from employers to a final list, based on employer rankings. When examining the skill set rankings, the team should highlight the top five per skill area. These can serve as the springboard for the actions in Step 3. (Note that the final list will vary by region, college, and program.) Revisit (and revise if needed) the milestones set by the team in the Framework Adoption Timeline in Action 1.4.

3 STEP THREE
Determine Curriculum Gaps and Integration Points

The best strategy for adding the Cross-Disciplinary STEM Core into technician programs is to integrate relevant lessons into existing courses rather than attempting to add new courses. In this step, team members determine where the skill sets are currently taught, if at all, within their programs and identify natural integration points within their courses.

Step 3 Checklist

Do you currently teach any of the Cross-Disciplinary STEM Core skill sets in your discipline?

☐ Yes ☐ No

If yes:

Would you be willing to share the content and lesson(s) with faculty from other disciplines?

☐ Yes ☐ No

Would the content and/or lessons need to be modified to share with faculty who may not be subject matter experts?

☐ Yes ☐ No ☐ Depends/Unsure

Are you familiar with the *Preparing Technicians for the Future of Work* materials available for classroom use, such as instructional cards, podcasts, and/or other resources?

☐ Yes ☐ No

Action 3.1

Identify where in the curriculum prioritized skill sets are already being taught.

Team members—ideally from multiple programs—examine their existing course content for lessons that could be used to teach the top skill sets prioritized by employers. This should include lessons that can be shared, if needed, with faculty who are not subject matter experts in the discipline. The Implementation Team then collects this information.

TOOL: *Cross-Disciplinary STEM Core Curriculum Matrix*

Action 3.2

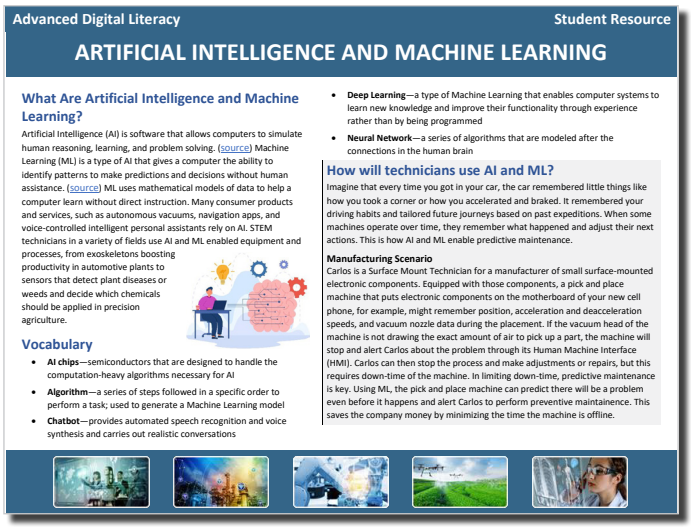
Determine which prioritized skill sets are not currently taught.

For Action 3.2, the Team examines the Cross-Disciplinary STEM Core Curriculum Matrix annotated in Action 3.1 and determines lesson gaps. These gaps represent opportunities for integration of cross-disciplinary skills within existing courses.

Action 3.3

Explore the cross-disciplinary instructional cards and select those that address gaps in the curriculum.

The *Preparing Technicians for the Future of Work* website offers resources to support the implementation of the Cross-Disciplinary STEM Core, including Instructional Cards. The purpose of the cards is to provide concise introductory activities related to skill sets within the Core that can be integrated into a wide range of technical programs. The audience is instructors and students outside of the card's specific discipline. Select any cards that might be used to address gaps identified in Action 3.2.


Advanced Digital Literacy — Student Resource

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

What Are Artificial Intelligence and Machine Learning?

Artificial Intelligence (AI) is software that allows computers to simulate human reasoning, learning, and problem solving. (source) Machine Learning (ML) is a type of AI that gives a computer the ability to identify patterns to make predictions and decisions without human assistance. (source) ML uses mathematical models of data to help a computer learn without direct instruction. Many consumer products and services, such as autonomous vacuums, navigation apps, and voice-controlled intelligent personal assistants rely on AI. STEM technicians in a variety of fields use AI and ML enabled equipment and processes, from exoskeletons boosting productivity in automotive plants to sensors that detect plant diseases or weeds and decide which chemicals should be applied in precision agriculture.

