Purposeful Pathways

Creating Purposeful Pathways: Aligning Advisement to Curriculum

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Georgia Regents University

Effective Academic Advisement
Curriculum Alignment
Integrated Approach to Overcoming Challenges
Early Intervention supporting Alternative Pathways to Success

Today's Students

http://www.youtube.com/watch?v=kAG39jKi0lI

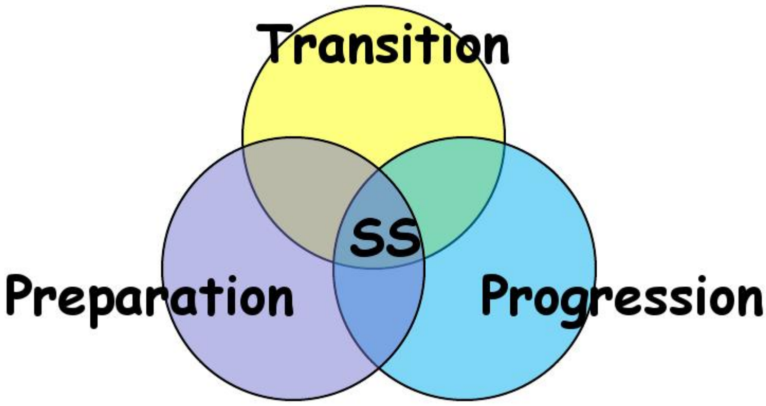
Why are we here?

- To discuss how integrated advising can support curriculum alignment
- To encourage students to imagine math, science, and English as key factors for student success in college
- To discuss how to begin proactive effective advising to support students' dreams while embracing their realities

Establishing a Context

- Nearly 60% of students will graduate with credits from more than one institution (not all would be considered transfer students). (Adelman, 2009)
- Community college to university is still the most prevalent transfer pathway. (Handel, 2007)
  - Historically, 80% of students of student who begin their careers at a community college indicated an interest in obtaining a bachelor's degree.
  - Fewer than 30% are likely to transfer, many of whom achieve an associate's degree. (Handel, 2013)
- Curriculum alignment and academic advising have the greatest opportunity to improve student success

Student Success Model



Key Factors for the Best Student Success Model

- Early intervention to impact students' decisions
- Proactive strategies to transition students
- Constant academic support

Career Advising and Decision Making

Career Advising Structures

- Proactive advising on career options and courses
- Connecting courses to majors
- Understanding the “why” of choosing a major or career
- Translating the “why” into multiple majors
- Understanding the twists and turns along the pathway to success

Planning for the Future

Plan – "personalization of each student's pathway; defining the individual steps required"

(Sandy Shugart, 2012)

- Using older student role models
- Developing community service programming
- Creating resources for students by students
- Working with students to understand their our multiple pathways to success

Dual Enrollment Advising

- Develop intentional advising techniques
- Focus on courses to build skills in math and science
- Explain prerequisites and sequencing
- Use courses to begin career development
- Encourage exploration of related fields

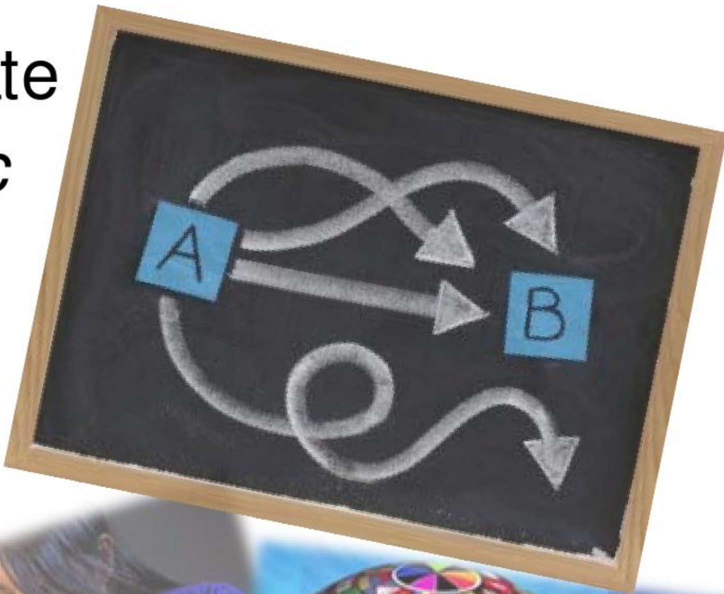
Technology and
Virtual Student Services

- Imagining the future
- Exploring careers and majors
- Understanding the diversity of options
- Setting broad goals and plans
- Learning from student role models
- Building academic support
- Tracking student success

Decision Making

- Focus on student strengths
- Explore skill development
- Attempt math courses – early and often
- Reality of academic performance and careers
- Passion vs. vocation
- Decision vs. swirling

Creating Pathways to Success



Most students to participate in some form of *academic or career advising*

Identify potential and link courses to options for careers

An Integrated Advising and Curriculum Alignment

Creating synergy for a relationship that will enhance student success

Thank you for all that you do to improve student success

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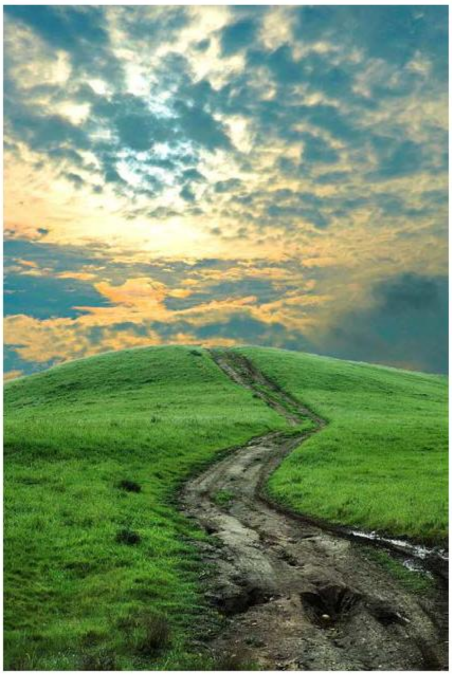
Developing Robust Pathways
Dr. Pam Cavanaugh
Assistant Vice Provost
UCF Regional Campuses
I DiRECT CONNECT TO UCF
UNIVERSITY OF CENTRAL FLORIDA

