Cognia STEM Standard Crosswalk – by Standard Concepts

How to interpret this document

At first glance, it might appear that the new STEM Standard framework contains more content than the original set of STEM Indicators. This is a reasonable assumption given that there are now 16 STEM Standards in place of 11 STEM Indicators. However, it is important to look at a standard crosswalk at the level of the *concepts* contained within the Standards and Indicators. Our original Indicators contain a total of 31 concepts. The concepts are not evenly distributed across these 11 Indicators; some have two concepts, while Indicator ST 1.6 contains the most content with five concepts. Each Standard within the new STEM framework contains two concepts, for a total of 32 across the 16 standards. From this perspective, we have only added one additional concept (in number) to our STEM framework. However, the shifts within the concepts reflect a great deal of work, research, and consideration from our team. The Appendix to this document provides more detailed information regarding the changes, including the rationale for the content revisions, as well as the content from the initial STEM Indicators that does not appear in the new Standards. The main section of the document, the crosswalk itself, is devoted to a comparison between the new Standards and previous Indicators, from the perspective of the new standard framework. This makes it possible to see how content has shifted or moved within the framework, how we have revised some concepts, and which content is completely new in the Standards.

When reviewing the crosswalk, please keep in mind that the previous framework of 11 Indicators was based on four Performance Levels for each concept. Cognia will be using a new evaluation model for STEM Certification (see the i3 Rubric), so there will not be a Performance Level map for each Standard. In order to make the crosswalk document more considerate to the reader, original Indicator concepts (column 3) reflect Performance Level 3 language from the original concept maps, as this was the level of expected practice.

STEM Standard Crosswalk

Revised Standard - **Standard 1** - School/program provides equitable opportunities for students to engage in high quality STEM learning		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program has adopted an inclusive model of STEM education that is representative of community served by the institution	⇒	*New content – not addressed in previous framework*
Concept 2 - School/program engages in proactive strategies to recruit and support engagement from students traditionally underrepresented in STEM fields of work and learning	⇒	Indicator ST1.1 – Concept 2 - Outreach activities to support and retain students from under-represented groups are strategic and varied.

Revised Standard - **Standard 2** - STEM educators collaborate to develop, implement, and improve high quality STEM learning activities		Alignment to Prior STEM Indicator/Concept
Concept 1 - STEM educators and leaders have formal, protected time scheduled on a regular and frequent basis to plan, revise, and improve STEM learning experiences and pedagogical best practices	⇒	Indicator ST 1.7 – Concept 1 – STEM educators meet on a frequent and regular schedule with an established agenda to collaborate, innovate, plan and adjust integrated STEM learning experiences.
Concept 2 - Collaborative time for STEM staff and leadership is structured using a research-based model for effective educator collaboration	⇒	*New content – not addressed in previous framework*

Revised Standard - **Standard 3** - School/program engages diverse STEM community in order to support and sustain STEM programs and initiatives		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program establishes and maintains sustainable partnerships with a variety of community organizations, including local businesses, STEM practitioners, institutions of higher education, and individuals/families	⇒	Indicator ST 1.10 – Concept 3 - The school/program has begun to implement plans for maintaining the support and engagement of community, post-secondary, and/or business/industry partners and/or families in the STEM school/program.
Concept 2 - School/program proactively seeks resources and support from STEM partners to improve STEM teaching and learning	⇒	Indicator ST 1.10 – Concept 4 - STEM partners frequently seek STEM resources to support the STEM curriculum.

Revised Standard - **Standard 4** - School/program has established a shared vision for STEM and has leadership structures to support effective implementation		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program has developed a model of shared leadership whereby structures exist both internally (i.e. STEM Leadership Team, STEM Coordinator) and externally (i.e. STEM Advisory Board, STEM Stakeholder Committee) to support and sustain STEM initiatives	⇒	Indicator ST 1.10 – Concept 1 - STEM partners with limited representation of stakeholders meet regularly to collaborate with, support, and sustain the STEM school/program and to create a STEM pipeline.
Concept 2 - STEM leadership has effectively communicated a shared vision and mission for the STEM culture, with goals and intended outcomes for STEM initiatives	⇒	*New content – not addressed in previous framework*

