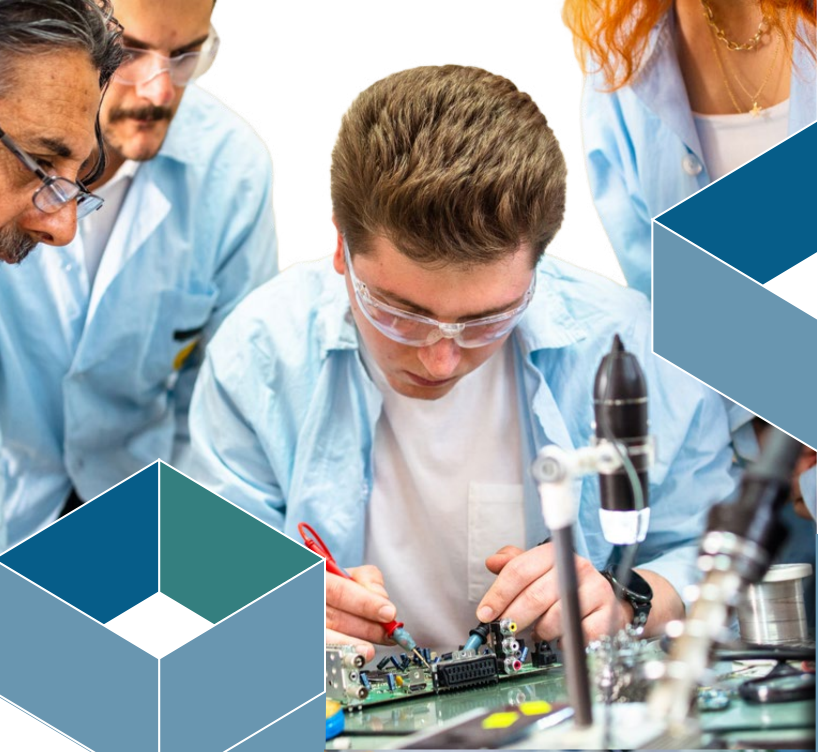
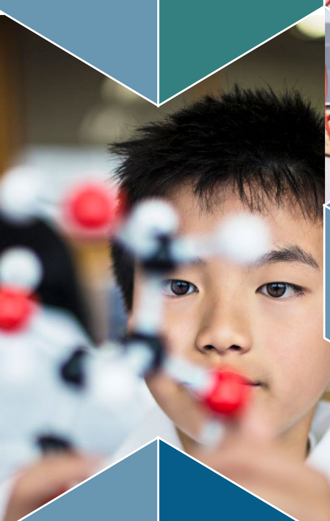


Utah State Board of Education | Teaching and Learning

UTAH'S P-12 SCIENCE FRAMEWORK



UTAH STATE BOARD OF EDUCATION
250 East 500 South/P.O. Box 144200
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Sydnee Dickson, Ed.D.,
State Superintendent of Public Instruction

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Utah's PK–12
SCIENCE FRAMEWORK

Utah State Board of Education | Teaching and Learning

250 East 500 South
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Salt Lake City, UT 84114-4200

Sydnee Dickson, EdD
State Superintendent of
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HOW TO USE
Utah's P-12 Science Framework

STEP 1 (pages 1–6):
Read the Introduction to ***Utah's P–12 Science Framework*** to gain a sense of its intent and purpose.

STEP 2 (pages 8–18):
Read the Self-Assessment tools' Critical Indicators for each of the PCBL elements to develop an overview of the essential evidence-based practices.

STEP 3 (page 7):
Review the definitions for Self-Assessment Scales to prepare for conducting a self-assessment.

STEP 4:
Establish a site/district-level science team to complete the Self-Assessment Tool for each element.

STEP 5 (pages 19–25):
Refer to the Lines of Evidence to identify the site/district-level science team of implementation for the five elements.

STEP 6 (pages 26-29):
Create an action plan using the Science Framework Planning Tool for Continuous Improvement for each of the five elements.

STEP 7:
Develop a process for monitoring efforts and evaluating progress towards your site's/district's goals. Continue to use the Science Framework Planning Tool for Continuous Improvement process to refine and monitor progress.

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INTRODUCTION

Utah's PK–12 Science Framework

Utah's PK–12 Science framework is meant to be a flexible self-assessment tool that can be used by educators and communities alike to self-assess where they are operating effectively and where there are opportunities for growth.

Resources have been linked in every indicator section in order to equip educators with the knowledge, tools, and resources necessary to meet the instructional needs of all students. It can be used in individual classrooms, across schools, and even leveraged in system-wide professional learning experiences. Further, it provides an explicit definition of what Personalized, Competency Based Learning (PCBL) looks like in Science through the lens of the PCBL Framework. The purpose of this framework is to support districts, charters, and schools in evaluating, refining, and monitoring the essential systems, structures, and science practices necessary to achieve high-quality instruction in science. This framework is meant to provide support to Utah's educators regarding evidence-based practices in Science.

The framework is divided into three sections: indicators, lines of evidence, and resources. Indicators represent components of effective three-dimensional science instruction (see three-dimensional science instruction introduction). These indicators are sorted into two roles, Educator and Educational Leaders. Lines of evidence represent examples of how the indicators might look in application. The resources section provides support that educators and Educational Leaders can use to achieve the indicators. All of these sections are organized by the components of the PCBL framework (see PCBL Introduction). This has been done to make the framework more practical to use for educators and educational leaders while focusing on the outcome of creating an educational environment that is conducive to student success now and in the future.
A rubric adapted from research on implementation

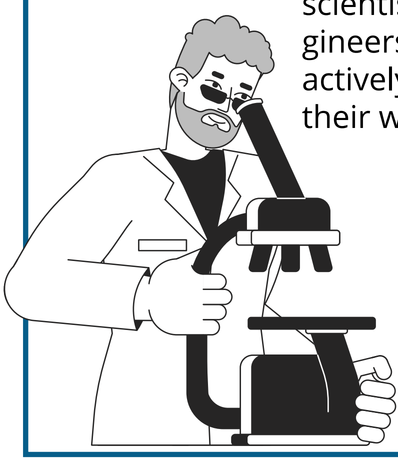
or Levels of Use (Hall, Kirksen, and George, 2013) of educational practices is provided within the indicators section. Its purpose is to assess current implementation of an indicator and provide next steps for future growth. It provides educators and educational leaders with the opportunity to self assess and chart their growth, while also offering communities the ability to collaboratively engage in assessing how to use their time, money and resources to continually improve.

