S²TEM Centers SC

Solutions in Science, Technology, Engineering & Mathematics Education

S²TEM SC Innovation Configuration (IC) Map

Overview

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IC Maps Purpose

According to Shirley Hord (2006), "Innovation Configuration Maps, or IC Maps, provide a description of what a specific educational innovation "looks like" when well implemented. It provides a mental image of an innovation in operation and "vision" toward which the user is moving. Thus, the IC map provides a tool that shares information and helps individuals and organizations figure out where they are and what they need to do to move toward implementation." S²TEM Centers SC has created an IC map for Characteristics of High Functioning STEM schools, and schools wanting to become more STEM-Minded.

The desired outcome is stated on the left. Decreasingly desirable levels along the continuum are to the right. *Sustaining* signifies the ideal and highest quality of implementation and reflects the processing of all actions through a data-informed, evidence-based continuous improvement process.

STEM schools aligned with the criteria identified in the IC maps, will progress toward developing students with world class knowledge, world class skills, and life and career characteristics as defined by the Profile of the SC Graduate.

IC Maps Format

Overarching Standard for the respective IC Map.

Standard: Professional learning for STEM educators: is a system of continuous improvement that increases educator effectiveness in preparing students for success in college, careers, and citizenship; it is data informed, research based, aligned with the school's mission, vision, and goals for STEM education and sustained by skillful leaders.

Desired Outcome(s) are listed in each IC Map as statements of STEM school characteristics as related to the Overarching Standard (shown above).

PL1 = Professional Learning Map, 1st

Words defined in the glossary are highlighted in blue

Title of IC Map (i.e., Professional Learning)

Total Instructional Focus – Professional Learning

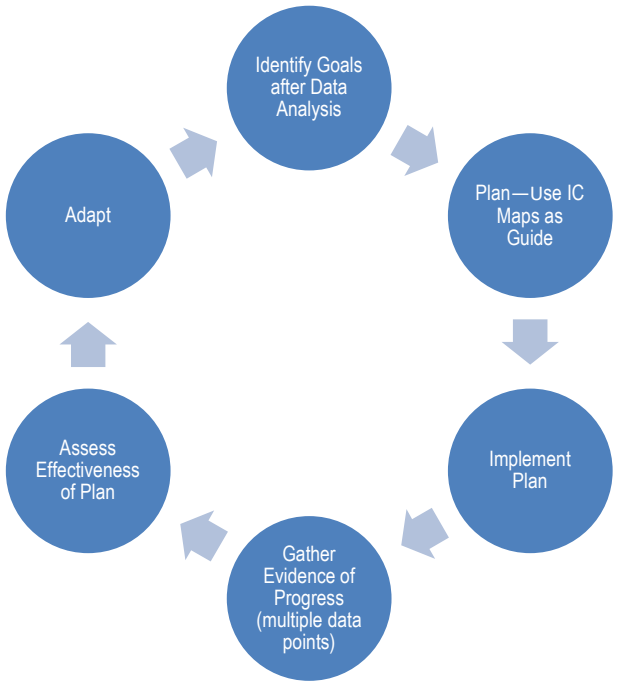
Sustaining	Fully Implementing	Refining and Expanding	Progressing	Getting Started
Desired Outcome PL1: Professional learning is the collective responsibility of all STEM educators and is the result of active engagement in a STEM professional learning community (PLC). It is a system of continuous improvement aligned with the school's/district's mission, vision, and goals for STEM education.				
PL1.Leaders1: Support faculty and staff in setting and implementing professional learning goals				
Model and employ with fidelity ALL essential elements of a continuous improvement process school wide including: • identifying STEM goals • planning • implementing • gathering evidence • self-assessing • adapting Support and maintain commitment to personal and PLC learning of faculty and staff through observation, reflecting conversations, and feedback as aligned with the school/district goals for STEM education.	Model and employ the essential elements of a continuous improvement process school wide including: • identifying STEM goals • planning • implementing • gathering evidence • self-assessing • adapting Support commitment to personal and PLC learning of faculty and staff through observation, reflecting conversations, and feedback as aligned with the school/district goals for STEM education.	Provide ongoing support to faculty and staff as they work toward their individual and PLC STEM focused goals for professional growth through observation, reflecting co... fe...	Support faculty and staff as they work toward their individual and PLC STEM focused goals for professional growth through observation and feedback.	Collaborate with faculty and staff as individual STEM focused goals for professional growth are set.

5 Implementation Levels on the continuum from Getting Started to Sustaining. Read the map from right to left.

Indicator by Role for the Desired Outcome (i.e., PL1), then the Role described (i.e., Leaders), then a number to represent which indicator is being outlined (i.e., 1) NOTE: Roles include Leaders, Teachers, Students, and Strategic Alliances.

