



From Alignment to Impact

A Mathematics Blueprint for a Future-Ready Workforce



About the Dana Center

At the Charles A. Dana Center, we envision a future where every student, regardless of their background or zip code, can experience the power and joy of mathematics, science, and literacy in ways that are meaningful and relevant to their futures. Our team works across the education spectrum—from developing and delivering innovative curriculum and professional learning to catalyzing the evolution of systems, structures, and policies. We support educators, administrators, and policymakers in creating seamless transitions throughout the K–16 system for all students, especially the underserved.

The Center was founded in 1991 at The University of Texas at Austin. Our staff members have expertise in leadership, literacy, research, program evaluation, mathematics and science education, policy and systemic reform, and services to high-need populations.

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Table of Contents

Executive Summary	4
The Challenge	5
The Opportunity	6
The Path Forward: A New Model for Education-to-Workforce Alignment	6
A Shared Skills Language	7
A Focused Collective Action Agenda	8
Call to Action	8
The Need for Coherent Pathways From Mathematics to the Workforce	9
Building a Shared Strategy for Alignment	11
Establishing a Common Language for Skills	12
Mapping Skills Across Education and Industry	15
Designing Applied Learning Opportunities	15
From Vision to Action	16
Collaboration Framework	18
The Collective Action Agenda	20
Research	22
Resource Development	23
Communication and Policy Strategies	23
Curricular Resource Development	24
Professional Learning Resource Development	25
Institutional Conditions for Systemic Change	25
Assessment and Data Systems	26
From Alignment to Impact	27
References	29

From Alignment to Impact

A Mathematics Blueprint for a Future-Ready Workforce



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Executive Summary

The U.S. is undergoing a profound workforce transformation driven by automation, generative AI, and other emerging technologies. “Good jobs” are rapidly shifting toward roles that require education beyond high school, while opportunities for workers with only a high school diploma continue to shrink. At the same time, advances in AI may be reshaping labor market opportunities for college graduates in ways that will require them to be agile and adaptable throughout their careers and to acquire work experiences integrated with education that compensate for changes to, if not reductions in, early career jobs critical to advancement.

Mathematics sits at the heart of these transformations: it is simultaneously a barrier to postsecondary completion—thereby limiting students’ access to high-quality career pathways—and a powerful engine for skills such as procedural skills, applied knowledge, critical thinking, problem solving, and communication, which employers increasingly demand. The future of the workforce depends in large measure on whether mathematics education equips all learners with the knowledge, skills, and ways of thinking needed to thrive in an AI-enabled economy. Mathematics education is therefore not only a foundation for individual economic mobility—it is an essential workforce infrastructure for building a resilient, adaptable, and competitive economy.



The Challenge

As the workforce undergoes rapid transformation, education systems face growing pressure to prepare students for a future that demands not only adaptability and innovation but also advanced quantitative reasoning skills. However, current mathematics education often lags behind these evolving needs, creating significant challenges for learners and employers alike. Mathematics, as a foundational discipline, plays a pivotal role in equipping learners with the skills needed to navigate these changes. Yet, persistent challenges in aligning mathematics education with the realities of the modern economy threaten to limit students' opportunities and potential.

Addressing the alignment of high school and entry-level postsecondary mathematics coursework is an essential first step—and building on this foundation will require continued, coordinated efforts to fully bridge the gap between education and workforce needs.

Mathematics pathways have been instrumental in removing barriers to postsecondary success, and they must now be strengthened to ensure that all learners have access to mathematics experiences that are relevant, transferable, and aligned with the evolving needs of education, careers, and society.

Too often, students experience mathematics as abstract and irrelevant to their career aspirations (Cohen et al., 2019), while employers simultaneously struggle to define and assess the specific quantitative skills required for success in rapidly advancing roles and industries. This disconnect reflects a broader challenge: education and workforce systems have not been intentionally designed to align around the mathematical knowledge and skills learners need to succeed. As a result, many students complete educational pathways without the quantitative competencies needed for postsecondary success and high-quality careers, while employers face persistent challenges identifying and developing talent with the skills required in a changing economy.

Although numerous workforce and pathways initiatives exist, most operate in silos, lack a shared language for describing skills, and rarely focus explicitly on the mathematical competencies that underpin access to and success in “good jobs.” Closing this gap will require moving beyond isolated efforts toward coordinated systems that define, develop, and validate the mathematical skills essential for education, careers, and economic mobility.



The Opportunity

The transformation of education and work creates an opportunity to reimagine mathematics pathways as a critical component of the nation's talent infrastructure. Building on the progress made in creating more coherent mathematics pathways, this work should extend across the full education continuum—from pre-kindergarten through higher education and into the workforce (P–20W)—to ensure that all learners develop the mathematical knowledge, skills, and ways of thinking needed to thrive in an evolving economy. This work must focus on ensuring pathways are:

- **Coherent and stackable**, enabling seamless progression from early learning through K–12, postsecondary education, advanced credentials, and the workforce.
- **Aligned with workforce needs**, emphasizing the mathematical skills and ways of thinking required across a range of industries, occupations, and roles.
- **Connected to real-world applications**, integrating mathematics into curricula, assessments, and experiential learning opportunities that enable learners to apply mathematical knowledge and skills in authentic contexts.
- **Broadly accessible**, ensuring that learners across educational pathways and contexts have meaningful opportunities to develop the mathematical skills needed for postsecondary success, high-quality careers, and economic mobility.
- **Validated and transferable**, establishing shared definitions of mathematical skills that can be developed, assessed, communicated, and valued across education and employment settings.

The Path Forward: A New Model for Education-to-Workforce Alignment

Addressing these challenges requires more than good intentions—it requires a sustained, cross-sector structure with the authority, capacity, and shared commitment to act. The proposed P–20W Education-to-Workforce Consortium, led by the Charles A. Dana Center at The University of Texas at Austin, is designed to be that structure. By bringing together PK–12 and postsecondary educators, career and technical education (CTE) and workforce development leaders, employers, policymakers, and community organizations, the Consortium will:

- Align and modernize **mathematics pathways** so that requirements across high school, certificates, apprenticeships, and degrees are coherent, stackable, and non-duplicative.

The Path Forward Cont.

