Online Resources to Support Academic & CTE Integration

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Academic & Vocational Integration

Defined:

"to provide vocational education in programs that integrate academic and vocational education . . . so that students achieve both academic and occupational competencies." **Perkins Legislation**

Richer, better sequenced curricula that enhance academic and generic skills needed by all workers.

Increased collaboration and coordination among academic and vocational teachers to create a more unified schooling experience.

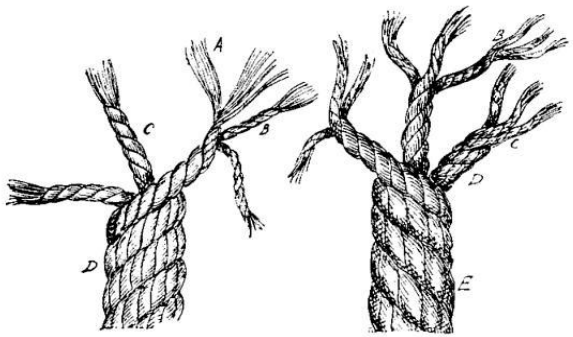


FIG. 1.—Construction of rope.

Why Integration?

NCLB

"….any program that is included in the school wide program, which may include - ……"(cc) the integration of vocational and technical education programs; ….."

Cherry Commission

"All students today must be equipped with rigorous academic preparation and high performance job skills".

Perkins IV

"promote the development of services and activities that integrate rigorous and challenging academic and career and technical instruction…".

Reasons to Integrate

- More highly educated workforce contributes to a healthy economy
- More skills = increased adaptability as society changes.
- Prevention of curriculum fragmentation
- Stimulates higher levels of integrated thinking
- Able to view complex issues from a broader perspective
- Time savings by overlapping academic and vocational content
- Integration is consistent with brain research and learning theory
- Increased graduation requirements

Reasons for Integration

- CTE has moved beyond working primarily with the hands only. All occupations required the use of hands and the head.

Research: Building Academic Skills in Context: Testing the Value of Enhanced Math Learning in CTE

An experimental study tested a model for enhancing mathematics instruction in five high school career and technical education (CTE) programs (agriculture, auto technology, business/ marketing, health, and information technology). The experimental teachers worked with math teachers in communities of practice to develop CTE instructional activities that integrated more mathematics into the occupational curriculum.

After 1 year of the math-enhanced CTE lessons averaging 10% of class time, students in the experimental classrooms performed significantly better on 2 tests of math ability–the TerraNova and ACCUPLACER®–without any negative impact on measures of occupational/technical knowledge.

Building Academic Skills in Context: Testing the Value of Enhanced Math Learning in CTE", was completed in 2005

Research: Building Academic Skills in Context: Testing the Value of Enhanced Math Learning in CTE Continued:

- After 1 year of exposure to the math-enhanced lessons, the students in the experimental classrooms performed significantly better on the TerraNova and ACCUPLACER tests of math ability.

- They also performed better on WorkKeys, though the difference was not significant.

- Furthermore, there were no differences in measures of occupational or technical knowledge—meaning that CTE students' math skills increased without detracting from the content skills learned in their CTE courses.

- ..the improved math performance of the experimental students was produced by assembling teams of teachers in a single occupational area and providing them with a process and a pedagogy through which they could successfully enhance the math in their own curricula. Essential to the model was the ongoing teamwork between CTE instructors and their math partners in an authentic community of practice.

Making Wise Decisions!

