Leadership in Engineering Education Accreditation Program (LEEAP)

UNAND
Aug 31 – Sept 4, 2015
Padang, Indonesia

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HIGHER EDUCATION LEADERSHIP AND MANAGEMENT

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ARIZONA STATE UNIVERSITY

Dr. Scott Danielson
Director, VULII
Ira A Fulton Schools of Engineering, Arizona State University

Dr. Kathy Wigal
Associate Director Curricular Innovation
Global Outreach and Extended Education
Ira A Fulton Schools of Engineering, Arizona State University

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Workshop Goals

- **Faculty Roles in Accreditation**
- **Introduction to Teaming / Collaborative Learning**
- **Research Basis for Active Learning Approaches**
- **Learning Styles**
- **Course Level Outcomes**
- **Classroom Assessment & Evaluation techniques: Rubric Use and Development**
- **Outcomes and Instructional Design**

Our approach . . . .

Cooperative Learning / Cooperative Teams

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Team Roles

- Note taker
- Time keeper
- Reporter
- Facilitator

Note Taker / Recorder

- Track discussion points and decisions made at the meetings
- Repository for team information
- Collects and distributes notes, data and other information within the team

Team Roles and Responsibilities

Time keeper

- Manages the team's time during meetings
- Tracks project schedule to ensure progress
- Communicate progress toward goal to team members

Team Roles and Responsibilities

Reporter

- Coordinates written and oral communication from the team.
- Ensures group presentation oral and written is
- May act as "spokesperson" for the team.

Team Roles and Responsibilities

Facilitator

- *Neutral position;* does *not* take a particular position in the discussion.
- Helps a group of people understand their common objectives
- Ensure equal participation by team members.
- Mediate and resolve conflict
- Provide feedback and support to the team.
- Suggest problem solving tools and techniques
- Assist the group in managing discussion and achieving consensus

Team Roles and Responsibilities

Team Members

- Offer perspective and ideas
- Actively participate in meetings
- Complete activities on time
- Support implementation of team recommendations

The second best job in the world . .

- If you could have any different job – except the one that you have – what would you choose and why?

- Decided silently – then share with others at your table

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Faculty Roles in Accreditation: Courses and Program Level Student Outcomes

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Faculty Have Many Roles

Teach Courses and Mentor Students!

Do Research and Publish New Knowledge

Do Service: University, Professional, Community

Help Programs Gain International Recognition!

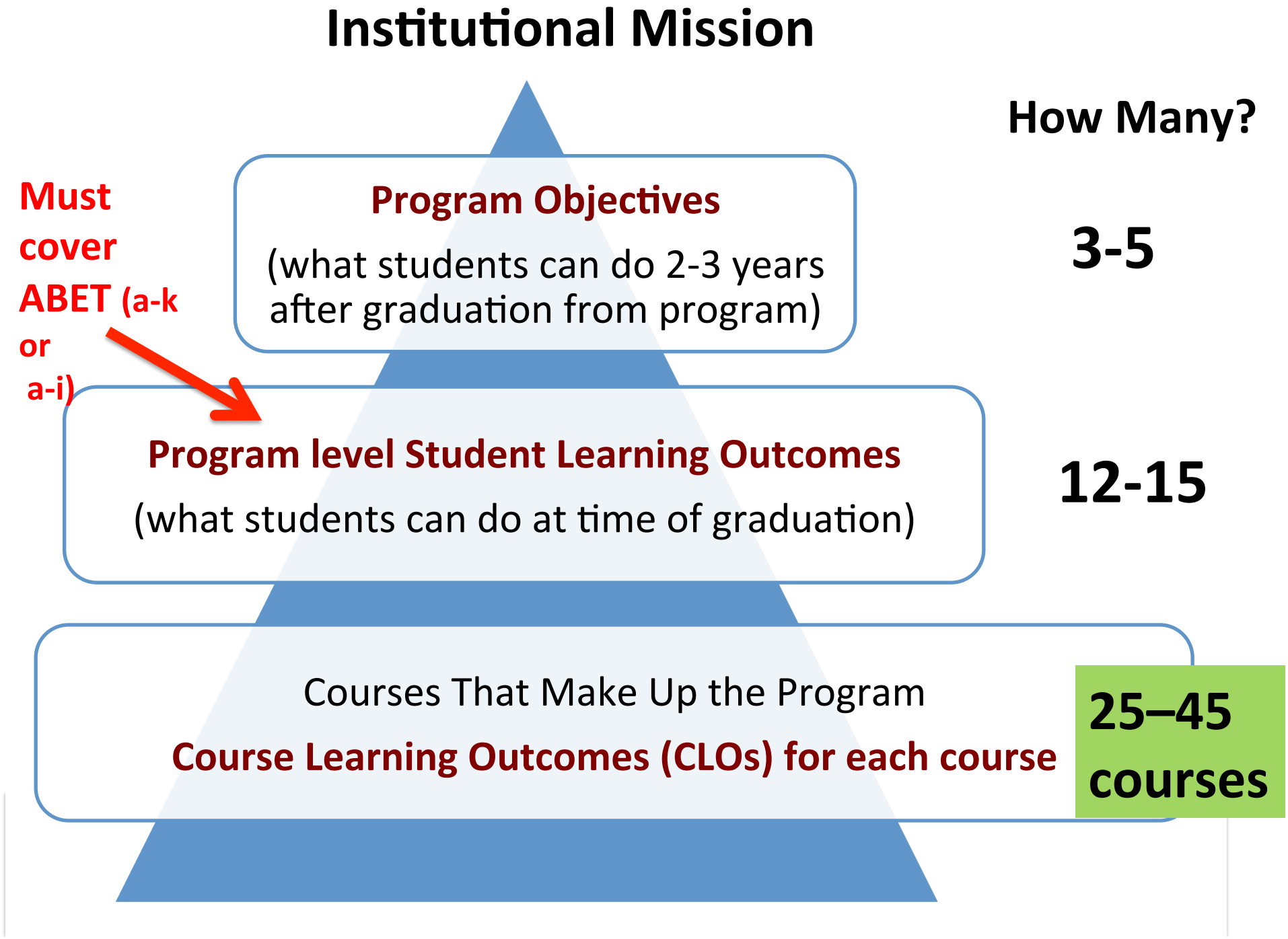
- AUN-QA Accreditation
- ABET Accreditation

What are the links between teaching and ABET accreditation

In your teams, discuss possible links.

Five minutes to agree on such links.

Then we will do a brief report from several tables.


Institutional Mission
How Many?
Must cover ABET (a-k or a-i)
Program Objectives
(what students can do 2-3 years after graduation from program)
3-5
Program level Student Learning Outcomes
(what students can do at time of graduation)
12-15
Courses That Make Up the Program
Course Learning Outcomes (CLOs) for each course
25–45 courses

Courses Are The Foundation of Gaining ABET Accreditation

Must support Program Student Outcomes!

Linkages must be explicit – Course Level Outcomes must clearly support Program Student Outcomes

Courses are where assessment of student attainment of program level outcomes happens!

Courses Are The Foundation of Gaining ABET Accreditation

Assessment of program student outcomes tells you what students have learned and know.

ABET requires that you are always trying to improve what students know and can do.

By far, the majority of what students learn is from your courses

Courses Are The Foundation of Gaining ABET Accreditation

With a focus on student learning (the output of your teaching), improving student learning is **VERY** important.

Thus thinking and learning about teaching to improve student learning is necessary.

So, we will focus on teaching to improve learning!

Why work in teams?

Performance Behaviors that Organizations Value – 1990s and Beyond!

Adapted from Katzenbach and Smith, The Wisdom of Teams, 1993

Individual Accountability	Mutual support, trust, joint AND individual accountability
Divides thinkers and doers	EVERYONE expected to think, work and do
Each person has narrow skill set	Multiple roles and continuous improvement
Relies on managerial control	"Buy-in" to meaningful purpose. All help shape direction and learn
Emphasize fair pay for days work	Personal growth; makes most of each persons capabilities

How should teaching and learning address this?