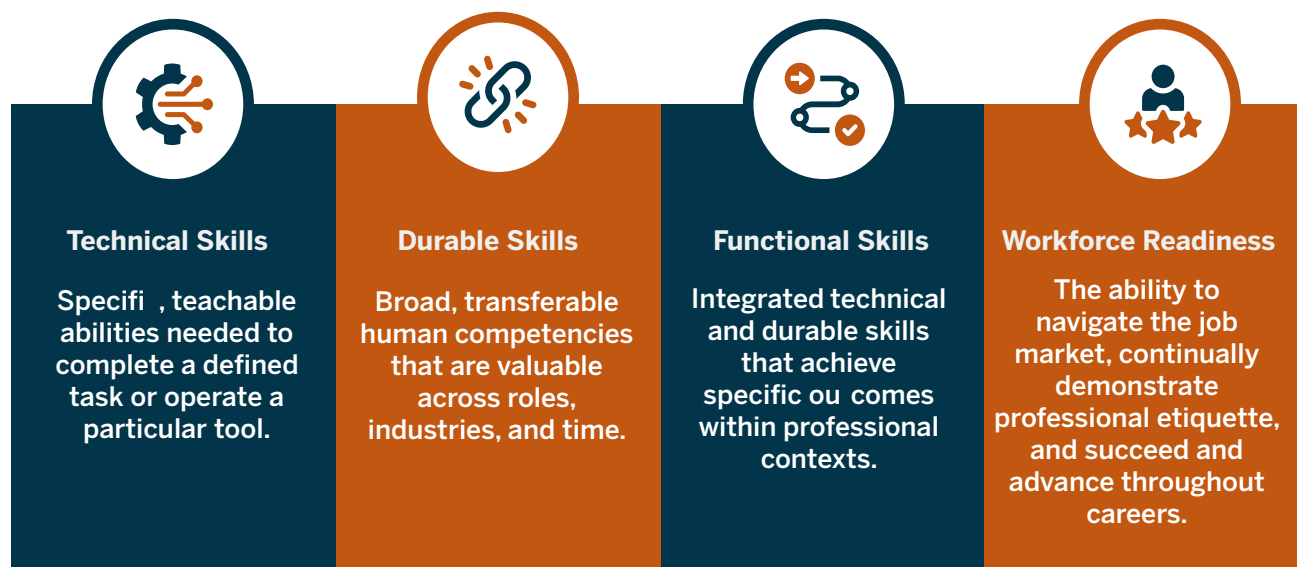


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- Define **high-priority mathematical skills** by sector and co-develop curricula, assessments, and experiential learning opportunities that help learners apply mathematics to authentic challenges across industries and occupations.
- Strengthen **local, regional, and national partnerships** to ensure students and families understand labor market opportunities and the mathematics required to access them.
- Build and optimize **longitudinal data systems** to track skills across education and into work, enabling continuous alignment and improvement.
- Support implementation and continuous improvement by equipping educators, institutions, and workforce partners with the **tools, resources, and professional learning** needed to translate aligned mathematics pathways into practice.

A Shared Skills Language

A shared skills language enables education and industry to align mathematics pathways, curricula, credentials, and hiring around clearly defined skills, fostering coherence and mutual understanding. To support this collective effort, a joint taxonomy is required that distinguishes the following (Pepin et al., 2026):



A Focused Collective Action Agenda

To move from vision to impact, this blueprint for a future-ready workforce calls for sustained, cross-sector action in four areas:



Research

Identify which mathematics competencies matter most for success in high-quality careers, determine how durable and professional skills can be effectively integrated into mathematics learning, and identify where cross-sector collaboration can have the greatest impact.



Resource Development

Develop communication campaigns, curricula, and professional learning that modernize mathematics, reflect real workforce demands, and demonstrate the relevance of mathematics to learners' lives, future opportunities, and careers.



Institutional Conditions for Systemic Change

Support education systems and higher education institutions in building the policies, leadership structures, incentives, and data systems necessary to implement and sustain systemic change at scale through continuous improvement informed by evidence, implementation learning, and shared accountability.



Assessment and Data Systems

Design credentials and data systems that verify and communicate technical, durable, and functional skills alongside workplace readiness across P-20W, enabling learners, educators, employers, and policymakers to understand and act on shared measures of readiness.

CALL TO ACTION

The Consortium cannot succeed alone. Building a future-ready workforce requires sustained collaboration across education, industry, government, and communities. In an economy defined by rapid technological change, these sectors must act together—and act now. The Consortium invites partners across the ecosystem to:

- **Adopt a shared language** for technical, durable, and functional skills and workplace readiness that connects education expectations with workforce needs.
- **Align mathematics pathways and credentials** across the P-20W continuum, ensuring coherence, relevance, and opportunity at every stage of a learner's journey.
- **Invest in the research, professional learning, and data infrastructure** needed to support continuous alignment, improvement, and sustainability.

Call to Action Cont.

The P–20W Education-to-Workforce Consortium is ready to lead this collective effort. This is not an investment in a single program, initiative, or institution—it is an investment in the systems that prepare people for opportunity, the workforce that drives innovation, and the capacity of our nation to thrive in a rapidly changing world. Together, the Consortium can build an education-to-workforce ecosystem where every learner develops the mathematical skills and ways of thinking needed to shape the future.

The Need for Coherent Pathways From Mathematics to the Workforce

The U.S. workforce is undergoing one of its most significant evolutions since the Industrial Revolution as companies grapple with the impact of AI and other emerging technologies on the future of work. Georgetown University’s Center on Education and the Workforce projects that by 2031, 66% of all “good jobs”¹ will require a bachelor’s degree or higher and another 19% will require credentials beyond a high school diploma but less than a bachelor’s degree, such as associate’s degrees, certificates, and certifications. Opportunities for good jobs for workers with only a high school diploma are expected to decline (Strohl et al., 2024).

Employers continue to prioritize skills that transcend narrow technical competencies and support evolving work requirements, especially analytical/critical thinking, communication, collaboration, and the ability to apply knowledge in complex, rapidly changing contexts (Hart Research Associates, 2013; World Economic Forum, 2023). They also increasingly value the ability to apply mathematical reasoning and ideas in novel, complex situations across sectors (Canada Prime Jobs, 2025). And yet, employers and the public are questioning the value of college, arguing that students graduate without necessary job skills.

Concerns about worker preparation are not new. In 1983, the National Commission on Excellence in Education’s report, *A Nation at Risk*, led to a focus on foundational academic skills and a push to raise academic standards (Gardner et al., 1983). In 1991, the skills gap shifted to focusing on soft skills, such as the ability to use resources, interpersonal skills, information systems, and technology (SCANS, 1991). Now, with the increase in automation, technology, and generative AI, the current shift to address the skills gap emphasizes the importance of meta-skills—higher-order capacities like learning how to learn—and interpersonal skills (Pepin et al., 2026). However, students are struggling to translate their coursework into career-ready skills, which compounds a perception that some people lack the real-world skills necessary to be reliable workers (Gray, 2025).

