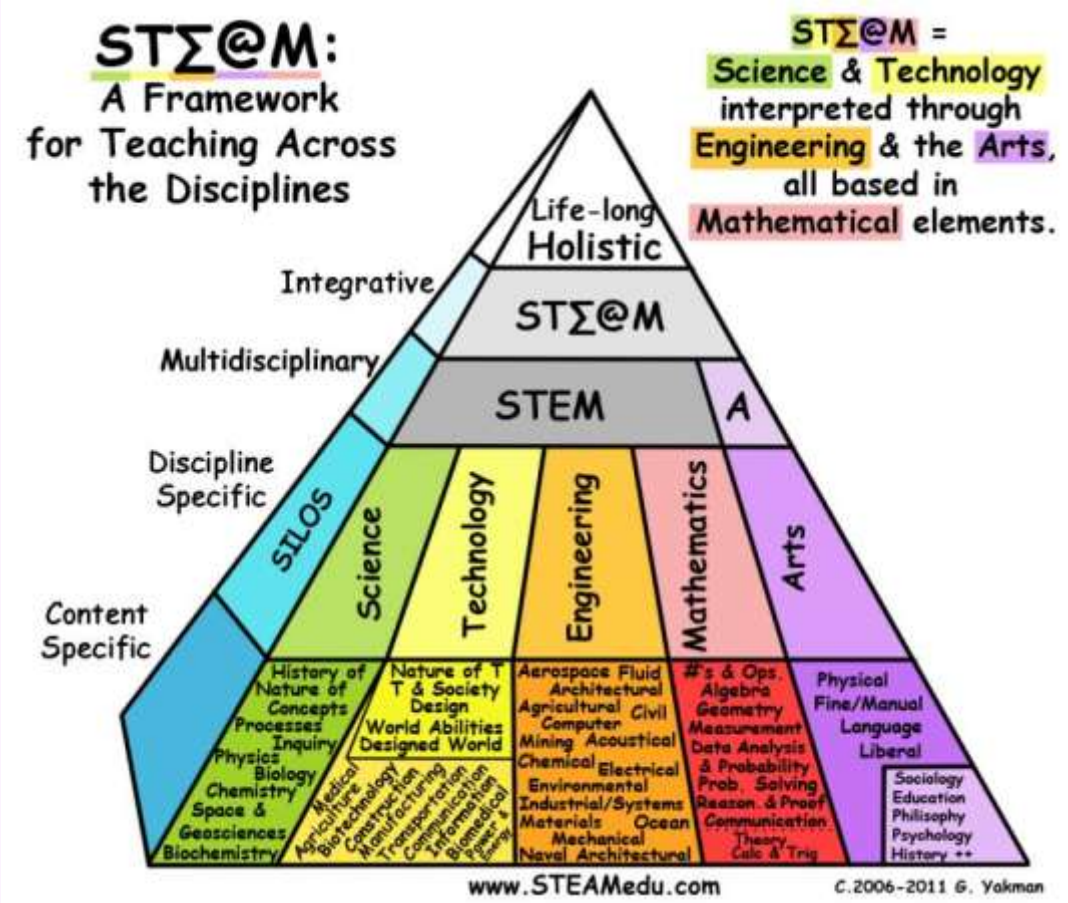
STΣ@M :

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



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

Why STEAM Education

C. 2012

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, Reponders & Innovators

(Barlex, p. 180)

