

How not to **Fail** with Technology

NIS Conference 2016

Dr. Tom Hsu

Chief Curriculum Officer

PASCO Scientific

TECHNOLOGY

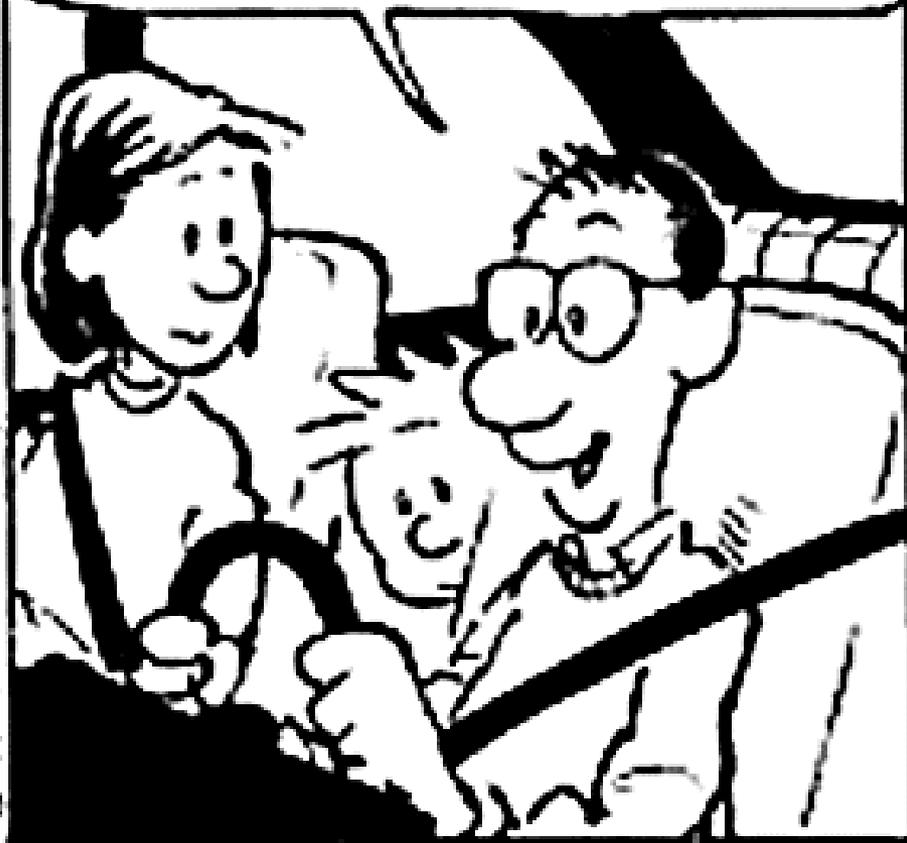


on STEM

HOW DO THEY KNOW THE
LOAD LIMIT ON BRIDGES,
DAD?



THEY DRIVE BIGGER AND
BIGGER TRUCKS OVER THE
BRIDGE UNTIL IT BREAKS.



on STEM

THEN THEY WEIGH THE
LAST TRUCK AND
REBUILD THE BRIDGE.



OH. I
SHOULD'VE
GUESSED.

DEAR, IF YOU
DON'T KNOW
THE ANSWER,
JUST TELL
HIM!