¹ Georgetown University’s Center on Education and the Workforce (CEW) defines a good job as one that pays at least \$43,000 with a median of \$74,000 for workers ages 25–44 and at least \$55,000 with a median of \$91,000 for workers ages 45–64, in 2022 dollars (Strohl et al., 2024).

The challenge of translation is accelerating. The World Economic Forum (2025) projects that an average of 39% of an individual worker’s core skills will be disrupted by 2030, making meta-skills—the ability to learn and unlearn quickly, navigate increasingly ambiguous problems, and lead cross-functional teams with a wide range of expertise—a key requirement for employment and advancement. Now, more than ever, education must prepare students for a future of continuous adaptation and learning and support them in clarifying the relevance of their knowledge (OECD, 2023).

The critique of career preparation intersects with another critical challenge: ensuring that all students have access to and succeed in higher levels of mathematical thinking. Research consistently identifies mathematics as a primary barrier to degree completion (U.S. Department of Education, 2017), and that barrier falls disproportionately on students who can least afford to be stopped by it. While significant progress has been made to increase entry-level mathematics course completion—through initiatives such as the Dana Center Mathematics Pathways and, more recently, the Launch Years Initiative—these efforts risk becoming “pathways to nowhere” if they are not connected to credentials and careers that deliver real economic value.

Students in all disciplines, including STEM, humanities, and technical fields, need to complete their educational journeys equipped with the appropriate skills for a career. The federal government has issued new requirements that deny financial aid to programs that do not provide an earnings premium, which signals that all majors must be designed with employment outcomes firmly in mind. Unfortunately, the gap between the quantitative skills taught in schools and those needed to secure family-sustaining jobs is often large.



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One key misalignment is the content taught in high school and postsecondary mathematics courses, which may not match the skills needed in current and emerging workforce sectors. The education system is, by design, narrowly focused on supporting students to and through the pathway to calculus. Other quantitative fields such as statistics, mathematical and data modeling, and data science are essential for emerging careers, and even in established sectors like healthcare and construction, inadequate quantitative skills continue to hamper career progression. However, the U.S. education system is slow to adopt large-scale change. This means millions of students are being left behind—denied the mathematical tools necessary to navigate an increasingly complex world.

In addition, even where mathematics connects to real-world and career applications, those connections are rarely made explicit for K–12 students (Cohen et al., 2019). While there is some overlap between the durable skills prioritized by employers and the habits of mind learned by studying mathematics (Student Achievement Partners, 2025), those connections are often implicit rather than explicit. Non-quantitative skills, such as critical thinking, communication, and problem solving, are often treated as secondary considerations rather than as core elements of course design.

Furthermore, although numerous workforce development initiatives exist at the national, state, and local levels, few build the essential mathematics skills required for specific careers—in part because they tend to focus on credentialing and job placement rather than on the underlying quantitative competencies that enable long-term career advancement (OECD, 2023). Career preparation experiences such as internships, apprenticeships, and work-based learning programs have significant potential, but without intentional design, they rarely help students connect their academic learning to professional expectations or develop the workplace readiness behaviors employers value (Cohen et al., 2019; Gray, 2025). The result is a persistent gap between what education delivers and what the workforce actually needs—a gap that neither sector has been positioned to close alone.

Bridging this gap requires mathematics education to explicitly connect classroom learning to authentic, real-world applications, ensuring students are prepared to meet workforce expectations. When combined with evidence-informed instructional practices and grounded in authentic contexts, collaboration, and inquiry, mathematics has the potential to nurture skills such as critical thinking, persistence, communication, metacognition, collaboration, and skills transference (Brandt & Lorie, 2024), as well as prepare students for the realities of the workplace.

Recognizing that no single industry, education sector, or organization can address these challenges alone, the U.S. needs to create cross-sector partnerships with the authority to act and the capacity to lead evidence-informed, constructive processes that yield actionable solutions with broad support. Currently, the Dana Center plays a leadership role in driving these efforts forward and ensuring their success. The Center's efforts include convening working groups that bring together mathematics educators, industry representatives, CTE leaders, region- or state-level decisionmakers, and other key constituents. These groups focus on identifying effective strategies to align mathematics education and labor market priorities. Emphasis is placed on industries where misalignments and career needs are well documented, ensuring representation includes forward-thinking professionals who recognize the urgency of adapting to shifting quantitative expectations within their fields. These collaborations build essential bridges between early learning, K–12, postsecondary, and workforce development systems, preparing individuals to meet current workforce demands and adapt their mathematical skills to thrive in an ever-changing economy.



Building a Shared Strategy for Alignment

As educators, employers, and organizations work to ensure that workers are prepared for good jobs and able to participate in a society increasingly shaped by mathematics, there are several strategies that could be adopted by robust cross-sector partnerships and collaborations that connect education and workforce development.

Establishing a Common Language for Skills

One way to address the skills gap is to develop a shared language that clearly defines the skills necessary for good jobs, both mathematical and otherwise. Without this common language, it is impossible to achieve meaningful alignment between education and the workforce. The report entitled *Architecting a Kindergarten-to-Workforce (K–W) Talent Pipeline: A Framework for Developing Skills for the Future* provides an initial taxonomy that moves beyond treating the “skills gap” as a singular phenomenon and instead reconceptualizes it as the interaction of three distinct skill types—technical, durable, and functional—and a related workplace readiness dimension, through which those skills are demonstrated, recognized, and applied in professional settings (Pepin et al., 2026).

The following table provides an overview of the three skill types and the workplace readiness dimension (Pepin et al., 2026).

Table 1. The Skills Framework: Three Skill Types and the Workforce Readiness Dimension

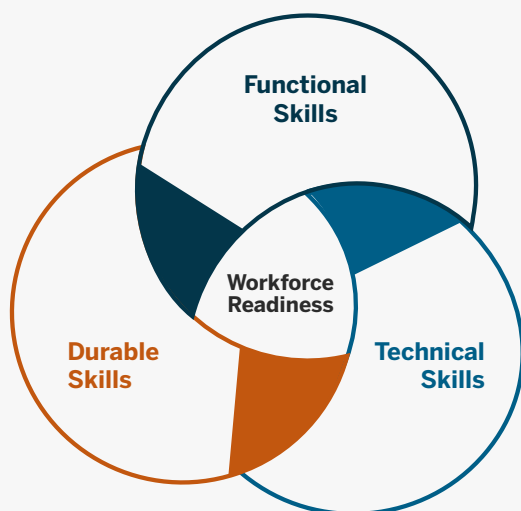
Skill Type	Definition	How to Develop	How to Identify	Key Distinction
 Technical Skills	Specific, teachable abilities needed to complete a defined task or operate a particular tool.	Through structured training and repetition (e.g., workshops, certifications).	Has the worker earned a related certificate or passed a test?	Tool/method-specific; evolves with technology and requires periodic updating.
 Durable Skills	Broad, transferable human competencies that are valuable across roles, industries, and time.	Through reflection and feedback from diverse experiences (e.g., coursework, group projects, internships, extracurricular activities).	Does the worker demonstrate adaptability, problem solving, and effective collaboration in varied situations?	Context independent; valuable across roles, industries, and career stages.
 Functional Skills	Integrated technical and durable skills that achieve specific outcomes within professional contexts.	Through authentic work experiences requiring a synthesis of skills (e.g., internships, capstone projects, applied research).	Can the worker successfully complete role-specific tasks by combining technical proficiency with durable competencies?	Context specific; demonstrated through purposeful integration.
Workplace Readiness	The ability to navigate the job market, continually demonstrate professional etiquette, and succeed and advance throughout careers.			