Just as the *paradigm* for what organizations value has shifted, our teaching *paradigm* must shift as well . . .

a commonly accepted view or model of how things work

Individual Accountability	Mutual support, trust, joint AND individual accountability
Divides thinkers and doers	EVERYONE expected to think, work and do
Each person has narrow skill set	Multiple roles and continuous improvement
Relies on managerial control	"Buy-in" to meaningful purpose. All help shape direction and learn
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Comparison of Old and New Paradigms of Teaching

Factor	Old Paradigm	New Paradigm
Knowledge	Transferred from faculty to students	Jointly constructed by students and
Students	Passi… know…	…scoverer, …dge
Nature of Learning	• •	…entally social …portive environment/ …y to unleash intrinsic …ation
Faculty Purpose	Cla… …and sort students	Develop students' competencies and talents
Relationships	Impersonal relationship among students & between faculty & students	Personal transactions among students and between faculty & students
Context	Competitive/Individual	Cooperative learning in classroom and cooperative teams among faculty
Assumption	Any expert can teach	Teaching is complex and requires considerable training

The environment or setting. The scene in which everything else happens.

Formal Teams or Informal Teams

Quality Circles ?

Project Team ?

Formal teams created deliberately by managers and are assigned to carry out specific tasks to help the organization achieve its goals

Think Pair Share groups?

Study Groups ?

Committees ?

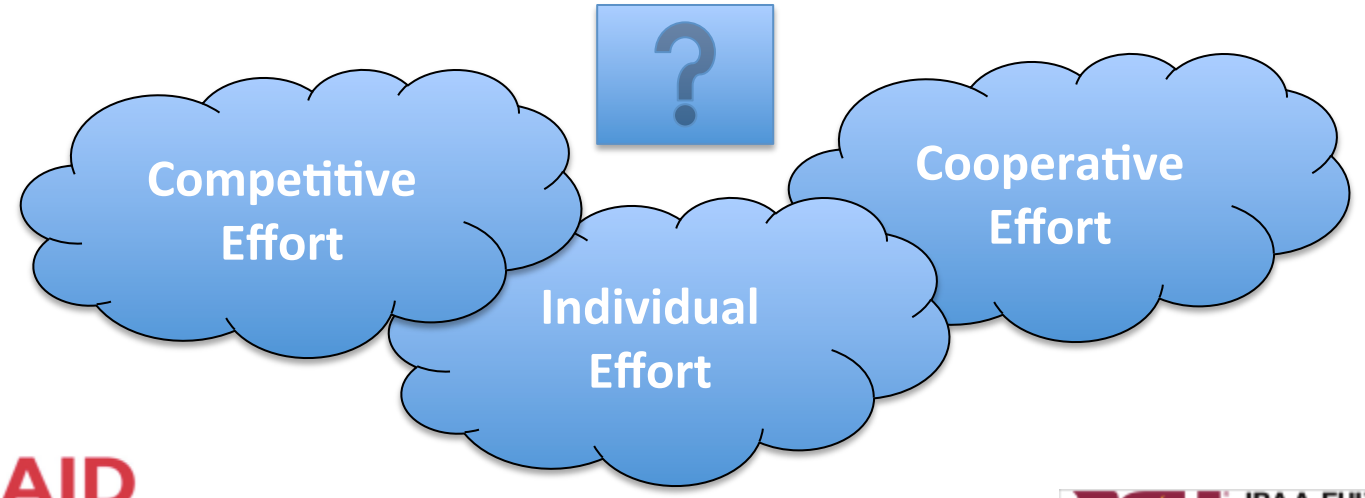
Informal teams or groups emerge whenever people come together and interact regularly. Such groups develop within the formal organizational structure.

Others ?

HEEAP Team ?

Exists when there is *positive interdependence* among students' goal attainments. Students perceive that they can reach their goals if and only if other students in the group *also* reach their goals.	Exists when there is *negative interdependence* among goal achievements. Students perceive that they can obtain their goals if and only if the other students *fail* to obtain their goals..	Exists when there is *no interdependence* among goal achievements. Students perceive that the achievement of their goals is *unrelated* to what other students do.

Can you match each concept with its definition?
Think, Pair, Share



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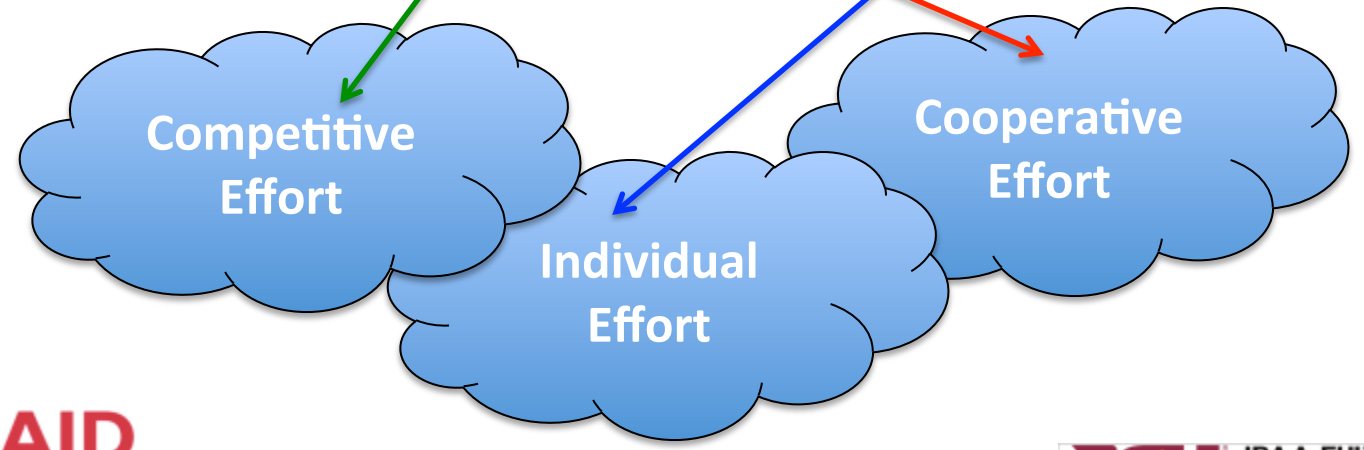
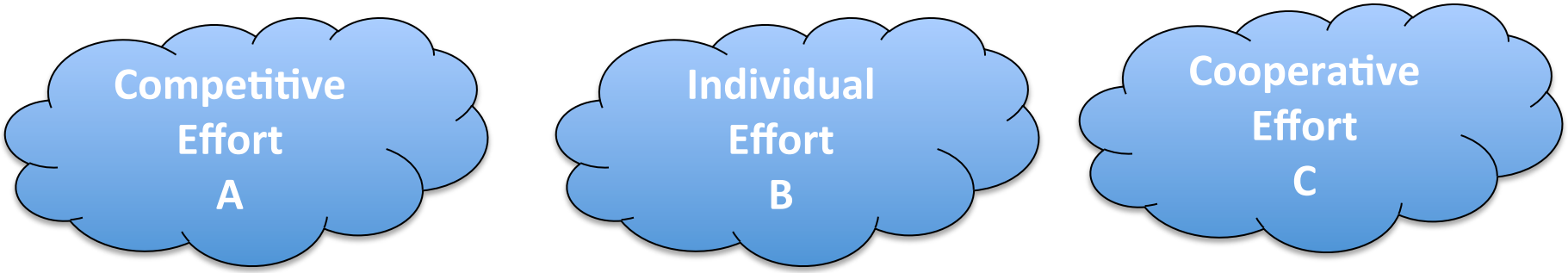