on Technology



Technology and what its good for



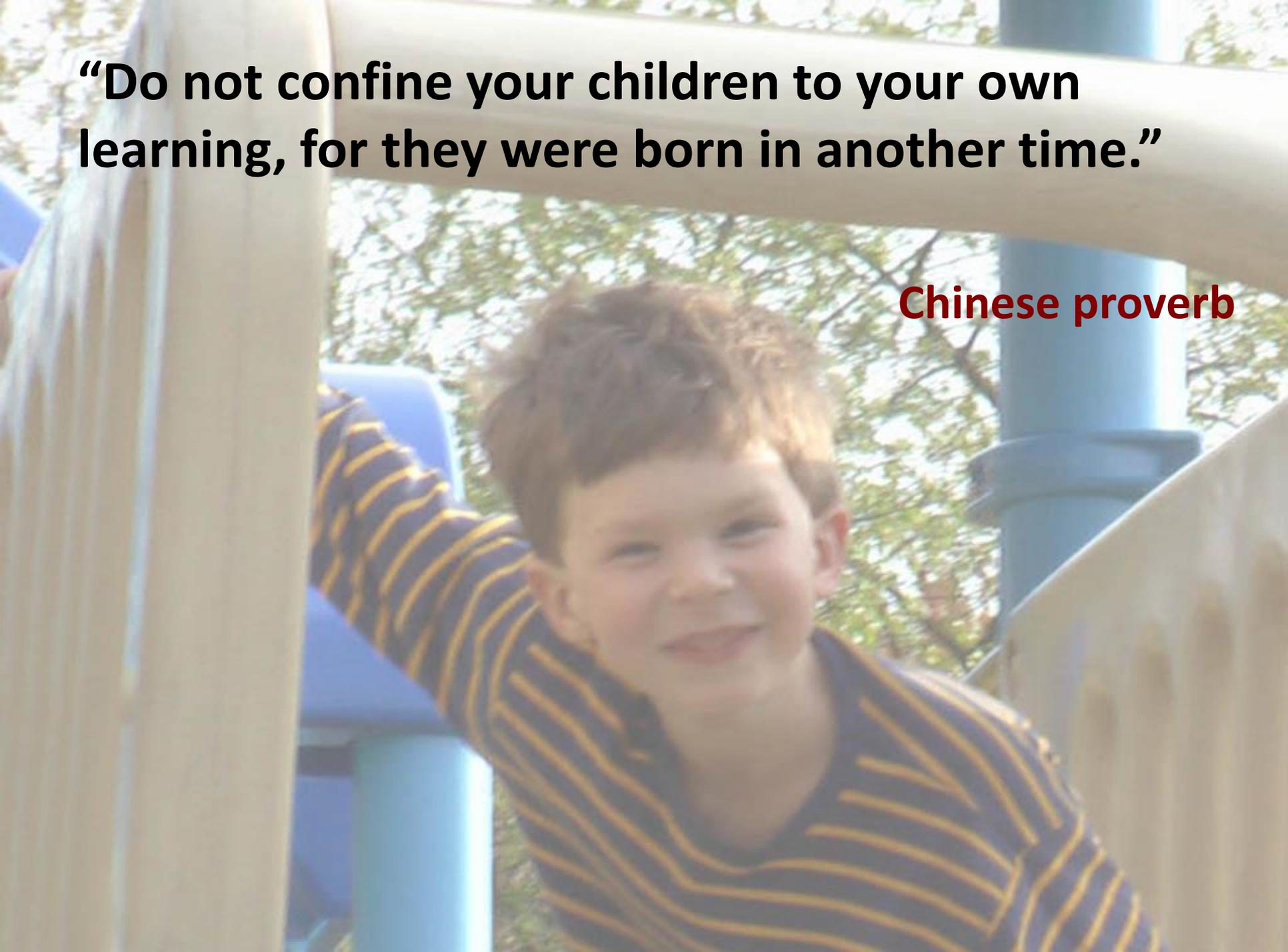
“If we teach today as we taught yesterday we rob our children of tomorrow.”

John Dewey



“Do not confine your children to your own learning, for they were born in another time.”

Chinese proverb





How **specifically** can technology improve teaching and learning?



We have had decent computers since the 80's. The information revolution changed everything **except** education.



Why is it going to change **now**?

People generally remember...
(learning activities)

People are able to...
(learning outcomes)

10% of what they read

Read

Define List
Describe Explain

20% of what they hear

Hear

30% of what they see

Passive Learning

Demonstrate
Apply
Practice

50% of what they see and hear

Active Learning

70% of what they say and write

Participate in Hands-On-Workshops
Design Lessons

90% of what they do.

Simulate, Model, or Experience a Lesson

Design/Perform a Presentation - "Do the Real Thing"

Analyze
Define
Create
Evaluate

Technology can unlock more effective modes of learning



The Window of Opportunity Illusion

- Each new advance touches off a race to be first to exploit new capabilities in a marketable way.
- New capabilities are glammed-on to educational software in meaningless ways because a “must have” new thing gets announced every six months.
- **The result: flash and novelty at the cost of usability and efficacy.**
- **Stability and well-engineered, tested and optimized solutions are far more important.**

Elmo CRV-32 Student Response System

B&H # EL133532 • MFR # 1335-32

ELMO



SPECIAL ORDER

Ship Time: 7-14 business days ⓘ

Free Standard Shipping

Not eligible for free Expedited Shipping

PRODUCT HIGHLIGHTS

- Record Student Responses
- Review Performance/Understanding
- Analyze Results
- Easy-to-Use Software

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You Pay: **\$1,286.00**

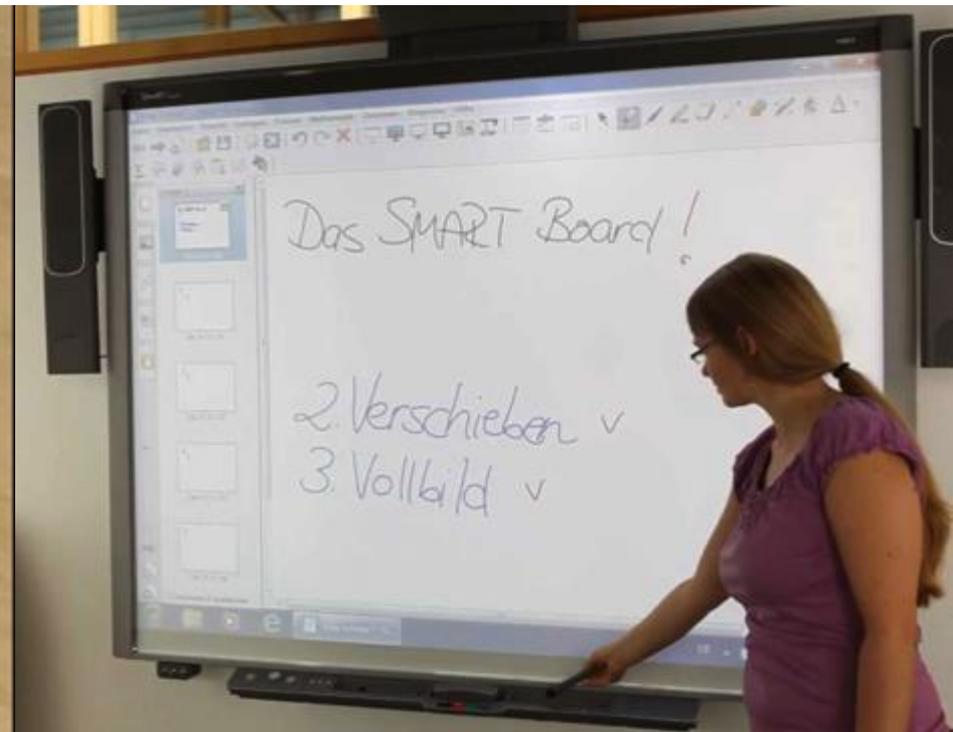
1 QTY

Add to Cart

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“In most classrooms, technology is merely grafted onto existing teaching practices, so what we get is educational practice that is technologically sophisticated but still fundamentally conventional: using PowerPoint instead of a blackboard or overhead projector for a classroom presentation, for example. Thus, in too many cases, technology reinforces rather than transforms educational practice.”