Three-Dimensional Science Instruction

Three-Dimensional Science Instruction Utah's critical components of three-dimensional science instruction include:

Science and Engineering Practices (SEPs)

Practices are what scientists and engineers do as they actively engage in their work.

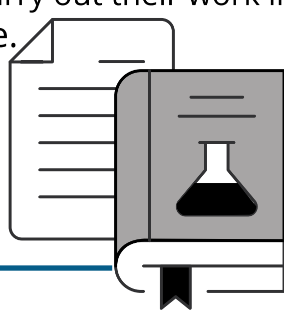


Crosscutting Concepts (CCCs)

Crosscutting concepts are the ways scientists think, the organizing structures that provide a framework for assembling pieces of scientific knowledge. They reach across disciplines and demonstrate how specific ideas are united into overarching principles.

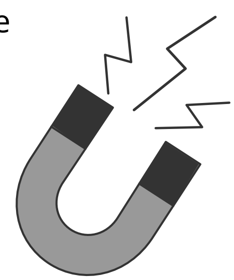
Disciplinary Core Ideas (DCIs)

Disciplinary Core ideas are the fundamental and explanatory pieces of knowledge that scientists know and apply as they carry out their work in their discipline.

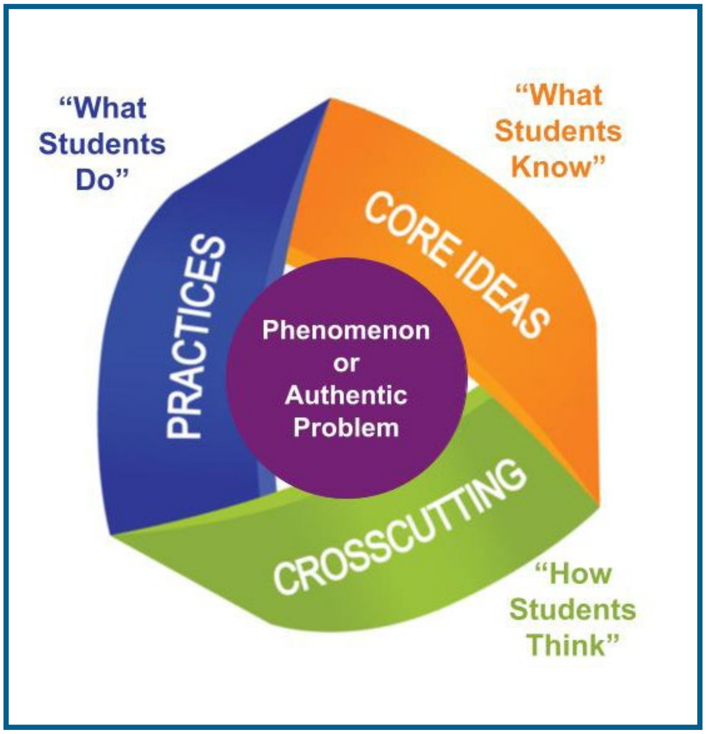


Phenomena (Real World Context

Phenomena are natural, observable events that can be explained or predicted by using knowledge of science concepts.



Science instruction should apprentice students into the ways scientists work, think, and apply science concepts to make sense of the world around them. Therefore, the three dimensions of science learning—practices, crosscutting concepts, and disciplinary core ideas—need to play a part in everything teachers and students do during science instruction. And they need to be woven together in a way that builds cumulatively.



Students explain phenomena by developing and applying the Disciplinary Core Ideas and Crosscutting Concepts through the use of the Science and Engineering Practices.

> Science, engineering, and technology permeate nearly every facet of modern life, and they also hold the key to meeting many of humanity's most pressing current and future challenges…Indeed, some knowledge of science and engineering is required to engage with the major public policy issues of today as well as to make informed everyday decisions, such as selecting among alternative medical treatments or determining how to invest public funds for water supply options. In addition, understanding science and the extraordinary insights it has produced can be meaningful and relevant on a personal level, opening new worlds to explore and offering lifelong opportunities for enriching people's lives. In these contexts, learning science is important for everyone, even those who eventually choose careers in fields other than science or engineering. (NRC, 2012, pp. 1 & 7).

This quote highlights the importance for every Utah learner to have the opportunity to acquire competence in the discipline of science. In fact, for our Utah students to have the knowledge, skills, and dispositions necessary to make critical decisions related to the welfare of their current and future lives, an understanding of the discipline of science is essential. However, many Utah students do not get a sufficient opportunity to engage with science on a regular basis during their PK–12 education. Therefore, *Utah's PK-12 Science Framework* is designed to serve as a guide for educators to initiate productive growth and change in science opportunities, achievement, and outcomes for students.

In 2012, new research, built upon a foundation of past research, identified best practices for science education: *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas* (NRC). This report promotes a vision for science education that was developed from the following assumptions: children are born investigators, science instruction should focus on core ideas and practices, learners' understanding develops over time, science and engineering require both knowledge and practice, instruction should connect to students' interests and experiences, and administration/educators should assure all students have access to effective science instruction.

The vision of science education, promoted through these assumptions and thus the conclusion of this research, is that science instruction should scaffold students to:

> "actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields. The learning experiences provided for students should engage them with fundamental questions about the world and with how scientists have investigated and found answers to those questions. Throughout grades K-12, students should have the opportunity to carry out scientific investigations and engineering design projects related to the disciplinary core ideas." (NRC, pp. 8-9)

Thus, a framework for quality science instruction was developed that included the following main components: Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), Disciplinary Core Ideas (DCIs), and authentic, real-world application of science concepts (phenomena). The expectation for science education is that all of these components are integrated within all science instruction students experience.

For more information about three-dimensional, phenomena-based science instruction, see:

- Introduction to the *Utah Science Core Standards: Utah Science with Engineering Education (SEEd) Standards*
- Introduction to the SEEd Core Guides
- Observation Rubric for Three-Dimensional Teaching and Learning
- A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (NRC, 2012)

Utah's PK–12 Science Framework synthesizes these research findings into a framework that provides opportunities for educational leaders, educators, and providers of professional learning opportunities to evaluate their knowledge, skills, dispositions, and resources for meeting the instructional needs of all students in science. This is laid out through the lens of *Utah's Personalized, Competency Based Learning Framework* and aligned with Utah's High Quality Instructional Cycle.