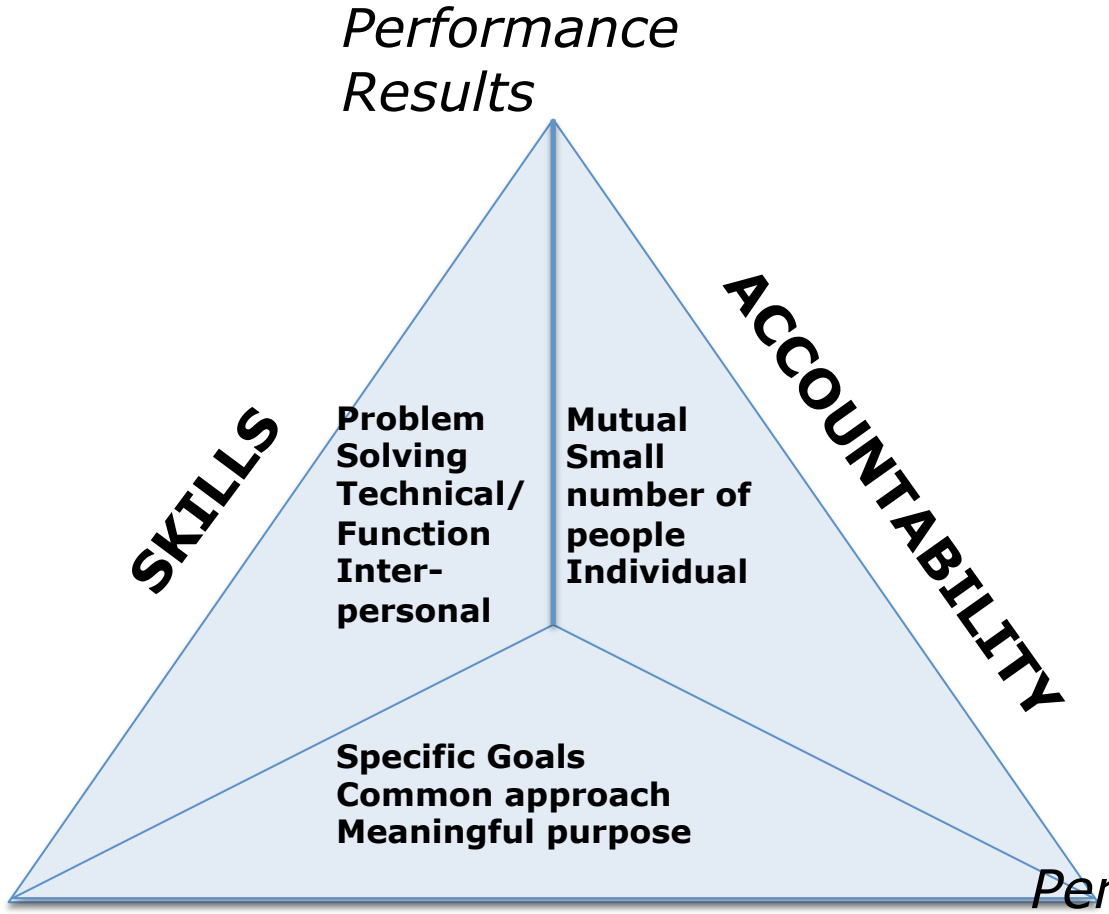
Which is it?
Can you reach consensus as a team?

1. We strive for everyone's success
2. I strive to be better than others
3. I strive for my own success only
4. What benefits me doesn't effect others
5. Only my own success is celebrated
6. I am motivated to help and assist others
7. What benefits me hurts and deprives others
8. I am motivated only to maximize my own productivity
9. I celebrate my own success and am happy when other fail
10. I want to ensure no one else does better than me.

Are you in a *group* or a *team*?

Team Basics

Adapted from Katzenbach and Smith, The Wisdom of Teams, 1993



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Team Basics

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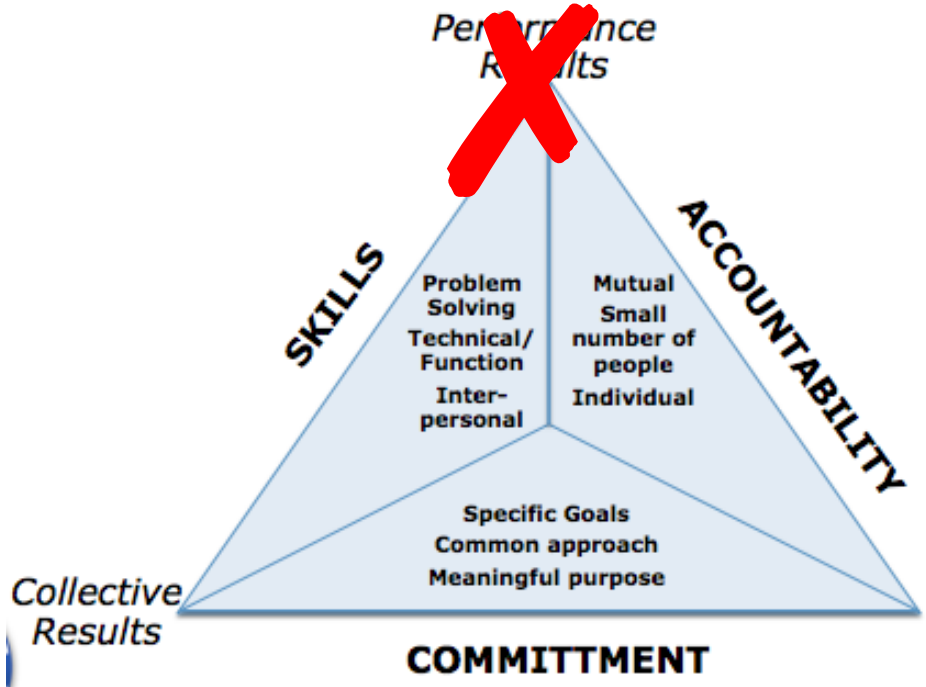
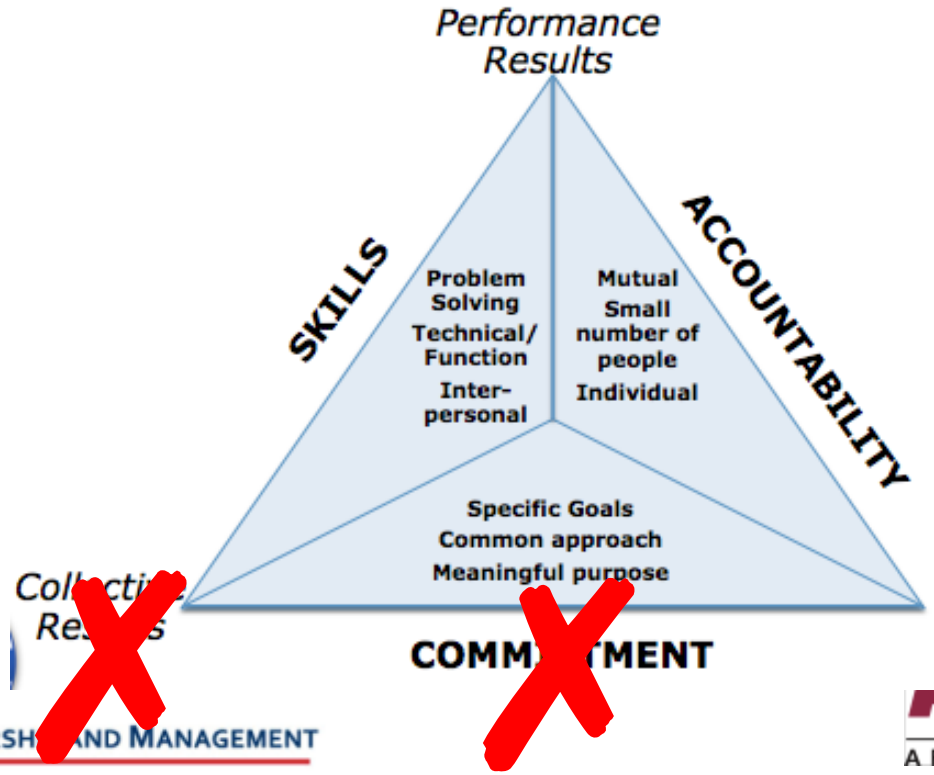
The Working Group: *This is a group for which there is no significant incremental performance need or opportunity that would require it to become a team. The members interact primarily to share information, best practices, or perspectives and to make decisions to help each individual perform within his or her area of responsibility.*



Team Basics

Adapted from Katzenbach and Smith, The Wisdom of Teams, 1993

Pseudo-team: *This is a group for which their could be a significant, incremental performance need or opportunity, but it has not focused on collective performance and is not really trying to achieve it. It has no interest in shaping a common purpose or set of performance goals, even though it may call itself a team. Pseudo teams are the weakest of all groups in terms of performance impact.*