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

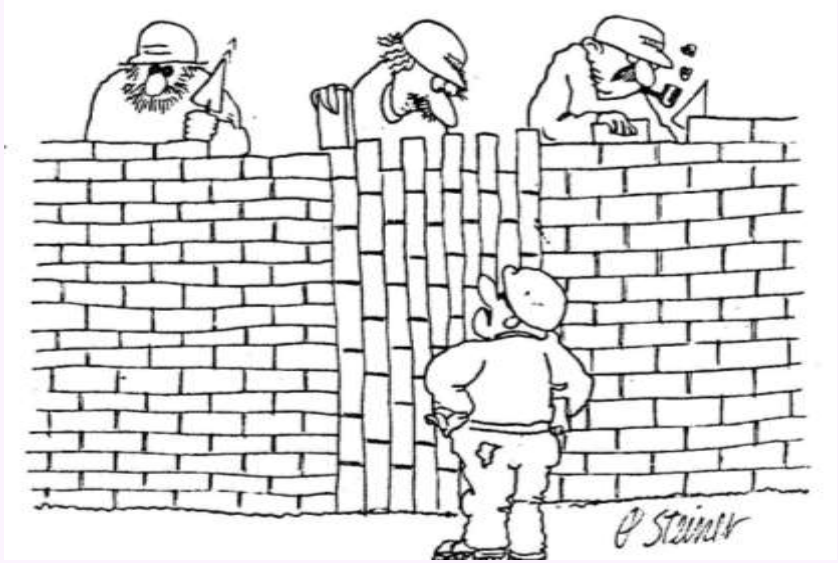
STE@M Education:

- 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**.
- can be done inexpensively!
- promotes deeper understandings and a transference of knowledge

What is technical literacy?

FUNctional literacy

~ being able to keep up with the modern world.



C. 2012

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.

All STEAM Learners:

All participants have ways they are advanced & ways they are challenged

further investigate & coordinate topics & tangents

fully participate, learn & teach others

STEAM teams naturally help balance work for all types of learners

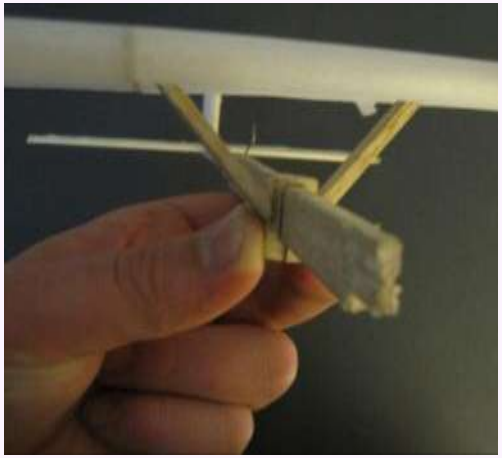
- Learn with each other for more perspectives in discussions and on projects
- Recognition & encouragement of varying skill sets
- More natural respect for other types of learning – multiple intelligences
- Easier for all personality types to have a say
- Impressive extensions (demtia & rehabilitation)
- Team dynamics help solve conflicts
- Group identity and pride – shift from ME to WE

http://media.collegepublisher.com/media/paper871/stills/3c628cd729253-97-1.jpg

Assessing STEAM students by using…

portfolios &
process work

the end product
is only part of it



Where the STEAM concept came from: research & practical results since the beginning of modern ed.

The Giants (Educational Researchers of Mod. Ed.)

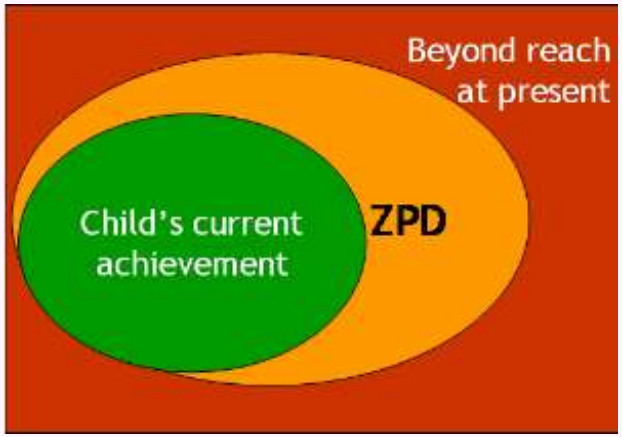
- Significant epistemological similarities among recognized philosophers
- Integration of cognitive theory & educational psychology strengthened

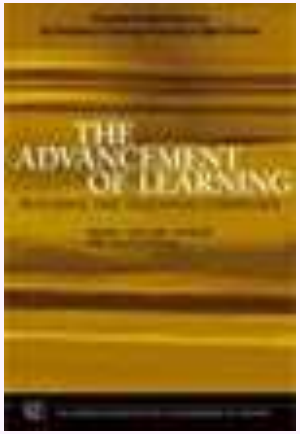
The Silos (Individual Disciplines)

- 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!