Personalized, Competency-Based Learning

Personalized, Competency Based Learning (PCBL) tailors the instructional methods, content, and pace of learning to the individual needs of each student as they acquire specific skills and master predefined learning objectives. It utilizes a student's different strengths, weaknesses, interests, and learning styles to advance mastery of content. Simply stated, PCBL is high-quality instruction in action.

A PCBL approach empowers students to take responsibility for their learning by giving them voice, choice, and customized support to achieve success in the essential knowledge, skills, and dispositions described in Utah's Portrait of a Graduate. PCBL shifts the focus of the classroom from teacher-directed learning to a culture of learning driven by the students. There are five essential components of PCBL: Culture of Learning, Learner Agency, Demonstrate Competency & Assessment, Customized Supports, and Social and Emotional Learning.

Culture of Learning

Each learner is supported by communities committed to creating the culture, structure, policies and instructional practices that engage them in their journey towards college, career and life readiness. By leveraging a learner's unique assets and interests, holding high expectations, executing teacher clarity and fostering meaningful relationships, an inclusive culture of learning allows each learner to define their pathway to success.

Learner Agency

Each learner develops understanding, skill and responsibility for the learning design and process in pursuit of achieving the characteristic of Utah's Portrait of a Graduate. Learner agency is achieved through a broad range of instructional strategies including goal setting, choice in learning pathways, voice in how to demonstrate competency and learner self-assessment.

Demonstrated Competency and Assessment

Each learner progresses through their learning based upon applying their knowledge, essential skills and dispositions. Timely, effective feedback and data from a variety of formative assessment processes are used to measure learner growth, progress and advancement based on high expectations.

Customized Supports

Each learner is provided with or selects appropriate and timely support to achieve growth or competency and to engage in personalized learning pathways. These customized supports are based on data about the learner's demonstrated strengths, interests and needs.

Social and Emotional Learning

Each learner is provided with opportunities to acquire and apply the knowledge, attitudes, and skills necessary for understanding and managing their emotions; setting and achieving positive goals; feeling and showing empathy for others; establishing and maintaining positive relationships; making responsible decisions; and self-advocating. The development of these SEL strategies is critical for a student to learn to effectively work with others, overcome challenges, and achieve success in multiple settings. Social Emotional Learning is intentionally and seamlessly integrated into classroom activities to allow students to continually build these skills.

Each section of the framework: indicators, lines of evidence, and resources, is divided into the five essential components and describes three-dimensional science instruction through the lens of PCBL. Despite the fact that many of these indicators do fit into more than one component of the PCBL Framework, they are only included within one component of the Science framework.

DEFINITIONS
for Self-Assessment Scales

The self-assessment tool uses the following five-point rubric:

RECOGNIZING:	Educators have a beginning awareness of the indicator and are not implanting yet.
PREPARING:	Educators are acquiring knowledge about the indicator, are exploring its implications for use, and are preparing to implement the indicator into practice.
USING:	Educators focus most effort on the short-term, day-to-day procedural use of the indicator. The educators are primarily engaged in a step-by-step process to master the tasks required to use the indicator, which may result in a superficial implementation. Emphasis is on how using the indicator impacts the educators. Use of the indicator becomes embedded into the educator's normal routines.
REFINING:	Educators vary the use of the indicator to increase the impact on students. Variations of indicator use are based on knowledge of both short- and long-term outcomes for students.
RENEWING:	Educators reevaluate the quality of use of the indicator, seek major modifications or alternatives to the present use to achieve increased impact on students, examine new developments in the field, and explore new goals for themselves and the educational system. Ultimately, a new balance is achieved in which the educators combine individual use of the indicators with the related activities of colleagues to achieve a collective effect on students.

INDICATORS

Indicators represent features of effective three-dimensional science instruction (see three-dimensional science instruction introduction) aligned with each component of Utah's Personalized, Competency Based (PCBL) Framework.

ELEMENT 1: **CULTURE OF LEARNING**

Each learner is supported by communities committed to creating the culture, structure, policies and instructional practices that engage them in their journey towards college, career and life readiness. By leveraging a learner's unique assets and interests, holding high expectations, executing teacher clarity and fostering meaningful relationships, an inclusive culture of learning allows each learner to define their pathway to success.

SELF-ASSESSMENT TOOL

Culture of Learning

1 Level 1: **RECOGNIZING**

2 Level 2: **PREPARING**

3 Level 3: **USING**

4 Level 4: **REFINING**

5 Level 5: **RENEWING**

▼ **CRITICAL INDICATORS** **EDUCATORS**	Recognizing	Preparing	Using	Refining	Renewing
A. Educators demonstrate their belief that all students can achieve in science by setting high learning expectations, using culturally relevant context, and using rigorous, asset-based instructional methods to meet each student's needs.	1	2	3	4	5
B. Educators include science instruction as part of daily instruction	1	2	3	4	5

▼ **CRITICAL INDICATORS** **EDUCATORS**	Recognizing	Preparing	Using	Refining	Renewing
C. Educators align instruction to the Science with Engineering Education (SEEd) Standards at the appropriate learning progression.	1	2	3	4	5
D. Educators implement phenomena-based, three-dimensional instruction (i.e., integrated SEPs, CCCs, and DCIs) during science instruction.	1	2	3	4	5
E. Educators implement productive science discourse during instruction.	1	2	3	4	5
F. Educators promote a positive science culture that allows for students to authentically engage in science instruction.	1	2	3	4	5
G. Educators see themselves as continuous learners and engage in authentic classroom learning.	1	2	3	4	5

▼ **CRITICAL INDICATORS** **EDUCATIONAL LEADERS**	Recognizing	Preparing	Using	Refining	Renewing
H. Educational leaders demonstrate their belief that all students can achieve in science by ensuring each student has equitable access to effective teachers, learning opportunities, academic and social support, and other resources necessary for success in science.	1	2	3	4	5
I. Educational leaders encourage and support science instruction to be part of daily instruction	1	2	3	4	5
J. Educational leaders provide professional learning for science educators which models the application of phenomena-based, three-dimensional teaching.	1	2	3	4	5
K. Educational leaders demonstrate a commitment to Professional Learning Communities (PLCs) by providing time, space, and resources for teachers of science to engage in sustained coaching opportunities, collaborative teaming, and professional learning.	1	2	3	4	5