Developing Robust Pathways

What we know about Transfer Students

- More than half of UCF Graduates
- Student Focus Groups
- Retention Strategies
  Noel Levitz 2013 Student Retention and College Completion Practices Report
- 1/3 of all students will change institutions prior to degree
  National Student Clearinghouse Research Report
- More likely to graduate than natives of home universities
  Bowen, W. (2006) Finishing the Crossing Line.

Developing Robust Pathways



- How do we align for success and completion?
- What defines a quality pathway?
- What role do advisors play?
- What are advisors saying?
- What does it look like?

Developing Robust Pathways

Advising Alignment

- Identify high impact practices to promote transfer success
- Gather and analyze data of transfer students
- Define the obstacles for transfer success
- Define what it means to be “Transfer Friendly”

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Student Steps for the "Knight Track"

- Know Career Interest
- Identify Program of Study
- Meet Academic Advisor
- Satisfy Foreign Language
- Complete Math and English early
- Apply to UCF

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Professional Practices for us

Partnership-Partnership-Partnership

Getting the right people around the table

- ✓ Advisors
- ✓ Faculty
- ✓ Student Services
- ✓ Enrollment Services
- ✓ Data
- ✓ Foundation

Developing Robust Pathways

Paving the way for student success, progress and graduation

I DiRECT CONNECT TO UCF

UNIVERSITY OF CENTRAL FLORIDA

UNIVERSITY OF CENTRAL FLORIDA

¿STEM:

Initiatives in STEM

Dr. Teresa Dorman

Associate Dean, College of Sciences

Presented for

Dr. Melissa Dagley, Executive Director of *¿*STEM

Why is STEM so important?

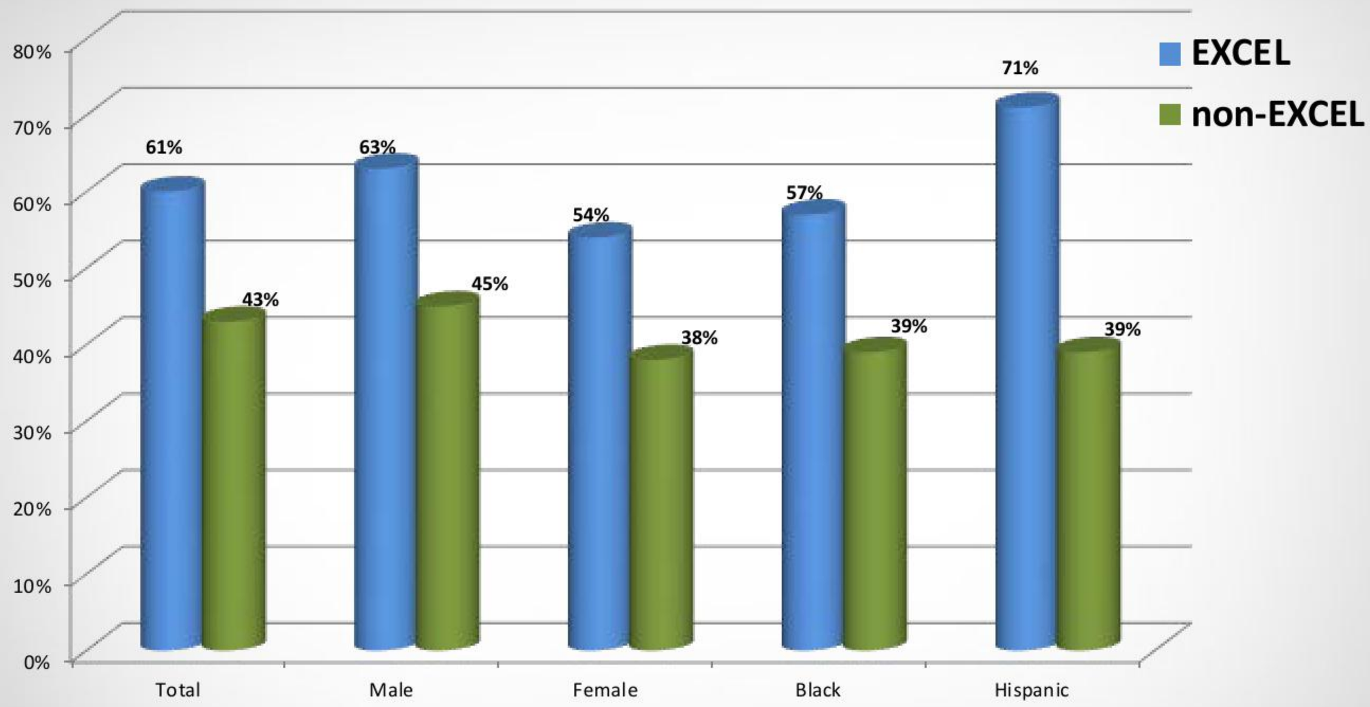
There is a national crisis in STEM education!