Supported by learning theories.

- Constructivism & PBL
- Scaffolding & ZPD
- Gardner's Multiple Intelligences
- Bloom's Taxonomy
- Marzano's Strategies
- CASTL: Teaching Commons



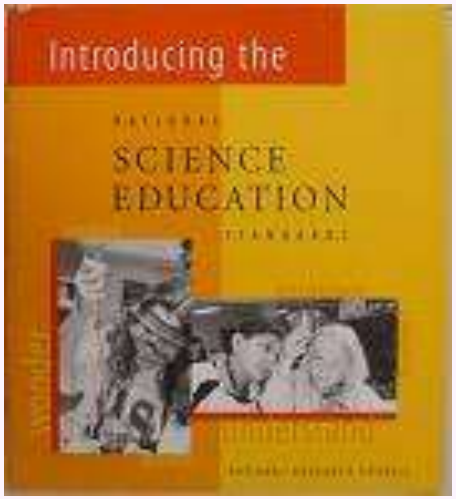


PBL:

Commitment, Engagement, Generativity, Performance, Reflection & Understanding

http://www.learningandteaching.info/learning/graphics/zpd.GIF

http://www.brandeis.edu/best/student_projects/EnvEd/multiple%20intelligences.jpg



STEM to STEAM as a Commons among the Silos

<u>2 significant trends in STEM education</u>;

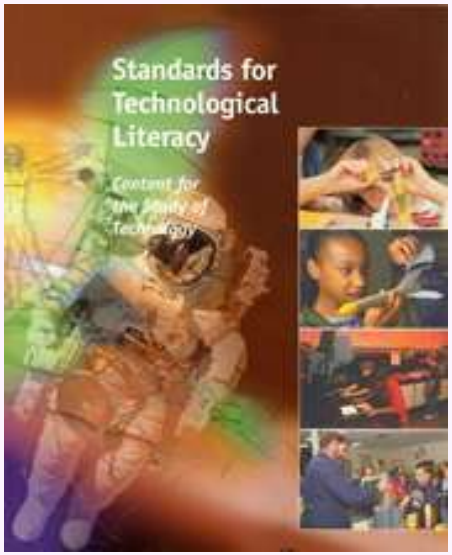
the tradition of advancing within the individual 'silo' fields as a base approach to the subject

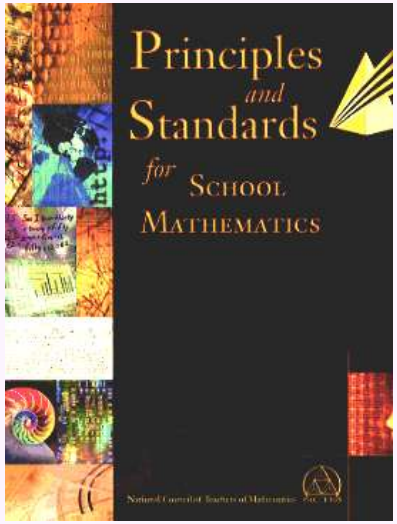
& the newer trend of purposefully integrated fields with one dominant or all blended to reinforce each other

both are needed

Commons among the Silos

Disciplines are essential for depth of knowledge - breadth & context equally important





SCIENCE is…

what exists naturally & how it is effected.

TECHNOLOGY is…

what is human-made.

ENGINEERING is…

R&D (research & development)

C. 2012 Design & Invention

MATH is…

The study of numbers, symbolic relationships,… patterns, shapes, uncertainty & reasoning.

