The Integral Role of Business Advisory Councils (BACs) in STEM/STEAM Education

A Crosswalk Between BAC Quality Practices and STEM/STEAM School Attributes

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Background Information

Ohio's Future is STEM

The Ohio Department of Education defines STEM as a learner-centered approach to teaching providing students with a problem-based, transdisciplinary, and personalized learning experience. STEM education uses the foundational practices and skills essential to the core disciplines of Science, Technology, Engineering, the Arts and Humanities, and Mathematics. These essential skills challenge students to think critically, design solutions, and make evidence-based explanations through real-world authentic learning experiences. STEM education creates meaningful pathways to post-secondary success for K-12 students through partnerships and career exploration with community entities.

Science, Technology, Engineering, and Mathematics (S.T.E.M.) jobs and career opportunities are growing at an exceptional rate. It is estimated that there will be at least 1,000,000 new jobs in S.T.E.M., Manufacturing, and other similarly related sectors by 2030 in Ohio. Additionally, this staggering estimate does not include career fields and job roles that require STEM competencies such as problem-solving skills at non-S.T.E.M. companies (such as an analyst at a publishing firm), or industries which are S.T.E.M.-aligned but not traditionally categorized as such, such as agriculture. It is critical that our Business, Industry, and Community Organization leaders and hiring managers take an active role in engaging our student population to ensure a sustainable pipeline of STEM-trained future employees.

This Document

The purpose of this document is to provide clarity and alignment between the expectations of high performing Business Advisory Councils (BACs) as measured by the BAC Quality Practices framework and STEM best practices as outlined in the STEM and STEAM Designation Rubric.

There is a crosswalk of how BAC Quality Practices align to the STEM/STEAM rubric attributes, and a crosswalk of how the STEM/STEAM rubric attributes align to the BAC Quality Practices. The purpose of including both perspectives is so that individuals and organizations that come from one background can learn about the alignment from the other background and optimize transparency. Essentially, this document shows that if STEM practices are implemented authentically, the BAC Quality Practices are met, and if a BAC implements the highest quality practices, this will advance STEM practices as well.

Success Stories

- **Global Impact STEM Academy**, part of the Ohio STEM Learning Network, has become a model of what happens when you pair education with community needs and interests. "Some days, it looks like chaos in here," Principal Josh Jennings said. "And those are the days that are the best! There are no bells at this school, no PA system and we don't purchase textbooks," Jennings said. Instead, teachers create their own material like using soybeans to make ChapStick or biofuels. The focus is making the learning **relevant** and **engaging** for students. "And we have **high expectations** of our students," he said. A total of 90 percent of graduates attend college, with 60 percent joining related industries and the average student graduating with at least 40 semester hours of college credit. And **100 percent of all students have a professional internship**. Creating pathways to careers is a deep part of the foundation of Global Impact STEM Academy. By making learning relevant with **connections to local industry**, students are far more likely to understand and engage in career exploration. They are tasked with **solving real challenges for businesses or organizations** in their community, including better ways of growing soybeans. "Students need to see **connections** to what they learn in school to their lives outside of school," said Jennings.

Ohio | Department of Education

- **The DO STEM Ecosystem** in Dayton, Ohio, recently collaborated with others for the "DO STEM Future Fair,' where students and families came together to discover STEM careers. The first DO STEM Future Fair was held in 2022 at the Air Force Museum and attracted 400 middle school to high school students and families to visit with 40 different companies and organizations from higher education, industry and nonprofits. "The goal was to not only be able to showcase the opportunities that they have within their industry, but also have a discovery opportunity. And it was so wonderful to give them the chance to talk with these industries and higher education platforms so that they could begin to make plans," Short said. "And this wouldn't have happened if not for the collaboration between the DO STEM ecosystem and the Ohio STEM Learning Network." DO STEM and the Ohio STEM Learning Network are joined by other collaborations with the Dayton Regional STEM Center (DRSC), a teacher-training institute for STEM education. It supports educators by designing curriculum aligned to workforce needs, training school leaders at the district and building level. The center's ultimate mission is to enhance the region's workforce pipeline to serve the needs of area employers, including the U.S. Department of Defense, which maintains a massive workforce at the Dayton area's Wright-Patterson Air Force Base, built on the actual site of most of Wilbur and Orville Wright's early flight experiments and tests. The air base employs more than 30,000 people – among them hundreds of data scientists, chemists and engineers. Not surprisingly, the Department of Defense is an important funding source for Dayton's STEM initiatives. In 2019, the Dayton Regional STEM Center was chosen as one of four operational "hubs" of the Defense STEM Education Consortium (DSEC). DSEC is a collaborative partnership that aims to broaden STEM literacy and develop a diverse and agile workforce with the technical excellence to defend our Nation. The consortium, aligned to the [Federal STEM Education Strategic plan](#), seeks to inspire the next generation of scientists and engineers through intentional investment in STEM enrichment programs for students, professional development for educators, and engagement with the civilian DoD STEM workforce.