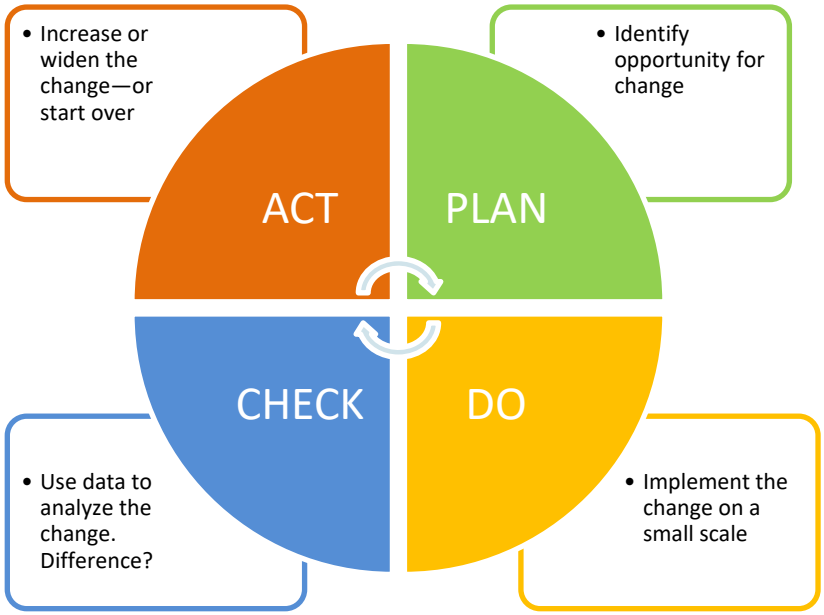
Within the white cells are descriptors for each of the 5 levels on the continuum.

Glossary

Collaborative Norms	The capacities and skills that guide productive dialogue and discussion in collaborative groups. Each group member agrees to the norms and governs himself or herself accordingly. Source: https://www.thinkingcollaborative.com/_files/ugd/6a5cc9_263cffd70d0d4a988fdfa77deaaa769c.pdf
Collective Responsibility	The attitudes and beliefs that all stakeholders in the school community share the responsibility of ensuring high levels of learning for every child and that they use their communal strengths to prepare students for success within and beyond K-12 schooling.
Computational Thinking	"Computational thinking (CT) is a problem-solving process that includes (but is not limited to) the following characteristics: • Formulating problems in a way that enables us to use a computer and other tools to help solve them. • Logically organizing and analyzing data • Representing data through abstractions such as models and simulations • Automating solutions through algorithmic thinking (a series of ordered steps) • Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources • Generalizing and transferring this problem-solving process to a wide variety of problems" Source: https://cdn.iste.org/www-root/Computational_Thinking_Operational_Definition_ISTE.pdf
Continuous Improvement Process	A data-informed, active and ongoing process in which self-directed learners at all levels of the school identify, plan, implement, monitor, and refine goals. This approach applies to the continuous learning and growth of students, faculty, staff, leaders, organization, and community. **Examples of Continuous Improvement Processes** (NOTE: These are a few examples; not an exhaustive list): Example 1 **Continuous Improvement Process** 

Example 2

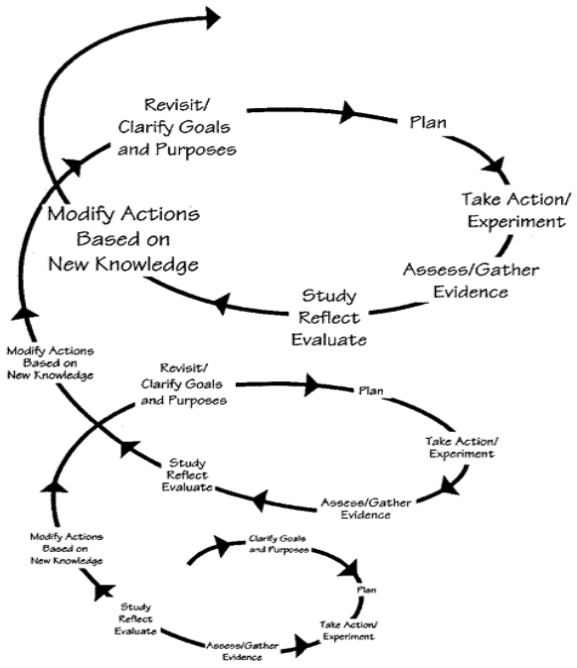
Continuous Improvement Process



(Deming, n.d.)