▼ **CRITICAL INDICATORS** **EDUCATIONAL LEADERS**	Recognizing	Preparing	Using	Refining	Renewing
L. Educational leaders implement coherent systems of curriculum, instruction, and assessment that promote effective phenomena-based, three-dimensional science instruction, embody high expectations for all students and promote student sense-making and reasoning.	1	2	3	4	5
M. Educational leaders intentionally develop educators' understanding of effective science instruction through a variety of opportunities for learning and growth, guided by an understanding of adult learning and current research-based science pedagogy (e.g., phenomena-based, three-dimensional science instruction, disciplinary literacy, science discourse).	1	2	3	4	5
N. Educational leaders provide professional learning opportunities to develop coherent curriculum, which is horizontally and vertically aligned through a collaborative team process.	1	2	3	4	5
O. Educational leaders seek, acquire, and manage fiscal, physical, and other resources to support effective phenomena-based, three-dimensional science instruction.	1	2	3	4	5

Evidences of Culture of Learning
Resources for Culture of Learning
Rubric Definitions

ELEMENT 2: **LEARNER AGENCY**

Each learner develops understanding, skill and responsibility for the learning design and process in pursuit of achieving the characteristics of Utah's Portrait of a Graduate. Learner agency is achieved through a broad range of instructional strategies including goal setting, choice in learning pathways, voice in how to demonstrate competency, and learner self-assessment.

SELF-ASSESSMENT TOOL

Learner Agency

1 Level 1: **RECOGNIZING**

2 Level 2: **PREPARING**

3 Level 3: **USING**

4 Level 4: **REFINING**

5 Level 5: **RENEWING**

▼ **CRITICAL INDICATORS** **EDUCATORS**	Recognizing	Preparing	Using	Refining	Renewing
A. Educators implement science instruction that supports student sense-making	1	2	3	4	5
B. Educators facilitate instruction that is student-centered.	1	2	3	4	5
C. Educators provide a broad range of assessment options in which students can choose how to demonstrate competency.	1	2	3	4	5
D. Educators engage in targeted opportunities to receive science learning and pedagogical skills through observation, instructional coaching, peer mentoring, and/or teacher leaders.	1	2	3	4	5
E. Educators engage in a broad range of instructional strategies to support students in demonstrating competency and self-assessment.	1	2	3	4	5

▼ **CRITICAL INDICATORS** **EDUCATIONAL LEADERS**	Recognizing	Preparing	Using	Refining	Renewing
F. Educational leaders provide teachers with professional learning and support to ensure the continual development of their science knowledge and pedagogical skills through a variety of opportunities.	1	2	3	4	5

[Evidences of Learner Agency](#)
[Resources for Learner Agency](#)
[Rubric Definitions](#)

ELEMENT 3: **DEMONSTRATED COMPETENCY & ASSESSMENT**

Each learner progresses through their learning based upon applying their knowledge, essential skills and dispositions. Timely, effective feedback and data from a variety of formative assessment processes are used to measure learner growth, progress and advancement based on high expectations.

SELF-ASSESSMENT TOOL

Demonstrated Competency & Assessment

1 Level 1: **RECOGNIZING**

2 Level 2: **PREPARING**

3 Level 3: **USING**

4 Level 4: **REFINING**

5 Level 5: **RENEWING**

▼ **CRITICAL INDICATORS** **EDUCATORS**	Recognizing	Preparing	Using	Refining	Renewing
A. Educators implement phenomena-based, three-dimensional assessments.	1	2	3	4	5
B. Educators use formative and summative assessment data to adjust and adapt science instruction.	1	2	3	4	5
C. Educators provide timely, constructive feedback to support students in the learning process as they work to demonstrate competency.	1	2	3	4	5

(Continued)

▼ **CRITICAL INDICATORS** **EDUCATIONAL LEADERS**	Recognizing	Preparing	Using	Refining	Renewing
D. Educational leaders support educators to develop strategies for eliciting, interpreting, and making use of students' reasoning to inform their science teaching.	1	2	3	4	5
E. Educational leaders use evidence from assessments of students and/or teachers to modify or adjust components of professional learning opportunities.	1	2	3	4	5
F. Educational leaders use data from participants, outcomes, and financial resources to evaluate the effectiveness of professional learning and materials provided to educators.	1	2	3	4	5

Evidences of Demonstrated Competency and Assessment
Resources for Demonstrated Competency and Assessment
Rubric Definitions

ELEMENT 4: **CUSTOMIZED SUPPORTS**

Each learner is provided with or selects appropriate and timely support to achieve growth or competency and to engage in personalized learning pathways. These customized supports are based on data about the learner's demonstrated strengths, interests and needs.

SELF-ASSESSMENT TOOL

Customized Supports

1 Level 1: **RECOGNIZING**

2 Level 2: **PREPARING**

3 Level 3: **USING**

4 Level 4: **REFINING**

5 Level 5: **RENEWING**

▼ **CRITICAL INDICATORS** **EDUCATORS**	Recognizing	Preparing	Using	Refining	Renewing
A. Educators utilize high-quality resources to support effective science instruction (e.g., SEEd Core Guides).	1	2	3	4	5
B. Educators implement appropriate scaffolds to support student science sensemaking.	1	2	3	4	5
C. Educators develop disciplinary literacy in science during instruction to support students authentically obtaining and communicating science information.	1	2	3	4	5
D. Educators provide balanced opportunities for appropriate student use of technology to facilitate science reasoning and sense-making.	1	2	3	4	5

▼ **CRITICAL INDICATORS** **EDUCATIONAL LEADERS**	Recognizing	Preparing	Using	Refining	Renewing
E. Educational leaders have expertise in effective phenomena-based, three-dimensional science instruction and continue to engage in science professional development.	1	2	3	4	5
F. Educational leaders provide instructional coaches for educators that have a working knowledge of phenomena-based, three-dimensional science instruction.	1	2	3	4	5
G. Educational leaders guide and support teachers in collecting and appropriately using varied science resources to effectively teach and assess student learning.	1	2	3	4	5
H. Educational leaders use data from participants, outcomes, and financial resources to evaluate the effectiveness of professional learning and materials to determine if additional support is needed.	1	2	3	4	5

Evidences of Customized Supports
Resources for Customized Supports
Rubric Definitions

ELEMENT 5: **SOCIAL & EMOTIONAL LEARNING**

Each learner is provided with opportunities to acquire and apply the knowledge, attitudes and skills necessary for understanding and managing their emotions; setting and achieving positive goals; feeling and showing empathy for others; establishing and maintaining positive relationships; making responsible decisions; and self-advocating. The development of these characteristics is critical for a student to learn to effectively work with others, overcome challenges and achieve success in multiple settings. Social Emotional Learning is intentionally and seamlessly integrated into classroom activities to allow students to continually build these skills.

