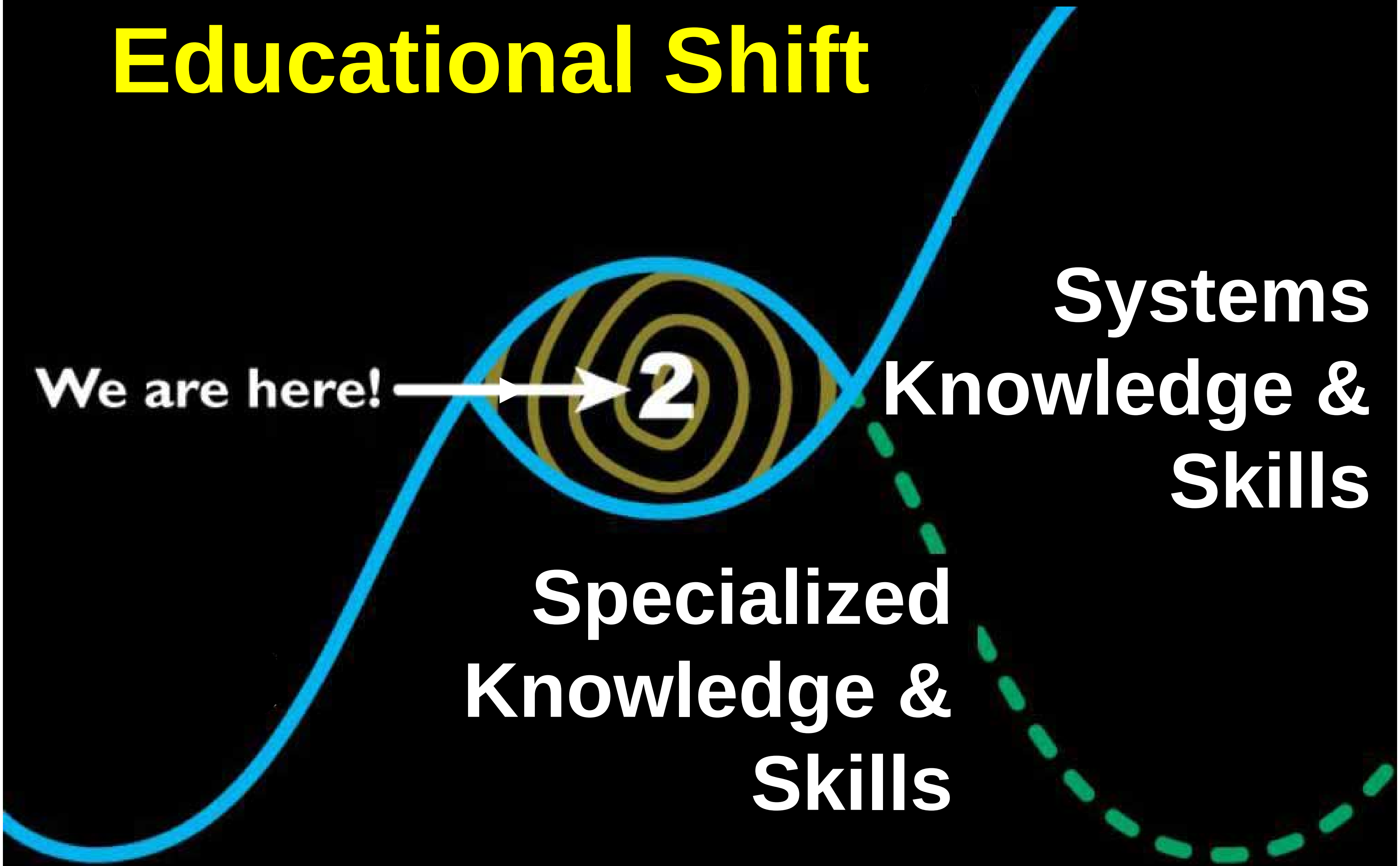
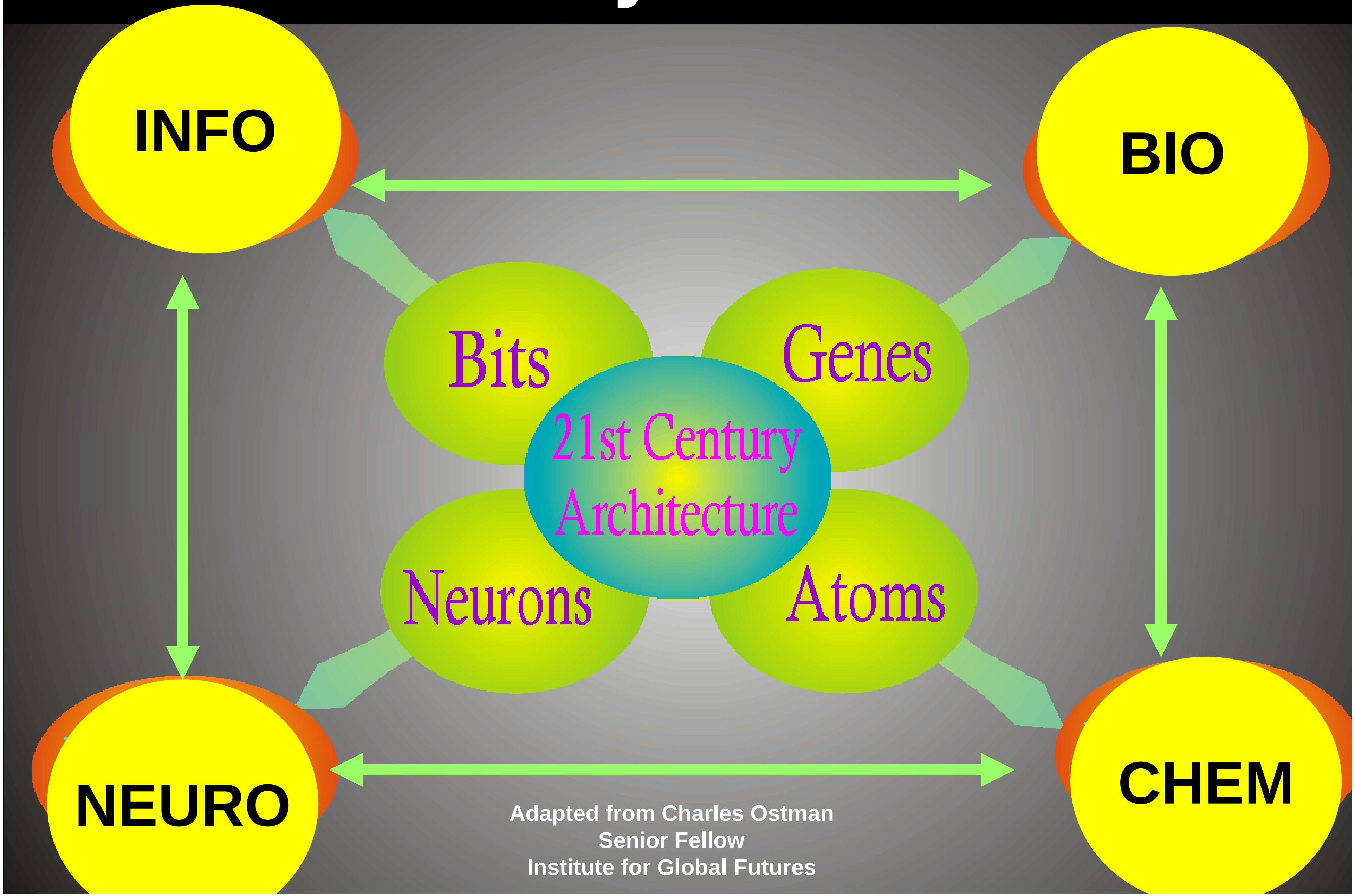
3