Resources to Support Integration

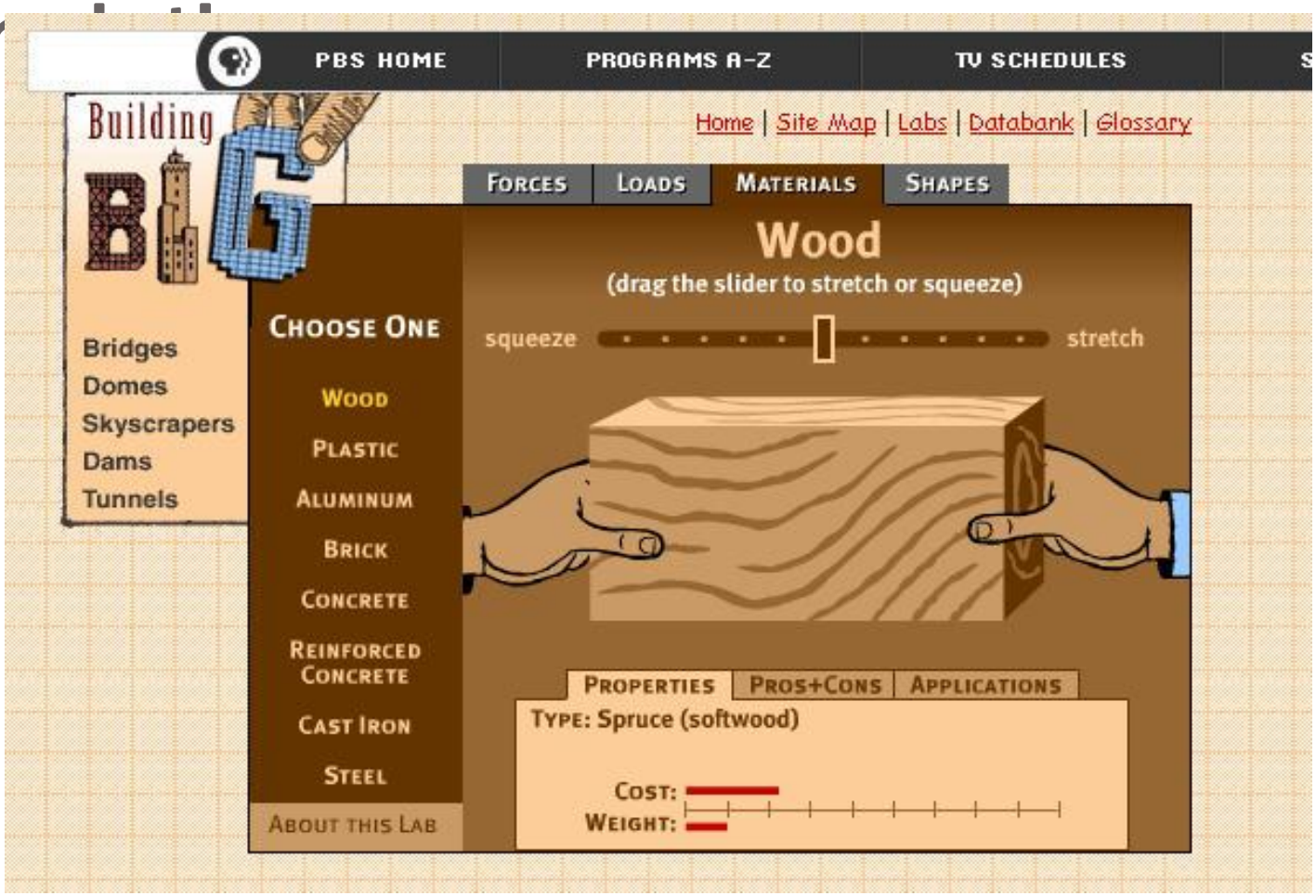
Utilization of Online Resources

- Supplement Direct Instruction
- Remediation
- Absent Students – Makeup Work
- Ease of Access
- Real World Application
- Broad Overview is Provided
- Linkage to Learning Objects Produced by
  - (NSF, Federal Gov. Associations, Non-Profits, etc.)

Simulations are Safer

Simulations are Steps in the Progress of Product Development

Sim

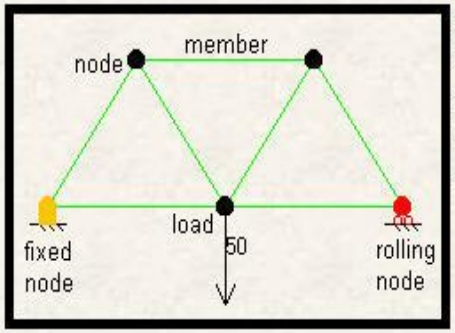


Understanding Physical Issues in Building Design Simulation

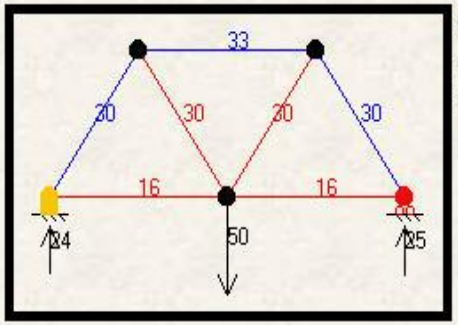
Bridge Design Simulator

Bridge Designer

Actually this program allows you design trusses. Trusses are composed of straight members connected at their ends by hinged connections to form a stable configuration. When loads are applied to a truss only at the joints, forces are transmitted only in the direction of each of its members. That is, the members experience tension or compression forces, but not bending forces. Trusses have a high strength to weight ratio and consequently are used in many structures, from bridges, to roof supports, to space stations.



In this simulation, trusses are created by attaching members to nodes (joints). First, nodal locations are specified; then the nodes are linked by members to create a structure. Once the structure is established, two of the nodes must be assigned as support nodes. One must be a "fixed" node, i.e., one that can provide support in both the x- and y-directions; the other must be a "rolling" node, one that can provide support in only the y-direction. Finally, one or more nodes can be assigned to bear loads.



Once these elements are specified, a click on "Calculate" will check your design. Another click will generate a complete force diagram showing compression/tension forces in each of the members and reactive forces at the support nodes.

http://www.jhu.edu/virtlab/bridge/truss.htm

Cooking Simulations

http://diehardgamefan.com/2009/11/09/review-food-network-cook-or-be-cooked-wii/

National Library of Virtual Manipulatives & Simulations

http://nlvm.usu.edu/

Simulation and Scenario Building Software

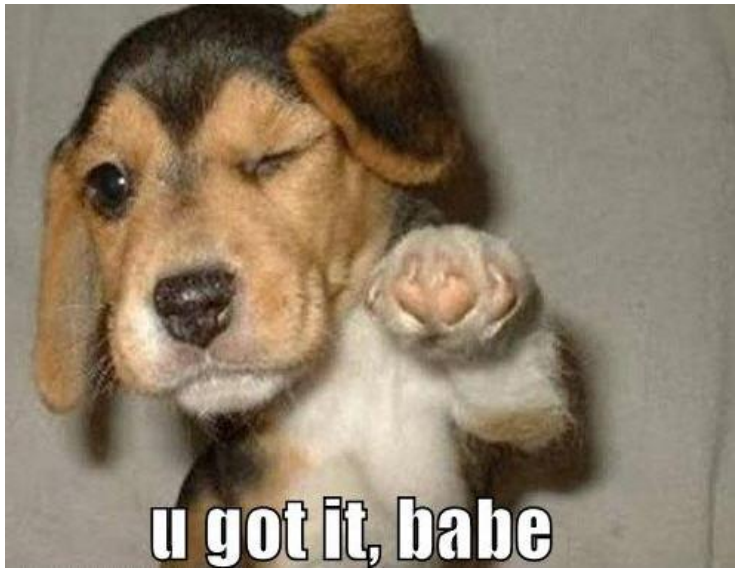
- http://www.raptivity.com/simulation-turbopack.html?gclid=CLTfn86yu58CFQwNDQodtXf3lw

Web-Based Simulations -Math + Science

- Math and Science Simulations
- ModuMath
- WISC Online
- Math: Algebra Flash and Lessons
- Basic Simulations

Videos

- eHow
- America's Career Infonet Video's
- Teacher Tube



Audio Support

- Breathing Sounds
- Auto Sounds
- Arc Weldling

Games

- Games on the History Channel Website

Why do we have to learn this stuff?

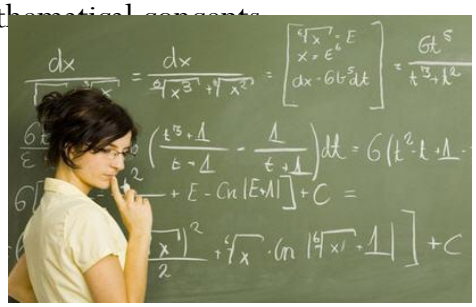
- **Examples of Industry Use of Academics**
- **Math Use and Examples in Careers**
- **Preparing for the Future**

Internet Based Resources: Math

1. Math on the Job – How you use Math at Work
2. Math Use on the Job Videos
3. Math In CTE

Internet Based Resources: Math

- PlanetMath.org -- open math encyclopedia
- Eric Weisstein's Mathworld -- an extensive collection of mathematical theorems and formulas.
- S.O.S. Math - math tables, explanations, examples, and bulletin board.
- Ask Dr. Math -- the question answerer.
- Math.com- general math resources
- The Math Forum -- many good math resources organized by subject, plus an extensive archive on commonly-asked questions.
- The Math Archives -- lesson plans, software, resources, and web-sites for K-12 math education.
- AmericaTakingAction.com. - other math resources
- Manipula Math with Java -- over one hundred graphical JAVA applets that demonstrate mathematical concepts (elementary to calculus).
- QuickMath - solves college and high school problems automatically
- Calc101.com - does derivatives and integrals, with each step explained
- A Resource Guide to Algebra



Internet Based Resources: Math

List of Math Help

Number Notation

Addition Table

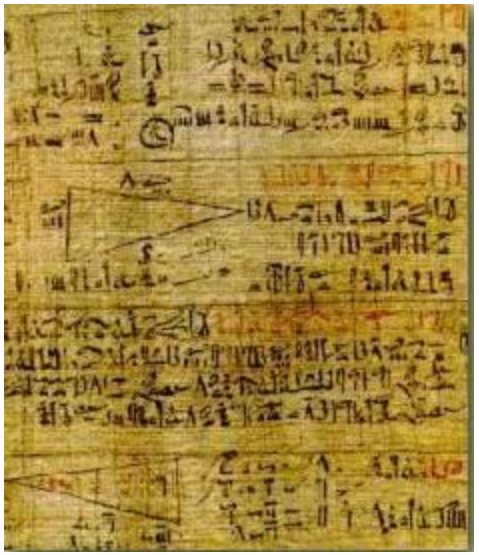
Multiplication Table

Fraction-Decimal Conversion

Interest

Units & Measurement Conversion

1835 B.C. Math Calculations



Internet Based Resources: Algebra

Linear Algebra

Basic Identities

Conic Sections

Polynomials

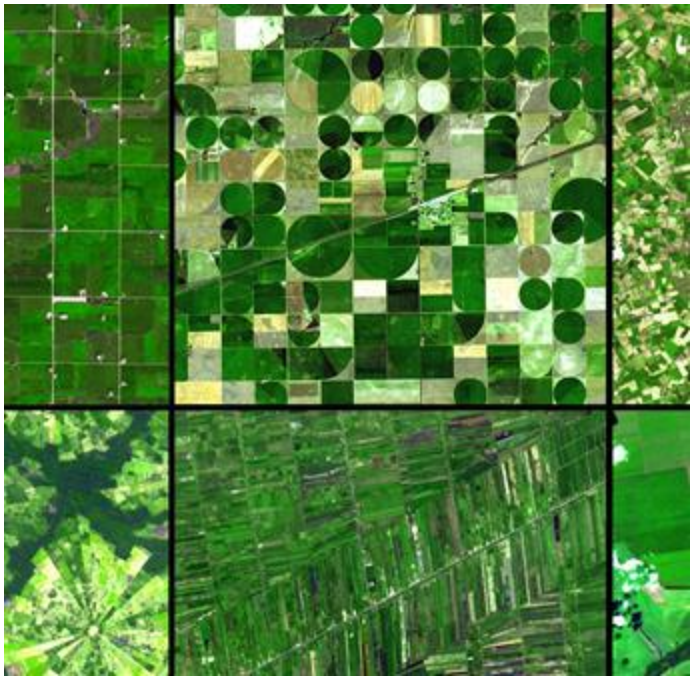
Exponents

Algebra Graphs

Functions

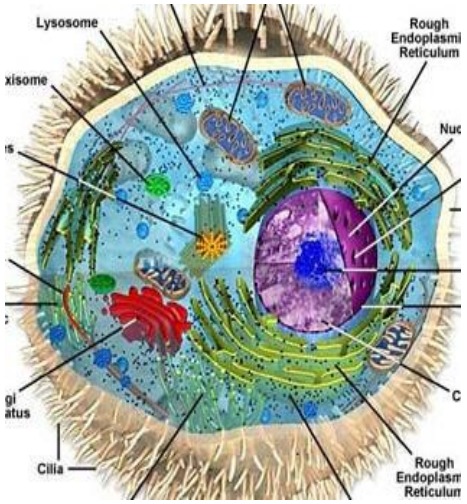
Internet Based Resources: Geometry

- Geometry and Math References
- CAD Points of View
- Inca Geometry
- Volume of a Cylinder
- Surface Area of a Cylinder
- Volume of a Cube
- Linear Geometry
- Volume and Area Formulas



