

STEMworks Design Principles rubric

A. Need: Does the program address a compelling and well-defined need?

ACCOMPLISHED

Statement of need is clear, compelling, and supported by recent, valid, and targeted data.

Program makes clear that it adds unique value in addressing the need.

Target audiences are well defined and closely tied to statement of need.

Program can demonstrate that it is reaching the target audience.

DEVELOPING

Statement of need is clear and compelling but cites only general data.

Program identifies other past or present programs that address the same need, but does not fully demonstrate how it adds to those programs.

Program defines target audiences but does not clearly tie them to statement of need.

Program makes clear efforts to reach target audience but cannot demonstrate what proportion of those audiences it is reaching.

UNDEVELOPED

Description of need is vague or unconvincing and cites little or no data.

Program makes no attempt to identify or evaluate other past or present programs that address the same need.

Program does not make clear what audiences it is targeting.

Program makes little effort to reach intended audience.

B. Evaluation: Does the program use rigorous evaluation to continuously measure and inform progress in addressing the compelling need identified in Principle A?

ACCOMPLISHED

Program goals are well-defined and linked directly to the statement of need and the identified target audience.

Current rigorous evaluation data demonstrate that the program is reaching its goals and having an impact with the target audience. If the program was established within the last three years, it is based on high quality research and has a plan for a rigorous evaluation.

Program regularly uses current data from external or internal evaluations to identify and act on opportunities for improvement. A viable

DEVELOPING

Program goals are well-defined and feasible but difficult to measure.

Program conducts its own evaluation in lieu of third-party evaluation. Program is based on research that does not directly apply to the program's circumstances.

Program only sporadically uses current evaluation data to identify and act on opportunities for improvement. A scope of work is included, but the timeline is vague or nonexistent.

UNDEVELOPED

Goals are poorly defined—or too unambitious to be worthwhile.

There is no research cited or plan to evaluate the program's progress to meet goals.

Program has no plans for using current evaluation data to improve itself. The program lacks clear milestones or timeline.

timeline with clear milestones for measuring progress is included.

C. Sustainability: Does the program ensure that the work is sustainable?

ACCOMPLISHED

Program has identified and made concrete plans to take advantage of opportunities such as matching funds, favorable state or local policies, or existing reform initiatives. Plans are clear for sustaining the program with public funds or ongoing support from other partners if/when philanthropic support ends.

Projected benefits to teaching and/or learning justify the cost per participant.

Program has identified potential challenges such as unstable political environments, changes in leadership, and bureaucratic barriers, and it has detailed plans in place to deal with such contingencies.

All stakeholder organizations actively support the program and communicate that support to their members or employees.

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Program has identified opportunities for securing future internal and external support after philanthropic support ends, but they are more hopeful than viable.

The cost per participant is high but justified, and there is a viable plan to reduce costs.

Program has identified potential challenges, but plans for addressing them are not yet fully developed.

Some stakeholders are supportive but there is no plan to communicate the importance of the program to others.

UNDEVELOPED

Program has made no efforts to identify funding opportunities that could advance its work. There is no plan or commitment to ensure the program's long-term survival after philanthropic support ends.

The program cannot demonstrate a benefit that justifies the cost per participant.

Program makes no effort to address potential barriers to sustainability.

Critical stakeholders—such as school district or community leaders—are barely aware that the program exists.

D. Replication and Scalability: Does the program demonstrate that it is replicable and scalable?

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Program documents how it can be scaled or replicated and offers tools to support such scaling up or replication.

A process for scaling up and replicating the program is offered, but it is not well documented.

There is no effort to show how the program might be scaled up or replicated at other sites.

Program regularly communicates information to new sites to support scaling up or replication.

Program provides information on scaling up and replication, but only on an ad hoc basis.

Program does not plan to promote scaling up or replicating.

Program demonstrates that it is adaptable to appropriate new sites and works with local sites to adapt to local conditions. There is strong fidelity of implementation among sites.

Program is documented so it can be replicated, but it does not account for local conditions that may affect implementation. Fidelity of implementation is weak or unproven.

Program is tied exclusively to a specific site because of its unique resources, personnel,

E. Partnerships: Does the program create high-impact partnerships where beneficial?

ACCOMPLISHED

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Recognizing that it lacks certain expertise or competencies, the program partners with other competent organizations.

Other organizations or businesses are brought in on an ad-hoc basis to perform discrete tasks, but partners are not included in planning stages, and their relevant competencies aren't fully integrated into the project design.

Though the organization lacks the competencies to reach its goals, it does not partner with organizations that can supply those competencies.

Program identifies and partners with organizations that have already done work that can help it reach its goals or magnify its impact.

Program bases its work on relevant prior work by other local organizations, but it does not explore partnerships with those organizations that could extend its impact.

Program makes no effort to build on the work of others or identify partners that could extend its impact.

Program has documented how staff or volunteers build strong relationships with educators, community members, and program participants they work with.

Program staff or volunteers are learning how to build strong relationships with educators, community members, and program participants.

Program staff or volunteers do not have the skills required to build relationships with key stakeholders.

F. Capacity: Does the program have the capacity to meet its goals?

ACCOMPLISHED

DEVELOPING

UNDEVELOPED

The program has been active in STEM learning in the past and has a track record of accomplishing STEM education goals with the target audience.

The program clearly articulates how its staff, infrastructure, internal expertise, and other resources support the project.

Staff or volunteers know STEM subject matter and have a command of pedagogy promoting STEM practices.

Where necessary, program provides staff or volunteers with effective professional development on STEM content and practices pedagogy and/or skills in building strong relationships. Alternatively, program provides staff or volunteers with outside resources and training.

The program has some track record in reaching educational goals but not in STEM, not to the extent proposed, or not with the identified target audience.

The program demonstrates that it has enough resources and staff to do the work, but it is not clear that its staff have the time or expertise to do the work.

Staff or volunteers have the STEM subject matter knowledge but may have too little experience with project-based learning or vice versa.

Program offers staff or volunteers professional development in some aspects, but neglects it in others. Alternatively, program offers no professional development of its own, but directs staff or volunteers to outside resources and training.

Though the program is not new to STEM learning, it cannot demonstrate any track record of accomplishing its goals.

The program makes no attempt to demonstrate that it has the staff, infrastructure, or expertise to carry out the project.

Staff or volunteers lack sufficient depth in STEM subject matter and cannot demonstrate experience with project-based learning.

Program offers staff or volunteers no training or direction on STEM content and practices pedagogy and/or skills in building strong relationships.

G. Challenging and Relevant Content: Is the STEM content challenging and relevant for the target audience?

ACCOMPLISHED

DEVELOPING

UNDEVELOPED

Program is clearly and explicitly aligned with local, state, or national standards in science, technology, engineering and/or mathematics. For evaluation of out-of-school (OST) programs, content is aligned with what students are learning in school or provides additional experiences that extend learning beyond what is offered during the school day.

Program materials and experiences clearly reflect high expectations for all participants. Program provides opportunities to apply STEM

Program states that it is aligned with standards and/or school activities but does not clearly demonstrate the strength of that alignment.

Program makes an effort to relate STEM learning to real world applications, but those applications are not always clear, they are forced, or they undermine the rigor of the STEM content.

Program pays no attention to local, state or national standards or what is currently being taught in school.

Program makes no attempt to link content to real world STEM applications.

Program focuses primarily on recall of knowledge and/or routine skills.

knowledge in situations that are relevant to the local community or resources.

Program prompts participants to apply or transfer STEM content to new or unexpected situations and to situation that are relevant in their local community.

Program offers opportunities to apply or transfer content knowledge, but they are artificial or inconsistent.

H. STEM Practices: Does the program incorporate and encourage STEM practices?

ACCOMPLISHED

Program creates an environment that fosters student's active participation in their learning.

Program promotes STEM practices by encouraging participants to: ask questions and/or define problems; develop and use models; plan and carry out investigations; analyze and interpret data; use mathematics and computational thinking; construct explanations and/or design solutions; engage in argument from evidence; obtain, evaluate, and communicate information; and attend to precision.

Program explicitly demonstrates how it builds skills like critical thinking, problem-solving, creativity, collaboration, and teamwork.

Program supports innovation, by encouraging students to create new ideas or products in an open-ended fashion.

DEVELOPING

At times, the program allows participants and staff/volunteers to work together as active learners, but, as a rule, the instructor drives the learning.

Activities are hands-on but do not consistently encourage STEM practices. Some hands-on activities are routine and focus on the 'right answers'.

Program explicitly aims to promote skills like critical thinking, problem-solving, creativity, collaboration, and teamwork, but it does not clearly specify how.

Innovation is discussed, but not used to create new ideas or products.

UNDEVELOPED

Program provides little opportunity for participants to become active learners.

The program does little or nothing to incorporate or encourage STEM practices.

Program makes no clear attempt to engage participants in skills like critical thinking, problem-solving, creativity, collaboration, and teamwork.

Program does not address innovation. Participants are not expected to create new ideas or products in an unscripted fashion.

I. Inspiration: Does the program inspire interest and engagement in STEM?

ACCOMPLISHED	DEVELOPING	UNDEVELOPED
Program creates excitement by providing positive experiences and dispelling negative misconceptions about STEM.	Program aims to inspire but does little to provide positive experiences and dispel negative misconceptions about STEM.	Program makes little or no attempt provide positive experiences and dispel negative misconceptions about STEM.
Program helps participants connect STEM content to career opportunities that require a strong STEM background.	Program occasionally helps participants connect STEM content to real-world careers, but those connections are not always clear or consistent.	Program makes little or no attempt to help participants connect STEM content and careers that use STEM knowledge.
Program clearly shows how it connects STEM to participants' own interests and experiences.	Program relates STEM to participants' experiences, but only occasionally.	Program does not connect STEM to participants' experiences.

J. Underrepresented Groups: Does the program identify and address the needs of underrepresented groups?

ACCOMPLISHED	DEVELOPING	UNDEVELOPED
Program explicitly identifies and addresses needs of groups that are underrepresented in STEM fields.	Program can be used successfully with underrepresented groups, but makes no explicit attempt to address their needs.	Program's structure and content is most likely to appeal to students who are already well represented in the STEM pipeline.
Program accommodates diverse learners' needs through tailored instruction. Where appropriate, technology promotes attention to individual students' needs, diverse interests, and different learning styles.	Instructors check participant progress regularly to address learning gaps. Program may use technology to aid instruction, but the technology does not always adapt to students' individual learning needs.	Instructors do not attempt to diagnose or address individual learners' challenges. Program neglects opportunities to use technology to address diverse learning needs.
Program ensures that individual participants spend the time on task they need to accomplish their learning goals. Students have the opportunity to learn at their own pace.	Program specifies ample time on task, but it is not clear that participants in greatest need will be able to make the time commitment required to see results. There is only one instructional method and pace,	Program does not consider the time different participants will need to spend on task to make meaningful progress. Most of the STEM instruction is delivered to the whole class, and learners are expected to absorb content delivered at the instructor's pace.
Program demonstrates that it successfully reaches underrepresented groups through targeted recruitment efforts.	Program plans targeted recruitment efforts but lacks mechanisms to document its success.	Program has no recruitment efforts to reach underrepresented groups and no evidence that it is actually reaching those groups.

Indiana-specific criteria

By implementing the curriculum students should be practicing the following:

	ACCOMPLISHED	DEVELOPING	UNDEVELOPED
Ask questions, define problems	Asking questions and defining problems builds across K-8 and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations. Questions arise from examining models or a theory to clarify relationships.	Poses questions that are based on models and theories but are not empirically testable.	Questions are not asked or those that are posed do not result from examining models or theories.
Develop and use models	Developing models that are used to predict and show relationships among variables between systems and their components in the natural and designed world. Models that are developed are based on evidence and are used to illustrate the relationships between systems or between components of a system.	Developing models that are not used to illustrate relationships between systems or components of systems.	Students do not have the opportunity to develop models.
Engage in argument from evidence : "make and defend a claim"	Defending and critiquing claims and explanations about the natural and designed world(s) by using appropriate and sufficient evidence and scientific reasoning and/or from current scientific or historical episodes in science. Evaluating claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. Making and defending a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.	Making claims and explanations about the natural and designed world(s). Students not always required to use evidence properly to defend claims and explanations.	Students do not have sufficient opportunities to collect evidence and use that evidence to defend claims.

<p>Construct explanation and design solutions: "construct an explanation based on evidence"</p>	<p>Constructing explanations and designing solutions supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. Constructing explanations based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.</p>	<p>Constructing explanations and designing solutions supported by student-generated sources of evidence that may or may not be consistent with scientific ideas, principles and theories.</p>	<p>Students are not constructing explanations or designing solutions.</p>
<p>Obtain, evaluate, and communicate information</p>	<p>Regularly communicating scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).</p>	<p>Regularly communicating scientific information in limited formats and with single representations (only textually or graphically, for example)</p>	<p>Students do not regularly communicate scientific information in any format.</p>
<p>Use math and computational thinking to analyze and interpret data</p>	<p>Using mathematics and computational thinking to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. Using mathematical representations of phenomena or designing solutions to support claims. Creating or revising a simulation of a phenomenon, designed device, process, or system</p>	<p>Using simple computational tools for analysis to analyze, represent and model data. Mathematical models are not used to support claims.</p>	<p>Students do not have the opportunity to use mathematical models to represent data or to support claims.</p>
<p>Plan and carry out investigations</p>	<p>Planning and carrying out investigations that provide evidence for and test conceptual models. Planning and conducting an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.</p>	<p>Planning and carrying out investigations either individually or collaboratively to produce data, but students not clearly required to use data as the basis for evidence or consider how the types, amount, or accuracy of data might support or undermine validity of conclusions</p>	<p>Students do not have the opportunity to plan or carry out investigations individually, but may participate in full-class demonstrations or investigations.</p>