Revised Standard - **Standard 5** - Leaders ensure that all stakeholders have ongoing opportunities to access information and learn about STEM implementation		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program utilizes a variety of strategies and platforms to share and communicate STEM vision, mission, goals, outcomes, responsibilities, roles, events, and activities to internal and external stakeholders	⇒	*New content – not addressed in previous framework*
Concept 2 - School/program plans for and facilitates a variety of STEM events and activities for the school community during and beyond the regular school day	⇒	*New content – not addressed in previous framework*

Revised Standard - **Standard 6** - Educators and leaders participate in an ongoing system of STEM-specific professional learning		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program facilitates professional learning opportunities for educators and leaders that lead to improved efficacy in specific areas of responsibility (such as STEM disciplinary content knowledge or instructional coaching)	⇒	Indicator ST 1.9 – Concept 3 - Professional learning for most STEM educators is usually based on individual needs.
Concept 2 - School/program facilitates professional learning opportunities for educators and leaders that lead to improved efficacy in STEM-specific practices (such as project-based learning, STEM integration, technology integration, etc.)	⇒	Indicator ST 1.9 – Concept 1 - Most STEM educators are usually provided with opportunities to stay current about practices in the STEM world through professional learning.

Revised Standard - **Standard 7** - Students engage collaboratively in authentic inquiry during ongoing units of study		Alignment to Prior STEM Indicator/Concept
Concept 1 - Students are provided opportunities to work collaboratively during project and inquiry-based units of study	⇒	Indicator ST 1.2 – Concept 3 - Students have some opportunities to work independently and collaboratively to solve problems.

Revised Standard - **Standard 7** - Students engage collaboratively in authentic inquiry during ongoing units of study		Alignment to Prior STEM Indicator/Concept
Concept 2 - Learning experiences provide opportunities for students to engage in authentic inquiry that requires problem identification, investigation, and analysis	⇒	Indicator ST 1.2 – Concept 1 - Learning experiences include real-world, locally-relevant, complex, open-ended problems that require problem identification, investigation, and analysis.

Revised Standard - **Standard 8** - Students engage in self-directed STEM learning guided by educators who are effective facilitators of learning		Alignment to Prior STEM Indicator/Concept
Concept 1 - Students are encouraged to be critical and creative thinkers as owners and managers of their own STEM learning experiences	⇒	Indicator ST 1.3 – Concept 1 - Students have some opportunities to personalize and self-direct their STEM learning experiences.
Concept 2 - STEM educators serve as facilitators who provide guidance and support for students as self-directed learners	⇒	Indicator ST 1.3 – Concept 2 - STEM educators frequently serve as facilitators who provide guidance and support for students as self-directed learners.

Revised Standard - **Standard 9** - School/program provides within-school and extra-curricular opportunities for students to extend STEM learning		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program provides a variety of STEM-specific extracurricular and extended day opportunities for all learners (clubs, competitions, summer camps)	⇒	Indicator ST 1.11 – Concept 2 - There are multiple extended day opportunities to engage students in STEM learning.
Concept 2 - Students have multiple formal, age-appropriate opportunities to engage with STEM practitioners, community experts, and/or other STEM partners	⇒	Indicator ST 1.10 – Concept 2 - Community, post-secondary and/or business/industry partners regularly engage with teachers and students in the STEM program.

Revised Standard - **Standard 10** - Students demonstrate their learning through performance-based assessments and have opportunities to develop self-assessment and self-monitoring skills		Alignment to Prior STEM Indicator/Concept
Concept 1 - Students engage in STEM-specific performance assessments that provide opportunities for public demonstrations of learning	⇒	Indicator ST 1.5 – Concept 1 - Most students have multiple opportunities to demonstrate their STEM learning through performance assessments. Indicator ST 1.5 – Concept 2 - Most students have multiple opportunities to present their STEM learning to a range of stakeholders within and outside of the school.
Concept 2 - Students engage in goal-setting, formative self-assessment, and reflections on learning	⇒	*New content – not addressed in previous framework*