SELF-ASSESSMENT TOOL

Social & Emotional Learning

1 Level 1: **RECOGNIZING**

2 Level 2: **PREPARING**

3 Level 3: **USING**

4 Level 4: **REFINING**

5 Level 5: **RENEWING**

▼ **CRITICAL INDICATORS** **EDUCATORS**	Recognizing	Preparing	Using	Refining	Renewing
A. Educators implement culturally relevant phenomena during science instruction.	1	2	3	4	5
B. Educators provide a variety of opportunities for students to engage in science instruction (e.g. individual, partner, small group, whole class).	1	2	3	4	5
C. Educators engage students in monitoring and assessing their own learning towards competency (e.g., teacher feedback, peer feedback, science discourse).	1	2	3	4	5

▼ **CRITICAL INDICATORS** **EDUCATIONAL LEADERS**	Recognizing	Preparing	Using	Refining	Renewing
D. Educational leaders build a professional culture of trust, collaboration, and professional learning among their educators of science (e.g., engaging teachers in sharing information, analyzing outcomes, and planning for improvement).	1	2	3	4	5
E. Educational leaders build positive educator science identities by supporting authentic opportunities for educators to participate in the discipline of science.	1	2	3	4	5

Evidences of Social Emotional Learning

Resources for Social Emotional Learning

Rubric Definitions

LINES OF EVIDENCE

Lines of Evidence represent examples of how the indicators might look in application.

Effective assessment processes use evidence of practice to justify scores on a rubric. Below, sample evidence has been provided, aligned to the indicators of the framework, to assist in using it to identify areas of celebration and opportunities for growth. When students are stated, they could be either a K–12 student in the classroom or a teacher engaging in professional learning. When teachers are stated, they could be either a classroom teacher or an educational leader providing professional learning.

ELEMENT 1: CULTURE OF LEARNING

LINES OF EVIDENCE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Students are actively making sense of a phenomenon or solving a problem.	A		C	D	E	F	G	H		J		L	M	N	O
Students are engaging in the science and engineering practices.	A		C	D	E	F	G	H		J		L	M	N	O
Students are guided to frame their thinking through the crosscutting concepts.	A		C	D	E	F	G	H		J		L	M	N	O
Students are using discourse to make sense of disciplinary core ideas and phenomena.	A		C	D	E	F	G	H		J		L	M	N	O
Students are applying science concepts in real-world situations.	A			D		F		H		J		L	M	N	
Students are engaging in science instruction daily.		B							I						
Teachers develop three-dimensional learning objectives.	A		C	D		F		H		J		L	M	N	
Teachers develop routines which encourage listening and purposeful talk.	A			D	E	F		H		J		L			

LINES OF EVIDENCE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Teachers select phenomena that are complex and puzzling to students while being familiar or from everyday contexts.	A			D		F		H		J		L	M	N	
Teachers activate and elicit student ideas about science phenomena.	A				E	F	G	H				L			
Teachers have access to and utilize high-quality instructional materials.												L			O
Teachers thoughtfully plan and intentionally sequence science instruction to promote sensemaking.	A		C	D	E	F	G	H		J		L	M	N	
Agendas and notes from PLCs contain evidence of sustained coaching, collaborative teaming, and professional learning opportunities.											K				

Indicators for Culture of Learning

Resources for Culture of Learning

ELEMENT 2: LEARNER AGENCY

LINES OF EVIDENCE	A	B	C	D	E		F	G	H	I	J	K	L	M	N	O
Student experiences, cultural knowledge, and questions are recognized and used to promote sensemaking of science concepts.	A	B					F									
Students make decisions about how they engage with the science and engineering practices.	A	B					F									
Students self-monitor their sense-making of phenomena and disciplinary core ideas.		B	C		E											
Students' assessments are authentic to the science and the engineering practice being used.			C		E											
Teachers provide varied opportunities for students to reason through talk.	A	B														
Teachers use frequent formative assessments that allow students to show what they know.	A	B	C	D	E		F									
Teachers choose good anchoring phenomena that allow students to construct different types of explanations and models.	A	B	C													
Teachers allow students to be self-reflective about their learning and the progress they are making.	A	B			E		F									
Teachers are engaging in professional learning to increase their knowledge, skills, and dispositions in science instruction				D			F									
Teachers provide students multiple opportunities and authentic methods to demonstrate learning.		B	C		E											

Indicators for Learner Agency

Resources for Learner Agency

ELEMENT 3: DEMONSTRATED COMPETENCY AND ASSESSMENT

LINES OF EVIDENCE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Student thinking is made visible and subject to evaluation by peers.		B	C	D											
Students are developing explanations or models of phenomena.	A	B													
Students are communicating explanations to phenomena.	A	B													
Summative assessments mirror instruction including phenomena and three-dimensional tasks to ultimately explain the phenomena.	A			D		F									
Students' assessments are authentic to the science and engineering practice being used.	A			D											
Students receive timely feedback from peers and/or teachers about growth towards competency.			C												
Teachers provide students multiple opportunities and authentic methods to demonstrate learning.				D											
Teachers have students revise models and explanations in responses to new evidence and ideas.		B	C	D	E										
Teachers utilize summative assessments that are phenomenon-based, which use a novel phenomenon. Students use the Gather, Reason, and Communicate (GRC) process (or similar 3D Science learning sequence) during the assessment to develop an explanation of the phenomenon.	A			D											
Teachers use assessment data to make decisions about needed instruction and supports.		B	C		E	F									

Indicators for Demonstrated Competency and Assessment

Resources for Demonstrated Competency and Assessment

ELEMENT 4: CUSTOMIZED SUPPORTS

LINES OF EVIDENCE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Student learning tasks include supports that provide access for all students to explore, reason, and communicate about phenomena.		B		d			G								
Students are actively making sense of a phenomenon or solving a problem.					E	F									
Students are engaging in the science and engineering practices.					E	F									
Students are guided to frame their thinking through the crosscutting concepts.					E	F									
Students are using discourse to make sense of disciplinary core ideas and phenomena.					E	F									
Students are applying science concepts in real-world situations.					E	F									
Students use technology appropriately to support deeper learning during science instruction.				D											
Students are scaffolded to use reading, writing, speaking, and listening in ways authentic to science.		B	C												
Teachers plan science instruction using the SEEd Core Guides.	A	B	C				G								
Teachers utilize tiered instruction interventions for students lacking essential foundational skills (reading, writing, just-in-time support course, etc.)		B	C				G								
Teachers engage in collaborative, data-driven discussions to determine the support students need within the learning environment.						F		H							