Educational Shift

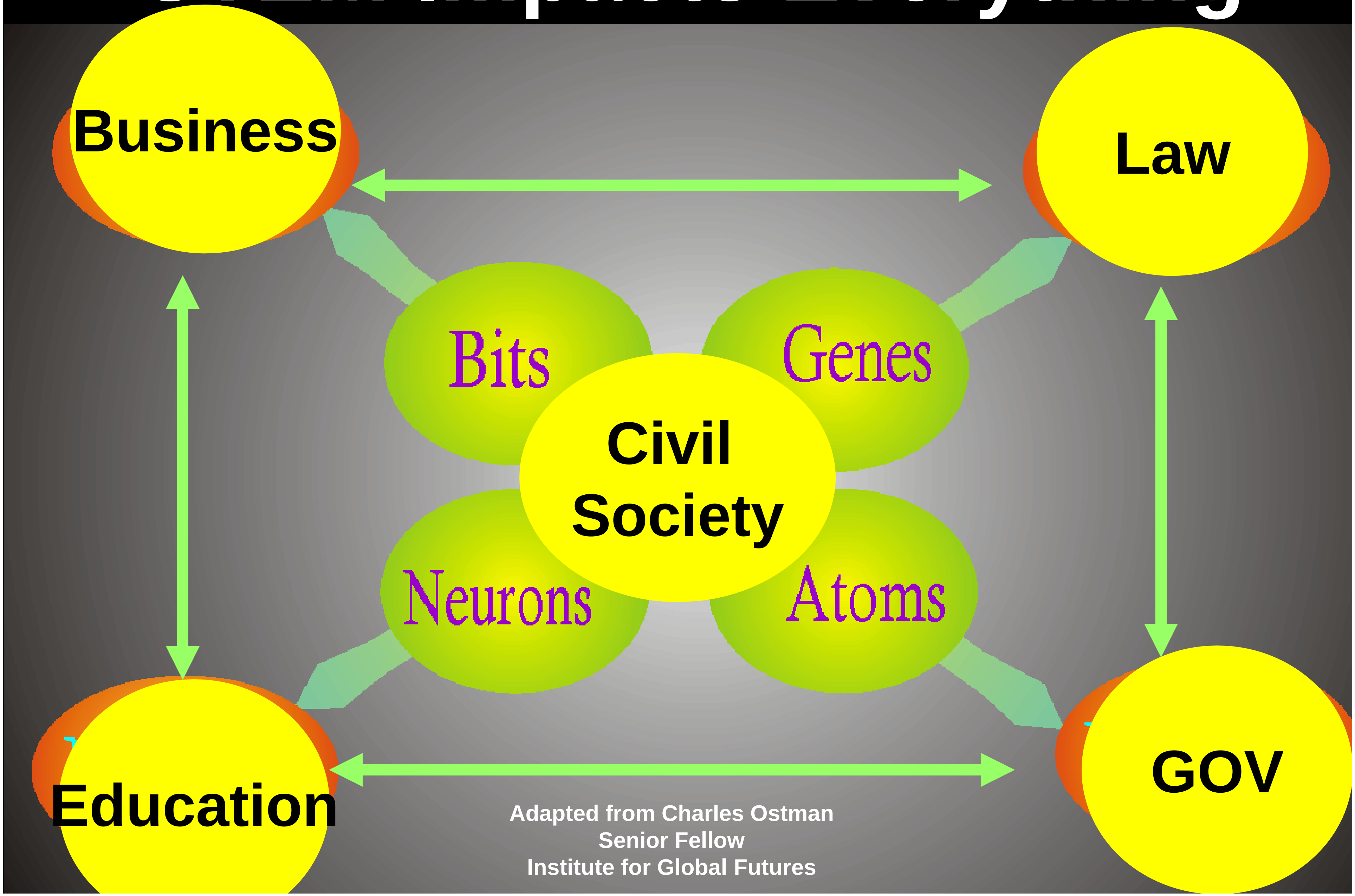


Systems



Adapted from Charles Ostman
Senior Fellow
Institute for Global Futures

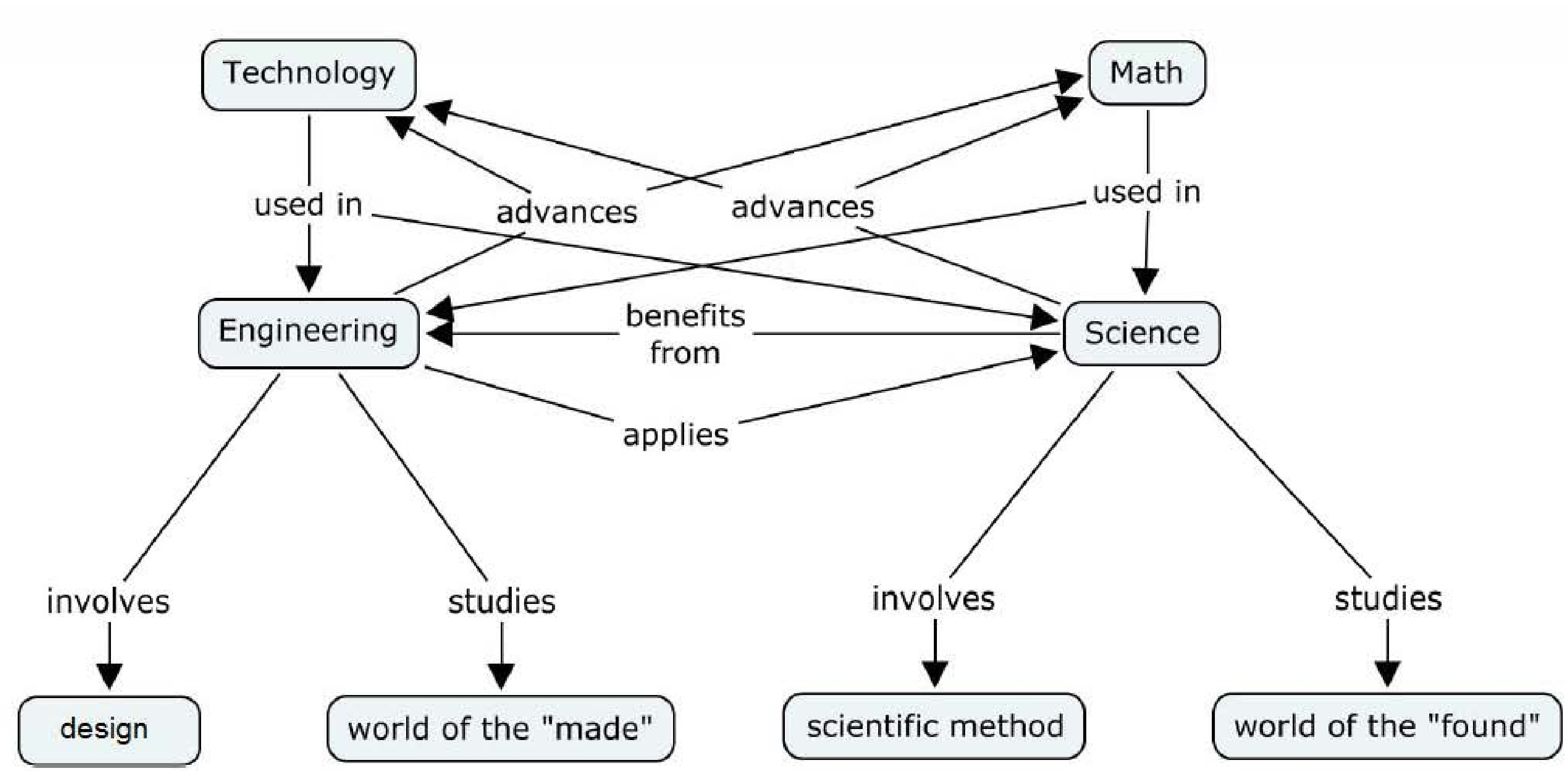
STEM Impacts Everything



Adapted from Charles Ostman
Senior Fellow
Institute for Global Futures

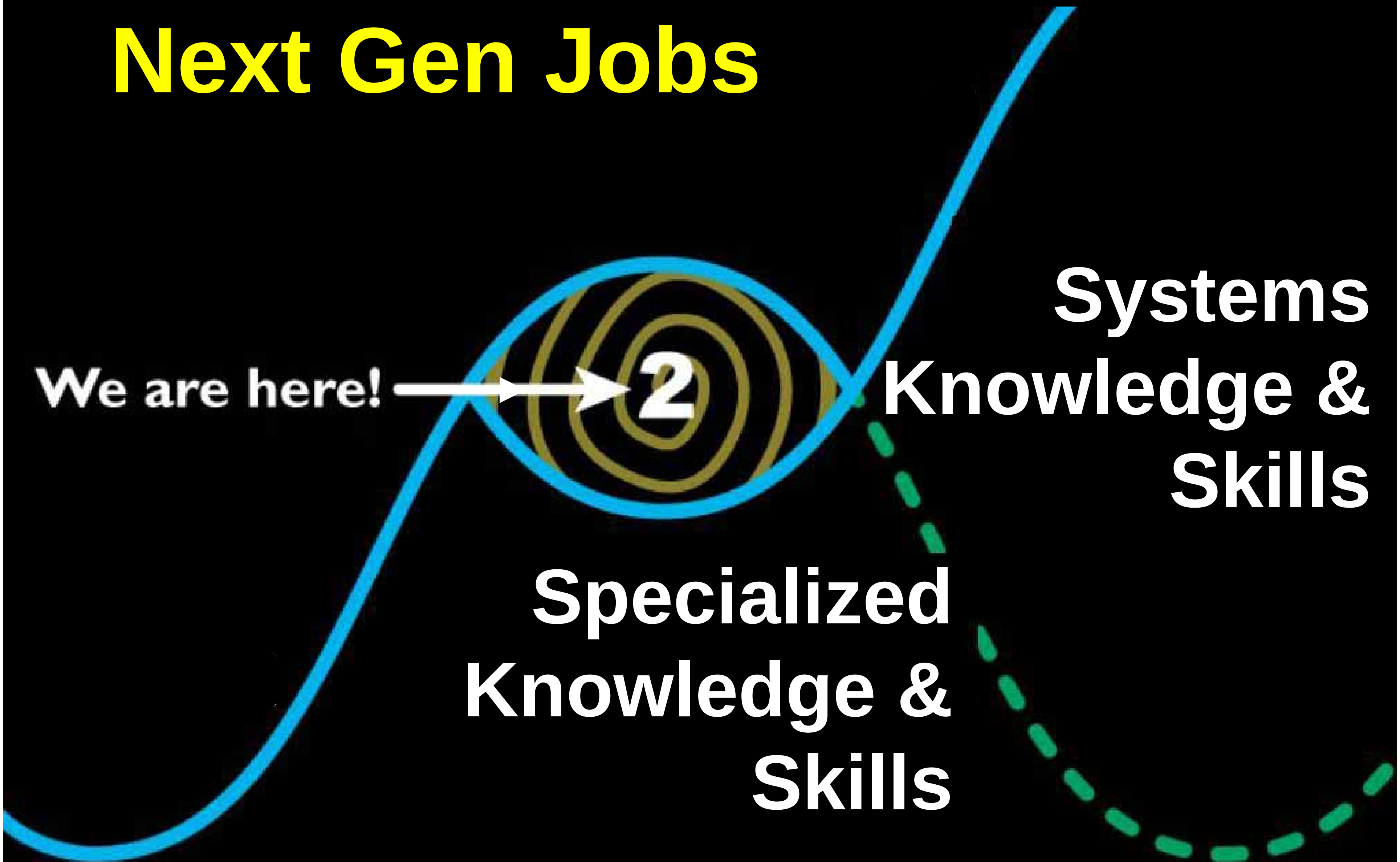
STEM

academic and CTE



Dr. David Thornburg, Center for Professional Development. Adapted by Jim Brazell, VentureRAMP, Inc.

Next Gen Jobs



Footprint of *Next* Generation Schools

TEAMS

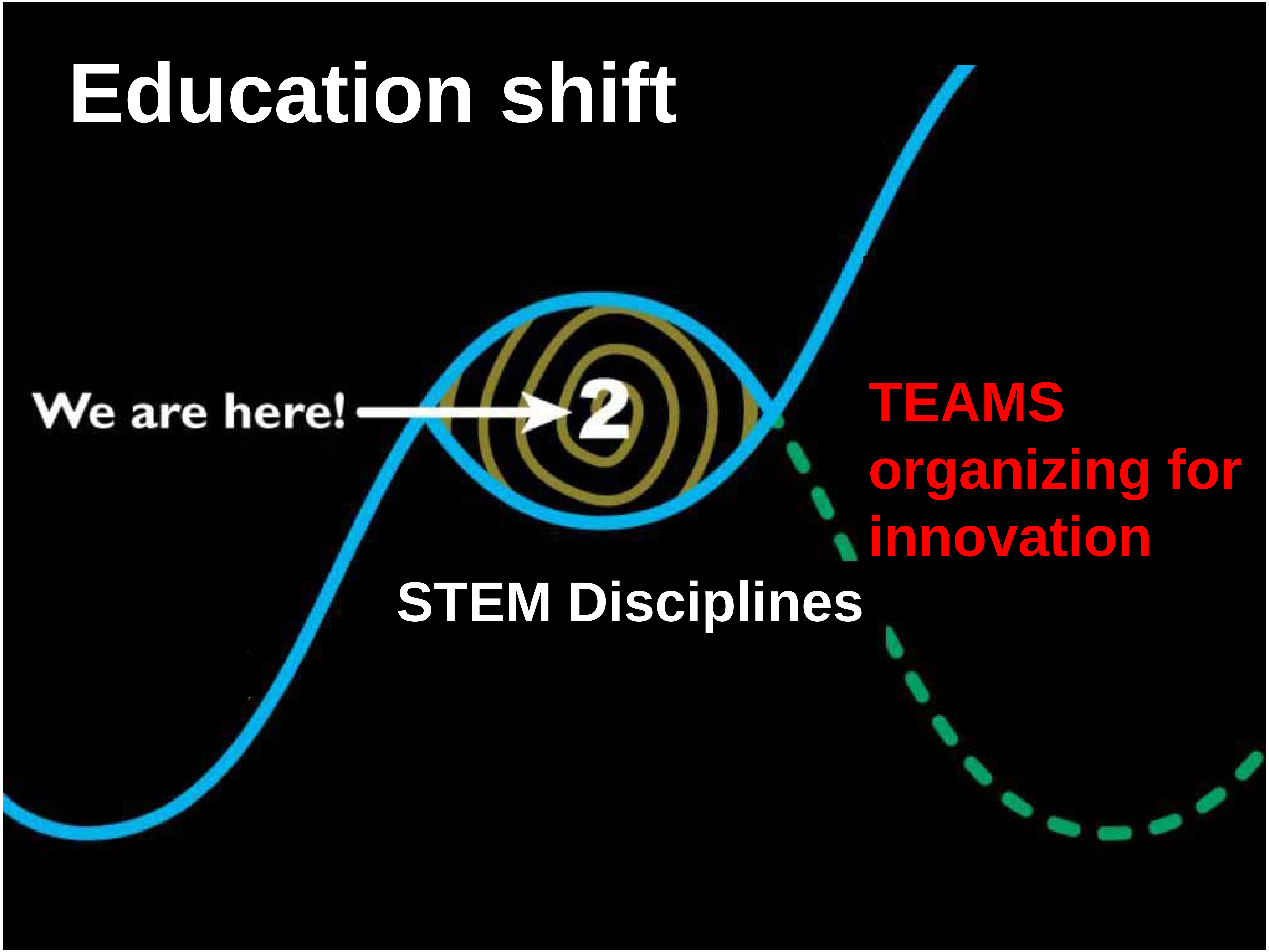
CTE-ARTS-Academic

Mergers

TEAMS Model Schools

Systems of Systems

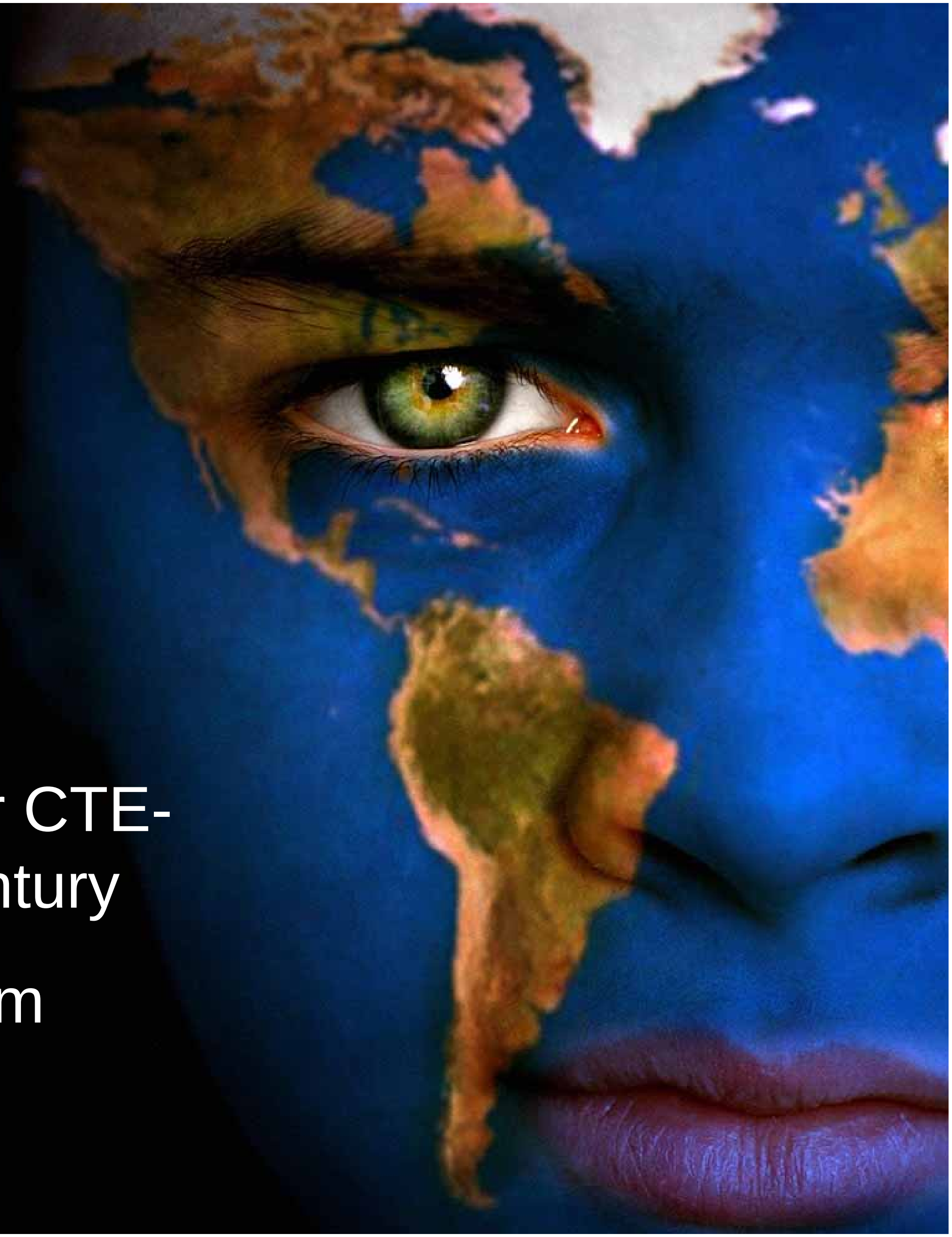
- High degree of faculty interaction across disciplines and grades (systems)
- Integrating CTE, Arts and Academics (systems)
- Learning laboratories and worldly experience with industry-standard tools, processes and problems (systems)
- Emerging P-20 systems (P-20) -- Sequenced, integrated and transferable courses HS to CTC to University (systems)
- Transdisciplinary culture (systems) Context and frame for learning is real world, purpose driven and action oriented.


Education shift
We are here!
2
TEAMS
organizing for
innovation
STEM Disciplines

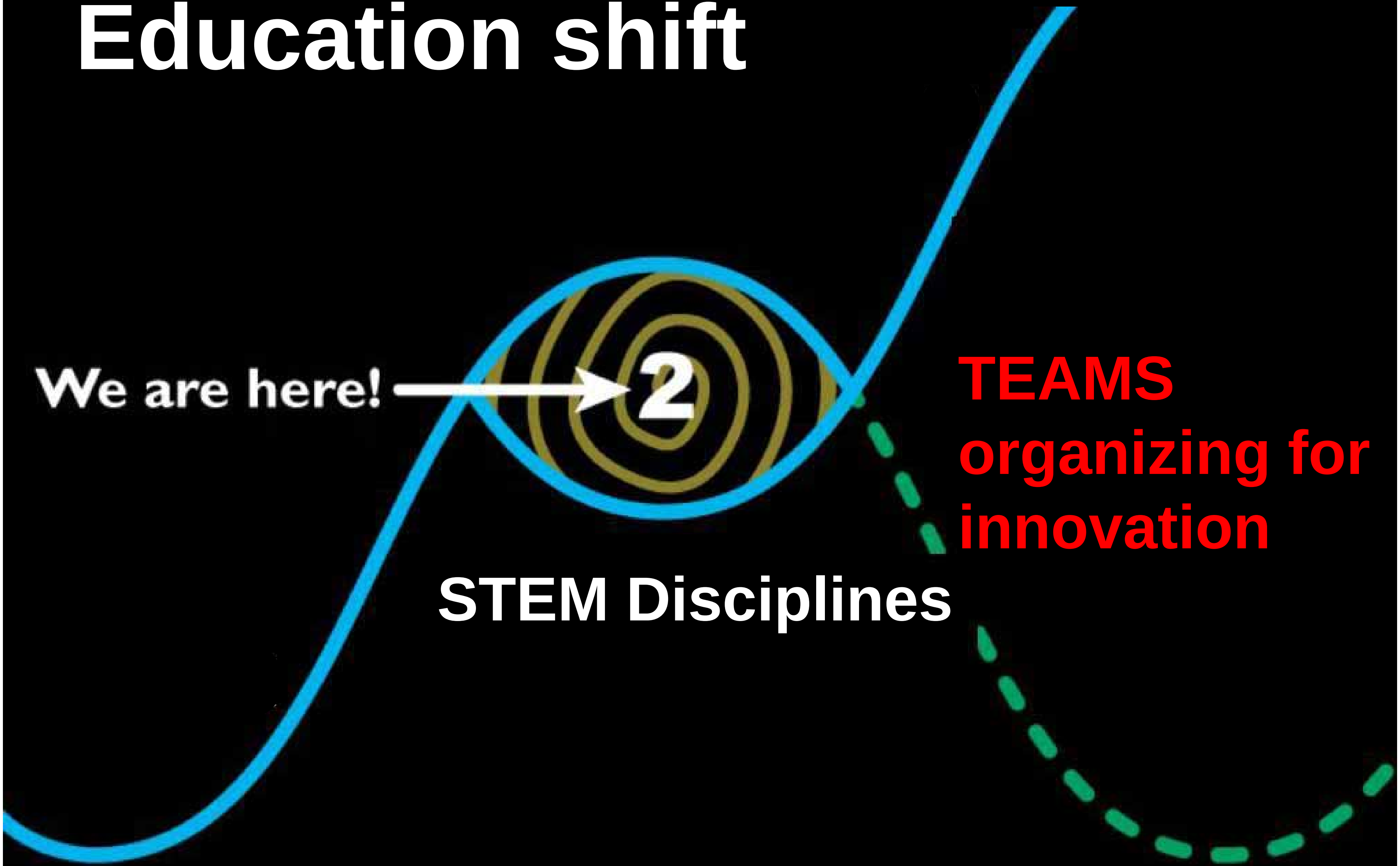
Story of 3R's

A Learning Theory for CTE-STEM & the 21ST Century

A Story of Shifting from STEM to *TEAMS*



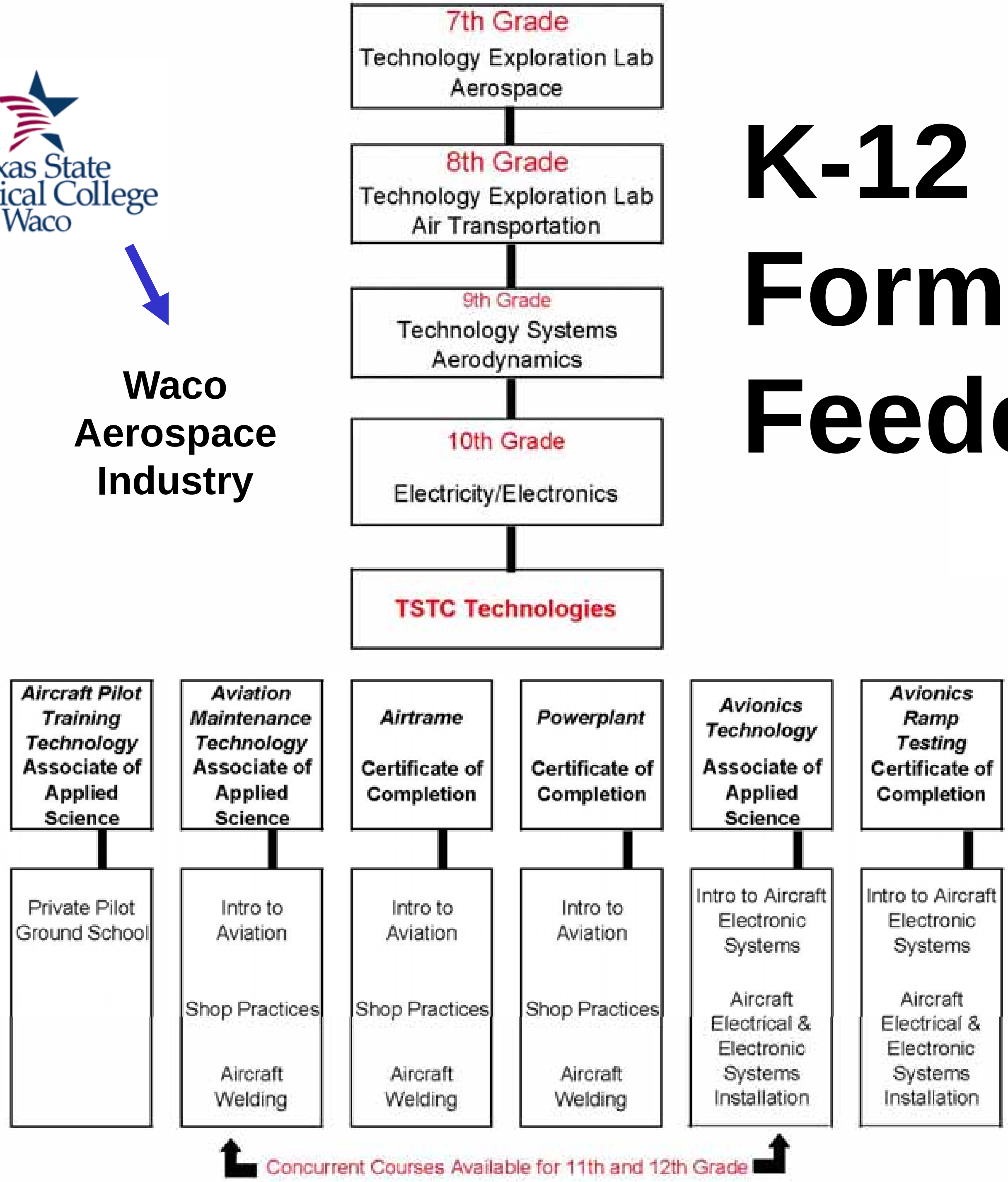
Education shift

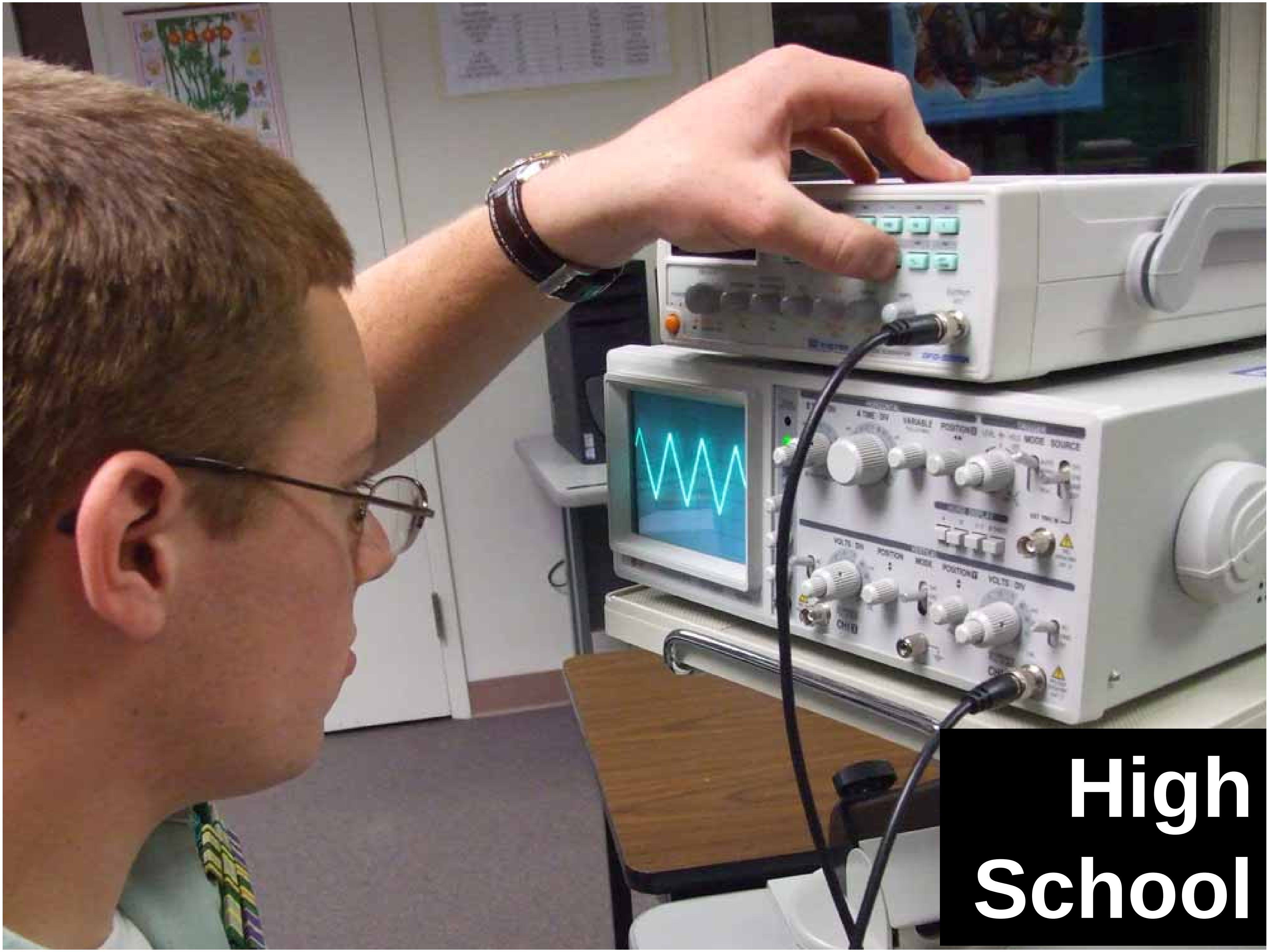


Waco – Texas State Technical College

K-12 Formal Feeders

Waco Aerospace Industry

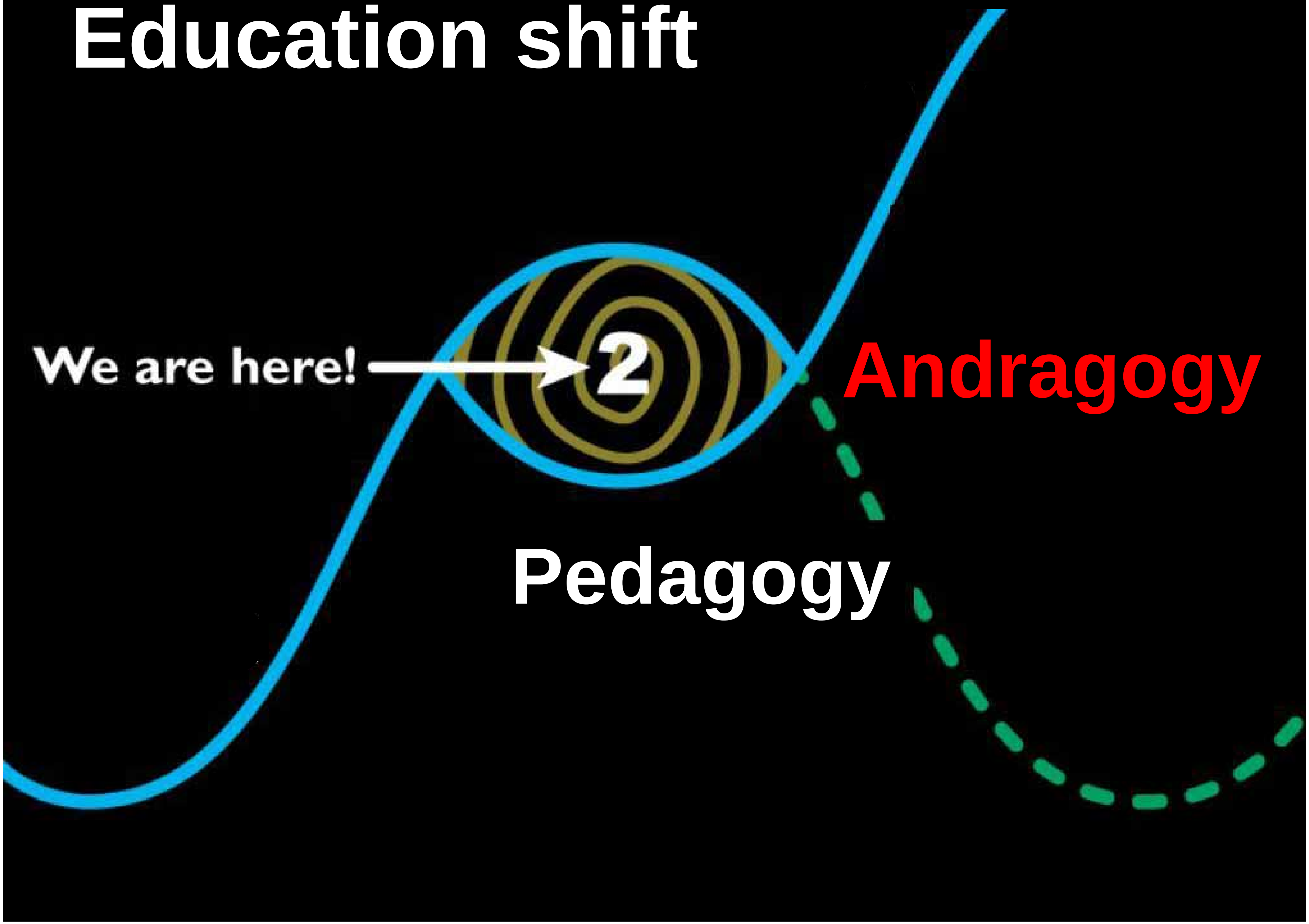



High
School


TSTC


CRAFTSMAN
Free Flight

Education shift



Analytical Integrated Mathematics (AIM)

Target Texas 4x4 – 4th Year of Math
Unify General Academics and CTE
Connect rigor and relevance
High motivation-TEAMS-Competition
Base for industry support in schools
Moving robotics from 10% penetration to 80% in 5 years

§111.37. Analytical Integrated Mathematics (One-credit)

(a) General requirements. The provisions of this section shall be implemented beginning September 1, 2008. Students can be awarded one credit for successful completion of this course. Recommended prerequisite: Algebra II

(b) Introduction.

1) In Analytical Integrated Mathematics, students continue to build on the K-8, Algebra I, Algebra II, and Geometry foundations as they expand their understanding through solving true-to-life problems. Students use algebraic, graphical, geometric, symbolic reasoning, analytical methods, and hands-on experiences to represent mathematical situations, to express generalizations, to model information, to study mathematical concepts and the relationships among them, and solve problems from a variety of work-related disciplines. Students use mathematical methods to model and analyze problems involving hydraulics, pneumatics, design, data acquisition, spatial applications, electrical measurement, manufacturing processes, materials engineering, mechanical drives, plastics, process control systems, quality control, robotics, and computer programming. Students will use mathematical concepts from algebra, geometry, pre-calculus, and trigonometry and connections among these to solve problems from a wide variety of advanced applications. Students use a variety of representations (concrete, pictorial, numerical, symbolic, graphical, and verbal), tools, and technology (including, but not limited to, calculators with graphing capabilities, data collection devices, and computers) to link design applications, modeling techniques and purely mathematical concepts to solve real-life and applied problems.

2) As students do mathematics, they will continually use problem-solving, language and communication, connections within and outside traditional mathematics, and reasoning (justification and proof). Students also use multiple representations, technology, applications and modeling, and numerical fluency in problem-solving contexts.

(c) Knowledge and Skills

(I.1) The student uses mathematically based hydraulics concepts to measure and find pump output, understand pressure vs. cylinder force, and understand flow rate vs. cylinder speed.

The student is expected to:

A. Explain how flow rate can be measured in GPM and LPM.

B. Calculate and record data using actual flow rates from a flow meter chart.

C. Calculate, measure, and illustrate the force output and speed of an extending and retracting cylinder.

D. Determine and depict the stroke time of a cylinder in GPM.

(I.2) The student uses mathematical concepts of structure design to define and describe statics, acquire data, apply concepts of moments and bending stress, and apply concepts of truss design and analysis.

The student is expected to:

A. Calculate a resultant force.

B. Apply the concept of equilibrium to force calculations.

C. Calculate a force using a free-body diagram.

D. Develop an application of strain gauges that determines mathematically and experimentally the force on a structural element.

E. Calculate the magnitude of force applied to a rotational system

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<#>Describe and calculate the extend speed of a hydraulic cylinder in GPM real world situations.¶
<#>Describe and calculate the retract speed of a hydraulic cylinder in GPM to solve problems.¶
Describe and calculate

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Describe how strain gauges determine force on a structural element.

F. Apply the moment equilibrium equation to force calculations.

G. Calculate, measure, and illustrate a bending moment on a beam.

H. Determine and depict the bending stress in a beam.

I. Calculate forces in truss using a six step problem solving method.

J. Apply modulus of elasticity to the deflection of beams.

K. Calculate a beam deflection for a given load.

L. Determine and depict the critical load for buckling using Euler's formula.

M. **Design and apply factors of safety to column and beam design.**

(I.3) The student understands and uses the properties of trigonometry in spatial applications.

The student is expected to:

A. Apply basic trigonometric ratios including sine, cosine, and tangent to spatial problems.

B. Determine the distance and height of remote objects using trigonometry.

(I.4) The student understands and uses the concepts of design processes with multi-view computer aided design (CAD) drawings for facilities layouts, precision part design, process design, computer aided manufacturing (CAM) for lathe, and injection mold design.

The student is expected to:

A. Determine a dimension of an object given a scaled drawing having no dimensions.

B. Compare and contrast the function of production time and production rate.

C. **Calculate, analyze, and apply the proper cycle time and machines required to meet a specified production rate.**

D. Demonstrate the calculationa and application of output shaft speed and torque in a gear train.

E. Create a method to determine the direction of a gear train's output shaft.

F. Design a spur gear train given speed and torque requirements.

G. Calculate and apply the proper spacing between the centers of gears in a gear train to a specified tolerance.

H. Apply positional tolerances to assembled parts.

I. Predict the production cost of a product given process information and a bill of materials.

J. Apply the correct spindle speed for a Computer Aided

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Describe how concrete is measured.
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Determine the additional machines needed to increase production rate of a process.
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Explain how to calculate the output shaft torque of a gear train.
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Explain how to specify
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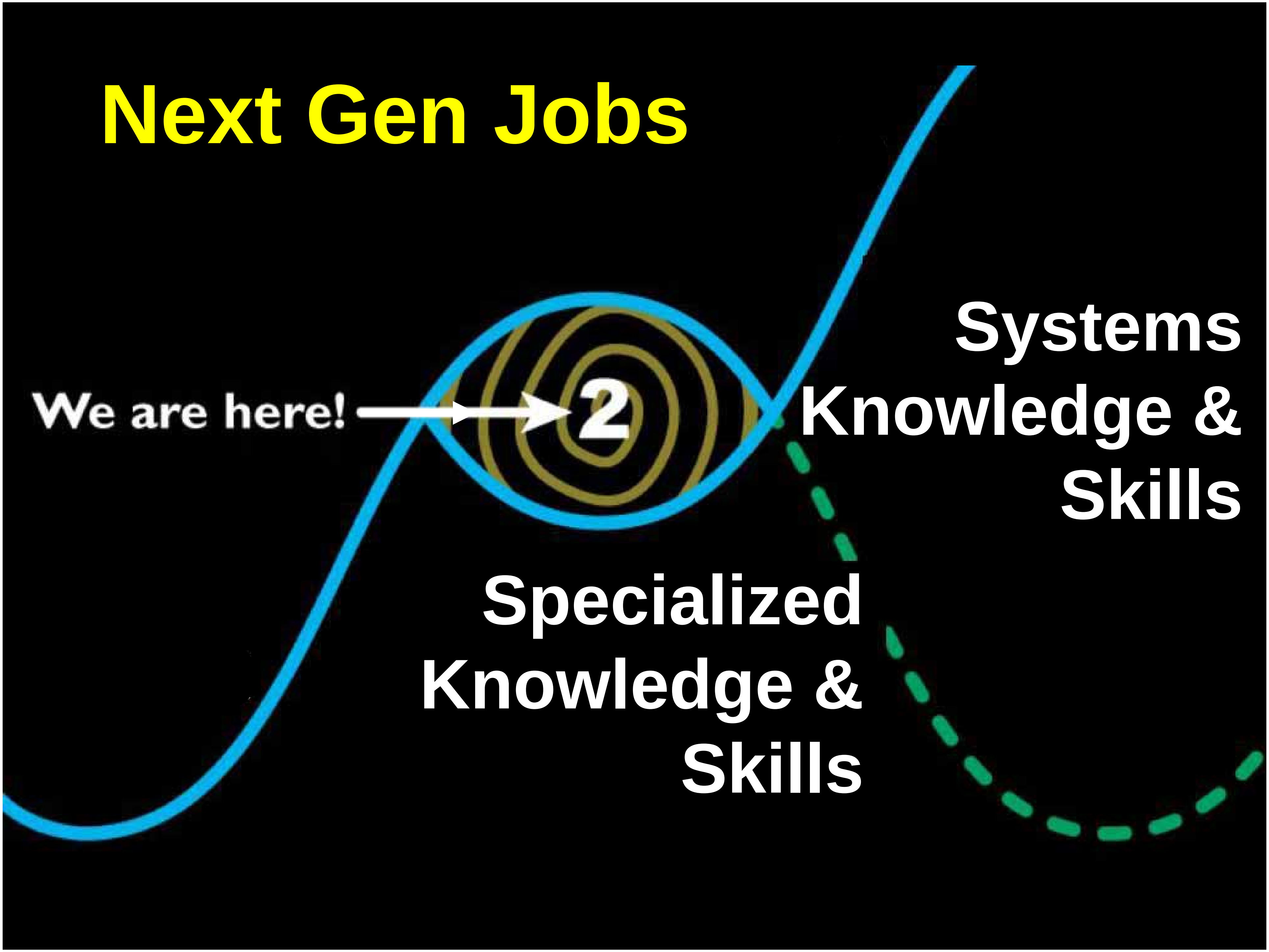
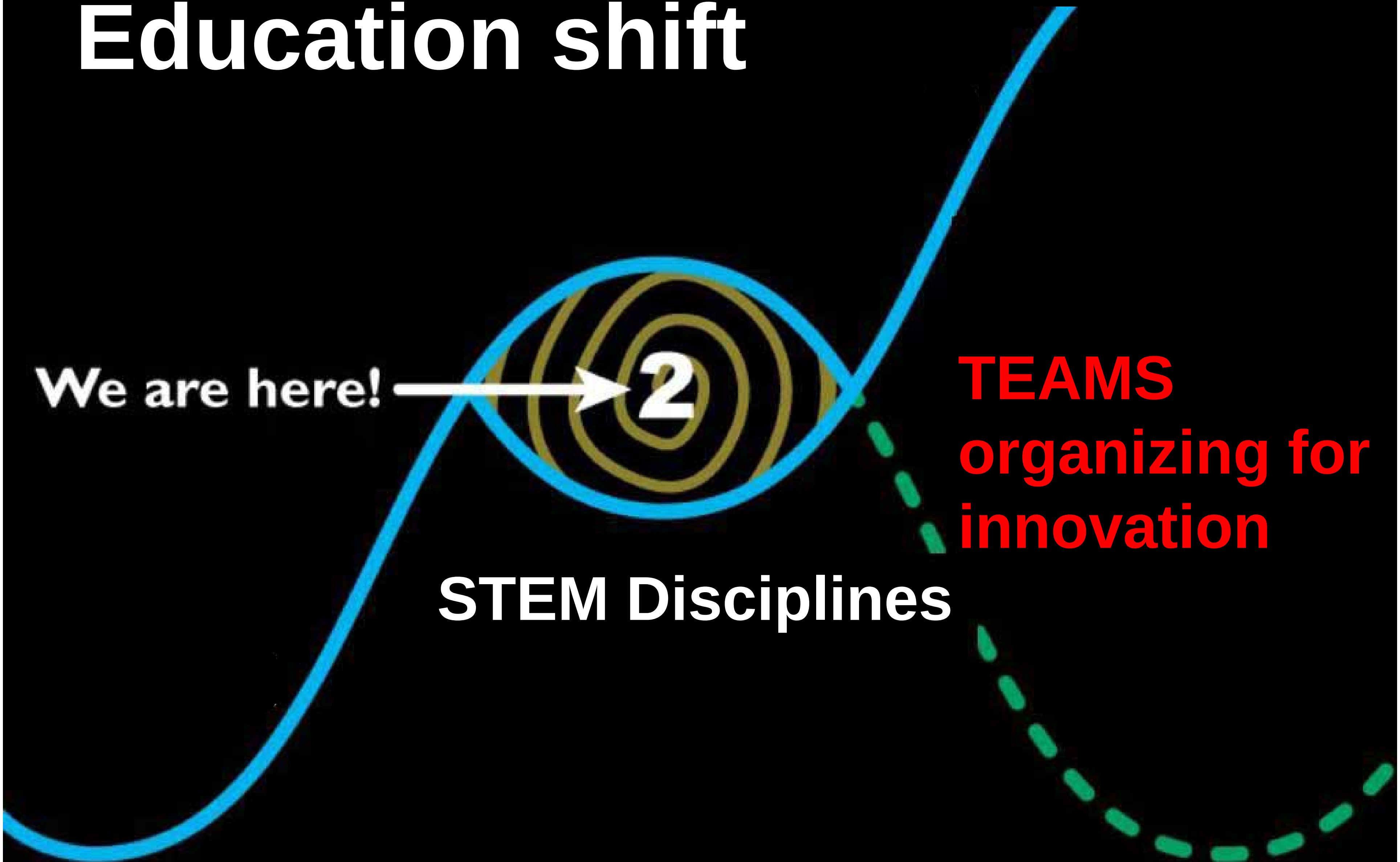
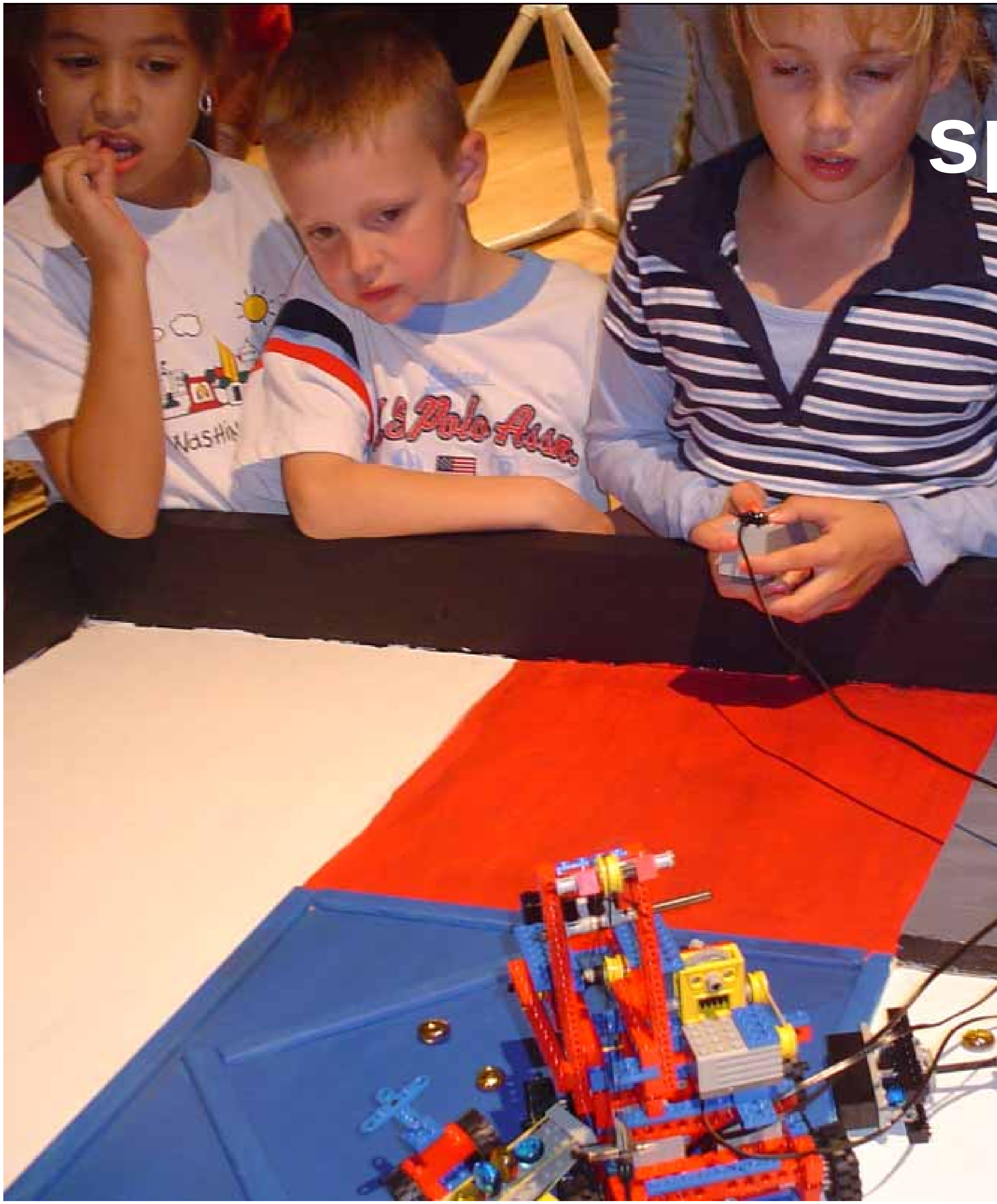

Next Gen Jobs
We are here!
2
Systems Knowledge & Skills
Specialized Knowledge & Skills

spaceTEAMS, San Antonio, TX – ACCD

Education shift



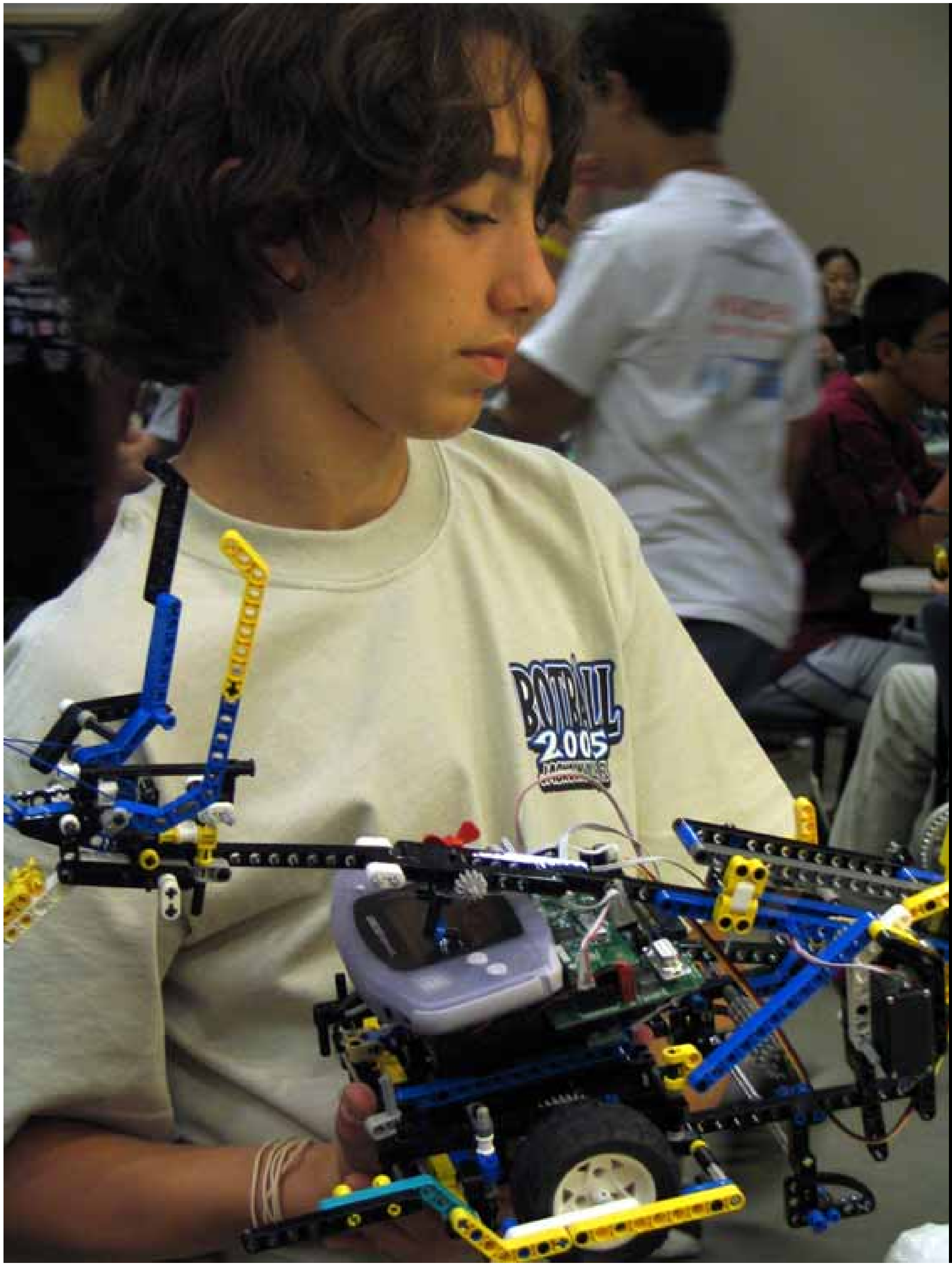


spaceTEAMS

San Antonio,TX

Robot competition plus career and academic exploration and history of science and technology.

Elementary



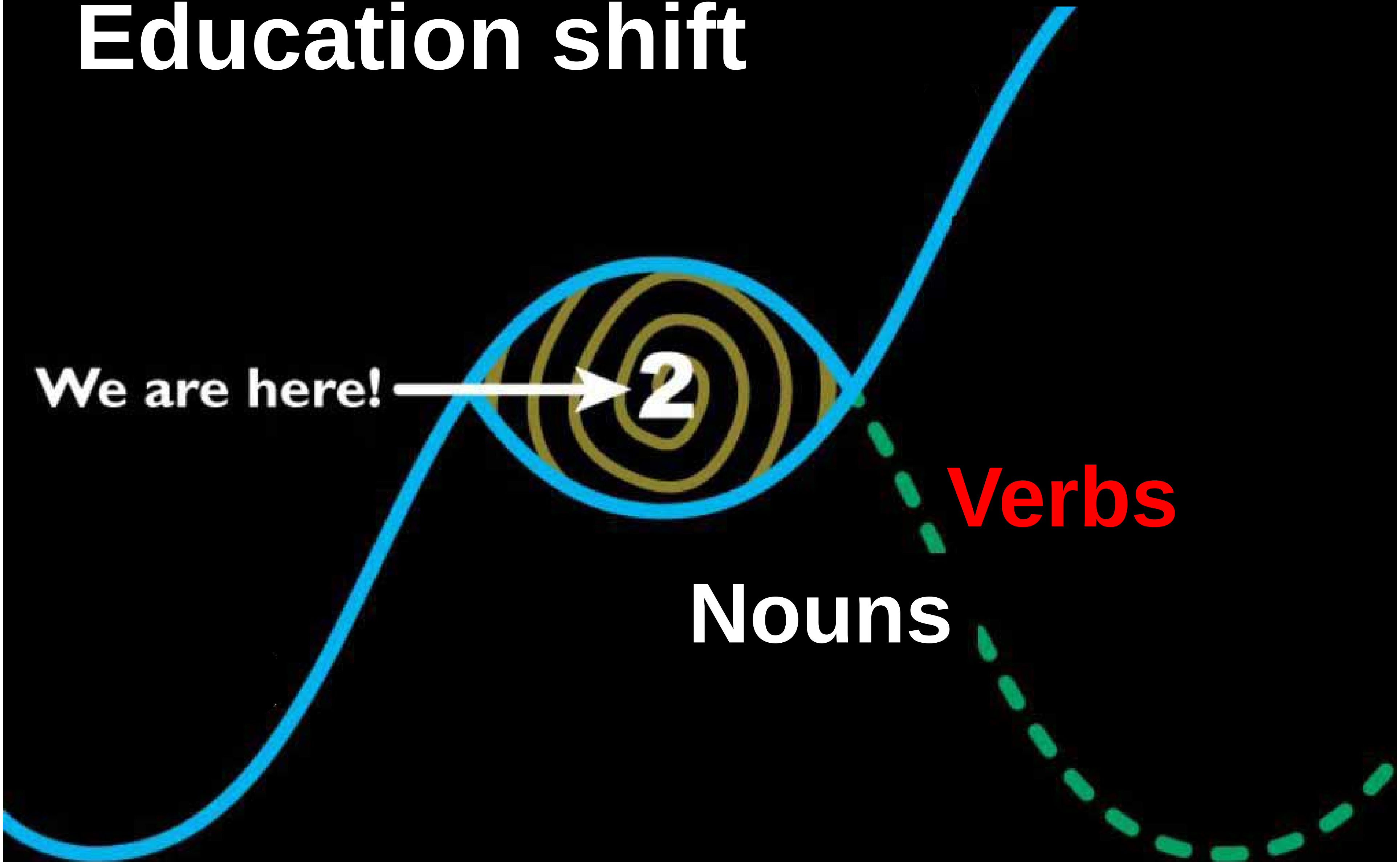
spaceTEAMS

San Antonio,TX

Middle School

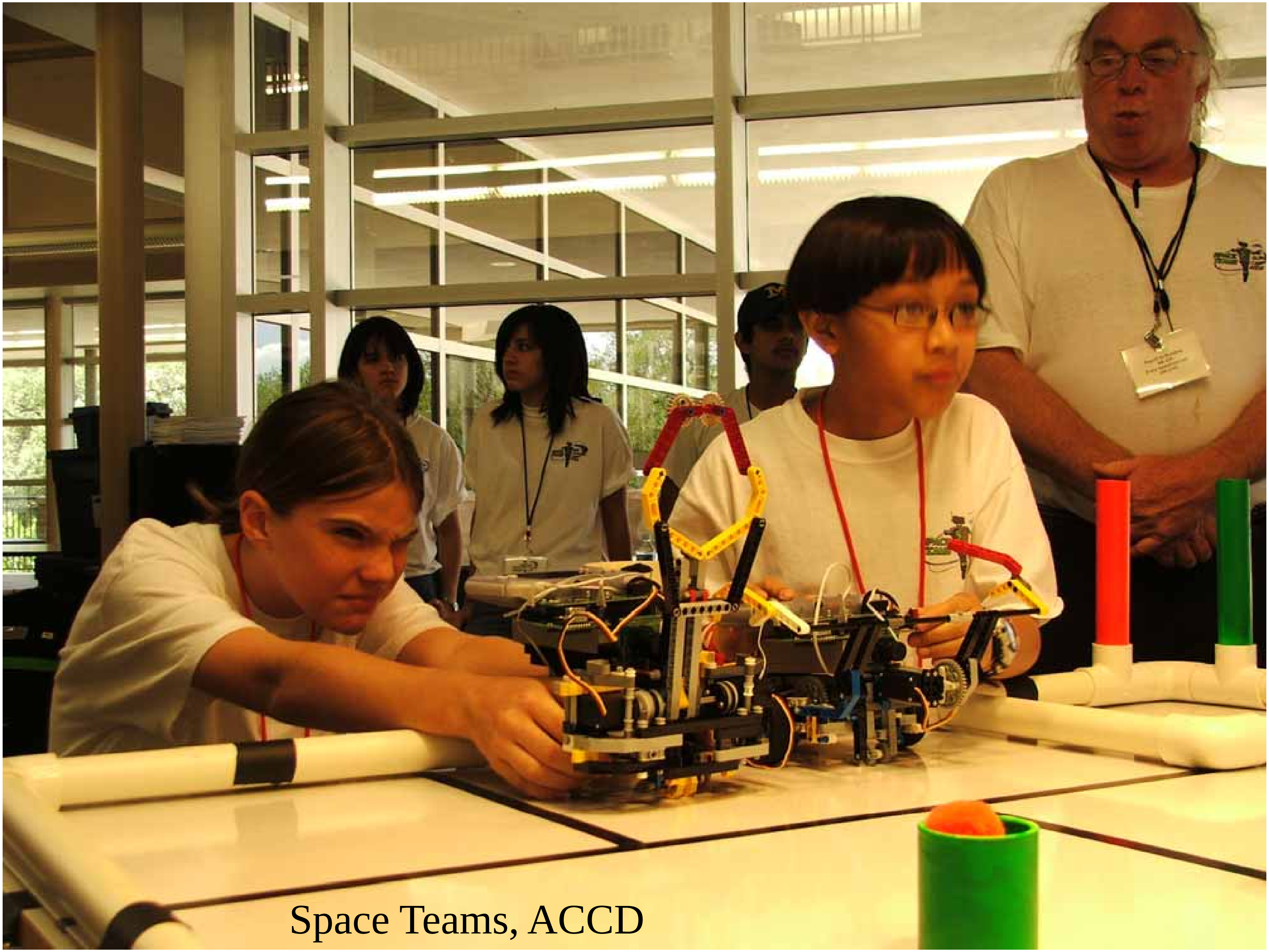
spaceTEAMS & TIER, ACCD

Education shift



Space Teams, ACCD


Space Teams, ACCD



Space Teams, ACCD

Space Teams, ACCD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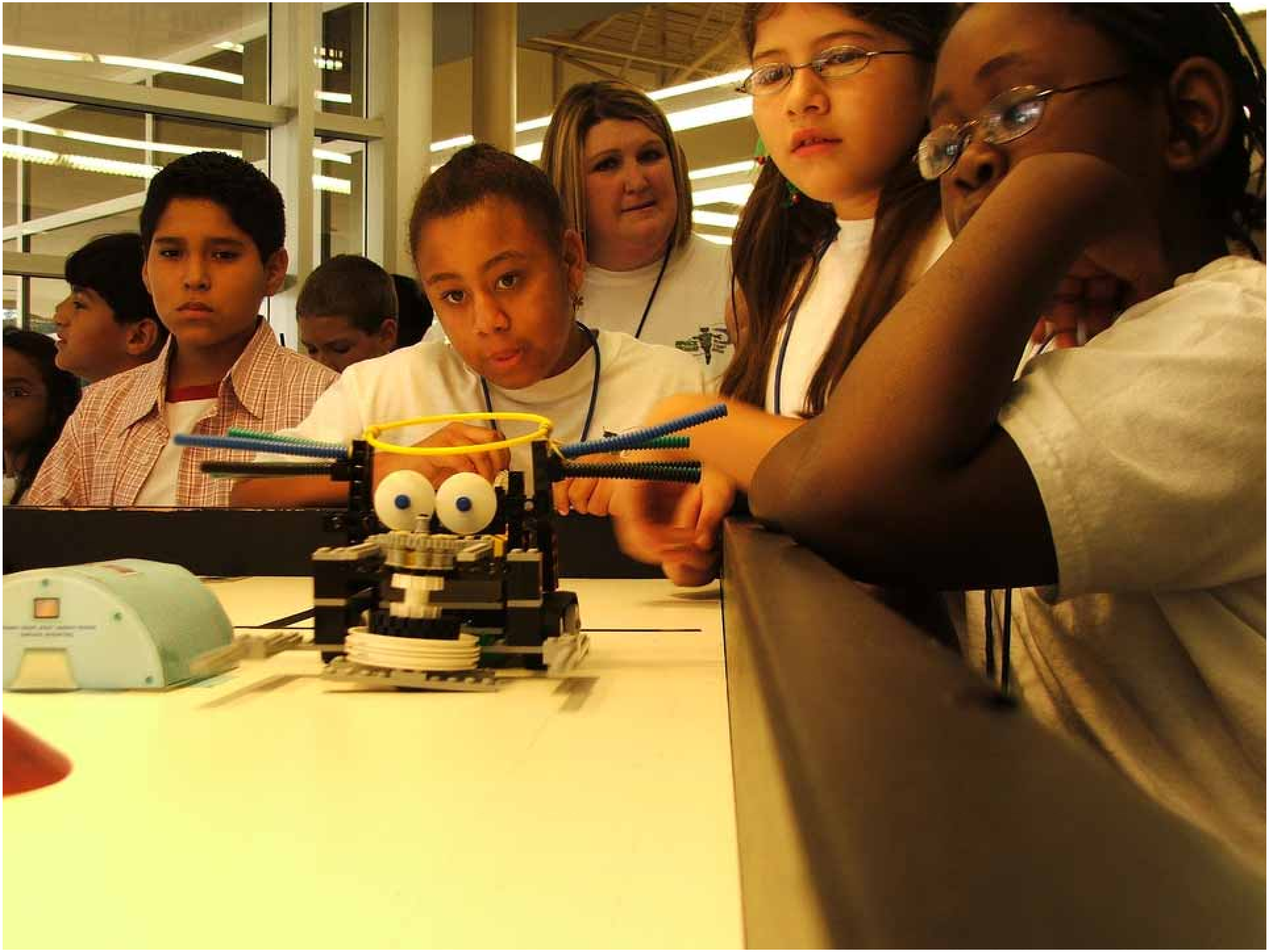

