



STEM MINDEDNESS: CULTURE INSPIRING INNOVATION

A culture that inspires innovation motivates school leaders, teachers, students and community alliances to think, dream and do in an atmosphere that has been thoughtfully created to embody a spirit of American ingenuity and inquiry.

Atmosphere

In a STEM school, the community is keenly aware of the importance of American ingenuity in maintaining our country's position as a global leader. The atmosphere is alive with the excitement of possibility thinking. Could this school be educating the developer of the next device demanded around the world, or the creator of the concept that eradicates world hunger? In this environment, self-directed individuals work interdependently to generate and test new ideas. Stakeholders are encouraged to question the status quo, deliberate about complex problems and pose creative solutions. Resulting actions are documented through a reflective process.

Nurtured by Visionary Leaders

The community is nurtured by visionary leaders who value the exchange of ideas and encourage out-of-the-box thinking. They collaborate with stakeholders in developing a shared vision for the acquisition and allocation of resources to support flourishing innovation. These resources include curriculum, creative work spaces, time, technology and human talent. Such leaders demonstrate their commitment to advancement through their words and actions. Throughout the organization, they inspire risk-taking, encouraging their colleagues to think and act in new ways.

Encourages Teacher Inventiveness

As school leaders encourage inventive thinking, teachers feel free to collaborate on innovative curriculum, instruction, and assessment design. They seek to become proficient in facilitating more inquiry and problem-based pedagogy, incorporating 21st century practices. They take risks in the integration of current technologies, often assisted by their students who are products of the digital age. Suzie Boss writes in *Bringing Innovation to School*, "The first step in teaching students to innovate is making sure that educators have opportunities to innovate themselves."

Promotes Inquiry and Engineering Design

Teachers who implement practices promoting innovation engage students in active learning experiences. In the Wall Street Journal article, *Educating the Next Steve Jobs*, Tony Wagner writes, "...at the most innovative schools, classes are 'hands-on,' and students are creators, not mere consumers. They acquire skills and knowledge while solving a problem, creating a product or generating a new understanding. In this type of learning, it is vital students understand that successful innovators take risks and channel creativity as they struggle to stick with an idea from conception to reality. Students should also recognize the opportunities presented by learning from failure.

Additionally, a key practice of successful innovators is implementing an engineering design process. According to NASA's education website, an engineering design process "is a series of steps that engineers use to guide them as they solve problems." The steps that NASA recommends for students in 5th – 12th grades are: 1) Identify the problem; 2) Identify criteria and constraints; 3) Brainstorm possible solutions; 4) Generate ideas; 5) Explore possibilities; 6) Select an approach ; 7) Build a prototype; 8) Refine the design.

There are many models of an engineering design process, some more complex than others. However, they share key elements. These cyclical tools provide structure to guide novices in their design work. Based on students' levels of cognition, teachers should teach and hold students accountable for using an engineering design process as they conduct investigations and design innovative products and creative solutions.

Engages Community Alliances

Developing and maintaining community alliances will infuse the school culture with new talent, ideas and resources to expand innovation efforts. Parents, universities, businesses and non-profit organizations can be tapped for mentors, internships, hands-on support with real world projects and sponsorships for innovation contests. In *Bringing Innovation to School*, Suzie Boss suggests establishing an innovation advisory council. This will engage all community stakeholders in sustaining the culture that inspires innovation.

A culture that inspires innovation brings together students' passions and interests with meaningful academic standards and the needs of society. Guided by this principle, the school becomes a laboratory where ideas that will positively impact the world are born.

Bibliography

Boss, Suzie. *Bringing Innovation to School: Empowering Students to Thrive in a Changing World*. Bloomington, IN: Solution Tree, 2012. Print.

Wagner, Tony. "Educating the Next Steve Jobs." *Wall Street Journal* (April 13, 2012): <http://online.wsj.com/article/SB10001424052702304444604577337790086673050.html> >.



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Guiding Questions

Use the reflection questions below to guide discussions. We recommend documenting evidence to support each question. Doing so will assist you in setting action plans, goals, and progress monitoring.

Atmosphere

- As you think about the culture at your school, what are some of the things you are doing to ensure that the atmosphere is alive with an excitement of innovation and “possibility thinking”?
- What is present in the environment in your school that cultivates self-directedness and working interdependently to generate and test new ideas?

Nurtured by Visionary Leaders

- In what ways do school leaders nurture the exchange of ideas and encourage out of the box thinking?
- In what ways do school leaders collaborate with stakeholders to inspire innovation? To develop a shared vision for innovation? To make decisions about acquisition and allocation of resources to support innovation?
- How do school leaders demonstrate their commitment to innovation?

Encourages Teacher Inventiveness

- What autonomy do teachers have to collaborate on innovative curriculum, instruction and assessment design?
- In what ways do teachers seek to become more proficient in facilitating problem-based learning in their classrooms?
- In what ways are teachers willing to take risks in integrating current technologies?

Fosters Student Inquiry

- What are some ways in which students learning experiences engage them in being creators, not mere consumers?
- What structures are in place to ensure that students take risks, learn from failure, implement a design process, and channel creativity as they struggle with an idea from conception to reality?

Engages Community Alliances

- In what ways does your school engage all community stakeholders in creating a culture of innovation?
- In what ways does your school engage all community stakeholders in sustaining that culture of innovation?