- Brief examples of Ohio BACs implementing quality practices:
  - **Barberton City** is developing future curriculum/programming including technology, math and writing to support businesses to build skill sets for students.
  - **Lawrence County ESC** runs the Marathon Petroleum Women's Day for 9th graders.
  - **Marion Area Workforce Acceleration Collaborative** started the "LJ Create" program to help students discover STEM career pathways with a focus on project-based activities.
  - **Auglaize-Mercer Business Education Alliance (Mercer-Auglaize BAC)** coordinated STEM tours for middle school students for approximately 220 students from 3 members district schools with 5 companies representing high-demand STEM areas of manufacturing/design.
    - **Student testimonials from this event include:**
      "I have learned that you do not need a degree to have some manufacturing jobs"
      "I have learned that all the nice plaques and awards have come from the town of Celina"
      "That right in Ohio we work with people around the world."
  - **Greenville City BAC** hosts a one-day IMPACT event with Darke County Chamber of Commerce and Darke Economic Development for girls in grades 9-12 to explore careers in STEM, continued from 2021-2022 school year.
  - **Marion Area Workforce Acceleration Collaborative's** Inventionland is a cross-curricular STEM project-based learning program for students in grades 6-8 to develop problem-solving, teamwork and communication skills (all of which have been identified as needed skills by employers).
  - **Licking County ESC** hosts "STEM over Lunch" where educators and business leaders are invited to hear a presentation concerning STEM topics related to area businesses and potential careers for students, includes discussion and collaboration between all members involved.
  - **Tri-County ESC BAC** invites elementary school students participate in BeeBots engineering design process. Students also participate in STEAM camp where they learn robotics and 3-d printing.
  - **Noble Local Schools** offers several career and college pathways in STEM fields such as a Medical/Health pathway, a Manufacturing/Construction pathway and a Business/Information Technology pathway. Each of these pathways include courses students can take in high school to prepare them for a career in that field, work-based learning placements and examples of future careers students could pursue in that field. Noble Local also partnered with *Building Bridges to*

Ohio | Department of Education

Careers to facilitate 11 project-based learning experiences for middle and high school students during the 2022-2023 school year, and high school students also had the opportunity to create their own Passion Project. Noble Local offers advanced and CCP courses in medical assisting, computer programming, and Java as well.

o **Cincinnati Public Schools** hosts "How I Got Here" video series for students in grades 6-12 where individuals from key employer partners such as Allied Construction Industries, TriHealth, and Cincinnati Children's Hospital, share their personal career journeys to inspire students and expose them to potential careers. They also provide students with internship and pre-apprenticeship opportunities with business partners, including some in STEM fields such as TriHealth, Cincinnati Children's Hospital, Allied Construction Industries, and Health Collaborative.

o **Loveland City Schools'** teacher and advisor of the Loveland Robotics Team, Ms. Stewart, works with business leaders to collect information related to STEM careers for her students. Ms. Stewart also teaches Project Lead the Way courses where students work individually and in teams to design solutions to problems using 3-D modeling software and document their work in an engineering notebook. Business leaders and local Career Tech Center support this course as well and help students develop technology-related skills.

