STEAM: A framework for teaching that is based on natural ways of learning, customizable for ALL types of students and programs and is FUNctional!

Why STEAM Education

A way to teach about all things as they relate to each other

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The pyramid helps map & connect the subjects to the business world.

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2,900+ educators, 87+ staff, 47 states, 36 countries

2435 of those educators have taken advanced STEAM courses
2007 – 1st PD at ITEEA, 2011 – 1st PD Course On-Site, Digital Data 2013+

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Shifting to STEAM:

- Framework Development – Researcher – Analysis & Planning
- Program Alignment – Admin - Paradigm Shift
- Educator Development – Teacher - Customization
- Community & Biz Partners – Contextualization
- Implementation Plans – Collective
- Assessment – On-going & Testing
- Me to We Student Teams

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How do you foresee using STEAM in your classroom?

Collectively 85.9% participants left the training experience expecting to or already using the STEAM framework. *Juried study based on STEAM Founder’s G. Yakman’s course 2013-2017

- % of 100  Likelihood to Use
- 07.69%  Already avidly applying
- 07.69%  Already have started some
- 41.03%  Will start avidly
- 29.49%  Will start slowly
- 12.82%  Neutral
- 01.28%  Won’t start

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What is technical literacy?

**FUNctional literacy**

~ being able to keep up with the modern world.

STEAM students not only learn to be literate in each (silo) discipline, but they become life-long learners who are much more capable of being functionally literate and advancing society.
Why teach how to learn?

To create Knowledgeable People to Shape the Next Generation and Keep Education going, who know how to use Teamwork to Evaluate Needs, Wants & Opportunities

To be Informed Users, Responders & Innovators

To create a culture to reduce: the Drop Out, Unemployment & Poverty Rates

having to Teach to the Test instead of the Individual

the Disproportionate percentage of Women & Minorities in Leadership Positions
STE@M Education...

• is where ALL subjects & peoples are recognized, can contribute & all effort is encouraged

• has curricula that is representative of the surrounding culture & aware & tolerant of all types of diversity & perspectives

• is adaptable, strong, benchmarked, measurable & inclusive of the standards & easily reinforces standards in unique & engaging ways.

• promotes deeper understandings and a transference of knowledge
STEAM Interdisciplinary Education - Reasons Why:

• Expands current curriculum’s lesson plans into STEAM plans for more realistic discovery & innovation for all types of learners
• Diversification of teaching methods - more engaging student self-directed, project-based, discovery learning
• Faculty rejuvenated by richer living learning environments in which to work
• Using purposeful integration of the exploratory subjects: fine art, music, PE, technology & engineering
• Opportunity to teach collaboratively: exchange ideas – reduce individual work load – more productive common planning times
• Subject matter integration/connections - Each subject helps students learn about the other subjects involved for deeper understanding
• Student team development & room management options
All STEAM Learners:

• work in teams, pairs & alone
• have ways they are advanced & ways they are challenged
• fully participate & teach others - allowing advanced & challenged students to further investigate topics & tangents
• have more perspectives in discussions and on projects
• recognize & encourage varying skill sets & multiple intelligences – making it easier for all personality types to have a say
• use team dynamics to create a shift from ME to WE, which helps solve conflicts, creates group identity & pride
• have more natural extensions with less pull-outs needed
Student Benefits of STEAM

• Connections & Transference
  • application of skills – design
• Subject matter integration/connections - Each subject helps students learn about the other subjects involved for deeper understanding
• Classroom management & student team development
• Interest, Engagement Behavior, Realistic Discovery & Innovation – Exploratory Subjects
• Balance of education – teams & subjects
• Understanding & respect of their ‘voice’ – student directed learning
• Adding human side to ‘hard sciences’ – discovery learning
Assessing STEAM students by using... portfolios & process work unify knowing & doing the end product is only part of it

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Where the STEAM concept came from:

*research & practical results since the beginning of modern ed.*

**The Giants (Educational Researchers of Mod. Ed.)**
- Significant epistemological similarities among recognized philosophers
- Integration of cognitive theory & educational psychology strengthened

**The Silos (Individual Disciplines)**
- Most schools have always taught subjects separately & have developed signature pedagogies & standards – they are all now recognizing the importance of inter-connecting to other fields
- Holistic – an unobtainable goal that each student will learn in the same way – STEAM gets close!
STEM Definition

‘The study of T & E is not possible w/o the study of the natural sciences. This in turn cannot be understood in depth w/o a fundamental understanding of M.’
SCIENCE is...
the natural universe, from where everything comes.