*Steve Rappaport,
University of California*



The Pedagogical ZigZag

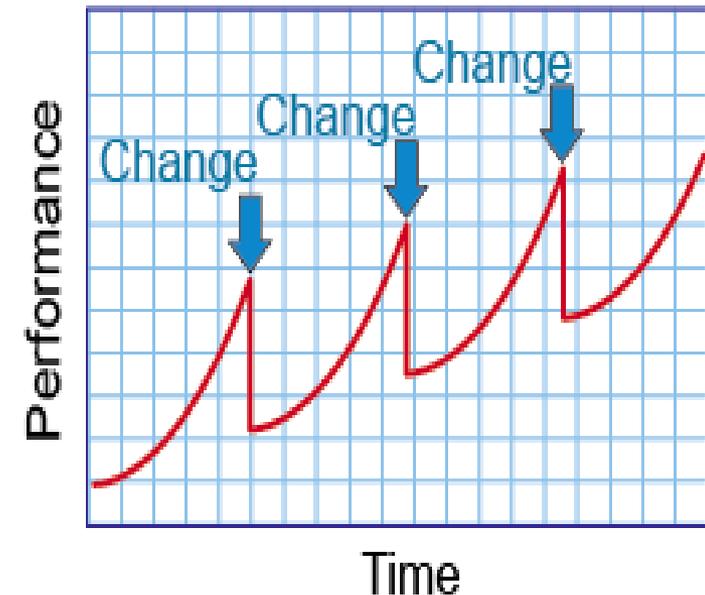
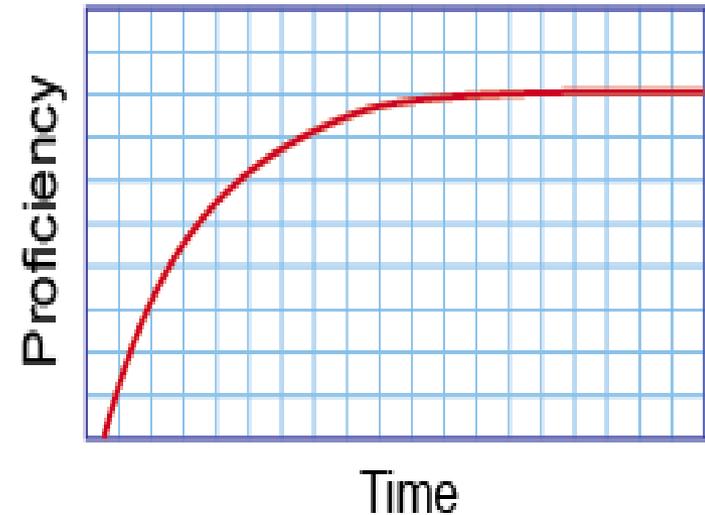
Excellent teaching requires experience with the curriculum being taught.

It takes 3 years to get proficient with a new curriculum.

Inadequate professional development means student performance decreases for at least a year after the adoption of new curriculum.

Frequent changes in curriculum or technology create this pedagogical zig-zag in which the real efficacy of learning advances only slowly if at all.

Curriculum changes need 3-4 years before long-term changes in student achievement can be realized.





Moore's Babel

- Different software works and “thinks” differently.
- Each “new version” often makes many connected programs malfunction.
- Tech companies fight this with IT departments.
- Many schools don't have IT departments.
- **Educational tech should stay far away from the bleeding edge. Use tried and tested software.**

.doc .aif .wmf .xls .prj
.xpf .mp4 .avi .key .dvm
.opl .ssc .pdl .ppt .oml
.dxf .idl .dpg .swf .dcs
.cdr .lib .mmf .pan .ppl
.wav .ddr .stl .xvf .obj