Establishing a Common Language Cont.

The three skill types are distinct but deeply interdependent. Technical skills provide the quantitative foundation; durable skills determine how flexibly and effectively a person can apply that foundation across changing circumstances; and functional skills represent the integration of both within specific professional contexts. No single type is sufficient on its own—a worker with strong technical skills but weak durable skills may struggle to adapt when tools or methods change, while strong durable skills without technical grounding leave gaps that employers consistently flag as preparation failures.

For mathematics education specifically, this means that building quantitative competency is necessary but not sufficient—students also need structured opportunities to develop the transferable capacities and contextual judgment that allow technical knowledge to become productive over a career.

The Workforce Readiness Dimension



Workplace readiness is where these skills meet the real world. It encompasses the behaviors, norms, and judgment that determine whether a capable person can successfully enter, navigate, and advance in a workplace—and it is often the least explicitly taught. It is also highly context-specific; what workplace readiness looks like in a healthcare setting differs from what it looks like in manufacturing, technology, or financial services.

This is precisely why education alone cannot fully develop it; internships, work-based learning, and applied experiences can introduce professional norms, but the primary responsibility for developing workplace readiness rests with employers through onboarding, mentorship, and day-to-day socialization into the culture of a specific workplace.

The practical implication for this work is clear: curriculum and pathway design must create structured opportunities for students to practice professional behaviors in authentic contexts—and employer partners must be willing to make their expectations explicit rather than assuming students will absorb them by proximity.

Infographic 1. Integrating Technical and Durable Skills





Mapping Skills Across Education and Industry

In high school and college, students should have access to mathematics pathways that align with their career aspirations and provide opportunities to develop the skills employers require. Once educators and employers align their way of distinguishing skills, they can cluster occupations and industries based on their existing and emerging requirements, rather than relying on outdated taxonomies.

This work can be supported by other efforts to identify the specific types of mathematics required for current and future careers. For example, Mathematics Hub listed 15 emerging jobs that require math, including AI researcher, data engineer, search engine optimization (SEO) consultant, data waste recycler, and garbage designer, along with the types of mathematics required for each career (Mathematics Hub, n.d.). In a similar vein, the Urban Institute developed a set of National Occupational Frameworks outlining core job competencies that usually include several specific mathematical skills (Urban Institute, n.d.).

Designing Applied Learning Opportunities

Functional skills and workplace readiness cannot be developed through coursework alone—they require students to practice applying their knowledge in authentic, professionally situated contexts. This demands intentional partnerships between educators and employers, designed not as one-time events but as ongoing structures that bring real-world problems into the classroom and real workplace expectations into view for students.

The National Science Foundation Preparation for Industrial Careers in Mathematics (PIC Math) program, a joint initiative of the Mathematical Association of America (MAA) and the Society for Industrial and Applied Mathematics (SIAM), offers a replicable model at the postsecondary level.

In PIC Math, faculty build sustained connections with business, industry, and government partners and then mentor teams of students working on semester-long projects sourced directly from those partners. Students engage with real problems—not textbook simulations—developing technical skills alongside the collaboration, communication, and problem-solving competencies employers consistently cite as critical. The program also produces paired case study videos in which industry professionals describe actual problems alongside faculty explaining the underlying mathematics, making the relevance of quantitative skills explicit and visible (MAA & SIAM, n.d.).

Designing Applied Learning Cont.

Consortium for Mathematics and its Applications' (COMAP) annual Mathematical Contest in Modeling (MCM) and Interdisciplinary Contest in Modeling (ICM) offer a complementary approach. Rather than industry-sourced projects, COMAP challenges student teams to independently define, model, and present solutions to open-ended real-world problems—building the kind of self-directed, collaborative, and communicative problem solving that mirrors professional practice (COMAP, n.d.).

Together, these models illustrate a broader principle: when educators and employers co-design learning experiences around real problems, students develop not just technical knowledge but also the functional skills and professional judgment needed to apply it. Employers, in turn, can reinforce this foundation by building onboarding and training processes that make explicit the durable skills and workplace expectations employees are expected to demonstrate—bridging the gap between what education provides and what the workplace requires.

From Vision to Action

To operationalize the strategies for alignment previously outlined, working groups will use the shared skills framework to focus on two core aims: identifying scalable solutions in industries with significant unmet quantitative needs and expanding the reach of effective but limited efforts to benefit more learners.

A central design principle is that mathematics and related skills requirements must be thoughtfully aligned across credentials and career pathways. To ensure learners can progress seamlessly through high school, certificate programs, apprenticeships, associate's degrees, or bachelor's degrees, mathematics instruction must be redesigned for coherence and alignment across all levels—so that students can stack credentials without unnecessary repetition, building on prior knowledge as they advance. Each step forward in their educational journey should build on, rather than duplicate, what came before.

Existing efforts have laid important groundwork:



Sector-specific task forces clarified quantitative needs in nursing and manufacturing.



Mathematics pathways work broadened options beyond a one-size-fits-all calculus path.



Employer-led programs strengthened experiential learning.



CTE innovations embedded richer mathematics into applied course-based learning experiences.

The Dana Center's proposed P–20W Education-to-Workforce Consortium will build on this foundation through six interconnected areas of work:



Align and modernize mathematics pathways

Develop evidence-informed, sustainable approaches that strengthen mathematics pathways and connect them to workforce needs in STEM and high-growth sectors, including manufacturing, healthcare, technology, and education. This work will provide clearer guidance to learners based on their aspirations, skills, and needs while ensuring pathways support seamless progression through stackable credentials.



Define and develop the mathematical skills needed for the future workforce

Establish shared definitions of technical, durable, and functional skills and workplace readiness experiences and co-develop aligned curricula, assessments, and experiential learning opportunities—including apprenticeships and internships—that connect mathematics learning to authentic career contexts.