- ***23 % of college freshman*** declare a ***STEM major***.
  (15% of the total student population of 3.6 million)[1]
- Only ***40 % of those*** that elect STEM ***receive*** a ***STEM degree*** within 6 years[1] (about 6% of the total 3.6 million student population)

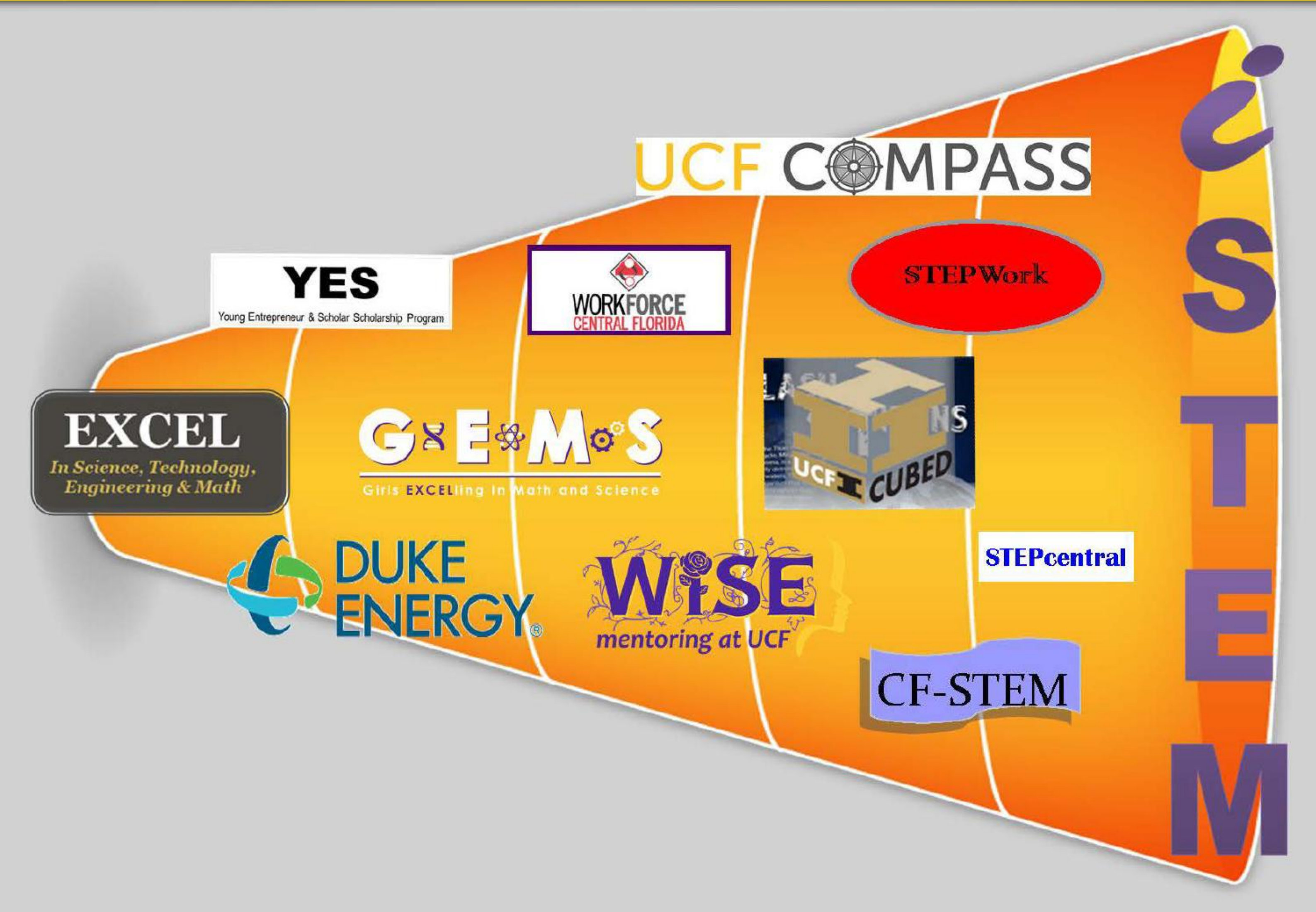
"We can't make progress if these students are leaving the STEM fields"[1]

[1] http://www.ed.gov/news/speeches/2009/10/10232009.html
(Arne Duncan's remarks to the President's Council of Advisors on Science and Technology; 10/29/09)