LINES OF EVIDENCE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Teachers solicit feedback from learners on the customized supports provided and ways to improve their impact.		B				F		H							
Teachers use assessment data to make decisions about needed instruction and supports								H							

Indicators for Customized Supports

Resources for Customized Supports

ELEMENT 5: SOCIAL EMOTIONAL LEARNING

LINES OF EVIDENCE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Students have opportunities to participate in partner and small groups during science instruction.		B													
Students state their perspectives and consider others' perspectives in respectful ways.		B													
Students self-monitor their sense-making of phenomena and disciplinary core ideas.			C	D											
Teachers elicit student ideas and activate prior knowledge.	A	B	C		E										
Teachers help students represent their thinking publicly.		B		D	E										
Teachers select learning experiences that help students build toward cumulative and nuanced understanding of big science ideas.			C	D											
Teachers provide varied opportunities for students to reason through talk.		B	C	D	E										
Teachers establish norms that cultivate an atmosphere of civility and safety.		B	C	D											
Teachers establish routines that encourage listening and purposeful talk.		B		D											
Teachers purposefully and seamlessly teach SEL characteristics.	A	B	C	D	E										

Indicators for Social Emotional Learning

Resources for Social Emotional Learning

FRAMEWORK PLANNING TOOL

FOR CONTINUOUS IMPROVEMENT

ELEMENT (circle one): **1 Culture of Learning** **2 Learner Agency** **3 Demonstrated Competency & Assessment** **4 Customized Supports** **5 Social & Emotional Learning**

Alignment to Critical Indicator What is the area of need?	**Proposed Solution** What will be done to address the area of need?	**Action Steps** How will the proposed solution be implemented?	**Responsible Individual(s)** Who will be doing it?

Expected Measurable Outcome What is the expected change?	**Projected Time Line** When will it occur?		**Resources** What resources are needed?	**Lines of Evidence to Be Collected/Monitored** How will the impact of the change be monitored?
	Start Date	End Date		

THIS IS A DUPLICATE SET FOR YOUR USE

ELEMENT (circle one): **1 Culture of Learning** **2 Learner Agency** **3 Demonstrated Competency & Assessment** **4 Customized Supports** **5 Social & Emotional Learning**

Alignment to Critical Indicator What is the area of need?	**Proposed Solution** What will be done to address the area of need?	**Action Steps** How will the proposed solution be implemented?	**Responsible Individual(s)** Who will be doing it?

Expected Measurable Outcome What is the expected change?	**Projected Time Line** When will it occur?		**Resources** What resources are needed?	**Lines of Evidence to Be Collected/Monitored** How will the impact of the change be monitored?
	Start Date	End Date		

RESOURCES

RESOURCES FOR **CULTURE OF LEARNING**

RESOURCES	DESCRIPTION AND LINK
A Framework for K–12 Science Instruction	Research that describes current shifts to science instruction. https://nap.nationalacademies.org/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts
Utah Science with Engineering Education (SEEd) Standards Core Guides	Provides guidance for developing effective instruction aligned to the Utah Science with Engineering Education (SEEd) Standards. They are intended to support teachers, administrators, science specialists, instructional coaches, parents, and other stakeholders as they plan instruction at a local level. https://www.schools.utah.gov/curr/science?mid=1128&tid=1
Observation Rubric for Three-Dimensional Science Teaching and Learning	Provides educators and administrators a way to identify where instruction falls on a continuum from less effective to highly effective and determine next steps for improvement. https://docs.google.com/document/d/1quNurnZ-AxfajLUrUqG5esqWQYtrzTH4Y01g5TimHLw/edit?usp=sharing
Utah Science Education Tool #1: Intentionally Aligned to SEEd Standards	Describes how to align to the SEEd standards can create an effective culture of learning. https://emedia.uen.org/courses/utah-science-education-tool-1-intentionally-aligned-to-seed-standards
Utah Science Education Tool #6: Student Sensemaking of a Phenomenon	Describes how to use phenomena to engage students in sensemaking to learn science content. https://emedia.uen.org/courses/utah-science-education-tool-6-student-sensemaking-of-a-phenomenon

RESOURCES	DESCRIPTION AND LINK
Rise and Thrive with Science: Teaching PK–5 Science and Engineering	Shows how learning can be more meaningful, equitable, and lasting by utilizing phenomena-based, three-dimensional instruction. A teacher's guide to classroom science instruction. https://nap.nationalacademies.org/catalog/26853/rise-and-thrive-with-science-teaching-pk-5-science-and
Talk Resource Cards	Prompts that support effective science discourse during instruction. https://stemteachingtools.org/assets/landscapes/Talk_Resource_Cards_TalkScience_AllCardsonOnePage.pdf
WIDA Focus On: STEM Discourse (Teacher and Student Discourse Moves)	Support teacher and student discourse moves that scaffold toward a reasoning-centered, discourse-rich style of instruction with these resources. https://drive.google.com/file/d/1gxaZPIbzzGToMyxHx0B9abfqTwcS1cCt/view?usp=sharing
Ambitious Science Teaching	Chapters three and four discuss how to use student talk as a tool for learning and how to encourage students to participate in talk. https://a.co/d/fkqpWHM (Link to buy Book)
Helping Students Make Sense of the World Using Next Generation Science and Engineering Practices	Chapter 14 is about fostering academically productive talk in science classrooms to support students' engagement with the eight science and engineering practices. https://a.co/d/hRhahBB https://my.nsta.org/resource/105619 (Link to buy Book)
Discourse Primer for Students	Describes effective science talk in the classroom and provides teachers with moves that can increase student talk in the classroom. https://ambitiousscienceteaching.org/wp-content/uploads/2014/09/Discourse-Primer.pdf