(AAAS, Chap 9)

http://www.abcgallery.com/A/arcimboldo/arcimboldo13.JPG

http://psychology.wichita.edu/vision/illusions.htm

Silo Divisions

SCIENCE

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

– Includes –

History of, Nature of, Concepts, Processes & Inquiry

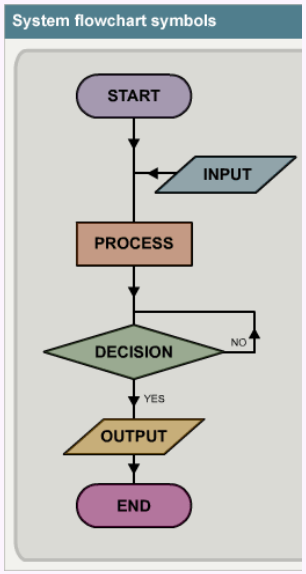
http://www.emotionaltechnologies.com/

TECHNOLOGY

Nature of Technology,
Technology & Society,
Design,
nological World Abilities,
The Designed World

– Includes –

Medical & Bio-Medical,
Agriculture & Biotechnology,
Construction,
Manufacturing,
Information & Communication,
Transportation,
Power & Energy



ENGINEERING

Aerospace,
Architectural,
Agricultural,
Bio-Chemical,
Bio-Medical,
Bio-Technology
Civil,
Computing,
Electrical,
Environmental,
Fluid,
Industrial/Systems,
Mechanical,
Materials,
Mining ,
Naval Architectural,
Nuclear,
Ocean

ARTS

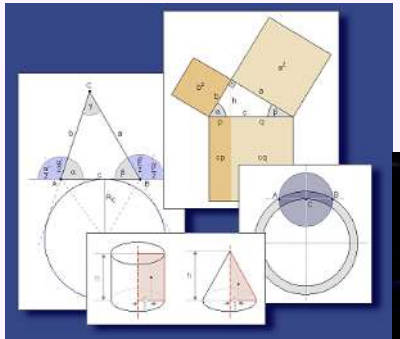
Fine,
Manual,
Language,
Liberal/Social,
Physical

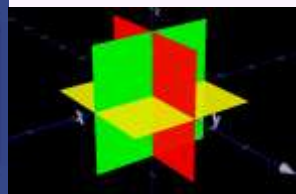
MATHEMATICS

#'s &
Operations,
Algebra,
Geometry,
Measurement,
Data Analysis,
Probability,
Reasoning &
Proof,
Communication,

– Includes –

Trigonometry,
Calculus,
Theory



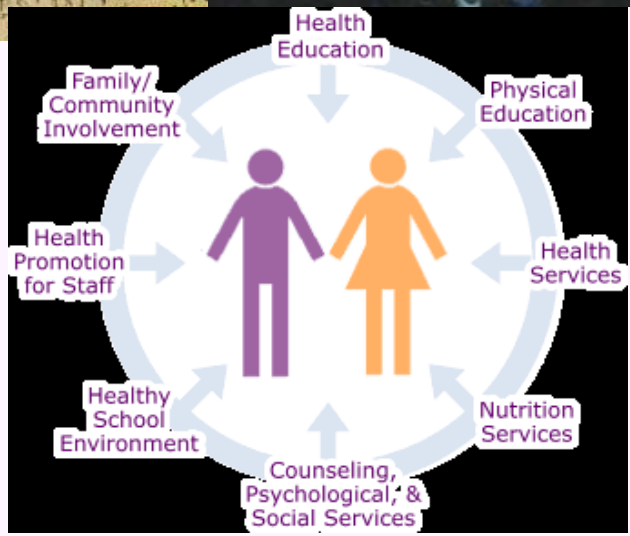


C. 2012

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.

