



STEM Skills Fluency Rubric

Intended Audience: Educators

Purpose: Content area fluency is an important aspect of integrated STEM Education. In addition, integrated STEM education also includes a fluency in the skills associated with career readiness and workforce development. This tool provides an overview of the skills associated with integrated STEM education, a rubric that provides a framework of skills for each level of development, and examples of what those skills might look like in a classroom.

- In grades PK–8 the focus is on developing skills related to collaboration, communication, creativity, critical thinking, and resilience.
- In grades 9 and up include the mastery of PK-8 skills, as well as developing skills related to promptness, time management, adaptability, and innovation.

STEM SKILLS ASSOCIATED WITH INTEGRATED STEM TEACHING AND LEARNING				
Skills	Starting Point	Developing	Intermediate	Advanced
Collaboration— <ul style="list-style-type: none"> ● ability to operate effectively in a team environment ● consider multiple perspectives ● identify strengths and weaknesses within the group 	Students work in partners, small groups or teams to complete STEM-based classroom assignments and activities. <i>Example: Students discuss their problem-solving strategies with a partner in a math class. Students work in a small group to complete an assignment.</i>	Students work in partners, small groups or teams to conduct inquiry investigations, design challenges, or PBL projects in a classroom <i>Example: Students work in teams to develop a solar cooker design that works to cook food at certain temperature.</i>	Students work in partners, small groups or teams to conduct inquiry investigations, design challenges, or PBL projects in a classroom and Students collaborate with a variety of other students within the school while taking into consideration the backgrounds, strengths and weaknesses of individuals. <i>Example: A student team comprised of students from a variety of classes/grade-levels work on a solution to a PBL problem.</i>	Students work in partners, small groups or teams to conduct inquiry investigations, design challenges, or PBL projects inside or outside the classroom setting and Students collaborate with a variety of other people within the school, as well as outside of the school while taking into consideration the backgrounds, strengths and weaknesses of individuals. <i>Example: A student team comprised of students from a variety of classes/grade-levels work on a solution to a PBL problem with school community members or outside partners.</i>
	Students... <ul style="list-style-type: none"> ● demonstrate respect and courtesy ● show sincere interest in others and their concerns ● relate to people in an open, friendly, accepting manner ● collaborate with a variety of team members ● collaborate well in a team to solve problem 	and... <ul style="list-style-type: none"> ● understand individual and team roles ● give feedback to teammates 	and... <ul style="list-style-type: none"> ● Exercise leadership within a team ● Reflects on the collaboration and makes recommendations for improvement ● Solicits ideas and feedback from teammates 	and... <ul style="list-style-type: none"> ● inspire and motivates others to perform at a high-level ● analyze how teams’ function ● see differences in people (i.e. strengths, personality, culture, or background) as opportunities for learning about and approaching things differently