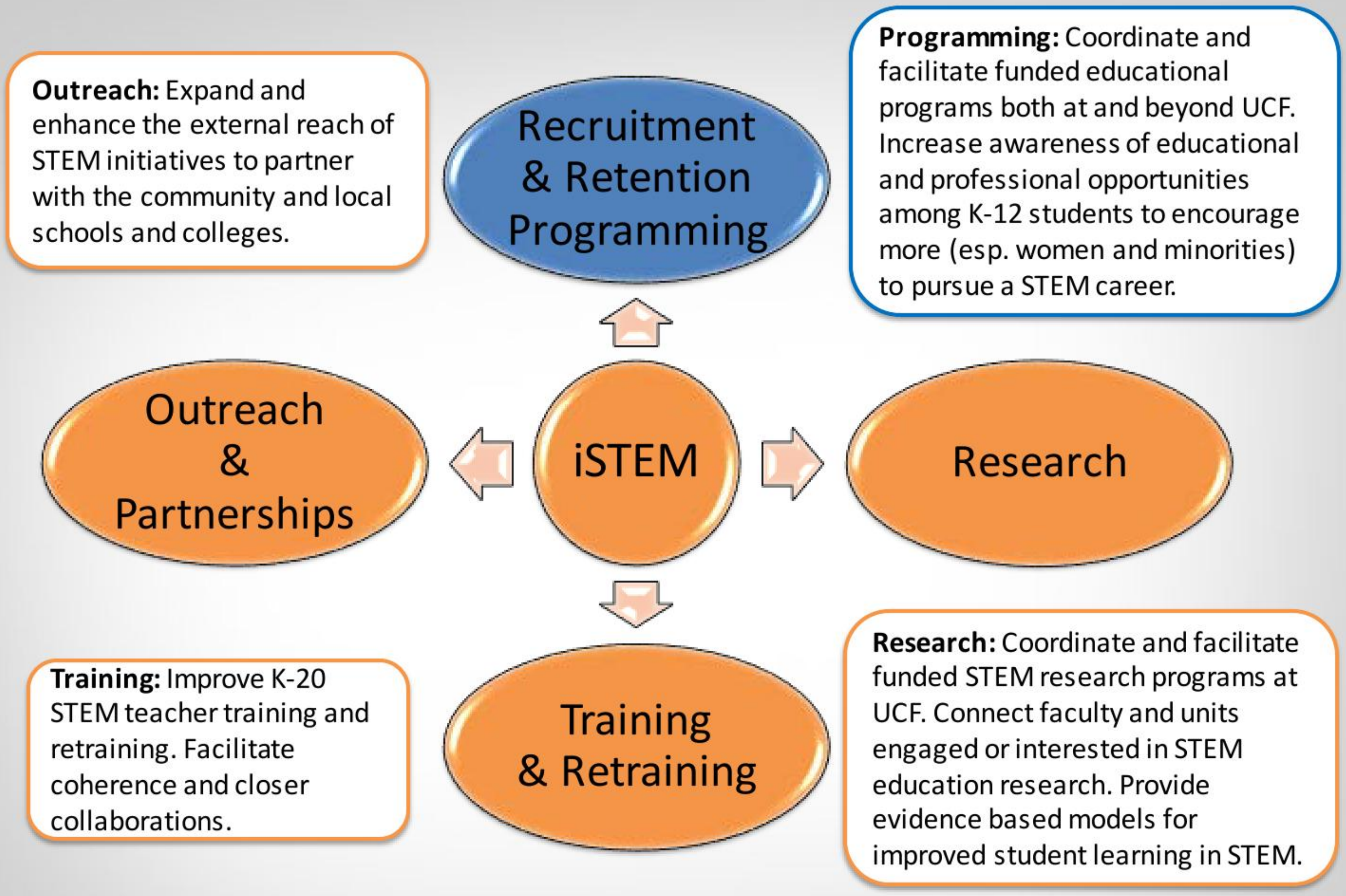
EXCEL's Success Story (Why EXCEL)



The chart shows EXCEL 06-12 STEM success (61%) versus non-EXCEL 06-12 STEM success (40%) for different student groups; national STEM success numbers are around 40%



EXCEL
In Science, Technology, Engineering & Math
YES
Young Entrepreneur & Scholar Scholarship Program
GEMS
Girls EXCELling in Math and Science
DUKE ENERGY
WORKFORCE CENTRAL FLORIDA
WiSE mentoring at UCF
UCF COMPASS
STEPWork
UCF CUBED
STEPcentral
CF-STEM
iSTEM


Outreach: Expand and enhance the external reach of STEM initiatives to partner with the community and local schools and colleges.
Recruitment & Retention Programming
Programming: Coordinate and facilitate funded educational programs both at and beyond UCF. Increase awareness of educational and professional opportunities among K-12 students to encourage more (esp. women and minorities) to pursue a STEM career.
Outreach & Partnerships
iSTEM
Research
Training: Improve K-20 STEM teacher training and retraining. Facilitate coherence and closer collaborations.
Training & Retraining
Research: Coordinate and facilitate funded STEM research programs at UCF. Connect faculty and units engaged or interested in STEM education research. Provide evidence based models for improved student learning in STEM.

Core Mission

- To promote and enhance multi-disciplinary ***collaborative efforts*** on STEM education and research

- To ***develop close ties*** with other colleges, centers, and institutes on campus, as well as other stakeholders with a similar interest in STEM initiatives

- To ***include*** both STEM and non-STEM units, internal and external to the University, with an interest in STEM-related education

Goals

- To bring ***coherence*** to the many externally and internally ***STEM funded projects at UCF***
- To position ***UCF in Florida and nationally*** as a hub for STEM education and related research
- To ***improve the STEM pipeline*** and produce a better ***STEM workforce***
- To ***increase grant and philanthropic funding efforts*** that support STEM education and related research by bringing together interested participants (internal and external to UCF)

Outreach

- **Engineering Forums** (middle & high-school)
- **Florida Engineering Education Conference** (K-12)
- **Summer Institutes/Summer Camps** (middle & high-school)
  - Expanding outreaching in summer 2014
- **Undergraduate Research Experiences** (FSC)
- **Science Olympiad** (middle & high-school)
  - UCF hosts 2014 National Olympiad
  - UCF annually hosts the statewide Olympiad

Community Partnerships and Collaboration

- Connecting faculty
- Multi/Interdisciplinary Partnerships
- Volunteer support
- State College STEM programming

Training and Retraining

- Newest initiative (the "4th pillar"), which is also informed by research
  - FSCs are partners in Wider Grant – teaching mathematics
  - Professional Development - sharing science and instructional techniques (currently focus in biology)

Questions? More Information?

Contact

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The ChemCollective
Online Materials for Chemistry Courses

David Yaron+, Michael Karabinos+, Jodi Davenport*, Jordi Cuadros+
Department of Chemistry+ and Psychology*, Carnegie Mellon University
Gaea Leinhardt, Jim Greeno, Karen Evans
Learning Research and Development Center, University of Pittsburgh

Projects

- ChemCollective (www.chemcollective.org)
  - Virtual labs, scenario-based learning materials and online tutorials for introductory chemistry courses
- ChemVlab+ (www.chemvlab.org)
  - Formative assessment activities for high school classes
- Science of Learning Center (www.learnlab.org)
  - Chemistry LearnLab: Bridging laboratory cognitive science with classrooms