Modernize systems for recognizing and communicating mathematics skills

Advance standards, frameworks, and workforce signals—including national systems such as O*NET—to reflect the full range of modern mathematics pathways and recognize the growing importance of statistics, data modeling, and data science across industries.



Strengthen connections between education, workforce, and communities

Foster local, regional, and national partnerships that provide learners and families with clear, accessible information about career pathways, labor market opportunities, and the mathematical skills needed to access and succeed in those opportunities.



Build data systems for continuous alignment and improvement

Optimize longitudinal data systems to track the development of technical, durable, and functional skills across P–20W and into careers, enabling partners to measure progress, identify gaps, and continuously improve pathways.



Create conditions for scale and sustainability

Align funding, policies, leadership structures, and cross-sector partnerships to support scalable solutions co-developed by educators, industry leaders, and policymakers. These structures will enable more flexible education-to-workforce journeys, including movement between learning and employment throughout a person's career.

Together, these six areas of work represent more than a program agenda—they are the architecture of a system designed to maintain coherence and relevance as the economy evolves. Existing efforts have demonstrated what is possible, but their impact has been limited by fragmented scope, short-term funding, and the absence of a shared skills language that can travel across institutions and sectors. The pace and scale of this transformation demand exactly this kind of agile, sustained initiative—one that bridges early learning, K–12, postsecondary, workforce development, and industry partners, anchoring the development and application of interconnected skills in real-world contexts. This is the only way learners can build, apply, and stack mathematics competencies while systems adapt continuously to meet their needs.

Collaboration Framework

Building this shared infrastructure requires more than good intentions—it requires a deliberate, coordinated collaboration framework that gives educators, industry leaders, policymakers, and community organizations the structures to codesign, test, and scale solutions together.

Preparing students for a rapidly changing workforce requires intentional, cross-sector collaboration to align mathematics education with real-world demands. Mathematics educators, discipline faculty, employers, policymakers, and community representatives must work together at local, regional, and national levels to address the mathematics-to-workforce gap. Achieving this alignment will require participants to embrace new roles, partnerships, and shared accountability—and it is precisely this kind of structured, sustained collaboration that the P–20W Education-to-Workforce Consortium is designed to facilitate and support. Examples of needed engagement include:

- **Anchoring a backbone organization** to sustain cross-sector collaboration beyond time-limited grants, maintaining infrastructure to bring together educators, employers, and workforce agencies.
- **Equipping and empowering education leaders** to adapt mathematics course content and teacher preparation more quickly to evolving needs.
- **Bridging two-year and four-year institutions** to maintain accreditation and academic integrity while addressing increasing workforce demands.
- **Convening industry representatives** to align workplace training and instructional design—ensuring that what is taught in classrooms and what is practiced on the job are mutually reinforcing.
- **Mobilizing community representatives and policymakers** to advocate for mathematics pathways as essential tools for workforce preparation and to design solutions that reflect local labor market needs.

The following examples demonstrate what this collaboration looks like when it is working. The goal is not to add new initiatives to an already crowded field but to align existing efforts around a shared skills language that bridges education and workforce priorities.



National partnership model

The High-Quality Mathematics Education for Nursing Task Force exemplifies a national partnership that aligned mathematics education with the quantitative needs of nursing. By focusing on the shared requirements of the National Council Licensure Examination (NCLEX), the task force developed a taxonomy of the mathematics nurses need today (Ozimek et al., 2025).



State leadership model

The Alabama STEM Council offers a state-level model. Established to strengthen STEM education and workforce development, it has helped evaluate the Alabama Numeracy Act, which aims to improve early mathematics education statewide (Alabama STEM Council, 2024). Council members also serve on the Alabama Launch Years Initiative leadership team, working to scale a transferable college-level quantitative reasoning course aligned with appropriate degree programs.



Regional industry partnership model

In Virginia, a coalition of three community colleges partnered with the shipbuilding industry to address hiring and training needs in manufacturing, welding, and electrical maintenance. The coalition developed short-term training programs embedding mathematical reasoning into realistic work-shift scenarios, equipping participants with the skills needed to secure employment and adapt to changing industry demands (Carter et al., 2022).



Local college-industry model

Local college and workforce partnerships can also be effective. Ferris State University's Kendall College of Art and Design (KCAD) Innovation Hub designs interdisciplinary educational experiences that respond to community and industry needs, including those of manufacturers, through projects co-developed by faculty and industry partners. A required research methods course introduces foundational statistics, and students complete at least one mathematics or science course. One option, Math in Art and Design, explores relationships between mathematics and the arts, covering number systems, logic, probability, basic statistics, algebraic formulas, geometry, and some trigonometry (Moroney, 2022).



Regional backbone organization model

Arizona’s SciTech Institute STEM Ecosystems initiative highlights the role of a backbone organization in sustaining regional collaboration. SciTech engages employers and educators in co-developing and validating the skills embedded in curricula and career pathway maps, ensuring alignment with evolving industry needs (STEM Ecosystems, 2025).

Together, these examples show that cross-sector collaboration works—at every level of the system. But they remain isolated, each operating within its own scope, timeline, and set of partners. What is missing is the connective tissue: a collective agenda that aligns these efforts around a shared skills language and sustains the partnerships needed to move from promising models to systemic change. The collective action agenda that follows outlines the critical steps to get there.

The Collective Action Agenda

Achieving sustainable, systemic change in mathematics education and workforce alignment requires a focused, coordinated collective action agenda—one that builds on existing progress while tackling the challenges that isolated efforts have been unable to solve. The P-20W Education-to-Workforce Consortium, led by the Dana Center, is positioned to drive this agenda forward. This agenda will focus on:

- **Identifying gaps in evidence** to address misalignments between mathematics education and workforce demands.

- **Developing and codifying resources** to guide the implementation of modern mathematics pathways and workforce-aligned practices.

- **Supporting education agencies and higher education institutions** in creating the institutional conditions—such as policies, leadership structures, incentives, and data systems—necessary to implement and sustain systemic change.

- **Improving assessment and data systems** to identify gaps, guide continuous improvement, and ensure alignment between mathematics education and workforce needs.

The next four subsections outline key components of this agenda, recognizing that additional priorities may emerge:



Research

Identify which mathematics competencies matter most for success in high-quality careers, determine how durable and professional skills can be effectively integrated into mathematics learning, and identify where cross-sector collaboration can have the greatest impact.



Resource Development

Develop communication campaigns, curricula, and professional learning that modernize mathematics, reflect real workforce demands, and demonstrate the relevance of mathematics to learners' lives, future opportunities, and careers.