TECHNOLOGY is...
tools and innovative devices, uses and enhanced abilities, what is human/animal-made.

ENGINEERING is...
R&D (research & development)
Purposeful Innovation & Invention
Design, Creation & Analysis

MATH is an organized fact-based language.
study of numbers, symbolic relationships, patterns, shapes, uncertainty & reasoning.

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SCIENCE

Physics, Biology, Chemistry, Geo-sciences, Space Science, Biochemistry, Biomedical, Biotechnology

ENGINEERING


MATH

#’s and Operations, Algebra, Geometry, Measurement, Data Analysis, Probability, Reasoning & Proof, Communication – Includes – Trigonometry, Calculus, Theory

TECHNOLOGY

The Designed World: Medical & Bio-Medical, Agriculture & Biotechnology, Construction, Manufacturing, Information & Communication, Transportation, Power & Energy

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Life-Long Socio-Emotional Learning Theories

PBL: Commitment, Engagement, Generativity, Performance, Reflection & Understanding
Arts Integration = Framing

STEM organizes the materials, principles & processes of what & how things can be done,

includes why & by whom things are done.

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The Arts are SO MUCH MORE than design, they add the **who & why** to the **what & how** of STEM.
Sociologically based communication systems used to more effectively exchange (share) based on common interpretations of concepts, knowledge understandings, designs+

Types: mathematical, technical, social written, symbol, spoken, sign, body+

Musical & Fine Arts

Language

1st cultural representations of framing the other arts. Inherently capture understandings & desires (phremenology).

Music, based on regional rhythms, patterns & human ecosystems are the structural basis for spoken languages

Fine arts are the basis of symbol formations that make up pictorial, alphabetic and grammatical communication structures.

Understanding how society develops with its attitudes, ethics, constructs & customs in the past, to be effective in the present & meaningfully create future.

INCLUDES; STS, ANT & EDUCATION!

Physical

Solo & Team - be the best one can be in all areas, respect & promote other things & people in one’s network with varying talents

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Including the Arts

S-T-E-M with the A includes:
• sharing knowledge with language arts,
• a working knowledge of manual and physical arts,
• better understanding the past & present through fine arts.
• understanding developments with social/liberal arts...

including: sociology, psychology, history, politics, philosophy, education, etc.
Sustainability

Limits & consequences of resources
- Cultures & Societies

Save $ & the environment
- Ultimate Recycling
- Businesses
- Sellable items
- Fill community needs
- Purchase responsibly
- Renewable Resources / Energy
- Biorestoration

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Many programs choose to revolve their STEAM curriculum framework around themes, here are some of the most popular ones worked with so far;

STEAM Themes

- Power & Energy
- Elements & Processes
- Life & Movement
- Transportation
- Communication
- Inventions

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STEA M Course: What’s Your POINT!?!?

Identify NEEDS, WANTS & OPPORTUNITIES

- Empower yourself to learn about all the silos and be most effective using your talents, exploring your interests and reducing your limitations

- It’s not homework
  It’s how prepared you are

- Inputs, Outputs, Impacts

Ex. Project: Around the World in Many Ways

Ideally a thematic unit taught by multiple teachers

- discipline based instruction: each teacher revolves some of their lessons around the theme and makes connections to their discipline's benchmarks/standards

- Overview lesson teachers about transportation systems well beyond planes, trains and automobiles to wireless technology ++

- Science – most closely linked to inputs, outputs and byproducts

- Technology – most closely linked to what has been developed – strong industrial and military ties

- Engineering – most closely linked to inventions and goals of industry

- Arts – LA research, reports, opinions – SS expectations of systems – FA design & PE interactive functions & Music, – the sounds of the machinery sending messages and being useful as a language as well as pleasing or not

- Math – most closely linked to understanding the equations that make things work – algebra and geometry key
2009 STEAM Student Team Wins National TSA Engineering Challenge

- S-T-E-A-M— research, chemistry, designing, geometry pattern making, sourcing, creating, writing, etc.
- Balanced Teams of varying skill sets, interests & personalities
- Failing Forward
- Group identity and pride – **ME to WE**
- More acceptance of other types of learning / perspectives
- Team dynamics help solve conflicts

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STEAM Law HR51 took only 3 years to pass due to the urgency to address educational gaps.

It took 10 years to pass STEM Bill!


US – VA Senator Mark Warner

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Science & Technology interpreted through Engineering & the Arts, all understood with elements of Mathematics.

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