Items in the collection

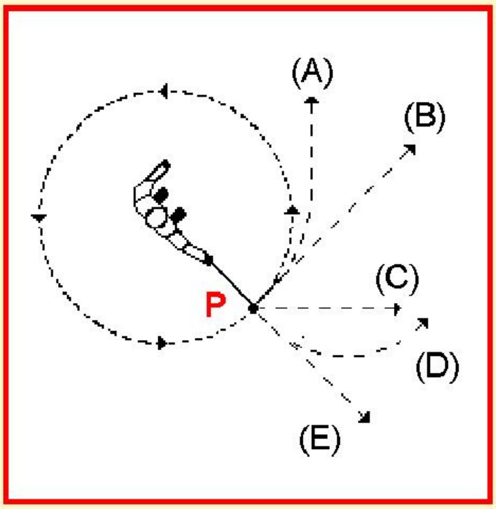
- Virtual Laboratory
- Tutorials
  - Stoichiometry course
  - New approach to equilibrium instruction
- Scenario based learning
  - “Mixed Reception” Murder Mystery
  - ChemVlab+: 8 activities for high school chemistry

Force-Concept Testing

A steel ball is attached to a string and is swung in a circular path in a horizontal plane as illustrated in the accompanying figure.

At the point **P** indicated in the figure, the string suddenly breaks near the ball.

If these events are observed from directly above as in the figure, which path would the ball most closely follow after the string breaks?



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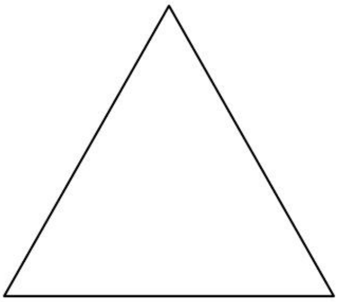
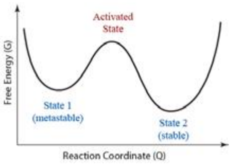
Chemistry is hard

Johnstone triangle

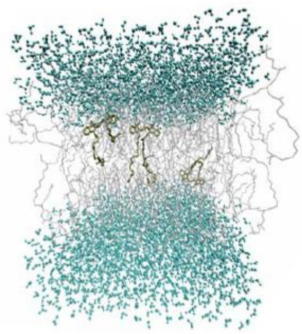
Macroscopic observations



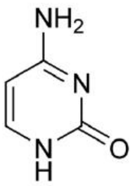


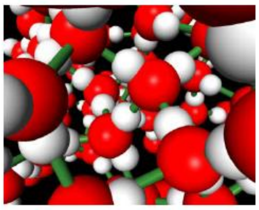
Symbolic

Atomic level



$H_2 + ½ O_2 \rightarrow H_2O$

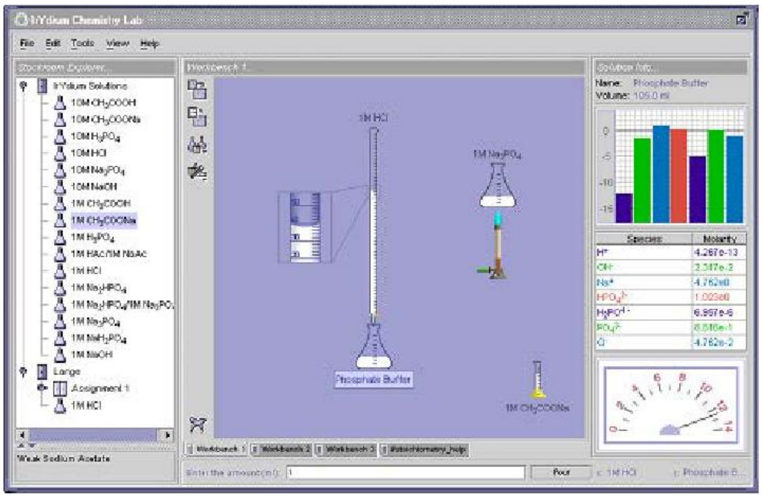




ΔH=-12 kJ/mol

ChemCollective Virtual Laboratory

- Flexible simulation of aqueous chemistry
- New mode of interaction with chemical concepts
- Ability to “see” inside a solution removes one level of indirection in chemical problem solving



Classroom uses

- During recitation
- As take-home work
- Pre- and post-labs
- Lab make-ups
- Supplement to in-class demonstrations

A survey of virtual lab problems

- Current topic list
  - Molarity
  - Quantitative analysis
  - Solubility
  - Acids and bases
  - Stoichiometry
  - Chemical equilibrium
  - Thermochemistry

The ChemCollective as a user community

- Web logs

	2006	2007	2008	2009	2010
ChemCollective Website Unique Visitors	123,400	161,481	211,477	259,325	325,163
Vlab (individual users)					
Access the applet to perform experiment online	59,733	62,871	117,875	154,223	177,652
Download the virtual lab to local drive	15,678	17,556	24,530	21,123	22,196
Mixed Reception					
Played Online Flash Game				6,027	22,707

- Contributions to the collection from 62 user groups
  - 11 have contributed activities (56 activities)
  - 11 have contributed translations (11 languages, 70 activities)
  - 40 have given feedback, 13 volunteered for learning studies

Automatically graded problems

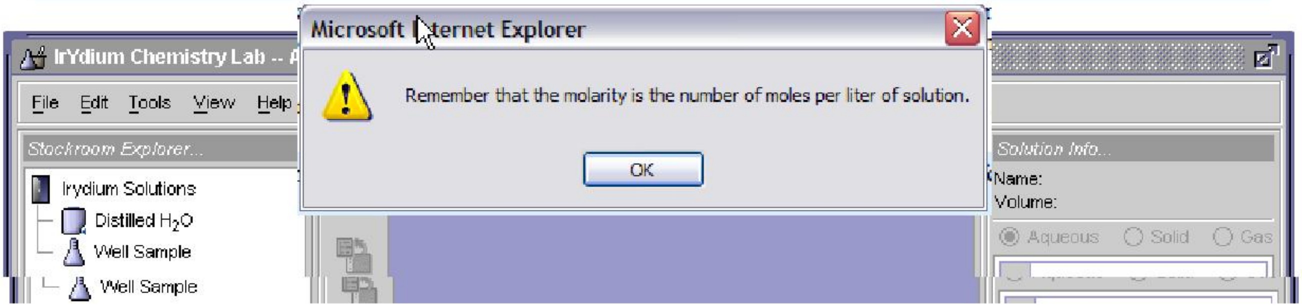
Analysis of student response for common error types   hints

Is this well sample toxic? - 2

According to the WHO, the recommended limit for arsenic in drinking water is 10 micrograms per liter. It is not easy to state if a well is toxic or not. A simpler question that can be answered is: Is the concentration of arsenic larger than the WHO recommendation?