TABLE 1: CROSSWALK BETWEEN STEM/STEAM EDUCATION ATTRIBUTES AND BAC QUALITY PRACTICES

STEM/STEAM Attribute	BAC Quality Practice
Domain 1: A Culture for Learning **1.1 Cultural Strategies:** STEM and STEAM schools exhibit age-appropriate, school-wide cultural strategies reflecting **innovation**, an **entrepreneurial spirit**, **inquiry**, and **collaboration** with **individual accountability**.	**#1 Develop Professional Skills for Future Careers:** Work together to delineate key professional skills that will be needed for the future job market. Develop curriculum that instills these skills while advising on changes in the economy and job market. **#3 Coordinate Experiences:** Create environments that allow students to demonstrate proficiency in critical professional and specialized skills that will aid in future employment.
Domain 1: A Culture for Learning **1.5 Governing Body and/or Advisory Group and Curriculum Team:** Schools are required to include Business and Industry representatives, individuals with expertise in Science, Technology, Engineering, and/or Mathematics fields, as well as individuals with expertise in STEM pedagogy on their leadership groups (governing body or advisory council and curriculum team).	**#1 Develop Professional Skills for Future Careers:** Work together to delineate key professional skills that will be needed for the future job market. Develop curriculum that instills these skills while advising on changes in the economy and job market. **#2 Build Partnerships:** Develop working relationships among businesses, labor and education personnel. **#3 Coordinate Experiences:** Create environments that allow students to demonstrate proficiency in critical professional and specialized skills that will aid in future employment.
Domain 2: Teaching and Learning **2.2 Teaching and Learning Approaches:** Schools offer a rigorous, diverse, integrated, and problem- or project-based curriculum to all students enrolled in the school, with the goal to **prepare all students for post-high school learning experiences, the workforce, and citizenship**, and that emphasizes **the use of design thinking** as a schoolwide approach.	**#1 Develop Professional Skills for Future Careers:** Work together to delineate key professional skills that will be needed for the future job market. Develop curriculum that instills these skills while advising on changes in the economy and job market. **#3 Coordinate Experiences:** Create environments that allow students to demonstrate proficiency in critical professional and specialized skills that will aid in future employment.
Domain 2: Teaching and Learning **2.5 STEM/STEAM Teaching Staff:** The entire teaching staff is included in timely, ongoing and relevant professional development opportunities focused on the STEM/STEAM instructional practices. Teachers and school leadership work together to personalize professional development based on individual development needs. School staff are invited to share their learning of best STEM/STEAM instructional practices beyond their school.	**#1 Develop Professional Skills for Future Careers:** Work together to delineate key professional skills that will be needed for the future job market. Develop curriculum that instills these skills while advising on changes in the economy and job market.

Domain 3: Pathways to Success in Careers	
Domain 3: Pathways to Success in Careers **3.1 Career Access and Exploration:** Schools are expected to establish curricular connections with Business & Industry, providing opportunities and access for success in college and career such as: • CTE courses / alignment, • Career-aligned curriculum and resources, • Graduation seals, • Credentials, • Dual-enrollment / CCP, and/or • Work-based learning credit	**#2 Build Partnerships:** Develop working relationships among businesses, labor and education personnel.
	#3 Coordinate Experiences: Create environments that allow students to demonstrate proficiency in critical professional and specialized skills that will aid in future employment.

Domain 3: Pathways to Success in Careers
 	
3.2 Partnerships Extend Learning Opportunities: Schools are expected to create meaningful partnerships with Business, Industry, Community Organizations, and Institutions of Higher Education that provide and enhance opportunities for practical and real-world experiences.
• Partners should be involved in schoolwide decisions in a leadership capacity.
• Partners may provide financial support, materials, or other goods and services.
• Partners may provide learning spaces, out-of-school opportunities, or sponsor other initiatives that the school needs.
• Partners may provide in-kind support, such as voluntary labor, including:
   o Speaking opportunities,
   o Curriculum feedback or design,
   o Providing authentic problems for students to solve,
   o Acting as authentic audience to assess student work and provide feedback, and
   o Serving as mentors during project completion and experts during learning experiences.
	#1 Develop Professional Skills for Future Careers: Work together to delineate key professional skills that will be needed for the future job market. Develop curriculum that instills these skills while advising on changes in the economy and job market.

	#2 Build Partnerships: Develop working relationships among businesses, labor and education personnel.
	#3 Coordinate Experiences: Create environments that allow students to demonstrate proficiency in critical professional and specialized skills that will aid in future employment.
Domain 3: Pathways to Success in Careers **3.3 Relevant Community Experiences:** Schools are expected to engage students in STEM-rich formal and informal learning experiences with the community that are personally relevant to students. • Community experiences should align to classroom learning, standards, and outcomes. • Community experiences should be student-driven. • The school engages directly with community organizations and experts outside the school to plan and implement community experiences connected to learning.	**#1 Develop Professional Skills for Future Careers:** Work together to delineate key professional skills that will be needed for the future job market. Develop curriculum that instills these skills while advising on changes in the economy and job market.