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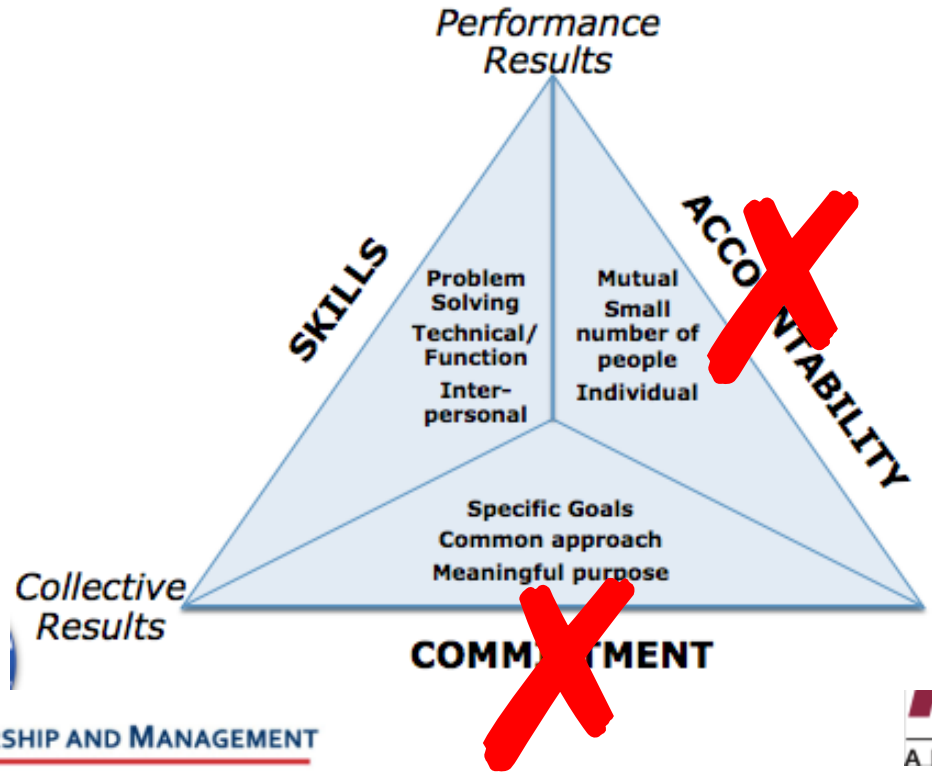
Team Basics

Adapted from Katzenbach and Smith, The Wisdom of Teams, 1993

Potential Team: *This is a group for which there is a significant, incremental performance need, and that really is trying to improve its performance impact. Typically, however, it requires more clarity about purpose, goals or work-products and more discipline in hammering out a common working approach. It has not yet established collective accountability.*



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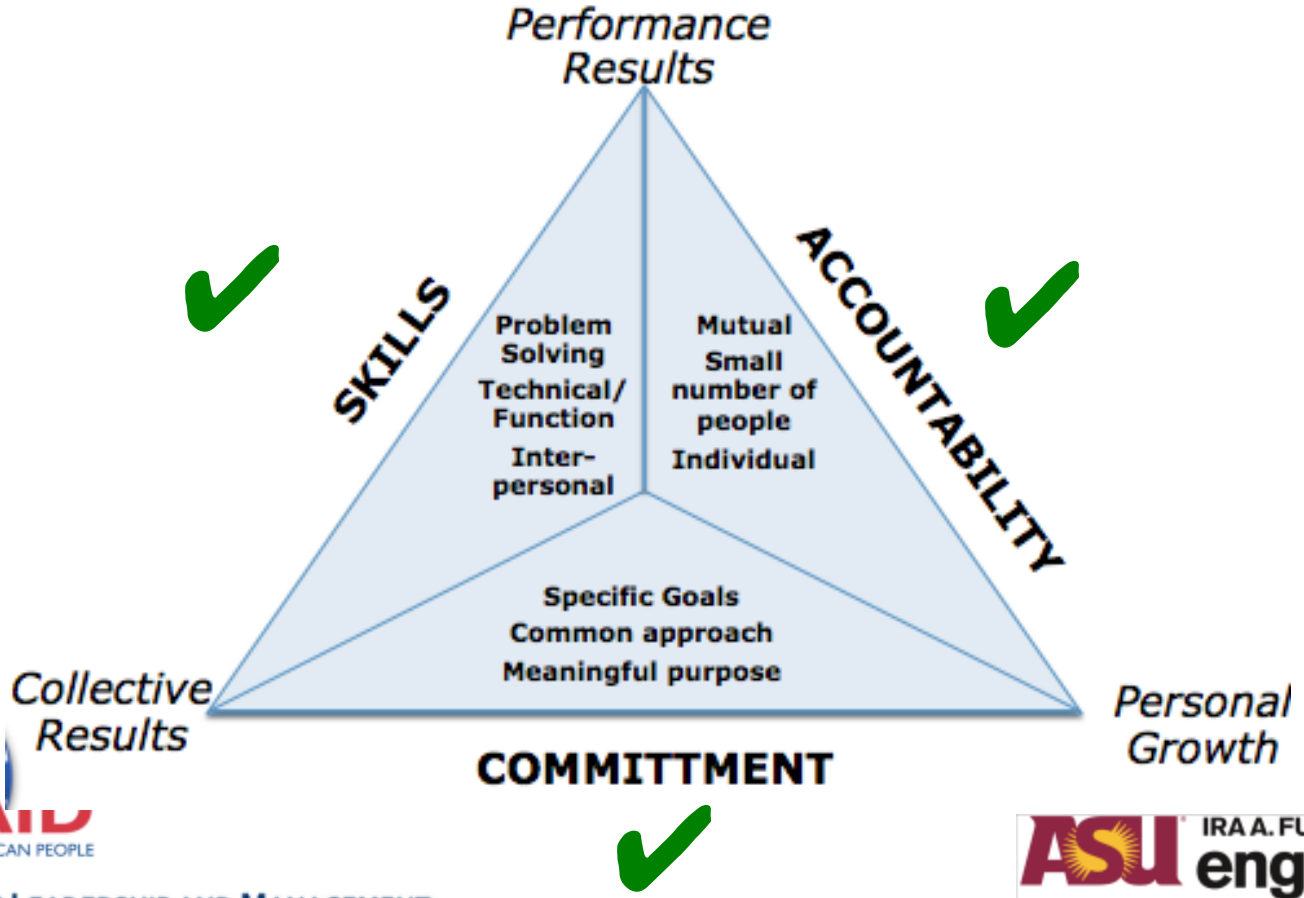
Group ≠ Team

Team Basics

apted from Katzenbach and Smith, The Wisdom of Teams, 1993

***Real Team**: This is a small number of people with complementary skills who are equally committed to a common purpose, goals, and working approach for which the hold themselves mutually accountable.*