Revised Standard - **Standard 11** - STEM learning experiences integrate all STEM disciplines with an emphasis on processes and practices associated with STEM		Alignment to Prior STEM Indicator/Concept
Concept 1 - The curriculum and associated learning activities integrate learning across all STEM disciplines (and additional content disciplines in schools that have adopted other inclusive models of integrated learning, such as The Arts for STEAM schools)	⇒	Indicator ST 1.6 – Concept 2 - The curriculum integrates learning across all of the STEM disciplines.
Concept 2 - The curriculum engages students in STEM processes and practices (such as the Engineering Design Process)	⇒	Indicator ST 1.6 – Concept 5 - The curriculum engages most students in science, technology, engineering and mathematical processes and practices.

Revised Standard - **Standard 12** - School/program provides high quality STEM courses and curriculum aligned to recognized standards and organized into interdisciplinary frameworks		Alignment to Prior STEM Indicator/Concept
Concept 1 - The STEM curriculum is mapped and aligned to formally adopted and recognized sets of standards and/or benchmarks	⇒	Indicator ST 1.6 – Concept 1 - Most of the curriculum is mapped and aligned to internationally accepted standards and/or benchmarks.

Revised Standard - **Standard 12** - School/program provides high quality STEM courses and curriculum aligned to recognized standards and organized into interdisciplinary frameworks		Alignment to Prior STEM Indicator/Concept
Concept 2 - The STEM curriculum is organized around multiple real world, interdisciplinary problem- and/or project-based units of study	⇒	Indicator ST 1.6 – Concept 3 - The curriculum is organized around some interdisciplinary and authentic problem-based learning experiences.

Revised Standard - **Standard 13** - Students demonstrate STEM content knowledge representative of STEM literacy outcomes that prepare them for the next level of learning and work		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program has identified learning standards and aligned sources of student performance data for each of the STEM disciplines, as well as content areas included in the institution's integrated model (i.e. STEAM, STREAM, etc.)	⇒	Indicator ST 1.8 – Concept 2 - Data on students' STEM literacy and postsecondary and workforce readiness are based on standardized test results and on some local qualitative and quantitative assessments.
Concept 2 - Trend data indicate student growth and mastery of learning standards and expectations associated with frameworks adopted by the school/program for all STEM disciplines, as well as content areas included in the institution's integrated model (i.e. STEAM, STREAM)	⇒	Indicator ST 1.8 – Concept 1 - Data on students' STEM content knowledge and skills, cross-cutting competencies, and creative and critical thinking strategies demonstrate continuous improvement toward readiness and success at the next level of STEM learning and, for high schools, post-secondary and workforce readiness.

Revised Standard - **Standard 14** - Students develop STEM skills and cross-cutting competencies that support workforce readiness		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program has identified discipline-specific skills and cross-cutting competencies (i.e. 21st Century Skills, soft skills) and aligned sources of student performance data for each of these areas	⇒	Indicator ST 1.8 – Concept 2 - Data on students' STEM literacy and postsecondary and workforce readiness are based on standardized test results and on some local qualitative and quantitative assessments.
Concept 2 - STEM events, curriculum, and learning activities provide opportunities for career exploration and workplace experiences	⇒	Indicator ST 1.11 – Concept 1 - Most STEM students participate in an age-appropriate formal program of mentorship, apprenticeship, internships, research, or job shadowing with researchers, business/industry, or other community partners.

Revised Standard - **Standard 15** - School/program engages in a continuous improvement process for STEM		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program engages in a research-based process for continuous improvement that involves establishing strategic vision and STEM goals, as well as planning for, implementing, monitoring and adjusting STEM initiatives.	⇒	*New content – not addressed in previous framework*
Concept 2 - School/program engages in a process for strategic resource management to ensure that there are adequate resources and supports for the full implementation of the STEM program	⇒	*New content – not addressed in previous framework*

Revised Standard - **Standard 16** - School/program conducts evaluative activities to ensure the effectiveness of STEM implementation		Alignment to Prior STEM Indicator/Concept
Concept 1 - School/program engages in a formal process to evaluate the effectiveness of its STEM initiatives and activities in terms of impact on student learning and development	⇒	*New content – not addressed in previous framework*
Concept 2 - School/program engages in a formal process to evaluate the effectiveness of its STEM initiatives and activities in terms of improvement of professional and teaching practices	⇒	*New content – not addressed in previous framework*