STEM SKILLS ASSOCIATED WITH INTEGRATED STEM TEACHING AND LEARNING

Skills	Starting Point	Developing	Intermediate	Advanced
<p>Communication –</p> <ul style="list-style-type: none"> ● use a variety of representations (e.g. verbal, written, auditory, pictorial/video, graphic, numeric, mathematical, physical models, etc.) ● use a variety of communication tools ● active listening ● body language ● etiquette/netiquette 	<p>Students use traditional tools, methods and types of representation to engage in one-way communication with the teacher and/or classmates.</p> <p><i>Example: Students verbally discuss, write, or present their answers to questions posed by the teacher or other students.</i></p>	<p>Students sometimes use a variety of tools, methods, and types of representation to engage in both one- and two-way communication with the teacher and classmates</p> <p align="center">and</p> <p>Students are somewhat active listeners while others are communicating</p> <p><i>Example: Students engage in whole-class or partner discussion and actively listen when others are communicating verbally. Appropriate methods of representation are chosen by students for communication.</i></p>	<p>Students often use a variety of tools, methods, and types of representation to engage in both one- and two-way communication with the teacher and classmates</p> <p align="center">and</p> <p>Students are active listeners while others are communicating</p> <p align="center">and</p> <p>Students use appropriate body language and etiquette most of the time when communicating directly with others in person as well as when using technology.</p> <p><i>Example: Students engage in discussion and active listening while utilizing collaborative documents to notate ideas while brainstorming for a design challenge. Students record video throughout the design process. Students develop models of a prototype. Students verbally discuss or write justifications for design decisions. Students present solutions to peers and in return receive constructive feedback.</i></p>	<p>Students consistently exemplify all components included in the intermediate stage</p> <p align="center">and</p> <p>Communication is expanded to authentic and larger audiences</p> <p><i>Example: Students communicate with the larger school community and/or other external stakeholders. Students might engage in a public exhibition, contest, or pursue publication of work/findings.</i></p>
<p>Verbal Communication</p>	<p>Students...</p> <ul style="list-style-type: none"> ● speak clearly and audibly with proper enunciation ● express ideas clearly in groups and one-to-one conversations ● use non-verbal cues appropriately aligned to message 	<p>and...</p> <ul style="list-style-type: none"> ● use appropriate and professional language ● use technical terminology and academic vocabulary accurately ● identify appropriate communication style to achieve goals 	<p>and...</p> <ul style="list-style-type: none"> ● communicate persuasively ● check for understanding and rephrase 	<p>and...</p> <ul style="list-style-type: none"> ● plan and present oral presentations ● pace presentations appropriately to convey message and ideas ● understand cultural implications of communication
<p>Active Listening</p>	<p>Students...</p> <ul style="list-style-type: none"> ● exhibit appropriate body language ● respond to verbal and non-verbal cues from others ● apply what was heard to the task 	<p>...and</p> <ul style="list-style-type: none"> ● take notes while listening 	<p>...and</p> <ul style="list-style-type: none"> ● restates or repeats what was heard to confirm information ● responds and asks clarifying questions 	<p>...and</p> <ul style="list-style-type: none"> ● summarize key points discussed

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Comprehends Written Material	Students... <ul style="list-style-type: none"> understand and follow written directions read materials specific to work or tasks 	...and <ul style="list-style-type: none"> ask clarifying questions regarding written materials or resources 	...and <ul style="list-style-type: none"> summarize key points from written materials or resources 	...and <ul style="list-style-type: none"> offer feedback and critique to written materials or resources
	Students... <ul style="list-style-type: none"> write clearly and coherently using standard writing conventions cite appropriately 	...and <ul style="list-style-type: none"> identify appropriate method, medium, format, and style to convey information 	...and <ul style="list-style-type: none"> convey written information in a variety of formats review and edit written work constructively 	...and <ul style="list-style-type: none"> write using academic and/or professional terminology convey information effectively and accurately through formal and informal documents or written presentation materials
Critical Thinking – <ul style="list-style-type: none"> Problem-solving strategies and processes Analytical thinking 	Students engage in discipline-specific problem-solving processes. <i>Example: Students identify a problem based on a scenario provided by the teacher. Students utilize a discipline-specific problem-solving strategy to solve provided problems.</i>	Students engage in more complex problem-solving processes including inquiry and the engineering design process. <i>Example: Students use the engineering design process to develop solutions to real-world problems provided by the teacher or problems identified by the students.</i>	Students continue to engage in more complex problem-solving processes including inquiry and the engineering design process. <i>Example: Students use the engineering design process to develop solutions to real-world problems identified by the students. Students use a variety of innovative strategies to solve a problem.</i>	Students engage in complex interdisciplinary problem-solving processes, inquiry investigations, and/or design challenges. <i>Example: Students use high-level critical thinking skills to design and defend a solution to a real-world problem in their community.</i>
	Students... <ul style="list-style-type: none"> identify the problem or core issue utilize a process to solve problems 	...and <ul style="list-style-type: none"> negotiate pros and cons of ideas, approaches, and solutions develop a plan to address problems learn from mistakes from past issues or problems 	...and <ul style="list-style-type: none"> debate an issue and converge to an understanding by questioning and assessing problems display analytical and strategic thinking develop and apply multiple strategies to solve a problem 	...and <ul style="list-style-type: none"> develop and defend solutions to problems based on evidence evaluate potential solutions for best possible outcomes consider a broad range of internal and external factors when solving problems and making decisions
Creativity and Innovation – <ul style="list-style-type: none"> Creative thinking Design processes Innovative solutions 	When engaging in STEM lessons, activities or projects, students... <ul style="list-style-type: none"> propose familiar approaches to address challenges or complete tasks offer ideas that are outside of the norm 	...and <ul style="list-style-type: none"> generate alternative solutions and ideas to address challenges and complete tasks 	...and <ul style="list-style-type: none"> create and share innovative solutions to address challenges and ideas to complete tasks 	...and <ul style="list-style-type: none"> contribute to a culture of innovation are willing to take risks understand design in products and processes in a variety of contexts.