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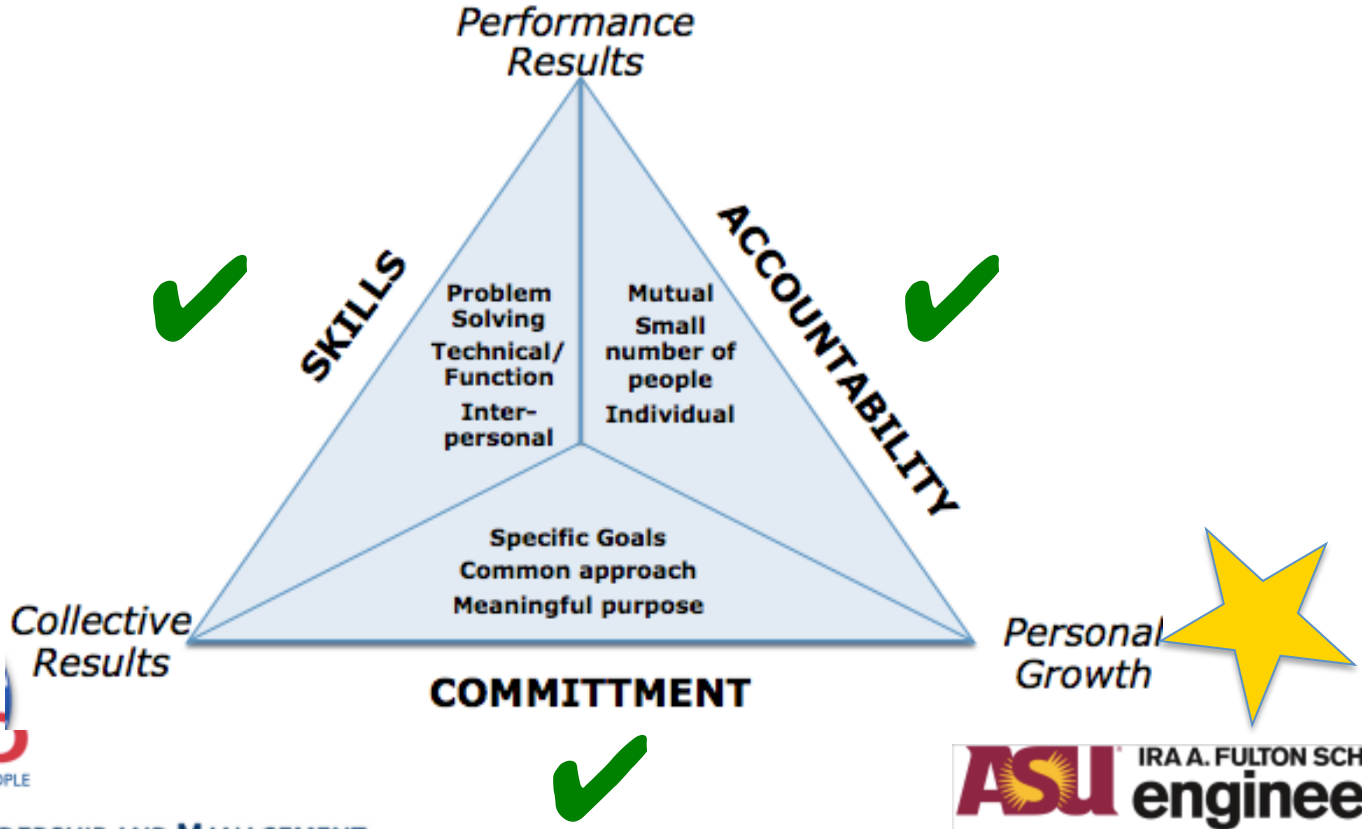
Team Basics

Adapted from Katzenbach and Smith, The Wisdom of Teams, 1993

High Performance Team: *This is a group that meets all the conditions of real teams, and has members who are also deeply committed to each other's personal growth and success. That commitment usually transcends the team. The high performance team significantly outperforms all other like teams, and outperforms all reasonable expectations given its membership.*



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Teaching and Learning

Learning Goals

Drivers for Change in Engineering Education

Why Use Active Teaching and Learning

Specific Techniques for Active Learning and Improving Student Learning

Teaching Goals and Links to Assessment

ACTIVITY: Think – Pair – Share (TPS)

Think-Pair-Share is an excellent activity for motivating a discussion or lecture

Think	*Think quietly about the question that was posed*
Pair	*Find a partner to work with to address the ??*
Share	*Share your thoughts and opinions*

Questions!

What are your program's graduates primary strengths?

What are your program's graduates primary weaknesses?

Take a few minutes to think, then talk with your table team and build two lists, one for each question. Put the lists on your large paper flip charts/pads.

Strengths

1.

Weaknesses

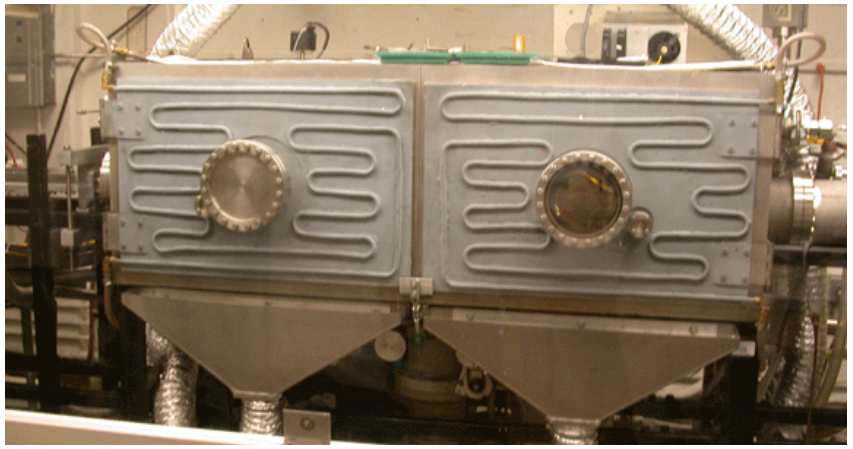
1.

Drivers for Engineering Education Change

Global challenges of delivering energy, water and food via sustainable development are becoming critical tasks for all engineering disciplines.

Drivers for Change in Engineering Education:

- **Increased Professional Expectations**
  - Engineering expertise will still be required but must incorporate non-technical skills and expertise.
  - Capability related to creativity, innovation, and leadership will be required to a much larger degree.



- **Globalization of Engineering Education**
  - Engineers are expected to work globally with a variety of societies and cultures.

Is Engineering Education Meeting Needs of Industry?

We must ask industry to know!

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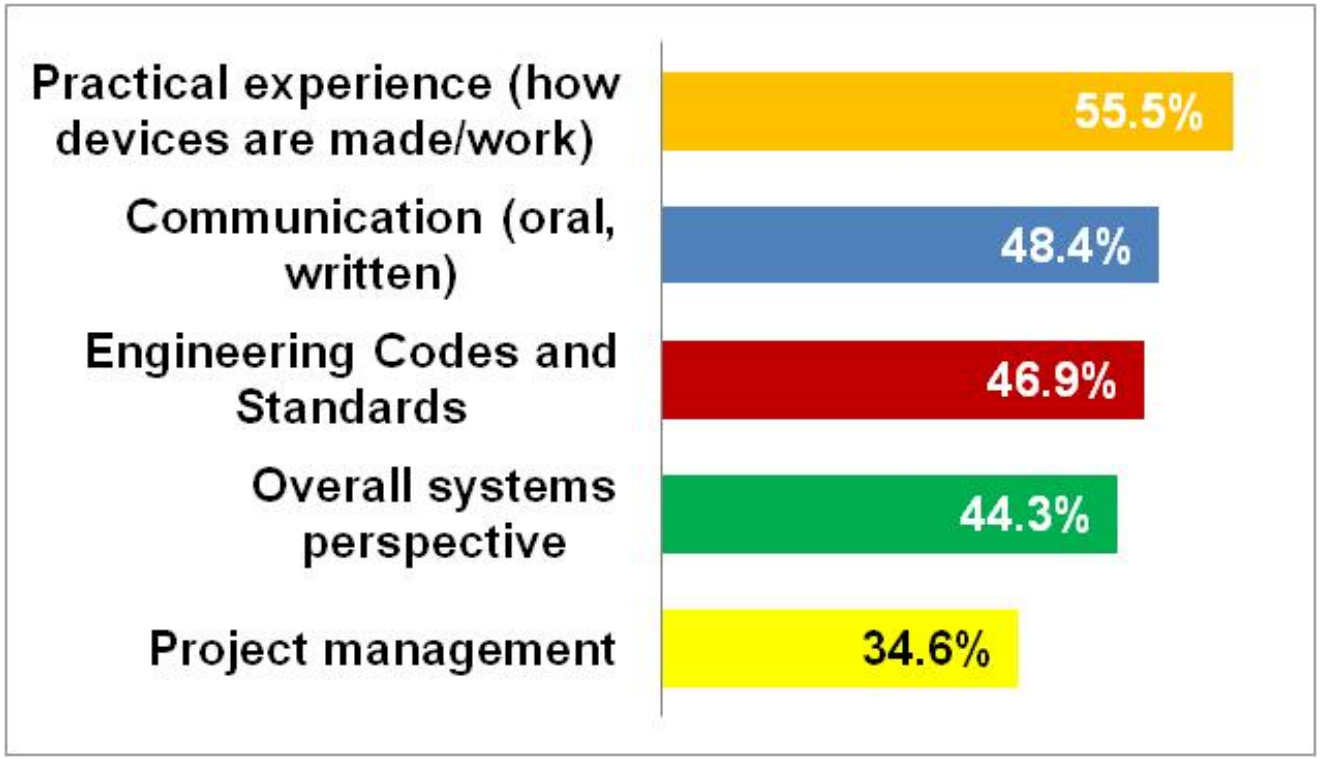
The American Society of Mechanical Engineers in its Vision 2030 project asked industry and academics about graduates.