RESOURCES	DESCRIPTION AND LINK
Ready, Set, Science: Chapter 5: Making Thinking Visible—Talk and Argument	Explores the Board on Science Education (BOSE) report on how talk and argument work in science and the role they play in good science teaching. https://nap.nationalacademies.org/read/11882/chapter/6
STEM Teaching Tool #6: How Can I Get My Students to Learn Science by Productively Talking with Each Other?	Discusses how to scaffold and manage productive discourse in the classroom. https://stemteachingtools.org/brief/6
STEM Teaching Tool #13: Professional Development that Supports Teacher Learning about the New Vision for Science Education	Discusses how to develop professional development that scaffolds teachers to shift to classroom instruction to become three-dimensional. https://stemteachingtools.org/brief/13
STEM Teaching Tool #14: Next Generation Science Standards—What's Different, and Do They Matter?	What's new about science standards? Do the differences really matter for my classroom? This resource discusses how the new vision includes several big shifts for how science should be taught and learned. https://stemteachingtools.org/brief/14
STEM Teaching Tool #54: How to Build an Equitable Learning Community in Your Science Classroom	Discusses how to create an equitable learning culture in the science classroom. https://stemteachingtools.org/brief/54

RESOURCES	DESCRIPTION AND LINK
STEM Teaching Tool #66: Why You Should Stop Pre-Teaching Science Vocabulary and Focus on Students Developing Conceptual Meaning First	Discusses why many science educators focus on pre-teaching technical vocabulary at the start of the unit to help students become comfortable with science discourse. This approach is especially common with students from historically marginalized communities, in particular emerging multilingual students. However, it is much more productive to support learners as they organically develop language (terms, phrases) that interprets and explains phenomena, rather than asking them to merely acquire terms. Additionally, it is key for equity that educators identify, value, and leverage students' home languages. https://stemteachingtools.org/brief/66
STEM Teaching Tool #85: Principals! Here's What You Can Do to Foster Equitable Three-Dimensional Science Learning	Discusses how principals directly influence classroom instruction, second only to teachers in impact on student achievement. However, school principals have varied content and pedagogical backgrounds and few have had learning experiences engaging in the practices of scientists and engineers to explain phenomena and solve challenging problems. Without these experiences, too few principals are effectively leading for improvement of equitable science instruction. This tool describes some steps that districts and/or individual principals can take to enable them to effectively lead the implementation of three-dimensional (3D) science learning in their schools. https://stemteachingtools.org/brief/85
STEM Teaching Tool #91: Why and How Should I Use Crosscutting Concepts to Enhance My Science Instruction?	Provides clarity on the instructional use of the CCCs to promote integrated understanding and sensemaking. https://stemteachingtools.org/brief/91

Indicators for Culture of Learning
Evidences for Culture of Learning

RESOURCES FOR **LEARNER AGENCY**

RESOURCES	DESCRIPTION AND LINK
Implementing the Utah Science with Engineering Education (SEEd) Standards K–12 SEEd Canvas Course	Course to support educators in understanding shifts to instruction that are required to effectively implement the Utah SEEd Standards. The Canvas-based course contains six modules: Introduction to the SEEd Standards, Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), Disciplinary Core Ideas (DCIs), Engineering Design, and Using Phenomena. This course is free for participants and is self-paced. K-12 educators may register at any point. Successful completion of the entire course is worth 2.0 USBE Credits. https://usbe.instructure.com/enroll/PKG398
SEEd Content Courses Grades K–8 Canvas Courses	Courses to build and support teacher science conceptual knowledge of the Disciplinary Core Ideas (DCIs) used within the SEEd Standards. The Grade K-6 courses are developed specifically for elementary educators and therefore only licensed K-6 teachers will be awarded USBE credit upon completion. https://usbe.instructure.com/courses/634
Utah Science Education Tool #2: Using Three-Dimensions in a Student-Centered Classroom	Discusses how to use the three-dimensions of science instruction to engage learners in the science classroom. https://emedia.uen.org/courses/utah-science-education-tool-2-using-three-dimensions-in-a-student-centered-classroom
STEM Teaching Tool #2: Why Should Students Investigate Contemporary Science Topics—and Not Just "Settled" Science?	Discusses how to effectively incorporate contemporary science topics into the science classroom to help spark student interest. https://stemteachingtools.org/brief/2
STEM Teaching Tool #3—Practices Should Not Stand Alone: How to Sequence Practices in a Cascade to Support Student Investigations	Discusses how to sequence and cascade the Science and Engineering Practices within instruction to support student learning. https://stemteachingtools.org/brief/3

RESOURCES	DESCRIPTION AND LINK
STEM Teaching Tool #19: Why Should Students Learn to Plan and Carry Out Investigations In Science and Engineering?	Discusses how to enable learner agency through the Science and Engineering Practice of Planning and Carrying out Investigations. https://stemteachingtools.org/brief/19
STEM Teaching Tool #31: How To Launch Stem Investigations That Build on Student and Community Interests and Expertise	Discusses how to get students engaged in the class-room by engaging students and communities inter-est and expertise. https://stemteachingtools.org/brief/31

Indicators for Learner Agency

Evidences for Learner Agency

RESOURCES FOR **DEMONSTRATED COMPETENCY AND ASSESSMENT**

RESOURCES	DESCRIPTION AND LINK
Utah Science with Engineering Education (SEEd) Standards Core Guides	Course to support educators in understanding shifts to instruction that are required to effectively implement the Utah SEEd Standards. The Canvas-based course contains six modules: Introduction to the SEEd Standards, Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), Disciplinary Core Ideas (DCIs), Engineering Design, and Using Phenomena. This course is free for participants and is self-paced. K–12 educators may register at any point. Successful completion of the entire course is worth 2.0 USBE Credits. https://www.schools.utah.gov/curr/science?mid=1128&tid=1
STEM Teaching Tools #16: The Informal Formative Assessment Cycle as a Model for Teacher Practice	Discusses research results about using the informal formative assessment cycle in the classroom. https://stemteachingtools.org/brief/16
STEM Teaching Tool #18: How Teachers Can Develop Formative Assessments That Fit a Three-Dimensional View of Science Learning	Discusses how to develop three-dimensional science assessments. https://stemteachingtools.org/brief/18
STEM Teaching Tool #26: How Can Assessments Be Designed to Engage Students in the Range of Science and Engineering Practices?	Discusses how to use the Science and Engineering practices in assessments. https://stemteachingtools.org/brief/26
STEM Teaching Tool #30: Integrating Science Practices Into Assessment Tasks	Suggests activity formats to help teachers create three-dimensional assessments based on real-world science and engineering practices. https://stemteachingtools.org/brief/30