STEM SKILLS ASSOCIATED WITH INTEGRATED STEM TEACHING AND LEARNING

Skills	Starting Point	Developing	Intermediate	Advanced
Adaptability and Resilience – <ul style="list-style-type: none"> ● proactive thinking and action ● perseverance/grit ● mindfulness ● growth mind-set 	When engaging in STEM lessons, activities or projects, students... <ul style="list-style-type: none"> ● ask for help ● proactively seek feedback, guidance, and information 	...and <ul style="list-style-type: none"> ● compromise ● persevere and show resilience in the face of constraints, frustrations, or adversity 	...and <ul style="list-style-type: none"> ● accept constructive criticism and modify behavior ● embrace new methods or approaches ● are reflective and introspective 	...and <ul style="list-style-type: none"> ● actively seek learning opportunities ● are comfortable adjusting to multiple demands, shifting priorities, ambiguity, and rapid change
Promptness and Time/Resource Management – <ul style="list-style-type: none"> ● Timeliness ● Resource prioritization and utilization ● Utilization of the individual strengths of team members 	When engaging in STEM lessons, activities or projects, students... <ul style="list-style-type: none"> ● arrive on time ● complete assigned tasks with some supervision on time and high-quality ● communicate any potential delays to supervisor/teacher ● identify resources available and needed to complete project or tasks ● complete tasks in the allotted time and manage own time appropriately ● adhere to budget or resources allocated 	...and <ul style="list-style-type: none"> ● plan out tasks ● utilize resources and materials effectively ● understand roles of others and the value of their time ● take inventory of materials ● understands project or task timeline 	...and <ul style="list-style-type: none"> ● create a plan to complete work on time ● identify and understand strengths and opportunities for growth of team members ● assign team roles or tasks based on strengths 	...and <ul style="list-style-type: none"> ● complete high-quality independent work on time without direct supervision ● understand how resources affect design choices and timelines ● maximize resources to save money and/or time ● prioritize use of resources based on the problem, issue, or challenge, as well as contextual factors

Use this score card as you read the STEM Skills indicators and examples for each of the four developmental stages on the identification guide. Place a mark for each indicator according to the level of the student(s). Your marks might be in different stages depending on the indicator. When all areas are marked, look to see which stage you have the most marks in and complete the reflection page.

STEM SKILLS FLUENCY SCORE					
Indicators	Starting	Dev.	Inter.	Adv.	NOTES
Collaboration					
Communication - Verbal					
Communication – Active Listening					
Communication – Comprehends Written Material					
Communication – Conveys Information in Writing					
Critical Thinking					
Creativity and Innovation					
Adaptability and Resilience					
Promptness and Time/Resource Management					

STEM SKILLS FLUENCY SCORE REFLECTION

My classroom had the most marks in the _____ stage.

The following STEM Skills need the most attention:

My classroom scored above target in some areas. The identified strengths are in the following areas: