STEAM Integrated Education: An Overview of What and Why

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

STEAM - BETT
London – 25 January 2017

Georgette Yakman

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

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FUNctional Literacy

Actions are based on understandings,

Life-long education is the key.

Phenomenology – making sense of information personally

Goal of Education

Enabling the future society by:

getting, making, selling, buying, using & disposing of its products and influencing others to do so.

Reinvention

Emerging Markets: Wearables

Envisioning a new world – plans and prototypes

Exploring options – needs, wants & opportunities
EpiSTEMologists Summary

- Disciplines Essential - Depth & Breadth
- Learners Interests - Engagement & Deeper Learning
- ‘Commons’ of Silos vs. ‘Holistic’
- Silos Reinforce each other
- Purposefully planned curricula
- Reality -> Transference
- Learning How to Learn – Adaptable
What's the POINT!?! 

Identify opportunities for your STUDENTS 

- Empower them to learn about all the silos and be most effective in using their talents, exploring their interests and reducing their limitations
TE/STEM/iSTEM Trends & US

iSTEM vs. S-T-E-M

- ‘Silo’
- Integrated
  1 dominant or blended
- PBL & RBL

- 3 Primary STEM Conferences
- All US states have STEM-focused schools and/or Programs


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'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.'

– Dr. Wm. Dugger
Science
the natural universe, where everything comes from.

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

– Includes –

History of, Nature of, Concepts, Processes & Inquiry

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Technology
Tools & innovative devices, uses and enhanced abilities

Nature of Technology, Technology & Society, Design, Technological World Abilities,

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

Engineering
purposeful innovation creation & analysis
Aerospace Architectural
Agricultural Bio-Chemical
Bio-Medical Civil
Bio-Technology
Chemical Computing
Electrical Fluid
Environmental
Industrial/Systems
Mechanical Materials
Mining Nuclear
Naval Architectural
Ocean

MATHS is...
The study of numbers, symbolic relationships,... patterns, shapes, uncertainty and reasoning.

(AAAS, Chap 9)

The Chinese Remainder Theorem

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

Chinese Numbers

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STEM organizes the materials, principles & processes of what & how things can be done, includes why & by whom things are done.

The Arts are SO MUCH MORE than design, they add the who & why to the what & how of STEM
Social Studies

How Society Develops Past, Present & Future
Societal Constructs, Ethics

STS – Science Technology Society

ANT – Actor Network Theory

INCLUDES EDUCATION!

http://members.shaw.ca/tzeglen

Moral Coursework

Gur/Yurt!

Language Arts is...

Communication used & interpreted
Written, spoken, sign, body, symbols, etc.

3 primary types
– Math, Technical & Social

Pictorial vs. Alphabetic Languages
Societal influences - from and on
Communicate effectively
Fine Arts

Oldest Sustainable Cultural Pieces

Interpreters of S & T Aesthetics

E hurt if A not included

4 Arts of Scholar: Qin, Qi, Shu, Hua,
Music, Go Strategy, Calligraphy, Painting

Critical to learning environments

Musical Arts

• Sound meanings - before words
• Mnemonics - social language
• Rhythm – math
• Sound - physics – instruments
• Videos - fine arts + music
Physical Arts

Connects to athletes

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

9-Subject Area
Full Integration
Discovery & Project Learning
Reality-Based
Engaging
Cross-transference of content and context
Inputs, Outputs, Impacts
Materials & Processes - Results

- Undesign – Redesign - Invention
- Electronics & Coding (link H to S)
- Black Boxes – S. Petrina
- 12 – 16 year olds
- Failing = learning

STEAM Teams

• Life-Long Learning
• 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

PBL–RBL & ?’s, Concepts & Rubrics

Essential Questions & Concepts

RBL’s
Open Rubrics – 80/20

Emersion tactics for all subjects

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Cell Dioramas Given Diseases

STEAM & Game of Wei-ch’i / Weiqi

Science – Mediums – wood, stones, bowls,
Technology – Creativity, Strategy, Materials & Processes
Engineering - Cognitive development, Balance, L/R Brain
Math - Patterns, Binary, Calendar, Analytics
Social Studies - Mutual Respect, History of Game
Arts – Poetry, Fine Arts, Design

‘If I had learned go as a young man, I might have been a smart man.’

Sustainability

Limits & consequences of resources

• Cultures & Societies

Save $ & the environment

• Ultimate Recycling
• Businesses
• Sellable items
• Fill community needs
• Purchase responsibly
• Renewable Resources / Energy
• Biorestoration

2,100+ educators, 60+ staff, 39 states, 15 countries
Student Benefits of STEAM

• Connections & Transference — application of skills - design
• Interest, Engagement, Behavior, Realistic Discovery & Innovation – Exploratory
• Balance of education – educator network and student teams & subjects
• Understanding & respect of their abilities – student directed learning
• Adding human side to ‘hard sciences’ – culturally relevant discovery learning
STEAM Conferences

Educator – Dallas 2017

Student - Chicago

Let us help create pathways for **FUNctional** Literacy for All!

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Join our Student Contest!