STEM Teaching Tool #41: Prompts for Integrating Crosscutting Concepts Into Assessment and Instruction	Prompts intended to help teachers elicit student understanding of crosscutting concepts in the context of investigating phenomena or solving problems. https://stemteachingtools.org/brief/41
STEM Teaching Tool #65: Using 3D Interim Assessments to Support Coherence, Equity, and a Shared Understanding of Learning	Helps teachers make ongoing instructional adjustments and promotes vertically coherent assessments at school-, district-, and state-levels. Interim assessments—that fall between formative and summative—can be a valuable part of a more balanced and comprehensive 3D assessment system. https://stemteachingtools.org/brief/65
STEM Teaching Tool #83: Steps to Designing Justice-Focused Assessments in Science	Outlines a nine-step process to help teams develop three-dimensional assessment tasks in science. https://stemteachingtools.org/brief/83
STEM Teaching Tool #94: Systematically Noticing and Responding to Learning Experiences Through Practical Measures	Provides practical measures of learning that can be used by educators to inform and adjust instruction to better meet the needs of every learner. https://stemteachingtools.org/brief/94

Indicators for Demonstrated Competency and Assessment
Evidences for Demonstrated Competency and Assessment

RESOURCES FOR **CUSTOMIZED SUPPORTS**

RESOURCES	DESCRIPTION AND LINK
Utah Science with Engineering Education (SEEd) Standards Core Guides	Course to support educators in understanding shifts to instruction that are required to effectively implement the Utah SEEd Standards. The Canvas-based course contains six modules: Introduction to the SEEd Standards, Science and Engineering Practices (SEPs), Crosscutting Concepts (CCCs), Disciplinary Core Ideas (DCIs), Engineering Design, and Using Phenomena. This course is free for participants and is self-paced. K–12 educators may register at any point. Successful completion of the entire course is worth 2.0 USBE Credits. https://www.schools.utah.gov/curr/science#Core%20Guides
Utah Science Education Tool #3: Scaffolds in Three-Dimensional Science	Describes how to effectively scaffold three-dimensional science to support student learning. https://emedia.uen.org/courses/utah-science-education-tool-3-scaffolds-in-three-dimensional-science
Utah Science Education Tool #4: Student Science Discourse	Describes how to use Student Science discourse to support student learning in the science classroom. https://emedia.uen.org/courses/utah-science-education-tool-4-student-science-discourse
Utah Science Education Tool #5: Disciplinary Literacy in Science	Discusses how to help student succeed in the science classroom through disciplinary literacy in science. https://emedia.uen.org/courses/utah-science-education-tool-5-disciplinary-literacy-in-science
Utah Science Education Tool #7: Equitable and Accessible Science Instruction for All	Discusses how to support all students with three-dimensional science instruction. https://emedia.uen.org/courses/utah-science-education-tool-7-equitable-and-accessible-science-instruction-for-all
Stem Teaching Tool #3: Practices Should Not Stand Alone: How to Sequence Practices in a Cascade to Support Student Investigations	Discusses how to sequence and cascade the Science and Engineering Practices within instruction to support student learning. https://stemteachingtools.org/brief/3

STEM Teaching Tool #6: How Can I Get My Students to Learn Science by Productively Talking with Each Other?	Discusses how to support student learning in the science classroom though student discourse. https://stemteachingtools.org/brief/6
STEM Teaching Tool #17: Beyond the Written C-E-R: Supporting Classroom Argumentative Talk About Investigations	Discusses how to support student learning in the science classroom through written CER statements and argumentative talk. https://stemteachingtools.org/brief/17
STEM Teaching Tool #33: How to Design Assessments for Emerging Bilingual Students	Discusses ways to create supports for bilingual students. https://stemteachingtools.org/brief/33
STEM Teaching Tool #59: Creating Science Learning Experiences That Support Learners Receiving Special Education Services	Discusses how to support equitable science learning environments that include activities that foreground multiple ways of knowing, doing, and expressing understanding. https://stemteachingtools.org/brief/59
STEM Teaching Tool #60: Designing "Productive Uncertainty" Into Investigations to Support Meaningful Engagement in Science Practices	Focuses on how uncertainty might be strategically built into learning environments so that students establish a need for the practices and experience them as meaningful ways of developing understandings. https://stemteachingtools.org/brief/60
STEM Teaching Tool #72: How Can Arguing From Evidence Support Sensemaking in Elementary Science?	Describes how young children are capable of engaging in argumentation in elementary school science. https://stemteachingtools.org/brief/72
STEM Teaching Tool #75: Using the Crosscutting Concepts to Reflect on and Refine Your Teaching	Supports teachers in engaging in deeper reflection and metacognition—and strengthening their abilities to help students use the crosscutting concepts to explain phenomena and design solutions. https://stemteachingtools.org/brief/75

Indicators for Customized Supports
Evidences for Customized Supports

RESOURCES FOR **SOCIAL EMOTIONAL LEARNING**

RESOURCES	DESCRIPTION
STEM Teaching Tool #28: Qualities of a Good Anchor Phenomenon for a Coherent Sequence of Science Lessons	Outlines criteria to consider when selecting an anchor phenomena or design problem. https://stemteachingtools.org/brief/28
STEM Teaching Tool #35: How Can I Foster Curiosity and Learning In My Classroom? Through Talk!	Discusses how to engage students to work together to learn about science through talk. https://stemteachingtools.org/brief/35
STEM Teaching Tool #36: Failing Forward: Managing Student Frustration During Engineering Design Projects	Discusses using engineering projects to help students learn to cope with failure. https://stemteachingtools.org/brief/36
STEM Teaching Tool #47: How Can I Promote Equitable Sensemaking by Setting Expectations for Multiple Perspectives?	Discusses planning purposefully to ensure that the various perspectives that students bring to making sense of phenomena are solicited, clarified, and considered. It is important to support students as they develop a shared understanding of the different perspectives in the group. https://stemteachingtools.org/brief/47
STEM Teaching Tool #58: How Can Science Instruction Leverage and Develop Student Interests? Short Answer: In So Many Different Ways!	Discusses how science instruction should help students understand "why does this matter to me?" This is because science learning is centrally shaped by the interests and concerns of learners and their communities— therefore relating science concepts and practices to the realities of students' lives, generationally and culturally, is crucial. There are many different ways that learner interests can be meaningfully taken into account during instruction— by creating experiences, by adapting curriculum, or by resourcing and positioning students. https://stemteachingtools.org/brief/58

Indicators for Social Emotional Learning
Evidences of Social Emotional Learning

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