Innovation for Engaged Learning: STEM Education Self-Reflection Tool

At the Wisconsin Department of Public Instruction, we embrace a vision that every child graduates from high school ready for college, career, and community. Within that broad umbrella of work, we realize all students must be prepared to address complex societal challenges that require a unique skill set encompassed within Science, Technology, Engineering, and Mathematics (STEM) education. Therefore, we have developed a more specific vision for STEM education:

"*All* students use a collaborative, innovative, and logic-based transdisciplinary approach, rooted in content knowledge, skills, and experiences, to identify and solve contemporary problems."

It is critical to note that this vision statement is for *all* students. Regardless of life paths chosen, all people of our world need to be "STEM literate" - to be able to apply their fundamental content knowledge and skills to collaboratively and creatively solve problems.

Reflect

As your local-level team reflects on STEM education programs within your school and/or district, first reflect on and discuss the following questions (which align with the four review categories in the tool below):

1. **Strategic Planning:**
   - What is your vision for STEM learning?
   - What specific goals have you established to reach that vision?
   - How are or how will you evaluate progress on those goals?
   - Who is involved in the work, both internally and externally?
2. **STEM is for All:**
   - How are underrepresented students being engaged in STEM?
   - Do training and materials address varying students needs and equity considerations?
3. **Collaborative and Transdisciplinary:**
   - What training has been provided to educators?
   - How is collaboration structured?
   - What instructional materials and equipment are available to support learning?
   - How are programs integrating STEM subjects in a "transdisciplinary" way that brings out key areas of each subject to be coherent and relevant?
4. **Real-World Learning with Partnerships:**
   - How is learning rooted in real-world contexts with authentic partnerships?

Plan and Act

The Department of Public Instruction recommends the following elements of a self-evaluation process for a team using this tool:

- As seen in the first review category below of **strategic planning**, schools/district should first collaboratively establish a vision, goals, and evaluation plan for their work to ensure programmatic coherence and progress. This reflection tool and the ideas in the categories below can support a local strategic planning process for STEM.
- In a self-reflection, a school or district level STEM Leadership Team will need to consider their priorities among the categories. It is important to review the details in each level of each category, as the language builds, and it is assumed that placing your program in a higher category suggests having the characteristics of previous categories. This building level STEM Leadership would also work with an external advisory committee, as noted below.
- **Many programs will be in the planning stages and not yet connected to the elements of this progression.** If that is the case, the **Planning Phase** column should be used to detail that work.
- Teams should collaboratively gather evidence in relation to their STEM work. **Evidence** could include course offerings, course enrollments broken down by gender and ethnicity, unit and lesson plans, authentic assessment examples and data, surveys of students and staff, details on partnerships and internal collaboration, etc.
- This reflection process acknowledges that **STEM schedules and structures can look different**, including self-contained classes, collaboration across several classes, whole school efforts, and after-school extension or club activities.
- After reviewing evidence in relation to the four categories below, teams will conduct a final reflection, guided by the steps listed on the last page of this document. That includes determining how well the STEM effort aligns with your vision and goals in relation to these categories, analyzing evidence of progress, and specifying next steps.

1) Strategic Planning: The Leadership Team, with Community Advisory Committee input, has a strategic plan for the STEM program, including a vision, goals, and adequate funding resources. They review data to establish, monitor, and measure programmatic goals and align resources accordingly.

a) Visioning and goals

Planning Phase	Initial	Developing	Systemic	Evidence
	A district or school-level team (which may be an existing team) develops a STEM vision and goals, and directs STEM efforts.	The district/school STEM Leadership Team goes through a strategic planning process to determine a vision and goals, with equity in mind for structures and scheduling. This team includes representation across STEM subjects, administration, and areas of unique student needs. It connects with community partnerships to support this work.	The vision and goals are supported by clear action steps to support an equitable STEM program, to be informed by work with a Community Advisory Committee. The Community Advisory Committee (which may be an existing group) is representative of the local community guides and reviews the STEM program. It includes students and community members, such as families, business leaders, local children-serving organizations, higher education representatives, etc. Compensation is provided for participation in the Community Advisory Committee.	

b) Evaluation of systems and progress checks

Planning Phase	Initial	Developing	Systemic	Evidence
	The local Leadership Team analyzes STEM course enrollment and other involvement data (such as STEM fairs and after-school programs) by subgroups and	The local Leadership Team evaluates school systems and STEM instructional practices and environments to determine and work on root causes for differences	The Community Advisory Committee supports the Leadership Team and provides progress checks on clear implementation goals as part of an ongoing evaluation of effectiveness	

	reflects on ways to improve access for all.	in enrollment among subgroups. Educators use authentic metrics (e.g., access and participation, job connections, projects, post-secondary plans and pathways, STEM fairs, portfolios, and student and educator self-efficacy) to evaluate programs and c**ourses** in relation to strategic goals.	based on community-informed metrics. All metrics of effectiveness are transparent and shared regularly with the public.	

c) Sustainable and sufficient funding

Planning Phase	Initial	Developing	Systemic	Evidence
	Programs provide adequate funding for STEM instructional materials and equipment.	Programs provide adequate funding for educators' ongoing professional learning. Funding comes from multiple sources.	Sustainable funding from a variety of sources supports the work, including accessible equipment that reflects current technologies and ongoing professional learning.	