Internet Based Resources: Biology

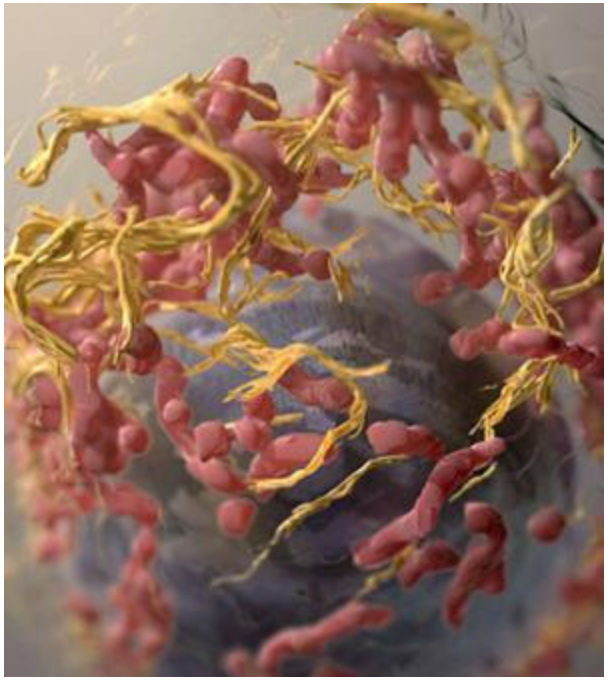
- Amphibian Embryology Tutorial
  Cat Anatomy Tutorial
  Classification of Living Things Tutorial
  Discovering Mammals
  How to Become a Gardener
  Landscape Irrigation Tutorials
  Natural History Online Book
  Oceans Deep - Exploring the Oceans
  Plate Tectonics
  Zoonotic Diseases Tutorials
  Here Comes the Sun - Solar Terrestrial Tutorial



Internet Based Resources: Science

About Electricity
AC Circuits – Hyper Physics
AC DC - What's the Difference
Atoms Family
Basics of Electrical Safety
Capacitance
CodeQuiz NEC
Copper Wire Chart – AWG
Current Electricity
Current Electricity Introduction - PDF
DC Circuits
DC Circuits - Hyperphysics
Direct Current
Electric It and Magnetism Modules
Electric Charge

Atoms



Internet Based Resources: Science

Ampere, Andre
Discovery of the Atom - A Look Inside
Edison, Thomas
Edison Museum
Electrical Inventors
Electricity and Magnetism - Historical Beginnings
Electron Discovery
Fiber Optic Chronology
Fiber Optics History
Invention Dimension
The Tech Museum of Innovation
How Lightning Works
Lightning Detection
Lightning Theme Page

Internet Based Resources: Language Arts

- Guide to Grammar and Writing
- Index of Grammar
- Grammar for ESL Students
- Kid Info on Grammar and Language Skills

Recommendations to Support Integration

- Develop academic skill competitions within the Career and Technical Student Organizations
- Create integration activities at the middle school level
- Create a public relations and marketing campaign aimed at highlighting achievements of those involved in integration
- Offer incentives for teachers that obtain additional teaching endorsements

Recommendations

- Articulate academic credit with colleges and universities.
- Seek student, parent and community input in the process.
- Utilize existing external standards both academic and vocational sources.
- Examine the attitudes and stereotypes.
- Incorporate quality improvement processes.
- Connect "integration" student senior projects with local problems and issues.
- Incorporate integration learning activities in teacher preparation.
- Require future math, English, and science teachers to have practical work experience in their specific field prior to teaching.

Tools

- Clip Nabber (capture Video Online)
- Zamzar Video Conversion Online
- Snag It (Image Capture)
- Snip Tool – free within MS Windows
- Others?

Questions & Sharing