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TABLE 2: CROSSWALK BETWEEN BAC QUALITY PRACTICES AND STEM/STEAM EDUCATION ATTRIBUTES

BAC Quality Practice	STEM/STEAM Attribute
#1 Develop Professional Skills for Future Careers: Work together to delineate key professional skills that will be needed for the future job market. Develop curriculum that instills these skills while advising on changes in the economy and job market.	
Have identified goals and developed a comprehensive plan for how professional skills will be taught and reinforced in kindergarten through grade 12.	**1.1 Cultural Strategies** **2.2 Teaching and Learning Approaches** **3.3 Relevant Community Experiences**
Include recommendations on how the professional skills identified use career trend data and how they will be taught through existing curricula and/or the creation of new curricula included in the submitted plan.	**1.1 Cultural Strategies** **2.2 Teaching and Learning Approaches** **3.3 Relevant Community Experiences**
Include recommendations for classroom instruction, as well as classroom activities, events and programs.	**1.5 Governing Body and/or Advisory Group** **3.2 Partnerships Extend Learning Opportunities** **3.3 Relevant Community Experiences**
Address how existing programs will be sustained and new, innovative programs will be initiated and supported. Educator engagement, professional development, employer involvement in the classroom, and sequenced, year-long engagement are prioritized.	**1.5 Governing Body and/or Advisory Group** **2.5 STEM/STEAM Teaching Staff** **3.2 Partnerships Extend Learning Opportunities**
Identify how the council will study historical and future changes to the economy and job market and include how the council will work with governing boards of districts to address these changing needs.	**1.5 Governing Body and/or Advisory Group** **3.2 Partnerships Extend Learning Opportunities**
Identify resources and partners, both regionally and/or nationally, that will inform the council.	**3.2 Partnerships Extend Learning Opportunities**
*Show evidence of the integration of identified professional skills and career trend data is used across kindergarten through grade 12 and a priority. Educator engagement, professional development and employer involvement in the classroom are evident and processes for continually evaluating skills for currency are identified. The council actively works with governing boards of member districts to fully understand and address these changing needs.	**1.1 Cultural Strategies** **1.5 Governing Body and/or Advisory Group** **2.5 STEM/STEAM Teaching Staff** **3.2 Partnerships Extend Learning Opportunities**

Ohio | Department of Education

#2 Build Partnerships: Develop working relationships among businesses, labor and education personnel.	
Show evidence of the business advisory council developing and sustaining meaningful relationships among the business community, labor and workforce development organizations and education personnel in the areas it represents.	**1.5 Governing Body and/or Advisory Group** **3.2 Partnerships Extend Learning Opportunities**
Include a list of members who are representative of the local, regional and/or state business community and job market of the service area.	**1.5 Governing Body and/or Advisory Group** **3.2 Partnerships Extend Learning Opportunities**
Identify how the council plays a key role in actively fostering new and current relationships across these communities, both through naming business advisory council members and providing opportunities to engage.	**1.5 Governing Body and/or Advisory Group** **3.2 Partnerships Extend Learning Opportunities**
Identify how meetings are run to ensure members respect the perspectives each brings to the council and actively look for ways to collaborate to advance each other's goals.	**1.5 Governing Body and/or Advisory Group** **3.2 Partnerships Extend Learning Opportunities**
*Show evidence that because of the relationships the business advisory council has fostered, students are placed in work-based learning experiences, earning industry-recognized credentials, and earning the OhioMeansJobs Readiness Seal. The council hosts activities aimed at developing new relationships, which continue beyond the council. The membership of the council is representative of the local, regional and/or state business community and job market of the service area.	**3.1 Career Access and Exploration**
#3 Coordinate Experiences: Create environments that allow students to demonstrate proficiency in critical professional and specialized skills that will aid in future employment.	
Outline how the council has helped students prepare and successfully enter the local workforce and support students in work-based learning opportunities.	**1.5 Governing Body and/or Advisory Group** **3.1 Career Access and Exploration**
Identify how council members serve as mentors to students in the community and work to identify qualified mentors for all students.	**3.2 Partnerships Extend Learning Opportunities**
Explain how mentors work together to ensure students have planned and are prepared for successful career paths.	**3.2 Partnerships Extend Learning Opportunities**
Identify how council members work together to provide students experience in developing and applying specialized skills.	**1.1 Cultural Strategies** **2.2 Teaching and Learning Approaches** **3.2 Partnerships Extend Learning Opportunities**

Ohio | Department of Education

Provide data that show more students are earning industry-recognized credentials, the OhioMeansJobs Readiness Seal and experiencing work-based learning as a result of the business advisory council's activities.	**3.1 Career Access and Exploration**
*Show evidence of annual growth in the numbers of students earning industry-recognized credentials and the OhioMeansJobs Readiness Seal. The council plays an important role in designing and implementing high-quality work-based learning and mentoring experiences for students. It is evident businesses are benefitting from the local talent these activities are helping produce.	**3.1 Career Access and Exploration**

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