Industry (n = 1500 firms)

Early Career Mechanical Engineers (n = 635)

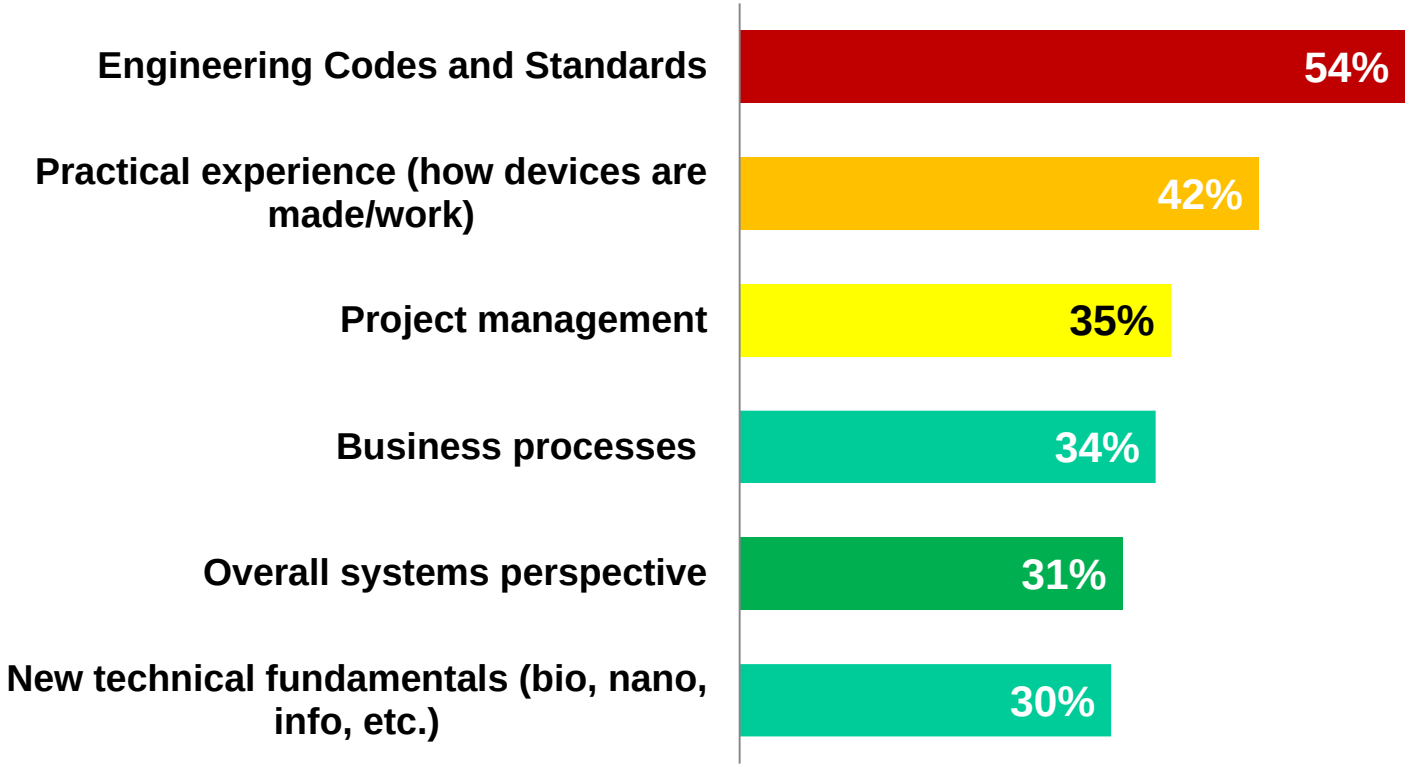
Academic (n = 80 department leaders)

Engineering Supervisors: Areas of largest weaknesses



What do you think Indonesian company supervisors would say about your graduates?

Early Career Engineers: Areas with largest weaknesses



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Vision2030
Mechanical Engineering Education

Students learn from faculty!

How we teach is critical to our students becoming successful in their careers!

Successful graduates will create a better Indonesia and ASEAN Community!

Learning is not a Spectator Sport

How much will they remember?

How much will they understand?

So why do we lecture?

- Efficient teaching
- Economy
- Large number of students served
- Human interaction (although limited)

Are They Learning?

Or not!


Sensory Systems
Twitter
email
Leaving Early
FB check
Paying attention

So why do we lecture?

Instructor “covering”

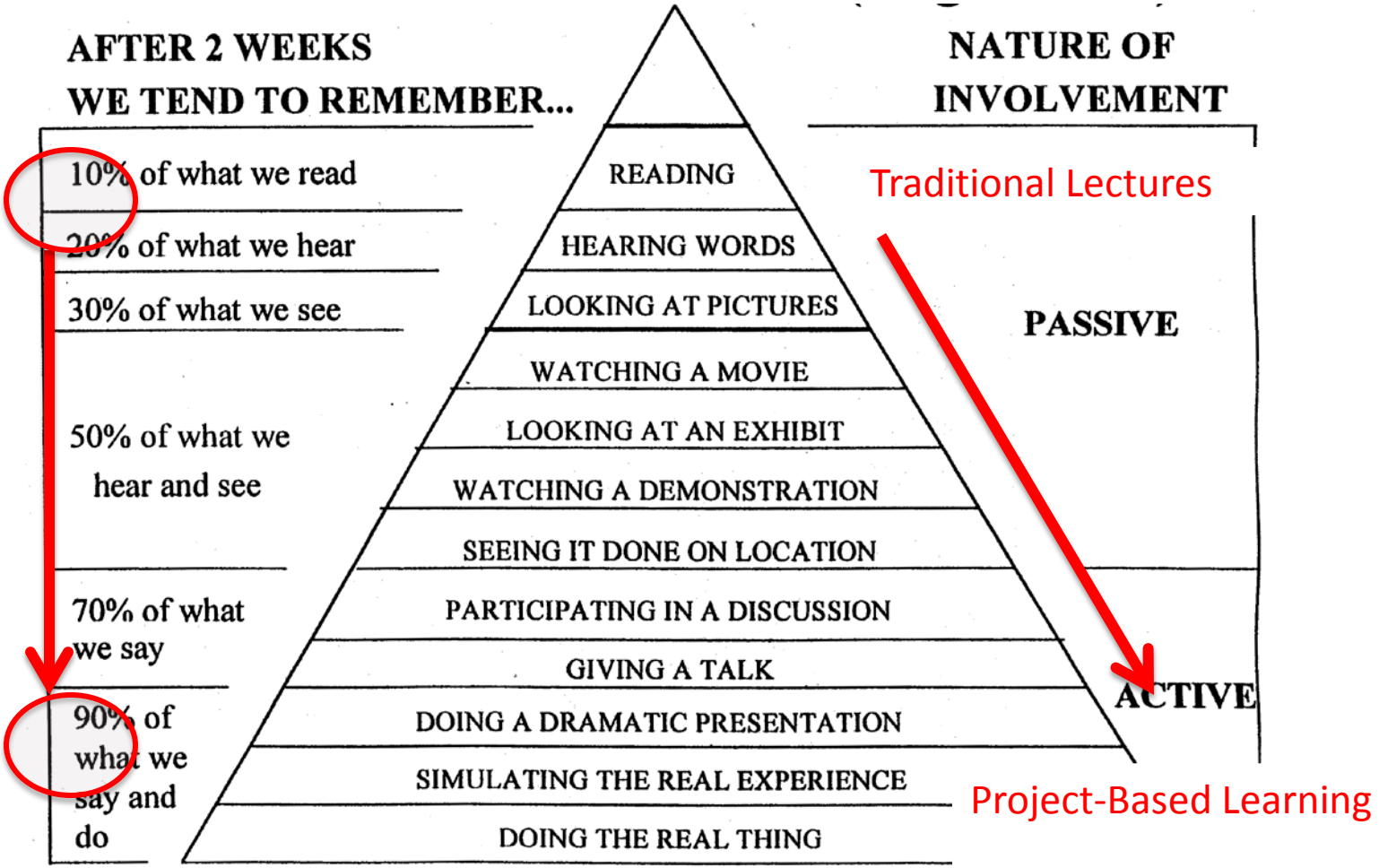
does not

equal

LEARNING!!