Vocabulary

- **AI chips**—semiconductors that are designed to handle the computation-heavy algorithms necessary for AI
- **Algorithm**—a series of steps followed in a specific order to perform a task; used to generate a Machine Learning model
- **Chatbot**—provides automated speech recognition and voice synthesis and carries out realistic conversations
- **Deep Learning**—a type of Machine Learning that enables computer systems to learn new knowledge and improve their functionality through experience rather than by being programmed
- **Neural Network**—a series of algorithms that are modeled after the connections in the human brain

How will technicians use AI and ML?

Imagine that every time you got in your car, the car remembered little things like how you took a corner or how you accelerated and braked. It remembered your driving habits and tailored future journeys based on past expeditions. When some machines operate over time, they remember what happened and adjust their next actions. This is how AI and ML enable predictive maintenance.

Manufacturing Scenario

Carlos is a Surface Mount Technician for a manufacturer of small surface-mounted electronic components. Equipped with those components, a pick and place machine that puts electronic components on the motherboard of your new cell phone, for example, might remember position, acceleration and deacceleration speeds, and vacuum nozzle data during the placement. If the vacuum head of the machine is not drawing the exact amount of air to pick up a part, the machine will stop and alert Carlos about the problem through its Human Machine Interface (HMI). Carlos can then stop the process and make adjustments or repairs, but this requires down-time of the machine. In limiting down-time, predictive maintenance is key. Using ML, the pick and place machine can predict there will be a problem even before it happens and alert Carlos to perform preventive maintainence. This saves the company money by minimizing the time the machine is offline.


Business Knowledge & Processes — Student Resource

ENTREPRENEURSHIP

What Is Entrepreneurship?

Entrepreneurship is the concept of developing and overseeing a new business for profit. Working inside a company and thinking like an entrepreneur by asking "how can we improve this process?" is just as important. Entrepreneurship means thinking beyond troubleshooting or problem solving. It involves taking extra effort that yields potential new products, services or processes.

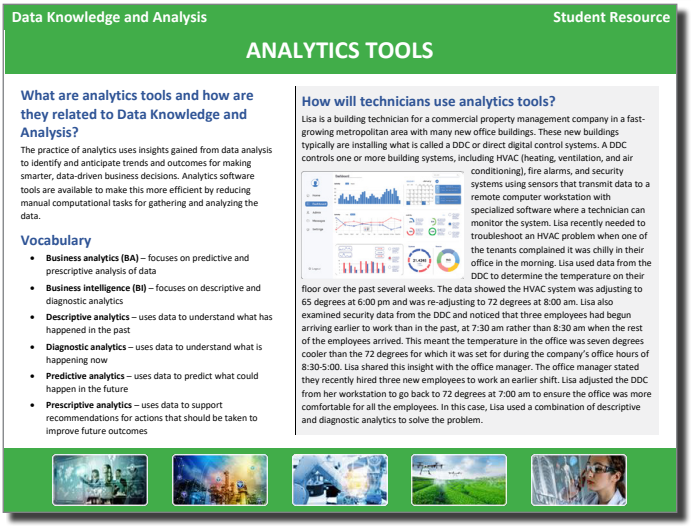
Vocabulary

- **Entrepreneur**—An individual who starts a new business venture. Typically, the individual who takes on most of the risk and develops the business concept.
- **Venture**—A business enterprise in which the expectation of gain is accompanied by the risk of loss or failure.
- **Capital**—The wealth or assets available to invest in a business.
- **Business Model**—A description of how a business will be able to create and deliver value and become profitable.
- **Market Research**—Relevant data that helps demonstrate market potential for a business venture.
- **Intellectual Property**—Works or inventions that is the result of creativity to which one has rights and can apply for a patent, copyright, or trademark.

How will an entrepreneurial mindset be used in the workplace?

An Industry 4.0 technician of tomorrow needs creative entrepreneurial thinking as a new, expected skill. John Gruene is an automotive technician at Advanced Auto. Lately John and his team have experienced several customer complaints regarding repair times. Using an entrepreneurial mindset, John identified the problem and then researched possible solutions and their value propositions. He asked questions like: how much is customer satisfaction and loyalty worth? and how much time and money can be saved through more accurate diagnosis and efficient repair? He then approached his supervisor about a potential solution he has researched that will provide better customer service, shorter wait times, and fewer errors by the technicians, resulting in higher profits for the business.