1910

Ed White
San Antonian

First US Astronaut to walk in space

June 3, 1965

Evan Gray
San Antonian

World Robotic Champion

Three time international Champion of the K'Bot K'Nex Robot Competition

2010

"In the spirit of Ed White, children such as Evan Gray make it in the realm of possibilities that the first person to walk on Mars will be from San Antonio."

– Dr. Francis K. Kane, Father of Global Positioning Systems

"spaceTEAMS can return San Antonio to the path of human development and space exploration making it in the realm of possibility that the first person to walk on Mars will be from San Antonio."

--General Robert F. McDermott and Dr. Francis "Duke" Kane

Story of 3R’s

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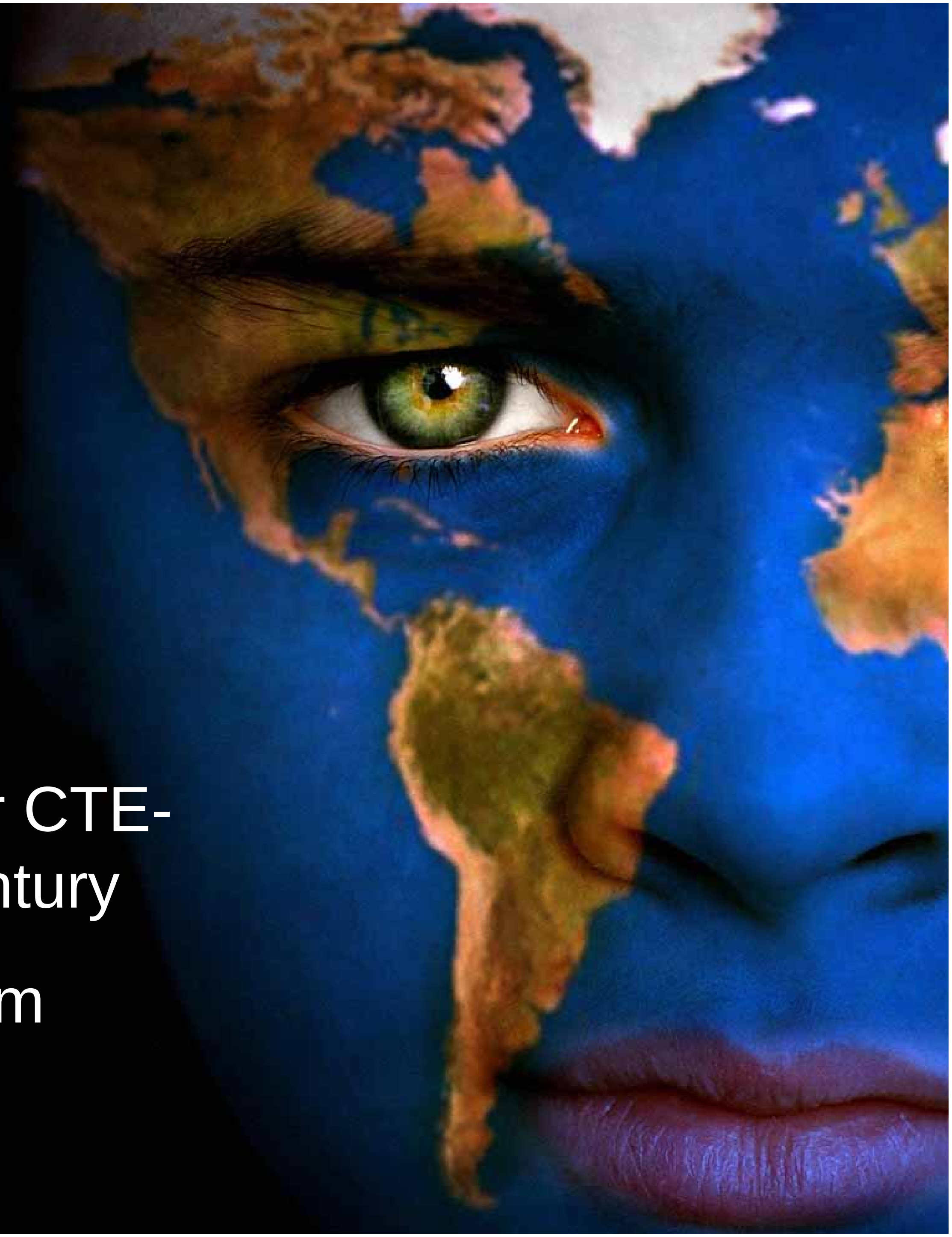


rigor = old knowledge--*the fundamentals*.

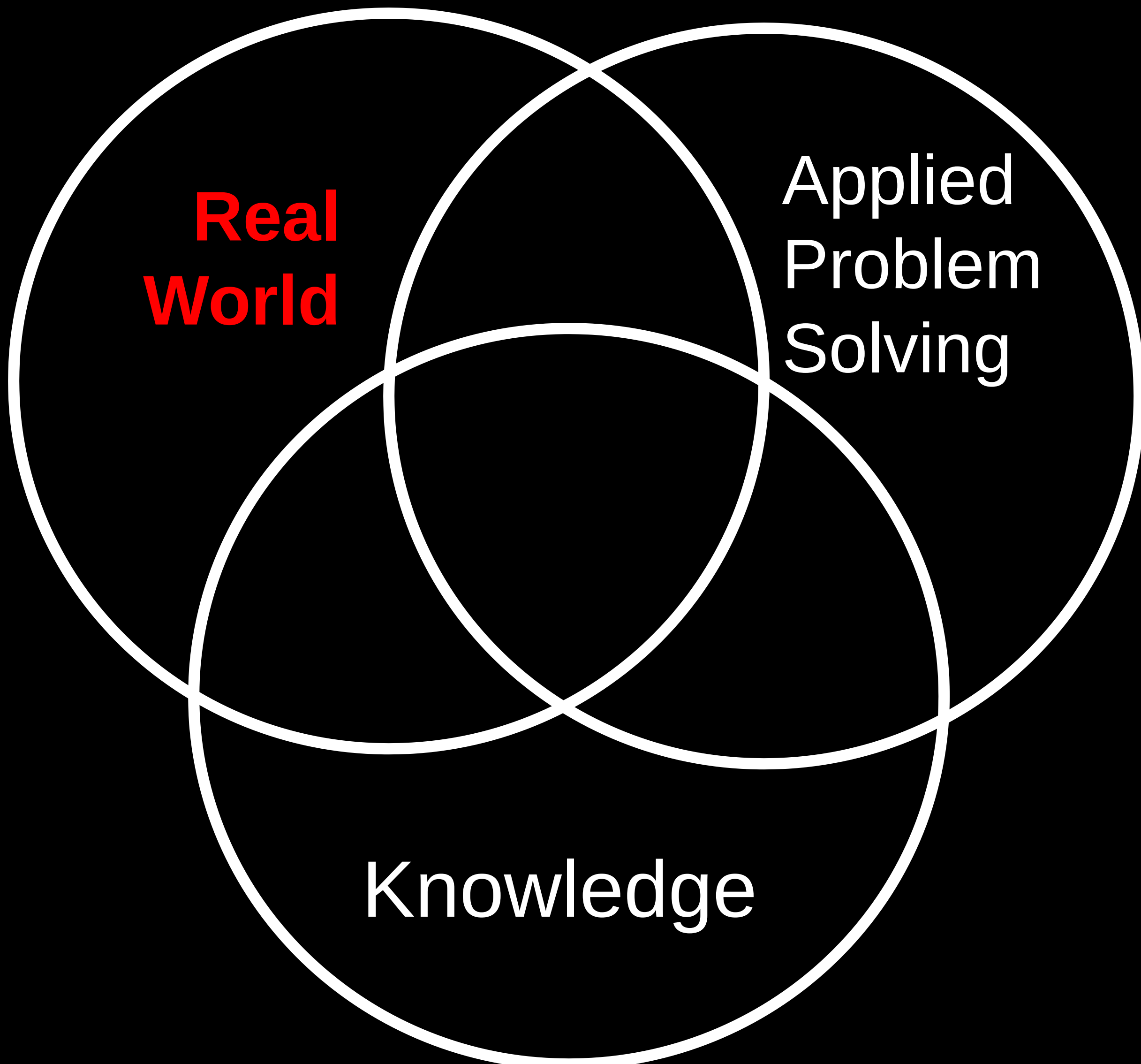
relationships =

systems.

relevance = currency to the *world*—past, present and/or future.

Transdisciplinarity

Unification of theory, action and the world.



The Future is Here: Learning in Action – Praxis, A Theory for CTE & 21st Century Learning

How the future works today™

JIM BRAZELL
jim.brazell@ventureramp.com