Appendix

I. Rationale and background for Standard revisions

It is vital for organizations that provide evaluative services to consistently and systematically assess their own processes and content to ensure that the standard frameworks and tools provided for evaluative purposes reflect not only the most current research, but also the data gleaned from previous review activities. Therefore, Cognia is committed to continuous improvement of its own content and protocols. In order to reflect the best and most relevant practices in K-12 STEM education, Cognia convened an internal committee to review its STEM Certification content (11 Indicators) as well as the process for review and evaluation.

Before identifying some of the findings and revisions resulting from the committee's work, it may be helpful to frame the new standards in light of the context for development for the initial STEM Indicators. Cognia initially sought to develop a framework of STEM Indicators, as well as a process for recognizing STEM schools and programs, as a result of many network members seeking guidance for effective STEM practices. The initial STEM framework was developed to complement Cognia's model for school accreditation. For this reason, important areas for effective STEM implementation, such as leadership and continuous improvement, were not originally addressed in the STEM Indicators because these areas are addressed in the accreditation standards. Cognia has since changed its approach and currently allows schools not accredited by Cognia to pursue STEM Certification. As such, the lack of certain themes, such as leadership and continuous improvement, now represent gaps in the STEM Indicator framework. A key rationale for revision was to address these areas that are vital to successful implementation of quality STEM programs.

As the review committee began the process of evaluating revision needs, its work was informed by three main sources of information. First, Cognia has conducted nearly 200 reviews of STEM schools and programs during the past five years. The data gathered by teams and reported by institutions are invaluable in terms of revising and refining our processes. Three examples of these data that supported improvements in the revised framework are 1.) student outcomes, 2.) equitable and inclusive learning, and 3.) student engagement in work-like settings. From a school performance perspective, some challenges have stemmed from problems of practice. Indicator ST 1.8 was the lowest average-rated Indicator across all reviews during the past five years. This Indicator addresses student STEM literacy in a way that is more comprehensive than current practices in most schools. As a result of the challenges associated with adequately addressing student growth and learning to support true readiness, the committee separated the content in ST 1.8 into two standards (13 and 14) in the new framework. A second area of challenge has been interpreting the intent and focus of standards. ST 1.1 in the initial framework emphasizes equitable access to STEM learning. This Indicator generated the most questions from schools regarding the meaning and intention, as well as how the concepts would be evaluated. This feedback led to important revisions for this standard (Standard 1 in the new framework), though Cognia is still

strongly committed to extending equitable STEM learning opportunities to all students. Similarly, many elementary schools expressed confusion regarding the language of Indicator ST 1.11 in the initial framework due to its reference to internships, externships, research partnerships, etc. The intent of this Indicator was not to engage young students in externships, or to exclude young students from important extensions of STEM learning through engagement with experts. However, the language proved to be problematic for our schools. For this reason, the committee revised the language of the new Standards to clarify the expectations for student learning opportunities.

A second important point of reference for standard revision was an environmental scan of current STEM frameworks used across the US. This review focused on nine different STEM models used by organizations including non-profits, education service agencies, state departments of education, and research teams. There were essentially two criteria for selecting these nine frameworks: 1) each is grounded in research on STEM best practice; 2) Cognia has observed each of the frameworks in use in the field. The scan consisted of an examination and comparison of overall framework structures, themes reflected in standards of practice, and concepts addressed across domains. The goal of this evaluation was not to ensure alignment with or adherence to other models. Instead, our committee sought to better understand the core practices featured in common among differing sets of standards and guidelines so that Cognia could approach the work of supporting STEM implementation in a coherent and consistent way for our national and international network. Though much of this review was helpful in informing the committee's thinking, two observations stood out as being especially impactful. First, there was very little consistency in terms of framework design, domain labels (and constructs), and overall amount of content. Importantly, the design of each model seemed to reflect its purpose. For instance, those frameworks created to support implementation seemed to have a much different design than those frameworks developed for evaluative purposes. Specifically, many standard documents addressing certifications or other recognition programs seemed to place more emphasis on compliance behaviors. Conversely, some frameworks designed to support STEM implementation contain an unwieldy amount of content, which makes self-assessment (or external assessment) quite difficult. Because Cognia seeks to provide a framework that supports both strong implementation for STEM, as well as evaluation of quality programs, we made important structural changes to our model to reflect these dual purposes. Second, the most consistently- identified areas across frameworks seem to deal with inputs into the system (teacher professional development, curriculum, etc.) The least-consistently addressed areas across frameworks seem to be related to outcomes. Though most models addressed student development in areas associated with "readiness", there was limited agreement across models in terms of program effectiveness or strategic management of STEM initiatives. Furthermore, the areas identified as important for student readiness overlap, but are not aligned. In part, due to the limited agreement among organizations regarding STEM outcomes, the committee decided that it would be important to address outcomes through both the evaluative model for certification, as well as within the domain constructs of the framework.