C. 2012

http://upload.wikimedia.org/wikipedia/commons/thumb/8/86/VanDusen_Botanical_Garden_maze.jpg/800px-VanDusen_Botanical_Garden_maze.jpg www.dailyutahchronicle.com http://www.library.uiuc.edu/committee/rpc/images/arcimboldo.jpg http://smedia.vermotion.com/media/13754/resources/SuperCharged%20Pencil.jpg

http://www.soul2soulangelichealing.com/images/wb_SacSymbols.jpg

http://www.blackwell-compass.com/render_image/fragments_linco_compass_intro_image

Language Arts is…

The way that all kinds of communication is used & interpreted.

Includes: written, spoken, sign, body, etc.

If you can't communicate effectively, then how can you prove your conceptions, understandings, designs, ideals, etc.

http://members.shaw.ca/tzeglen/

Social Studies / Civics is…

The study of how society develops with it's attitudes & customs in the past, present & future.

Cornerstone of understanding development, societal constructs, ethics

IF YOUR STUDENTS DON'T UNDERSTAND THE PAST, HOW CAN THEY BE EFFECTIVE IN THE PRESENT TO PREDICT & CREATE THE FUTURE?

STS – Science Technology Society

ANT – Actor Network Theory

Liberal Arts Education

INCLUDES EDUCATION!

Fine & Musical Arts

oldest sustainable cultural pieces – interpreters of S & T use and understanding

Aesthetics

- Engineers notoriously overlook this component
- Critical to learning environments

Music – mnemonics

- Rhythm makes things easier to remember for everyone – and more FUN and meaningful too!
  - Videos – combination of the two

Physical Arts

Connects to athletes

- hands-on field & classroom
- memorize mental 'plays'
- S-T-E-A-M of athletics
- Push oneself to be the best in all areas and respect and promote other things and people in one’s network
- **Success Just Makes Sense** - SJMS

Sustainability x 2

UNIVERSAL

Foster student's awareness of the limits & consequences of resources use & disposal methods in past, present & future

Prove you're saving money AND the environment

- Ultimate Recycling
- Business Donations/Involvement
- Make sellable items
- Fill community needs
- Purchase from responsible companies

PROGRAMS

Foster administrator's & the public's view of how education directly supports US economy & universal sustainability efforts

Prove you courses reinforce core-curricula

- Align with S-M-LA-SS + TE benchmarks
- Promote cross-curricular projects
- Work directly with other teachers
- Put up displays in commons

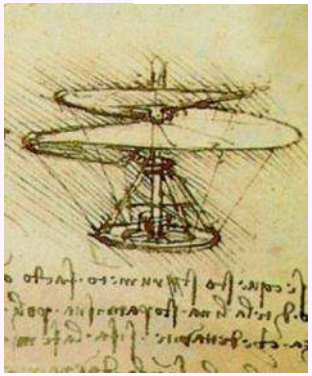
STEAM Interdisciplinary Education - Reasons Why:

- 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 to work in
- 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

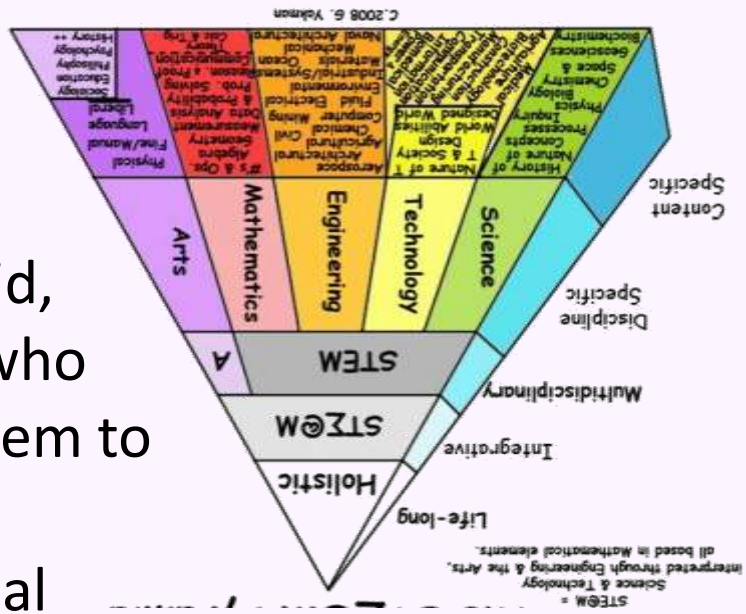
Many programs choose to revolve their STEAM curriculum framework around themes, here are some of the most popular ones worked with so far;