In another example, Casey Sanders is a robotics technician at Cooper BioLogic, an automated filling and packaging company. Over the last seven days, a robot gripper has been dropping every hundredth vial. The fault affected everything down the line, to the point at which several boxes shipped to a customer were short a few vials. This is clearly not an acceptable business practice. Casey applied troubleshooting skills to


Data Knowledge and Analysis — Student Resource

ANALYTICS TOOLS

What are analytics tools and how are they related to Data Knowledge and Analysis?

The practice of analytics uses insights gained from data analysis to identify and anticipate trends and outcomes for making smarter, data-driven business decisions. Analytics software tools are available to make this more efficient by reducing manual computational tasks for gathering and analyzing the data.

Vocabulary

- **Business analytics (BA)** – focuses on predictive and prescriptive analysis of data
- **Business intelligence (BI)** – focuses on descriptive and diagnostic analytics
- **Descriptive analytics** – uses data to understand what has happened in the past
- **Diagnostic analytics** – uses data to understand what is happening now
- **Predictive analytics** – uses data to predict what could happen in the future
- **Prescriptive analytics** – uses data to support recommendations for actions that should be taken to improve future outcomes

How will technicians use analytics tools?

Lisa is a building technician for a commercial property management company in a fast-growing metropolitan area with many new office buildings. These new buildings typically are installing what is called a DDC or direct digital control systems. A DDC controls one or more building systems, including HVAC (heating, ventilation, and air conditioning), fire alarms, and security systems using sensors that transmit data to a remote computer workstation with specialized software where a technician can monitor the system. Lisa recently needed to troubleshoot an HVAC problem when one of the tenants complained it was chilly in their office in the morning. Lisa used data from the DDC to determine the temperature on their floor over the past several weeks. The data showed the HVAC system was adjusting to 65 degrees at 6:00 pm and was re-adjusting to 72 degrees at 8:00 am. Lisa also examined security data from the DDC and noticed that three employees had begun arriving earlier to work than in the past, at 7:30 am rather than 8:30 am when the rest of the employees arrived. This meant the temperature in the office was seven degrees cooler than the 72 degrees for which it was set for during the company's office hours of 8:30-5:00. Lisa shared this insight with the office manager. The office manager stated they recently hired three new employees to work an earlier shift. Lisa adjusted the DDC from her workstation to go back to 72 degrees at 7:00 am to ensure the office was more comfortable for all the employees. In this case, Lisa used a combination of descriptive and diagnostic analytics to solve the problem.

Instructional cards for Advanced Digital Literacy, Business Knowledge and Processes, and Data Knowledge and Analysis

Student content includes an introduction to the skill set with a real-world scenario in a technical field.

Instructor content is at a higher academic level but intended for newcomers to the subject. It is designed to support instructors in a variety of technical fields. The content also includes a student activity.

Review Instructional Cards

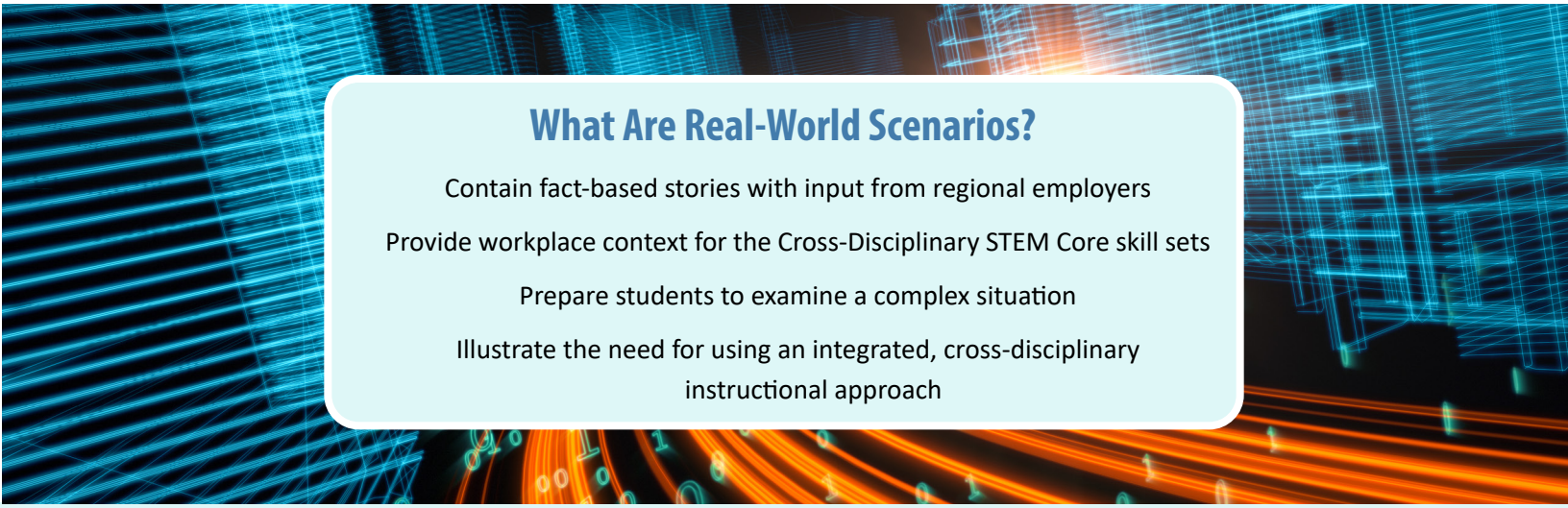
Action 3.4

Determine natural integration points and prepare to teach the prioritized skill sets.

For Action 3.4, the team examines remaining lesson gaps and brainstorms natural cross-disciplinary integration points for prioritized skill sets. For example, the team may find that blockchain can be introduced in an advanced manufacturing course or that computational thinking fits well within biotechnology. Once these integration points are noted in the Curriculum Matrix, the team is ready for a few volunteers to teach cross-disciplinary content. Watch this webinar from the project for insight on how the instructional cards can support content from many different disciplines. If the team members are ready to start developing their own lessons, they are ready to move on to Step 4, develop real-world scenarios.

4 STEP FOUR Develop Real-World Scenarios

Real-world scenarios provide students with examples of how particular cross-disciplinary skill sets are used in the context of the workplace. The Instructional Cards include real-world scenarios representing a wide range of industries. Faculty are encouraged to implement them as-is or with adaptations. Step 4 provides guidance and supporting tools for faculty to develop region-specific, customized scenarios with their employer partners.



What Are Real-World Scenarios?

Contain fact-based stories with input from regional employers

Provide workplace context for the Cross-Disciplinary STEM Core skill sets

Prepare students to examine a complex situation

Illustrate the need for using an integrated, cross-disciplinary instructional approach

Step 4 Checklist

Do faculty use learning activities with real-world scenarios in their courses?

☐ Yes ☐ No ☐ Don't Know

Do faculty write their own real-world scenarios?

☐ Yes ☐ No ☐ Don't Know

Do employers provide real-world scenarios?

☐ Yes ☐ No ☐ Don't Know

Action 4.1

Select real-world scenarios from the *Preparing Technicians for the Future of Work* Instructional Cards that can be used as examples/models.

Team members from various program areas should review the Instructional Cards to determine which scenarios are a good fit for the specific industries and employers in the region. Select those that can serve as examples for the scenarios that will be developed with employer input.

Action 4.2

Develop real-world scenarios with input from employers.

Volunteers from the program areas take the lead in collaborating with an employer partner to develop scenarios relevant to their industry. The Planning Checklist below can be used to organize and track progress on scenario development.

TOOL: *Real-World Scenario Planning Checklist*

Getting input from an employer on a real-world scenario can typically be accomplished in a short virtual meeting. Start by discussing how scenarios will be used to support student skill development in the college's technician programs. Then, share a sample scenario from one of the instructional cards. Next, engage the employer in a conversation around a prioritized skill set from the Cross-Disciplinary STEM Core and identify a challenging situation in which a technician might encounter those skill sets. Discuss the specific steps a technician will need to take to address the problem and achieve a favorable outcome. Use the Real-World Scenario Interview Template to record this information. Based on that information, draft the scenario. The last step is to email a copy of the scenario to the employer to review it for accuracy.

TOOL: *Real-World Scenario Interview Template*

Action 4.3

Finalize and share real-world scenarios.

Once the real-world scenarios are ready (and any accompanying lessons or projects, if applicable), share them across programs. Remember that the scenarios are the foundation for cross-disciplinary instruction.

5 STEP FIVE
Participate in Professional Development Opportunities

To ensure colleges are training technicians who are prepared for the technological advancements of today and tomorrow, instructional leaders and faculty need to be aware of the Cross-Disciplinary STEM Core skill areas and strategies for integration. This toolkit provides a professional development plan that points users to resources available through the *Preparing Technicians for the Future of Work* project.

Step 5 Checklist

Has the college offered professional development opportunities on the skill sets within the Cross-Disciplinary STEM Core?

☐ Yes ☐ No ☐ Don't Know

Have instructional leaders and faculty participated in professional development on strategies for cross-disciplinary instruction?

☐ Yes ☐ No ☐ Don't Know

Action 5.1

Determine areas of need for professional development.

If the response to either question (above) is "Don't Know," attempt to find the answer by asking faculty members and department chairpersons. What training, if any, have instructional leaders and faculty received on the cross-disciplinary skill sets? The professional development plan can serve as a self-assessment to determine individual learning needs.

TOOL: *Cross-Disciplinary STEM Core Professional Development Plan*

Action 5.2

Locate and participate in professional development opportunities.

The completed plan includes links to instructional cards and podcasts on the preparingtechnicians.org website. Explore these resources to learn more about the skill sets and how to integrate them into courses. Check the website periodically for new resources and professional development opportunities.

Action 5.3

Share learnings and materials.

Instructional leaders and faculty are encouraged to share what they are learning with the Implementation Team. All materials available through *Preparing Technicians for the Future of Work* are open educational resources. Allow time at team meetings for members to share how the lessons are affecting student understanding.

6 STEP SIX
Support Systemic Change

Because the systemic change required to adopt the Framework for a Cross-Disciplinary STEM Core requires effort by community college faculty and instructional leaders, College Presidents have the important role of championing a culture in which cross-disciplinary collaboration is embraced and encouraged. Establishing this priority and supporting it with positive messaging and funding will be necessary to effectively address the goals of the Framework. To foster the integration of skill sets across the college's STEM technical programs, two important actions for College Presidents are recommended below. Note that these actions build upon meetings and activities that Presidents are already conducting.

Step 6 Checklist

Is the President aware of the Framework for a Cross-Disciplinary STEM Core?

☐ Yes ☐ No ☐ Don't Know

Does the college have systemic change initiatives that could serve as a model for cross-disciplinary collaboration?

☐ Yes ☐ No ☐ Don't Know

Have industry executives expressed the need for skill sets within the Cross-Disciplinary STEM Core?

☐ Yes ☐ No ☐ Don't Know

Action 6.1

Communicate the significance of the Cross-Disciplinary STEM Core across the college and in the community.

College Presidents should first read A Framework for a Cross-Disciplinary STEM Core to understand the premise and rationale of cross-disciplinary teaching. Equipped with this information, they can leverage their meetings with industry executives to elicit responses to the STEM Core skill sets in light of emerging workforce needs. College Presidents should also meet with the members of the Implementation Team, senior leadership, and other key players to gather input on how to best approach systems change.

Action 6.2

Incorporate Implementation of the Cross-Disciplinary STEM Core into the college's strategic plan.

After pertinent information has been gathered, drafting short- and long-term plans for system change around the Cross-Disciplinary STEM Core should follow, perhaps as a special presidential initiative. If this becomes part of the college's strategic plan, the initiative and metrics for determining its success will need to be presented to the Board of Trustees. As part of the strategic plan, a funding stream can be assigned to support the initiative.

Concluding Observations

While the Preparing Technicians for the Future of Work project supports the integration of cross-disciplinary skill sets by individual instructors, true change with an eye toward educating the skilled technical workforce requires systemic collaboration across disciplines and departments. Instructional leaders and technical program faculty in a wide variety of advancing and emerging fields play a vital role in the implementation of the Cross-Disciplinary STEM Core. Additionally, local and regional employers and College Presidents can make a substantial contribution toward wider adoption of the Framework and institutionalization of its recommended practices. Beyond Step 1, many of the steps outlined in this Toolkit can be carried out concurrently, so stakeholders can begin working together quickly.

If you have questions about using the Toolkit, please send them to STEMCore@cord.org.

Preparing Technicians for the Future of Work (DUE 1839567; www.preparingtechnicians.org) is funded by the NSF ATE program and led by the Center for Occupational Research and Development (CORD), a national nonprofit organization that partners with educators, employers, states, and federal agencies to prepare learners for success in college and careers.

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.

Preparing Technicians for the FUTURE OF WORK

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