A final source of information informing the review committee's work is new research that has been published to support improved practice in STEM implementation and evaluation of STEM programs. Though there is still a significant lack of longitudinal data available to suggest positive effects for STEM education in K-12 settings as it applies to standardized measures of student achievement, there are a number of policy documents that have examined key practices associated with STEM teaching and programming that seem to result in deeper learning. There are also a number of localized studies and emergent research programs that show early indications of the positive impacts of STEM education in PK-12 settings. In addition to these contributions from researchers in cognitive and non-cognitive sciences, there are a number of organizations that have published forecasts of future needs for workforce and economic development. Many of these studies predict that current teaching and learning practices and "traditional" school models will not be sufficient in preparing our workforce to address future needs. While the emergent research in STEM education has not influenced significant changes to the existing standard content, these studies and policy guidance have further emphasized the need to create outcomes-oriented models for evaluation. This includes models for implementation that align change-management strategies with STEM-specific practices to support improvement in leadership efficacy, teaching practices, and learning behaviors.

II. Concepts from original STEM Indicators not addressed in new STEM Standard framework

It should be noted that all of the concepts below represent best practices for any STEM school or program. Ultimately, there was the need to make difficult decisions in order to maintain an appropriate amount of content and focus for the new standard framework. In some cases, these decisions were based on core philosophy. For example, the exclusion of a standard addressing technology in the new Standard framework is based on the belief that none of the STEM disciplines should be singled out or siloed. However, it is still vital that all students in STEM schools and programs have access to and use technology and tools for learning on a daily basis. There were other concepts that were difficult to remove but that are addressed, to an extent, by a different standard. For example, ST 1.6 - Concept 4 (see below) is a vital component of learning experiences for students. However, this expectation is reflected in Standard 14 of the new framework, albeit in the form of student outcomes rather than STEM curriculum.

Concepts excluded from the Revised Standards
Indicator ST 1.1 – Concept 1 - *The school/program has a STEM outreach plan with measurable goals to increase enrollment, support, and retention of students from under-represented groups and can demonstrate progress meeting such goals.*
Indicator ST 1.2 – Concept 2 - *Creative problem solving is encouraged.*
Indicator ST 1.4 – Concept 1 - *Most students use a range of technological resources in their STEM learning experiences during, after and away from school.*

Indicator ST 1.4 – Concept 2 - *Most students use technology to conduct research, demonstrate critical and creative thinking, and communicate and work collaboratively.*
Indicator ST 1.5 – Concept 3 - *Most students have multiple opportunities to clarify, elaborate on, and defend their thinking and conclusions using verbal, symbolic, and visual means.*
Indicator ST 1.6 – Concept 4 - *The curriculum provides learning experiences for most students that develop cross-cutting competencies (e.g., collaboration) necessary for college and career.*
Indicator ST 1.7 – Concept 2 - *STEM educators regularly review student work together as an interdisciplinary team.*
Indicator ST 1.7 – Concept 3 - *Teachers have regular common planning time to collaborate and discuss integrated STEM curricular and instructional practices.*
Indicator ST 1.9 – Concept 2 - *STEM educators have multiple opportunities to expand their proficiency in the use of technology.*