Institutional Conditions for Systemic Change

Support education systems and higher education institutions in building the policies, leadership structures, incentives, and data systems necessary to implement and sustain systemic change at scale through continuous improvement informed by evidence, implementation learning, and shared accountability.



Assessment and Data Systems

Design credentials and data systems that verify and communicate technical, durable, functional, and career skills across P–20W, enabling learners, educators, employers, and policymakers to understand and act on shared measures of readiness.

Central to this agenda is the use of a shared skills language that bridges education and workforce priorities, **ensuring that mathematics pathways are designed to develop the technical, durable, and functional skills and workplace readiness experiences required for success in the modern economy.** Together, these recommendations help focus collective efforts and clarify next steps for action.



Research

Transforming education-to-workforce systems requires focused research and planning to ensure sustainability, address persistent disparities in access and outcomes, align mathematics pathways with workforce needs, and guide systemic improvement. Key areas of focus include:

Sustainability and Scalability

- **Define the infrastructure and conditions needed** to sustain and replicate local, regional, and national mathematics-to-workforce ecosystems beyond initial grant funding.
- **Map existing effective, scalable initiatives** to avoid duplication, leverage proven assets, and accelerate progress.

Effective Representation

- **Identify partners** that represent learner interests across demographic groups—especially underserved communities, rural systems, and underrepresented employer segments—and ensure their perspectives shape the work from the outset.

Mathematics Competencies and Workforce Needs

- **Compile evidence** on which mathematics competencies most strongly predict success in quality jobs across industries to guide pathways and instructional priorities.
- **Study the impact of incorporating technical, durable, and functional skills** and workplace readiness experiences into mathematics curricula to ensure learning translates into valued workplace performance.
- **Identify gaps** between current instructional practices, the skills they cultivate, and actual workforce needs; develop strategies to close those gaps.

Cross-Sector Collaboration and Alignment

- **Conduct cross-sector analyses** to determine where collaboration yields the greatest return and to guide phasing and investment.
- **Examine how CTE and industry-recognized credentials can reinforce standards-aligned mathematics learning**, support higher-level study, and create work-based learning opportunities where students can demonstrate mathematics competencies in authentic contexts.

Frameworks and Models

- **Gather evidence** on which frameworks work best under which conditions so local task forces can select models suited to their contexts.
- **Research how to diversify mathematics pathways** to meet workforce needs without limiting access to advanced mathematical thinking.

The field needs answers to two fundamental questions:

Question 1

How should modern mathematics pathways be designed to ensure that every learner can access and develop the mathematical skills needed for an evolving economy—including advanced mathematical thinking, problem solving, and application?

Question 2

How can work-based and applied learning experiences be intentionally integrated with mathematics education so that academic rigor, real-world relevance, and workforce readiness mutually reinforce one another?

This agenda is built to do what isolated efforts cannot: generate transferable evidence, align expectations across education and workforce systems, and enable the field to act with confidence at scale.



Resource Development

In addition to the research questions listed in the previous section, improving the mathematics-to-workforce connection to close the skills gap will require the development of communication, curricular, and professional learning resources.

Communication and Policy Strategies

Scaling modern, productive mathematics pathways nationwide requires a shared understanding of the critical role mathematics and related skills play in preparing students for the workforce and supporting economic growth. Consortium members and partners should lead a national campaign that:

- Highlights the benefits of learning mathematics and its real-world career applications.
- Emphasizes that industry and education must work as interconnected systems.
- Calls for investment in mathematics pathways and workforce alignment to sustain a strong talent pipeline.

Targeted campaigns for mathematics educators should promote modern curricula and pedagogy that emphasize the application of mathematics in authentic, complex contexts. This shift ensures students develop the skills required to secure jobs and to drive innovation and problem solving in the workforce. Showcasing schools and districts that successfully use application-based and phenomenon-based learning and providing professional development to support similar adoption will be key.

Resource Development Cont.

A parallel policy priority is updating Occupational Information Network (O*NET) standards to reflect the full range of modern mathematics pathways. Current standards reinforce a one-size-fits-all calculus track and overlook the growing importance of statistics, mathematical and data modeling, and data science. Modernized standards would allow education systems to adjust requirements more quickly to meet changing quantitative needs across industries. Members of the Consortium are well positioned to advise and champion this shift.

Curricular Resource Development

The field needs high-quality, industry-informed instructional materials that connect mathematics to real-world career applications—and producing them requires collaboration among curriculum developers, publishers, industry partners, and educators. Individual educators should not bear this burden alone; they should be supported by well-resourced development processes that bring professional contexts into classrooms through materials they can actually use. These resources give students authentic exposure to how mathematics is applied across industries, building the technical, durable, and functional skills and workplace readiness that determine whether learners can translate classroom learning into workplace performance. While some experiences will align with existing CTE career clusters (Advance CTE, n.d.), they may also reveal emerging pathways to good jobs. Realizing this vision will require both phenomenon-based mathematics instruction and assessment tools capable of capturing the full range of competencies learners need—not just technical proficiency but the broader skills that enable them to apply that knowledge in professional contexts.



Within institutions, mathematics faculty should collaborate with colleagues in other disciplines to design cross-course projects and support them in teaching mathematics within discipline-specific courses. For example, Dr. Daniel Ozimek of Saint Joseph's University partnered with nursing faculty to integrate accurate clinical contexts into his mathematics courses and co-develop mathematically robust lessons for nursing courses.

A further priority is preparing students to use rapidly evolving technologies in the workplace. As automation and AI expand, programs must ensure students can work effectively with technology and apply their skills in a changing environment. Mathematics programs that do not integrate relevant tools limit students' workforce readiness. Embedding modern statistical, data-analytic, and quantitative technologies within evidence-based pedagogy that builds conceptual understanding and critical thinking is essential to closing the mathematics education-to-workforce skills gap.

Finally, educators need resources to measure mathematics competency in work-based learning settings. Such tools can verify that skills in stackable credentials are well aligned and create additional pathways to good jobs beyond the traditional high school-college-career route, supporting more flexible lifelong learning.

Professional Learning Resource Development

Pedagogical change at this scale requires more than better materials or professional development—it requires confronting deeply held beliefs about mathematical ability and who deserves access to it. Without sustained investment in mindset shifts across all grades and roles—from classroom teachers to national organizations—even the strongest curriculum will fail to reach its potential.



Faculty cannot teach what they have not been equipped to practice. Employers cannot expect students to master niche, proprietary tools in school, but they can expect them to arrive with the technical foundations needed to quickly acquire job-specific functional skills. Meeting that expectation requires sustained faculty development that brings modern technologies—generative AI, contemporary statistics, and data analysis tools—into quantitative coursework through active, applied practice rather than theoretical introduction alone.