STEAM Themes

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



Example Course



WHAT'S YOUR POINT!

Students start at the point of the pyramid, based on their perspective as a person who learns holistically. The course teaches them to evaluate their skills & interests within a structure for investigating the educational discipline fields to learn more about the breadth & depth of career, hobby & life options.

Exposes students to a large range of skill sets & career choices through projects that include research & development

Students perpetually evaluate their points of interest, experiences & talents – develop portfolios

Evaluate local to global career path opportunities & developments in historical, current & potential contexts

Investigate a spectrum of careers & the related discipline skills needed to pursue them

C. 2012

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 transportations 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 – most closely linked to research and reports on any element – also linked to societal expectations of systems – aesthetic and personal functions
- Math – most closely linked to understanding the equations that make things work – algebra and geometry key

STEAM Team – WINS National Technology/Engineering Contest

S = table of elements – chemistry

T = industry & home production & machinery – element examples

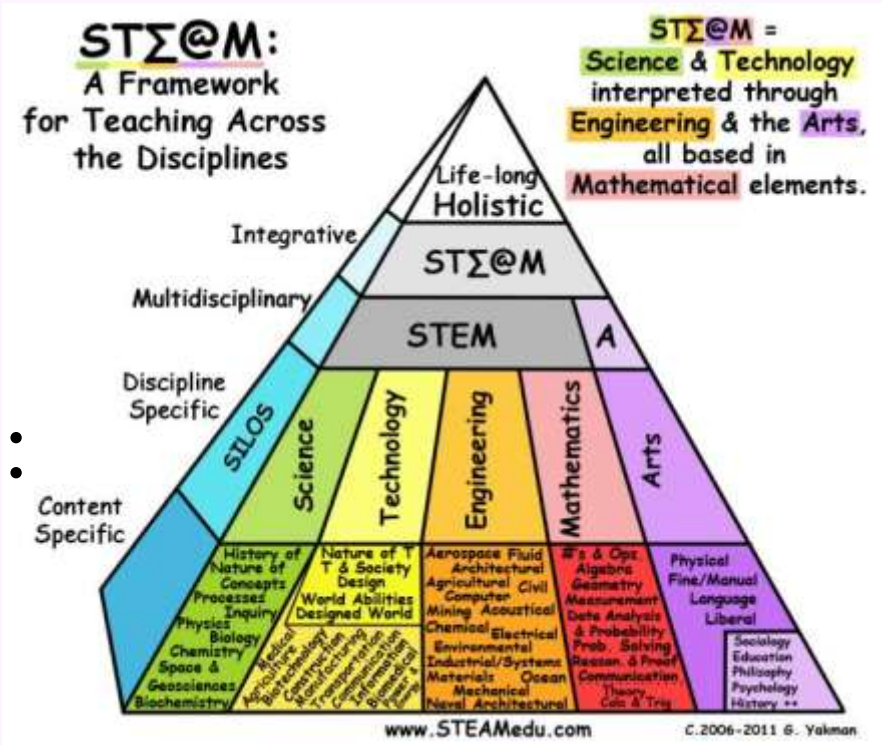
E = what can be done - new combinations – designing

A = aesthetics, drawing, photography, technical and creative writing

M = measuring, drafting,

STΣ@M

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



More info: Materials, Certifications, Program Accreditation & Keynotes:

www.steamedu.com

info@steamedu.com