HTML5 / CSS



WC3 compatible browser



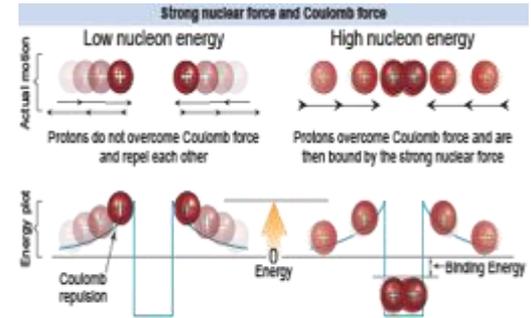
Vanilla javascript



The Courseware Mirage

- Interactive technology costs five times as much to develop (at least) compared to static illustrations.
- There is ongoing version support cost.
- **Consumers expect to pay less for an ebook compared to a print book!**
- Profit margins drive most companies.

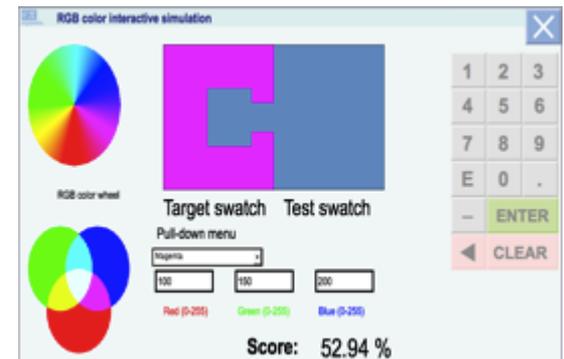
\$250
illustration



\$2,500
Video



\$12,500
Software





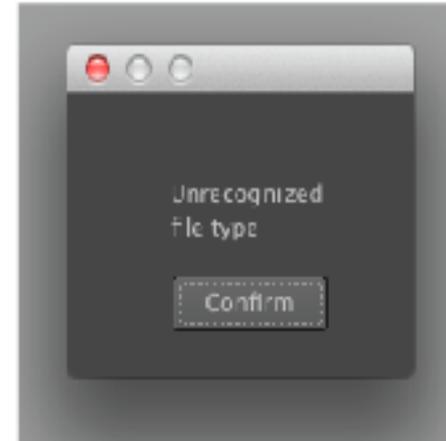
Moore's Amnesia

- Humans have an innate ability to suppress memory of past pain in order to surmount future obstacles.
- Moore's Amnesia describes why "we'll never to do this again" are famous last words.
- **There is no such thing as "intuitive" software. Intuitive to whom? The programmer?**
- **Preparing teachers to use new technology effectively is the single most important factor in determining the outcome.**

"File Not Found"



"File type not readable"



"network unavailable"



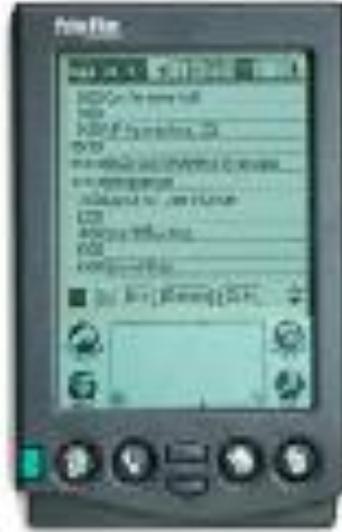
"cannot connect to the internet"





The Rapture of the Technology

- The physics textbook in my local high school was written in 1980 and is still being used today - with only minor updates.
- I don't know anyone who still uses a Palm device.
- The real innovation is in re-engineering the learning process and not on which technology is under the hood.



A good scientist is a person with original ideas. A good engineer is a person who makes a design that works with as few original ideas as possible. There are no prima donnas in engineering.

Freeman Dyson

Technology **can** unlock more effective modes of learning



Personal interaction



Visualization



Making Meaning



Real Time Feedback



Providing Context



Self Assessment



Multiple Perspectives

How fast did you learn the essence of this very challenging idea?

How did the **technology** help you learn?