No single institution can develop the curriculum materials described above alone—nor should they. Authentic collaboration among mathematics faculty, discipline faculty, and industry representatives requires shared terminology, intentional structures, and the kind of sustained dialogue that one-time convenings cannot produce. The Dana Center has built this model through efforts like the High-Quality Mathematics Education for Nursing Task Force, and the proposed Consortium can deepen it through partnerships with organizations such as Jobs for the Future and the Lumina Foundation. In a landscape shaped by rapid advances in automation and generative AI, codified, long-term partnerships—like those anchored by the Alabama STEM Council—are not optional infrastructure. They are the prerequisite for lasting impact.

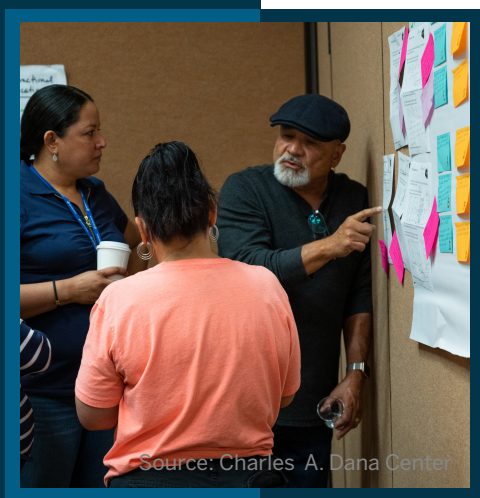


Institutional Conditions for Systemic Change

Even the strongest curriculum and most committed faculty cannot drive systemic change without the institutional conditions that allow reform to take root and sustain itself.

Education agencies and higher education institutions need support in building the internal infrastructure that makes systemic change possible: aligned policies that remove barriers to pathway innovation; leadership structures that distribute accountability across roles rather than concentrating it in a single champion; incentives that reward collaboration and credential alignment; and data systems that provide timely feedback on what is and is not working.

This is work the Dana Center knows well. For decades, the Center has partnered with institutions at every level of the education system to navigate exactly these challenges—helping leaders align policy with practice, build the structures that sustain reform beyond initial funding, and create the conditions under which good ideas become durable change. It is not peripheral to the Dana Center’s mission; it is central to it.



Source: Charles A. Dana Center

Institutional Conditions for Systemic Change Cont.

Without these conditions, even the most well-designed mathematics pathways and workforce-aligned curricula will struggle to move from pilot to practice. The P–20W Education-to-Workforce Consortium can accelerate this work by providing technical assistance to institutions navigating policy change, connecting leaders across institutions who are tackling similar challenges, and developing implementation guides that translate the research and resources described in this agenda into actionable steps for local contexts.



Assessment and Data Systems

Closing the mathematics-to-workforce skills gap requires a coherent data and assessment infrastructure that can reveal how learners develop, demonstrate, and apply mathematical skills across the P–20W continuum.

A new assessment framework is needed that clearly distinguishes technical, durable, functional, and workplace readiness capabilities (Pepin et al., 2026), makes workplace applications explicit, and issues portable credentials that reflect verified competencies.

Building on the Dana Center’s ongoing efforts in the Launch Years Initiative to develop stronger data infrastructure for understanding how students access, navigate, and succeed within mathematics pathways, new data systems must extend visibility across the full P–20W continuum. By connecting information on mathematics course-taking, pathway progression, credentials, and workforce outcomes, these systems can illuminate which pathways and learning experiences enable students to develop the mathematical skills needed for postsecondary success and career opportunity.

Updated or newly built data systems must transform disconnected data into actionable intelligence that supports decision making across the P–20W continuum. These systems should provide learners, educators, institutions, employers, and policymakers with timely insights into pathway access, progression, skill development, credential attainment, and workforce outcomes. They must include strong privacy protections and meaningful disaggregation to understand who is benefiting from opportunities, where barriers exist, and where changes are needed to improve outcomes. Critically, these systems must enable partners to identify where mathematics education practices, pathway structures, and workforce expectations are aligned—and where they require adjustment at local, regional, and national levels.

Assessment and Data Systems Cont.

The data infrastructure required will depend on the existing systems, capacity, and priorities of states, regions, and communities. Regardless of context, partners will need data capabilities that support the following functions:

-  **Conceptualization:** High-level labor market and skills intelligence to identify emerging skill demands and inform future pathway design.
-  **Design:** Skills-based data and crosswalks linking mathematics competencies to broad work roles to guide pathway design, curriculum alignment, and stackable credentials.
-  **Implementation:** Operational data on adoption, learner progression, and access to applied and work-based learning to support rapid-cycle improvement.
-  **Research and Evaluation:** Linked education-to-workforce outcomes (e.g., completion, employment, wages, earnings gains), disaggregated to assess impact and identify disparities across student populations.
-  **Scaling:** Shared data definitions, interoperable systems, and dashboards that enable learning across regions while remaining responsive to local workforce contexts.

By addressing these research, resource, institutional conditions for system change, and assessment needs, the collective action agenda creates the foundation for sustained alignment between mathematics education and workforce opportunity. This work is essential to preparing learners for lifelong success and ensuring that education systems remain agile, responsive, and capable of adapting to the evolving needs of society and the economy.

From Alignment to Impact

The work described in this report is not a vision for the future—it is a call to action for the present. The alignment required now is not simply alignment among courses, curricula, or credentials; it is alignment across the systems that shape how learners develop, demonstrate, and apply mathematical skills throughout their education and careers. Every year that mathematics education and workforce systems remain disconnected is another cohort of learners denied access to opportunity and another generation of employers struggling to find the talent they need.

The field has generated important insights, promising approaches, and evidence of what is possible. What has been missing is the coordinated infrastructure and collective will to connect those efforts, accelerate learning, and build the systems needed to produce impact at scale. That is what this collective action agenda provides.

The P–20W Education-to-Workforce Consortium, led by the Dana Center, is positioned to create the shared infrastructure that no single institution, sector, or initiative can build alone: a system that connects mathematics pathways, workforce expectations, credentials, and data around a shared skills language, shared measures of progress, and a shared commitment to learner success. The actions that follow are not aspirational—they are operational. Each one targets a specific point of failure in the current system and assigns clear responsibility for addressing it.

