How does STEM affect classroom and school design and renovation?

How can schools build or retrofit space to accommodate STEM curriculum and pedagogies?

**PURPOSE**

Design with the essence of the STEM strategy

*The purpose is to inspire students to inquire, think, investigate and innovate in teams.*

- Problem-Solving / Problem Finding
- Innovative Thinking
- Communications
- Collaboration - Productive Teamwork
- Creative Thinking - Ideation
- Critical Thinking - Decision-Making

Let the scope of STEM teaching and learning drive classroom layout.

STEM can be taught in only one classroom or one subject, such as math or science, or it can be taught closely integrated, with teachers of various subjects planning together. It can be integrated throughout the whole school.

Any exposure to STEM is good, research after research study on STEM education has shown that kids who experience STEM early through hands-on and minds-on learning are the ones who will be best equipped to develop a strong understanding of STEM concepts.

**Design SPACE**

The best architects and designers of preschool -12 STEM spaces today, understand what real-life STEM programs look and sound like. **STEM Classrooms** are adaptable, flexible, mobile and ergonomic.

STEM rooms can be noisy, exuberant classrooms where multiple right answers abound and failure is regarded as a positive step toward discovery and successful solutions. Students work closely together; using hands-on methods to solve real-world problems … *give them enough room to become creative, innovative, critical thinkers.*

Because STEM is generally an integrated project-based, problem solving, inquiry learning programs, students need **small-group areas to plan and discuss their projects.**

STEM's influence has literally changed how designers label classrooms. For example, in the past, classroom learning was separate from lab learning. Today, the term “lab/classroom" is used to describe a combination space where students can move from discussion to hands-on work and back during a single class period.

Research on designing STEM hubs show a minimum of 5.57 square metre per student and a maximum of 24 students is ideal.
Another important feature is student project spaces that are readily accessible from the science classrooms, as well as access to the outdoors. That access is essential for students to test creations and display them, without the limitations of walls and ceilings.

Ideally, “technology should be everywhere” in the STEM classroom. Tablet-type devices should travel with students and connect to a wireless network. The engineering aspect of the program should include CAD with screens, printers (including 3D), and plotters.

Connectively is key, digital devices are essential for students to be able to instantly connect with global data and other resources. Optimised STEM classrooms allow students to have power for their computers or tablet devices, as well as Wi-Fi.

**STEM Furniture**

For maximum longevity, invest in furniture that is modular and sturdy. The extra cost – and functionality – is worth it.

**SEATING:** The days of traditional, single-function classroom furniture are dwindling. The STEM classroom has students standing, sitting on stools, rolling on chairs, and casual lounging to collaborate. Above all, classroom seating must offer a range of movement, positions and functions.

**DESKS AND TABLES:** Project-based learning requires desks or tables capable of being arranged into compact pods that fit six to eight students. Having the flexibility and ability to rearrange the desk for uses in multiple ways is key. For example, desktops that taper back to front (think pie shape) allow for a tight circle or individual arrangements.

Table design and materials have certainly expanded to accommodate STEM. Work surfaces can now stand up to chemicals and heat, and height varies, all without compromising a large work area and stability.

**STORAGE:** Most of the student projects within the STEM environment will take place over more than one class period. It’s essential to have space to safely leave or store in-progress projects. And, educators need mobile storage for organizing hands-on project materials and tools, as well as mobile units to house projectors and computers for presentations.

**STEM Infrastructure**

When designing a STEM space it is important to consider the scope of practical learning that may occur. Ideally, a STEM space is conducive to all learning activities and holds the infrastructure to support this.

Examples of this infrastructure may include:

- Wet Areas (wet flooring, sinks, taps)
- Fume Extraction
- Accessible Power (overhead power for soldering etc.)
- Chroma Key wall
- Testing Space (enclosed area)
- Fixed Recording Equipment

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