The screenshot shows a software interface titled "Phases of matter simulation". The main window displays a 4x5 grid of blue circular particles. To the right of the window are several control panels:

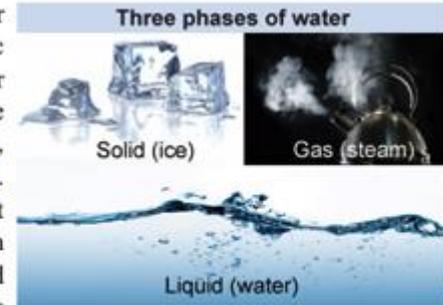
- A "Temperature (K)" panel with a text input field containing "10" and two triangular buttons for increasing and decreasing the temperature.
- An "Element" panel with a list of elements: Argon, Chlorine, Bromine, Mercury, Lead, Iron, and Tungsten, each in a green button.
- A numeric keypad with buttons for digits 1-9, 0, and a decimal point, along with "ENTER" and "CLEAR" buttons.

Phases of matter

Animation and visualization are extraordinary tools for creating understanding.

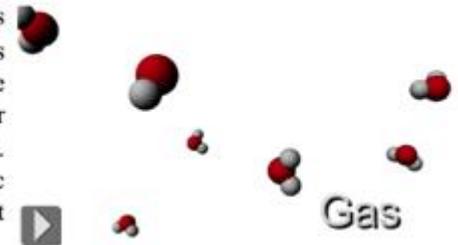
The phases of matter

Matter, such as water, can be a solid, liquid, or gas depending on its temperature. In the kinetic theory, the phase of matter for a particular substance is likewise related to the average thermal energy of its atoms or molecules. Solid, liquid, and gas are three of the **phases of matter**. Whether a substance is solid, liquid, or gas at any given temperature depends on the strength of the attractive forces that pull atoms and molecules together compared to the chaotic agitation of thermal motion. [more](#)



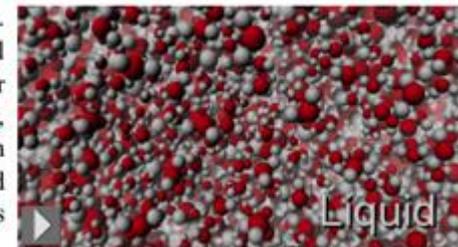
The gas phase

In a **gas** the thermal motion of atoms completely overcomes attractive forces between molecules. Molecules in a gas are typically far apart from each other. Water becomes a gas above its *boiling point* of 100°C. Of the three phases, gas has the highest kinetic energy per molecule and occurs at the highest temperature.



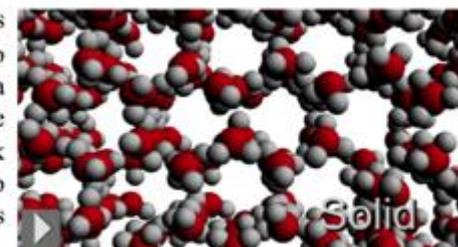
The liquid phase

Between 0°C and 100°C water is a **liquid**. Molecules in a liquid have enough thermal energy to break away temporarily from their neighbors and change places with one another, but liquid molecules do not have enough thermal energy to separate completely and become a gas. Liquids flow because molecules can change places with their neighbors. [more](#)



The solid phase

Below 0°C water is a **solid**. Matter becomes solid when thermal energy is too low to overcome intermolecular forces. Molecules in a solid are still vibrating, but an average molecule does not have enough energy to break away from its immediate neighbors or to exchange places with another molecule. That is why solids hold their shape.





Personal interaction



Visualization



Making Meaning



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Self Assessment



Multiple Perspectives

Build today's education systems on yesterday's technology – **stay off the bleeding edge.**

Don't buy computers or tablets **UNTIL you have the curriculum and training to effectively use them before they become obsolete.**

AT LEAST 50% of technology expenditures should be for training and curriculum

Thank you!

Dr. Tom Hsu

thsu@pasco.com

tinyurl.com/PascoTGs

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