Example 3

Feedback Spiral



(Costa & Kallick, Assessment in the learning organization, 1994)

Digital Fluency	Digital fluency is the aptitude to effectively and ethically interpret information, discover meaning, design content, construct knowledge, and communicate ideas in a digitally connected world. Source: https://www.digitallearningcollab.com/blog/what-is-digital-fluency

Gatekeeping Processes	Processes (multiple measures) that are the entry requirements for STEM courses of study.
Interdisciplinary	Processes, methods and language from more than one discipline.
Intra-disciplinary	Processes, methods, and language within a single discipline.
Performance Based Assessment	A form of measuring student progress towards the attainment of curricular concepts by having them actively demonstrate their understanding.
Performance Based Learning	An approach to learning that engages students in performing tasks or activities that are meaningful and engaging as they learn curricular concepts.
Problem-based Learning	"An approach to teaching and learning in which students gain knowledge and skills by solving authentic, complex problems. Problem Based Learning is similar to Project Based Learning, but the problems posed for student learning typically focus on one subject such as math and the tasks are shorter than the projects in Project Based Learning." Source: https://www.pblworks.org/blog/project-based-learning-vs-problem-based-learning-vs-xbl
Professional Learning Community (PLC)	A group of educators who engage in job-embedded, collaborative learning; together, participants develop professional and student learning goals, and monitor progress towards meeting those goals through a continuous improvement process.
Project-based Learning	An approach to teaching and learning in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge. Source: https://www.pblworks.org/what-is-pbl
School Community	The collective group of stakeholders reflecting the environment in which the STEM school operates including the cultural norms, political influences, economic resources, and education levels.
Self-Directedness	Being guided by oneself to set challenging goals, develop a plan of action, persevere in the face of challenges, and accurately assess progress and performance based on evidence.
SMART Goals	**Framework for goal setting. SMART goals should be:** **S** = Specific **M** = Measurable **A** = Attainable **R** = Results-based **T** = Time-bound
Stakeholder	An individual or group with an interest in the success of a school in fulfilling its mission, includes but not limited to parents, students, faculty and staff, businesses, institutions of higher education and community organizations.
STEM Leadership Team (SLT)	A team representing the diversity of the community, consisting of school/district leaders and representatives from all stakeholder groups. The SLT will lead in the development and implementation of the STEM mission, vision, and goals ensuring that all stakeholder ideas and concerns are represented. SLT members should be influential within the groups they represent and able to articulate with clarity communication from their constituent groups to the SLT and vice-versa.

STEM Learning Ecosystem	A network of in-and-out of school STEM learning opportunities that work together to deepen students' STEM understandings; the system may be comprised of STEM learning experiences made available by schools, afterschool providers, universities, museums, science centers, community organizations, and families. "This phrase," according to the National Academy Press publication, Identifying and Supporting Productive STEM Programs in Out-of-School Settings, "refers to the dynamic interaction among individual learners, diverse settings where learning occurs, and the community and culture in which they are embedded. STEM learning ecosystem includes all of a community's STEM-rich assets, which include: • *designed settings,* such as schools, clubs, museums, and youth programs; • *naturalistic settings*, such as city parks, waterways, and forests and deserts; • *people and networks of people,* such as practicing STEM professionals, educators, enthusiasts, hobbyists, and business leaders who can serve as inspiration and role models; and • *everyday encounters* with STEM, such as on the internet, on television, on the playground, or during conversations with family members and other young people." Source: http://www.nap.edu/catalog/21740/identifying-and-supporting-productive-stem-programs-in-out-of-school-settings
STEM Literacy	The knowledge, skills, attitudes, and capacities to: • integrate transdisciplinary concepts purposefully and strategically in the design and implementation of innovative solutions (explanations, products, processes) to complex, real-world, personal, local, and global challenges • think critically and flexibly • refine designs through an iterative process (e.g., engineering design process/continuous improvement process)
Strategic Alliance(s)	An individual or group of stakeholders who may be outside of the day to day work of schools, but who engage in ongoing active partnership with schools in developing and implementing a shared mission, vision and goals for STEM education. Strategic alliances may include but are not limited to businesses, institutions of higher education, community and civic organizations.
Transdisciplinary	Student driven approach to teaching and learning in which students, guided by their own questions, design solutions to solve complex, real world problems by calling upon the knowledge, skills, and processes of multiple disciplines as they need them.
Workforce data	"Information that is collected for the purpose of clarifying a state's workforce needs and resources. The data is used by students, families, policymakers, colleges, and employers to gain insight into: • Employment and wage prospects for degree and non-degree holders in identified fields • Fields that have a shortage of workers as well as those with a surplus • Regional career trends and forecasts"
World Class Knowledge	• Rigorous standards in language arts and math for career and college readiness • Multiple languages, science, technology, engineering, mathematics (STEM), arts and social sciences Source: Profile of the South Carolina Graduate
World class skills	• Creativity and innovation • Critical thinking and problem solving • Collaboration and teamwork • Communication, information, media and technology • Knowing how to learn Source: Profile of the South Carolina Graduate

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