If so, we may consider this water source toxic. If not, we may say that in terms of its arsenic content it is safe to drink this water.

Activity 1: How many micrograms per liter of As is in the sample? (use three significant figures for your answer) ✓ ?
______ micrograms/L



Taking learners beyond means-ends analysis

Typical textbook problem

"When 10ml of 1M A was mixed with 10ml of 1M B, the temperature went up by 10 degrees. What is the heat of the reaction between A and B?"

Virtual Lab problem

Thermochemistry/Camping 1: "Construct an experiment to measure the heat of reaction between A and B?"

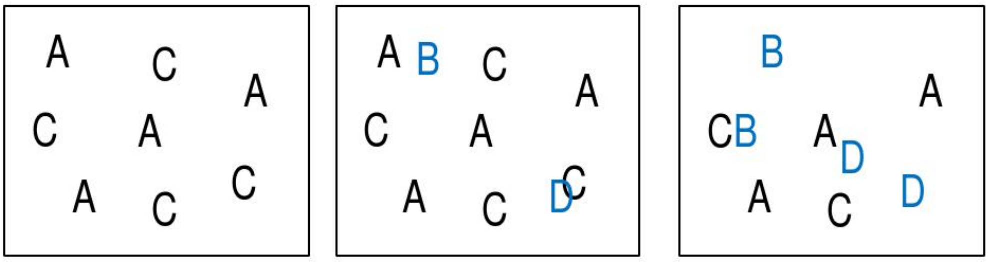
- Result of student observations
  - 4 sections of 30-45 students working alone; 4-5 instructors/observers
  - The Virtual Lab format requires students to go beyond a strategy of matching words to equations

Virtual lab error

"The virtual lab contains 1M solutions of A, B, C, and D. Construct experiments to determine the reaction between these reagents"

100 mL 1 M A + 100 mL 1 M C → 0.25 M A + 0.25 M B + 0.25 M D

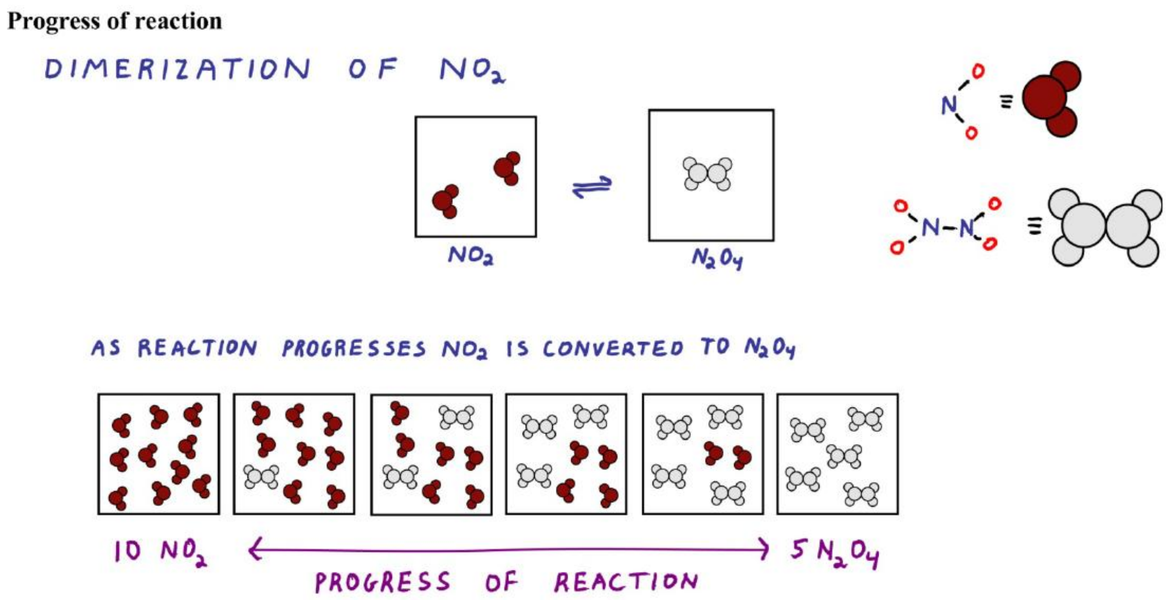
- Actual reaction
  A + 2 C → B + D



- 50 % of students put A as reactant and product
  A + C → A + B + D

Tacit Knowledge: Progress of Reaction

$$2NO_2 \rightleftharpoons N_2O_4$$



Online tutorials

- Stoichiometry
  - Instructional videos followed by practice problems
  - Available as individual tutorials (www.chemcollective.org) or as a course (www.cmu.edu/oli)
- Equilbrium
  - New approach to equilibrium instruction (AP level)