Cone of Learning

Edgar Dale; American Society of Engineering Education: National Teaching Institute, 1997



Edgar Dale, *Audio-Visual Methods in Teaching* (3rd Edition). Holt, Rinehart, and Winston (1969).

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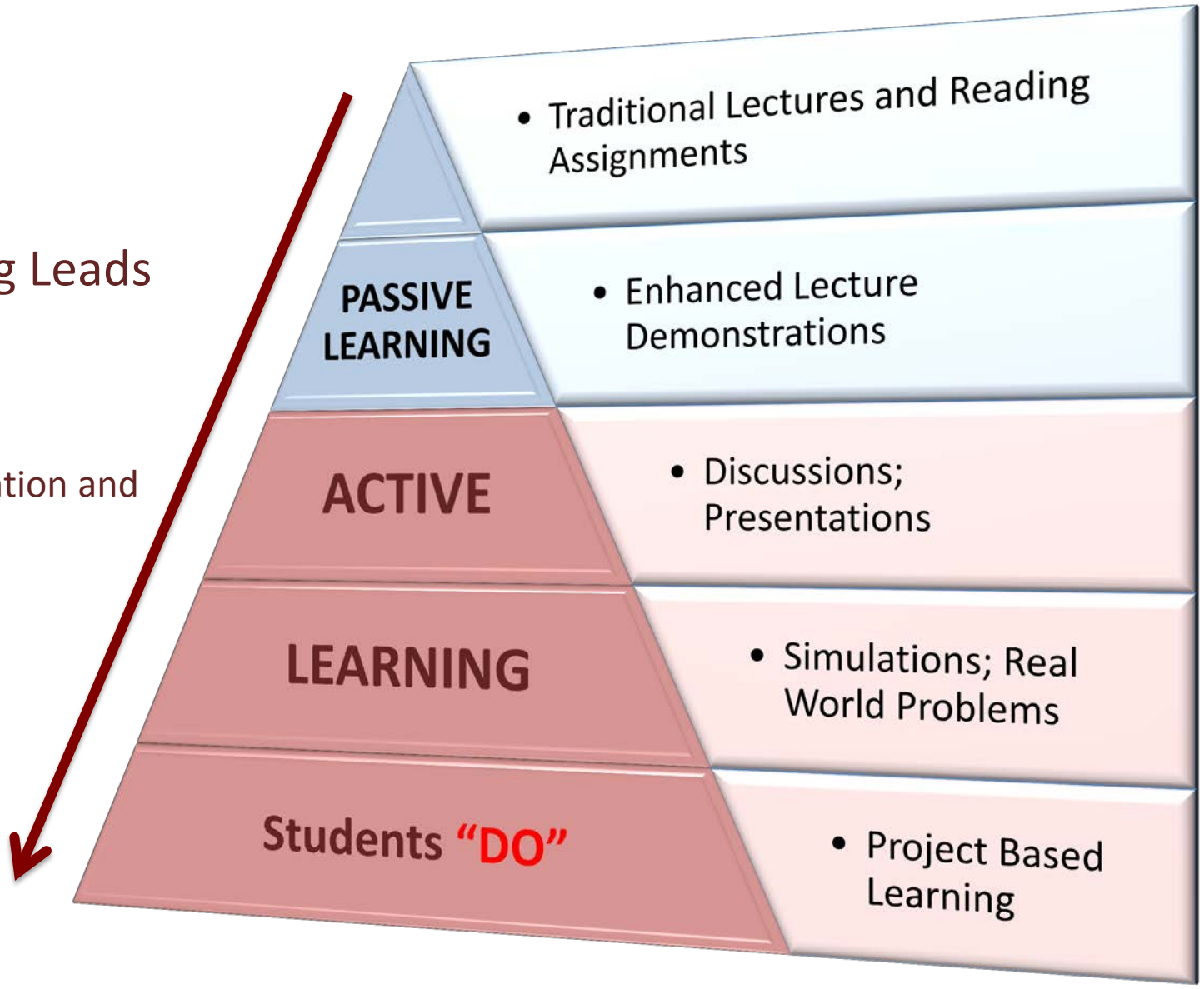
Active Learning Leads to

- Engagement
- Relevance
- Improved Retention and Performance



Remember: Think-Pair-Share Activities

- **Engaged** in a class discussion on a topic
- Multi-dimensional topic = no right answer
- Provided structure to formulate opinions
- Provided structure to express opinions

- Not “sage on stage”
- Can use images to engage brain

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Active Learning Importance

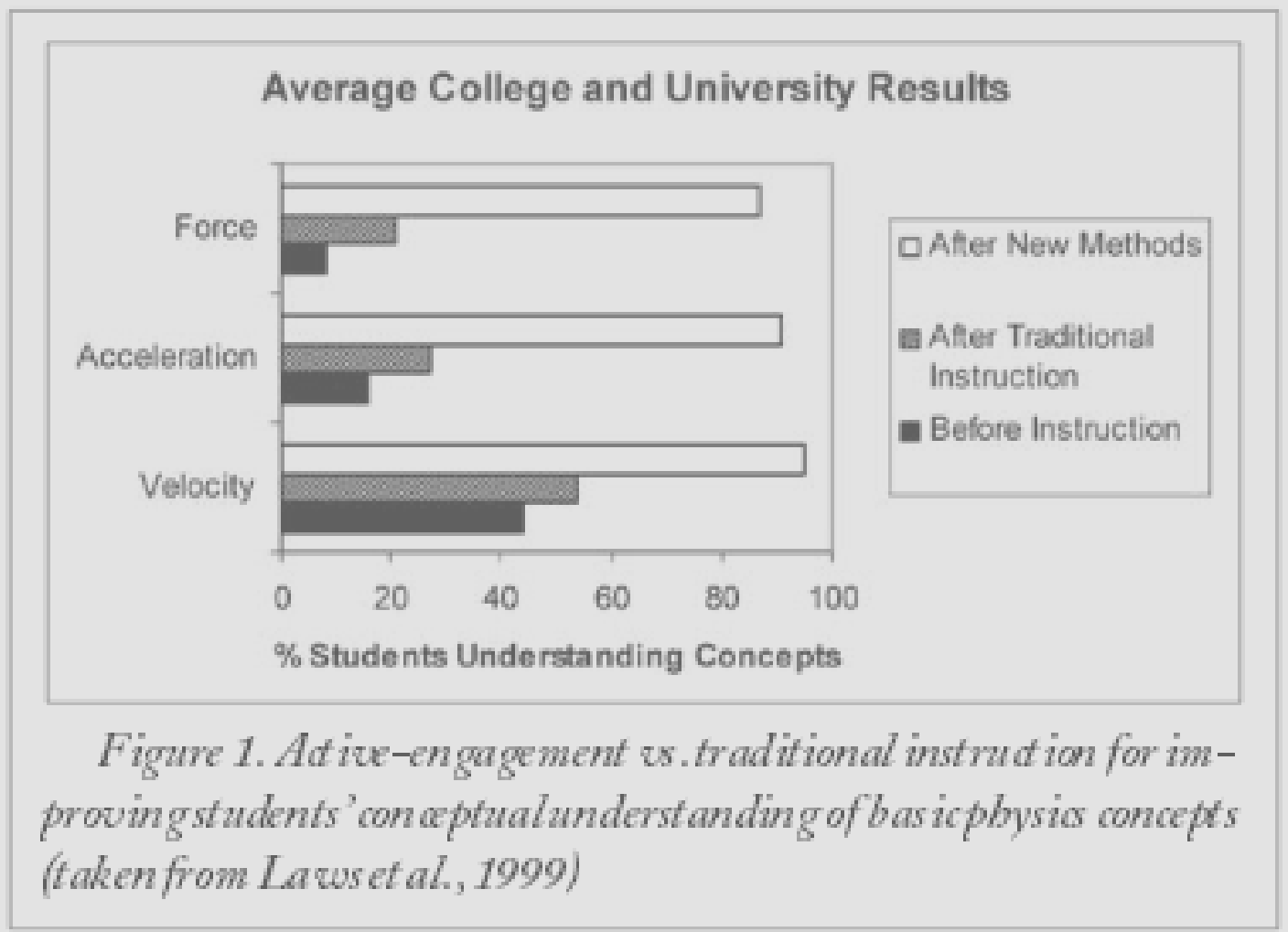

Figure 1. Active-engagement vs. traditional instruction for improving students' conceptual understanding of basic physics concepts (taken from Laws et al., 1999)