2) STEM is for ALL: Students from all backgrounds are represented, respected, connected, and engaged; all PK-12 students have multiple STEM opportunities that connect to their communities and their linguistic and cultural backgrounds, and enable them to become STEM literate.

a) Training that supports all students

Planning Phase	Initial	Developing	Systemic	Evidence
	Classroom educators receive training to use STEM equipment and materials.	Educators (including library media specialists, special education and multilingual resource teachers, after-school teachers, etc.) receive ongoing training connected to standards-aligned materials and on how to use these materials to engage all students.	Educators receive training on how to draw upon students' language(s), identities, strengths, and background experiences so that students can fully participate in STEM practices and discourse. Educators engage in ongoing reflection of their own	

			identities; they also engage in ongoing learning about the identities (history, cultures, and interests) of their students and the greater community.	

b) Materials that support all students

Planning Phase	Initial	Developing	Systemic	Evidence
	Educators have STEM equipment and standards-aligned instructional materials to support student learning.	Educators have sufficient STEM equipment and standards-aligned materials that connect to the identities and interests of all students.	Educators have standards-aligned materials and spaces that safely welcome the participation of all students. Materials are free from bias.	

c) Targeted outreach and recruitment

Planning Phase	Initial	Developing	Systemic	Evidence
	Staff recruit all historically underrepresented subgroups of students to participate in STEM courses and other extracurricular opportunities.	District and school leaders recruit diverse educators to teach in and lead the STEM program. K-12 STEM courses and after-school program enrollment mirrors the school demographics.	The leadership team recruits community members from underrepresented groups for partnerships, support, and advising, including the Community Advisory Committee.	

3) Collaborative and *Transdisciplinary*: Programs function through authentic and systemic collaboration and learning across disciplines *that builds from unique aspects of each and results in more than a sum of their parts.*

a) Professional learning

Planning Phase	Initial	Developing	Systemic	Evidence
	Educators engage in professional learning in the STEM subjects as well as in specific STEM tools (e.g. robotics, 3D	Educators engage in learning and demonstrate growth as they collaborate to support authentic	All educators, including administrators, engage in ongoing professional learning and demonstrate growth in STEM subjects and	

	printing, maker spaces, etc.) and authentic STEM pedagogies.	transdisciplinary learning across STEM subjects. Professional learning connects to standards-aligned instructional materials. The underlying goal is STEM literacy for all.	tools, differentiated to meet their needs. Professional learning emphasizes how to support students in collaborative, community-based, and quantitative problem solving.	

b) Standards-based, transdisciplinary student learning (instruction and assessment)

Planning Phase	Initial	Developing	Systemic	Evidence
	Students engage in STEM projects that align to grade-level standards in relevant content areas.	Students engage in integrated problem solving, across all four STEM subject areas and connect to digital literacy and computational thinking as appropriate.	Students learn grade-level standards of mathematics, science, technology, and engineering, not doing a little bit of each, but using them together as a transdisciplinary problem-solving approach. Students are guided in projects and assessment to understand their learning related to particular targets.	

c) Scheduling and Collaborative Planning (Professional Learning Communities)

Planning Phase	Initial	Developing	Systemic	Evidence
	Districts have structures for ongoing collaboration across educators (including library media specialists, EL, and special education) related to STEM.	No one teacher or discipline runs STEM; all are willing to take risks, learn from failure, and learn from one another. School structures and culture support this type of collaboration.	School schedules and structures build in collaboration time across disciplines since all STEM disciplines are routinely working together, including educators of special populations, as well as PK-12 vertical alignment and collaboration.	

4) Real-World Learning with Partnerships: Authentic learning captures student imagination and builds on community partnerships.

a) Authentic, open-ended projects and assessment

Planning Phase	Initial	Developing	Systemic	Evidence
	Open-ended projects connect to specific job-related skills.	Students have work-based training opportunities and experiential classroom-level learning. Assessments are authentic and problem-based (e.g., capstone projects, reflective portfolios, and community-connected presentations).	Students engage in projects that are grounded in their socio- political contexts and emphasize criticality--meaning they understand how power, oppression, and equity operates within their community and society. Student needs and interests inform course design and delivery and their projects. The Community Advisory Committee helps determine the skills emphasized and options offered in STEM courses and other programs.	

b) Workforce preparedness and regional ecosystems

Planning Phase	Initial	Developing	Systemic	Evidence
	Programs focus on perpetually needed skills, like communication, teamwork, and problem solving.	While linked to regional workforce pathways, programs acknowledge that the trendy career or pathway now might not be as relevant in 10 years.	Regional STEM leadership groups unite local/district advisory committees, leadership teams, and other stakeholders around a common, relevant vision for student STEM learning. Students connect to community partners for shadowing, interning, and/or relevant projects.	

In addition to extensive Wisconsin stakeholder input, categories and content of this tool were informed by the Univ of Chicago STEM School Study, Carnegie STEM Excellence Pathway, and Indiana DOE K-8 and 9-12 Certification Rubrics.

Final Reflection

Date completed_____

It is critical for schools and districts to conduct this reflection thoroughly and collaboratively. Notably, your analysis may weigh some characteristics more than others. Teams will have to determine which characteristics and evidence are most important based on their context and needs.

Overall reflection(s) about the current STEM efforts and *next steps*	
Evidence-based reflections and *next steps* related to **strategic planning** - including vision, goals, evaluation, and people involved	
Evidence-based reflections and *next steps* related to ensuring **STEM is for All**	
Evidence-based reflections and *next steps* related to ensuring STEM is **Collaborative and Transdisiplinary** - including materials, coherence, training, and collaboration structures	
Evidence-based reflections and *next steps* related to ensuring STEM learning connects to **Real-World Contexts and External Partnerships**	