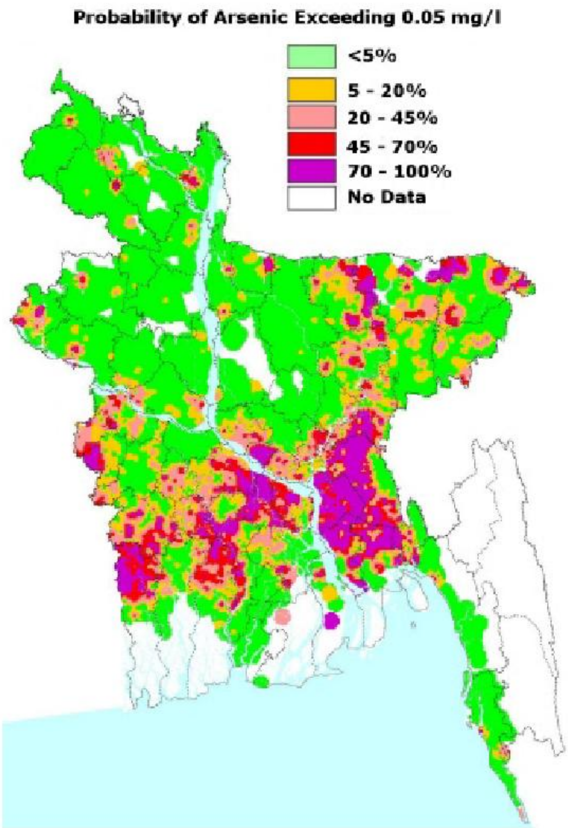
Stoichiometry review course

- Basic tools of stoichiometry
  - Significant figures
  - Unit conversions, including Avogadro's number
  - Molecular weight/ molar mass
  - Composition stoichiometry
  - Solution concentration
- Empirical formula
- Reaction stoichiometry
  - Stoichiometric conversion and percent yield
  - Limiting reagents
  - Titration
  - Analysis of mixtures

Stoichiometry review course

- As in Bangladesh groundwater

  - Measurement of As concentration
  - Remediation
  - Challenges facing modern analytical chemistry



Stoichiometry tutors

$$AsO_4^{-3} + Fe^{3+} \text{ ---> } FeAsO_{4\,(s)}$$

What will be left over if we mix a diluted solution that contains 1.60 g of arsenate with 1.35 g of iron(III) ion?
Please, give your results with three significant figures.

Step 1: How many moles of each the reactants are present in the system?

[ ] moles of arsenate

[ ] moles of iron(III) ion

Step 2: How many moles of iron(III) arsenate will be formed if each reactant is entirely consumed?

If the entire amount of arsenate is consumed, [ ] moles of iron(III) arsenate will be formed.

If the entire amount of iron(III) ion is consumed, [ ] moles of iron(III) arsenate will be formed.

Step 3: What is the mass of iron(III) arsenate that will be formed?

[ ] g of iron(III) arsenate will be formed.

Step 4: How much of each of the reactants will react?

[ ] g of arsenate

[ ] g of iron(III) ion

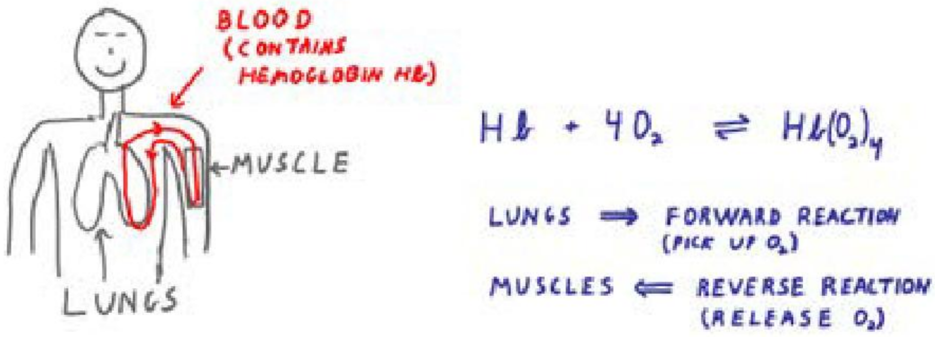
Step 5: How much of each of the reactants will be left?

[ ] g of arsenate

[ ] g of iron(III) ion

Equilibrium instruction

- Use human respiration for “initial” vs. “equilibrium” state



Old Instruction

Protein	$+$ Drug	$\Leftrightarrow$	Protein:Drug	$K = 10^8$
$1.2\text{x}10^{-6}$	$3.0\text{x}10^{-3}$		0	*Initial*
0	$3.0\text{x}10^{-3}$		$1.2\text{x}10^{-6}$	*Better*
x	$3.0\text{x}10^{-3} + x$		$1.2\text{x}10^{-6} - x$	

$$K = 10^8 = \frac{[\text{Protein:Drug}]}{[\text{Protein}][\text{Drug}]} = \frac{1.2\text{x}10^{-6} - x}{\text{x}\left(3.0\text{x}10^{-3} + x\right)}$$