- **Identify and prioritize strategies to modernize educational and workforce systems** by aligning mathematics pathways with workforce demands, supported by research on the skills most critical for success in current and emerging industries.
 - **Convene cross-sector collaborative groups** two to four times per year, with participants and agendas tailored to specific priorities to ensure the right voices are at the table for each stage of the work.
 - **Develop case studies** that document successful local, regional, and national initiatives, emphasizing replicable strategies and the resources required to scale them.
- **Identify additional high-priority workforce sectors** with shared national credentials or certification exams, and replicate proven models that develop the technical, durable, and functional skills required for success.
- **Develop and implement a national campaign to modernize O*NET standards**, ensuring they reflect the full diversity of mathematics pathways in secondary and postsecondary education—moving beyond the one-size-fits-all calculus track to reflect the growing importance of statistics, mathematical and data modeling, and data science.
- **Support partner organizations in building the capacity and measurement infrastructure** required for sustainable implementation, enabling timely, data-driven continuous improvement.
- **Organize and align funding for scalable, collaborative solutions** that center the critical intersections of skills, mathematics pathways, and workforce demands—co-developed by educators, industry leaders, and policymakers to ensure systemic alignment and sustainability.

The stakes are clear. Employers cannot find the talent they need; learners cannot access the pathways that would prepare them, and the seams between early learning, K–12, higher education, and the workforce cost capable people their futures—and cost the economy the talent it cannot afford to lose. This is a solvable problem—but only if education and industry stop working in parallel and start working in concert.

The Dana Center has spent decades building the relationships, the models, and the evidence base to make this possible. The P–20W Education-to-Workforce Consortium is the structure to turn that foundation into field-wide action. Funders, policymakers, educators, and employers who invest in this work are not funding a program—they are funding the infrastructure that makes every other workforce investment more effective.

The era of disconnected alignment efforts has passed. The moment for coordinated action and measurable impact is now.

References

- Advance Career Technical Education (CTE). (n.d.). *The national career clusters framework*. <https://careertech.org/career-clusters/>
- Alabama STEM Council. (2024). *2024 annual report*. <https://stemcouncil.alabama.gov/wp-content/uploads/2025/02/Annual-Report-2024-Final-Draft.pdf>
- Brandt, W. C., & Lorié, W. (2024). *Measuring student success skills: A review of the literature on analytical thinking*. National Center for the Improvement of Educational Assessment.
- Canada Prime Jobs. (2025). *Math skills beyond finance: Their ubiquity in the workplace*.
- Carter, J., Lawhorne, A., Estes, M., Gross, M., & Leech, J. (2022). *Math for manufacturing, Workforce and higher education partnerships - Case study: Virginia*. Charles A. Dana Center, The University of Texas at Austin. https://www.utdanacenter.org/sites/default/files/resources/ccny_case_study_4_virginia.pdf
- Cohen, M., Therriault, S., Scala, J., Lavinson, R., & Brand, B. (2019). *Afterschool programming as a lever to enhance and provide career readiness opportunities*. College and Career Readiness and Success Center at American Institutes for Research. <https://files.eric.ed.gov/fulltext/ED603026.pdf>
- Consortium for Mathematics and its Applications (COMAP). (n.d.). *COMAP contests*. <https://www.comap.com/contests/contestsoverview>
- Gardner, D. P., Larsen, Y. W., Baker, W. O., Campbell, A., Crosby, E. A., Foster, C. A., Jr., Francis, N. C., Giamatti, A. B., Gordon, S., Haderlein, R. V., Holton, G., Kirk, A. Y., Marston, M. S., Quie, A. H., Sanchez, F. D., Jr., Seaborg, G. T., Sommer, J., & Wallace, R. (1983). *A nation at risk: The imperative for educational reform*. National Commission on Excellence in Education. <https://files.eric.ed.gov/fulltext/ED226006.pdf>
- Gray, K. (2025). *The gap in perceptions of new grads' competency proficiency and resources to shrink it*. National Association of Colleges and Employers. <https://www.nacweb.org/career-readiness/competencies/the-gap-in-perceptions-of-new-grads-competency-proficiency-and-resources-to-shrink-it>
- Hart Research Associates. (2013). *It takes more than a major: Employer priorities for college learning and student success*. The American Association of Colleges and Universities. <https://www.aacu.org/research/it-takes-more-than-a-major-employer-priorities-for-college-learning-and-student-success>
- Mathematical Association of America (MAA) & Society for Industrial and Applied Mathematics (SIAM). (n.d.). *Preparation for industrial careers in mathematics (PIC Math)*. <https://maa.org/resource/pic-math/>
- Mathematics Hub. (n.d.). *15 amazing future jobs that need maths skills*. <https://www.mathematicshub.edu.au/students/student-resources/careers-with-maths/15-amazing-future-jobs-that-need-maths-skills/>

References Cont.

- Moroney, J. (2022). *Math for manufacturing, Workforce and higher education partnerships - Case study: The innovation hub at Kendall College of Art and Design of Ferris State University*. Charles A. Dana Center, The University of Texas at Austin. https://www.utdanacenter.org/sites/default/files/resources/ccny_case_study_3_kcad_ferris.pdf
- The Organisation for Economic Co-operation and Development (OECD). (2023). *OECD skills outlook 2023: Skills for a resilient green and digital transition*. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/11/oecd-skills-outlook-2023_df859811/27452f29-en.pdf
- Ozimek, D., Bowers, H., Good, L., Kelch, B., & Valcourt, M. (2025). Building consensus on the essential quantitative competencies, skills, and practices for entry-level nurses. *Nursing Education Perspectives*, 46(2), E12–E17. DOI: 10.1097/01.
- Pepin, S., Arrington, K., & Wiggins, A. Y. (2026). *Architecting a kindergarten-to-workforce (K–W) talent pipeline: A framework for developing skills for the future*. Charles A. Dana Center, The University of Texas at Austin.
- The Secretary’s Commission on Achieving Necessary Skills (SCANS). (1991). *What work requires of schools: A SCANS report for America 2000*. U.S. Department of Labor. <https://files.eric.ed.gov/fulltext/ED332054.pdf>
- STEM Ecosystems. (2025). *Participating STEM learning ecosystems*. <https://stemecosystems.org/ecosystems/>
- Strohl, J., Gulish, A., & Morris, C. (2024). *The future of good jobs: Projections through 2031*. Georgetown University Center on Education and the Workforce. <https://cew.georgetown.edu/cew-reports/goodjobsprojections2031/>
- Student Achievement Partners. (2025). *Durable skills in state policy: Bridging the gap to math classrooms*.
- Urban Institute. (n.d.). *What are national occupational frameworks?* <https://apprenticeships.urban.org/design-program>
- U.S. Department of Education. (2017). *Developmental education: Challenges and strategies for reform*.
- World Economic Forum. (2023). *The future of jobs report 2023*. <https://www.weforum.org/publications/the-future-of-jobs-report-2023/>
- World Economic Forum. (2025). *The future of jobs report 2025*. <https://www.weforum.org/publications/the-future-of-jobs-report-2025/>