$$assume\ x << 10^{-3}$$

$$10^8 = \frac{1.2\text{x}10^{-6}}{\text{x}\left(3.0\text{x}10^{-3}\right)}$$

Meaning is obscured by the math

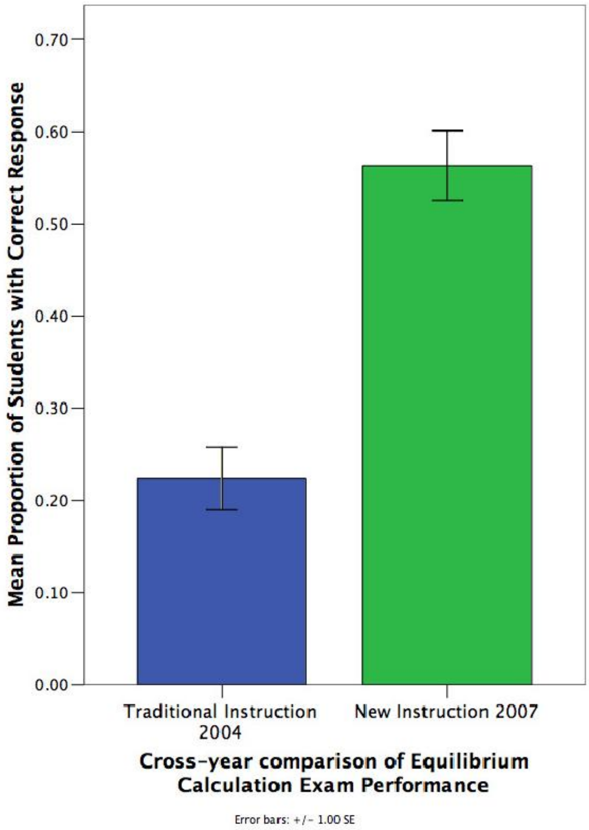
Majority/Minority Species Strategy

Protein	+ Drug	$\Leftrightarrow$	Protein:Drug	$K = 10^8$
$1.2x10^{-6}$	$3.0x10^{-3}$		0	*Initial*
0	$3.0x10^{-3}$		$1.2x10^{-6}$	$if\ K = \infty$

$$K = 10^8 = \frac{[\text{Protein:Drug}]}{[\text{Protein}][\text{Drug}]} = \frac{1.2x10^{-6}}{[\text{Protein}]3.0x10^{-3}}$$

Mental model: First: What if K were ∞? Then: K is large but not ∞.

Classroom Results on Learning M&M Mechanics



M&M strategy as a unifying framework

- Mental model that connects problems solving to conceptual understanding
- Approach to initial problem analysis
  - Analysis of a large set of problems shows general applicability
  - Initial analysis focuses student attention on important concepts, since first step is to find all strong reactions (K>>1)
    - Acid base: $OH^- + H^+$; $HA + OH^-$ and $A^- + H^+$
    - Solubility: $M^+ + X^-$ and $M^+ + L$

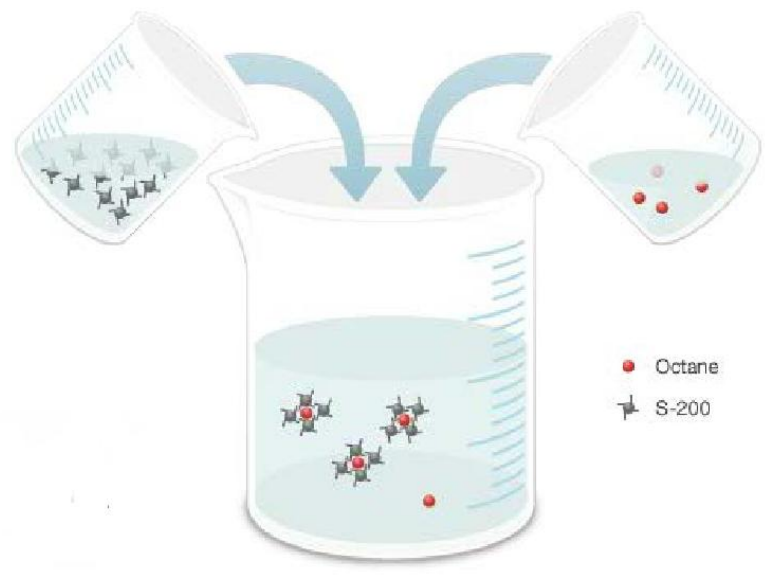
Chemistry in Context

- Mixed Reception
  - Murder mystery
  - 1 to 2 class periods
- ChemVlab+
  - Eight activities that put chemistry in context

ChemVlab+

- With Jodi Davenport of WestEd
- Interactive tutorials to learn and practice chemistry
- 4 stoichiometry activities
  - Concentration: Gatorade
  - Dilution: River systems
  - Gravimetric analysis: City water tastes bad
  - Reaction stoichiometry: Oil spill remediation
- 4 on thermochemistry, equilibrium and acid-base
  - Thermochemistry and Heat Capacity: Solar energy
  - Thermochemistry: Hot/cold packs
  - Equilibrium: Color changing reactions
  - pH and Acid Base Chemistry: Swimming pool maintenance

Bioremediation of Oil Spills: Limiting Reagents



Mixed Reception

Computer agent guided discussion of intermolecular forces

- Jigsaw design: Each student is trained in one type of force

  vdW polar ionic

- Chat room contains 3 students + computer agent
  - one student trained in each area

When you've discussed these things with your group and come to a consensus, everyone should record their answer on their paper and then type "Ready"

Quinn's roles

- Poses discussion topic/question
- Monitors, and interjects in, the student discussion
- Listens for all students to agree on a response (by typing "ready")

Closing comments

- Please let us know if you would like to:
  - Work with us to develop virtual lab activities for your class
  - Collaborate on learning studies

Thanks To

Carnegie Mellon

- Michael Karabinos
- Colin Ashe
- Donovan Lange
- D. Jeff Milton
- Jordi Cuadros
- Rea Freeland
- Emma Rehm
- William McCue
- David H. Dennis
- Tim Palucka
- Bridget Hogan
- Soojin Jeong
- Jef Guarent
- Amani Ahmed
- Dustin Haffner
- Giancarlo Dozzi
- Katie Chang
- Erin Fried
- Jason Chalecki
- Greg Hamlin
- Brendt Thomas
- Stephen Ulrich
- Jason McKesson
- Aaron Rockoff
- Jon Sung
- Jean Vettel
- Rohith Ashok
- Joshua Horan
- Chun How Tan
- Jake Mohin

LRDC, Univ of Pittsburgh

- Gaea Leinhardt
- Jim Greeno
- Karen Evans
- Baohui Zhang

WestEd

- Jodi Davenport

Funding

- NSF: CCLI, NSDL, SLC
- William and Flora Hewlett Foundation
- Howard Hughes Medical Institute
- Dreyfus Foundation