Richard Hake:

January 1998 American Journal of Physics

Interactive Engagement Versus Traditional Methods:

A **Six-Thousand** Student Survey of Mechanics Test Data for Introductory Physics Courses

- Multiple Institutions
- Pre/Post Standardized Test
  Force Concept Inventory (non-technical, conceptual)
- Measured Normalized Gain
- Lecture vs. Active Learning

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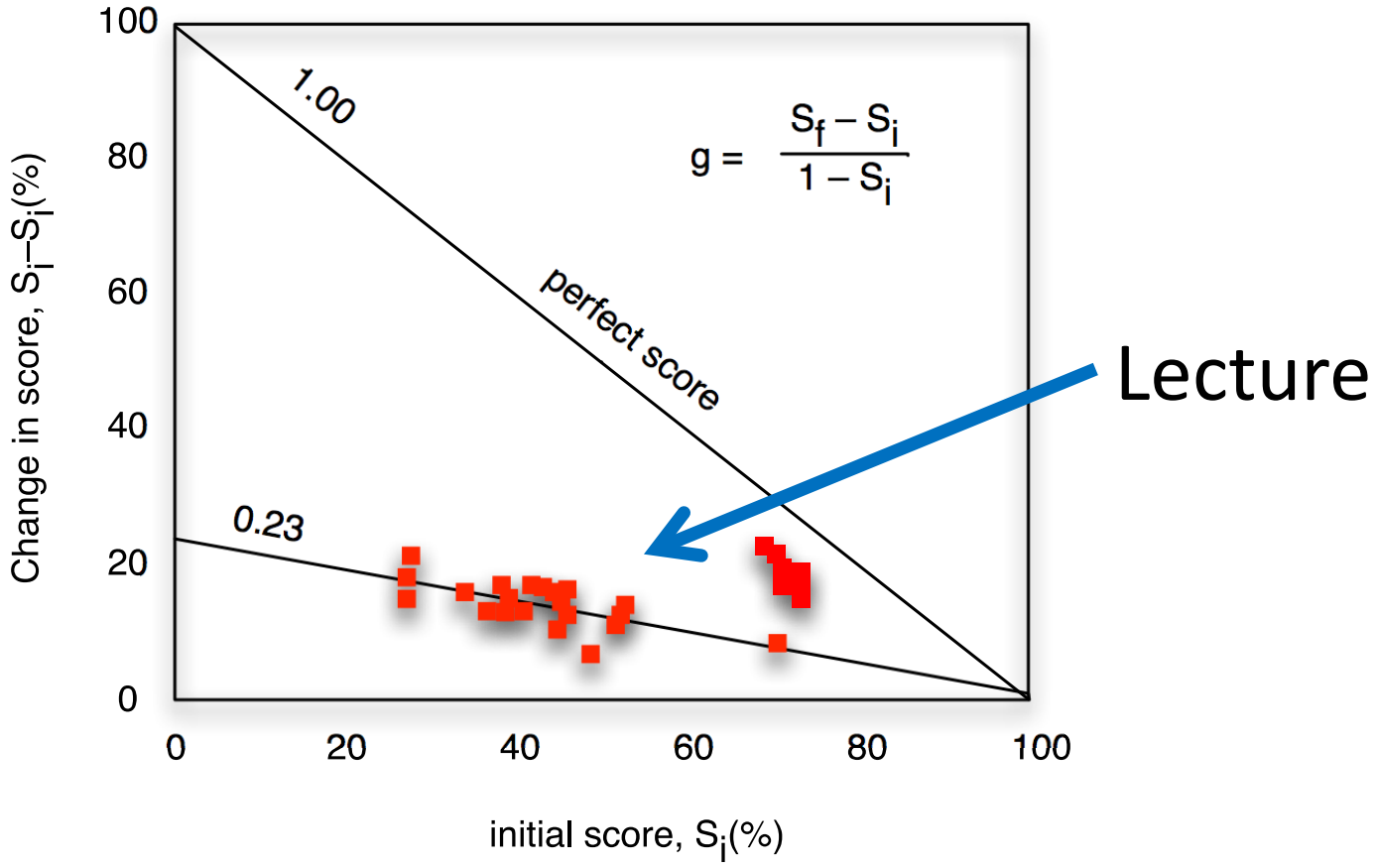
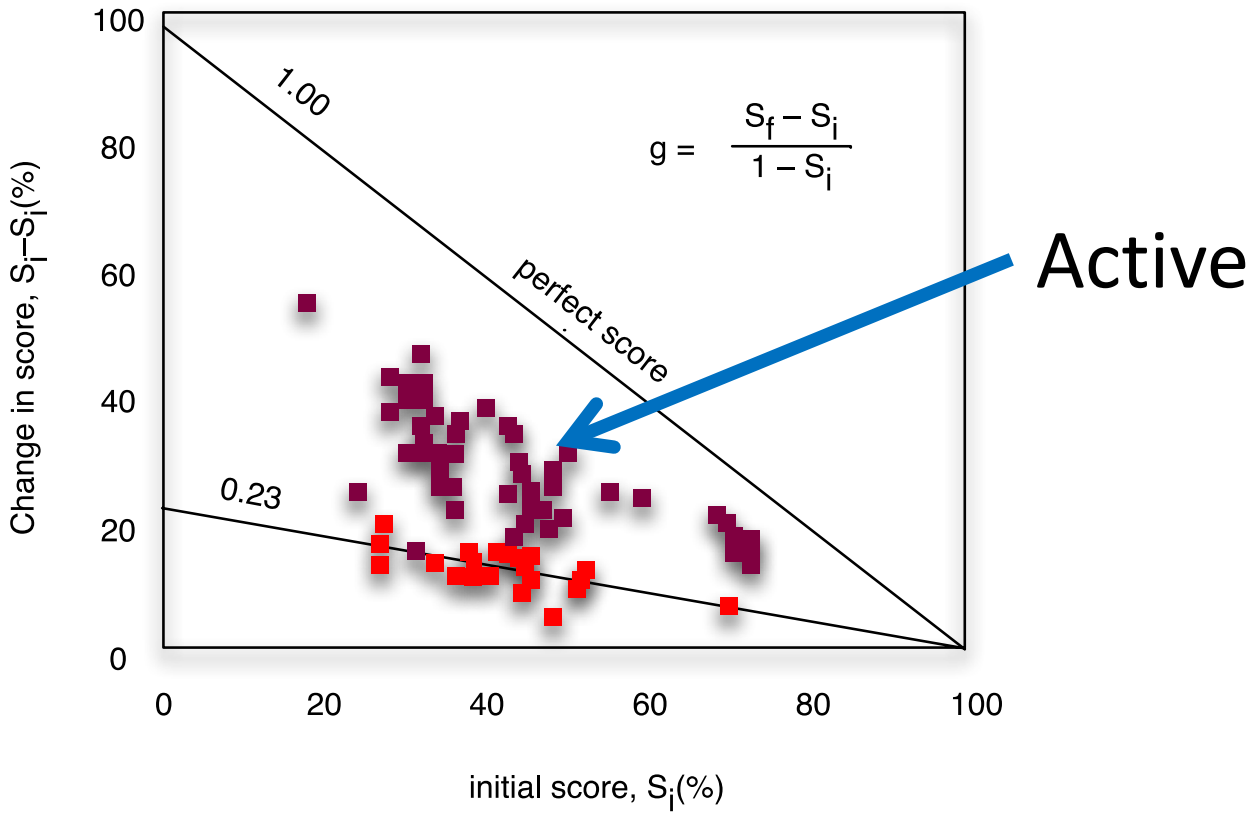
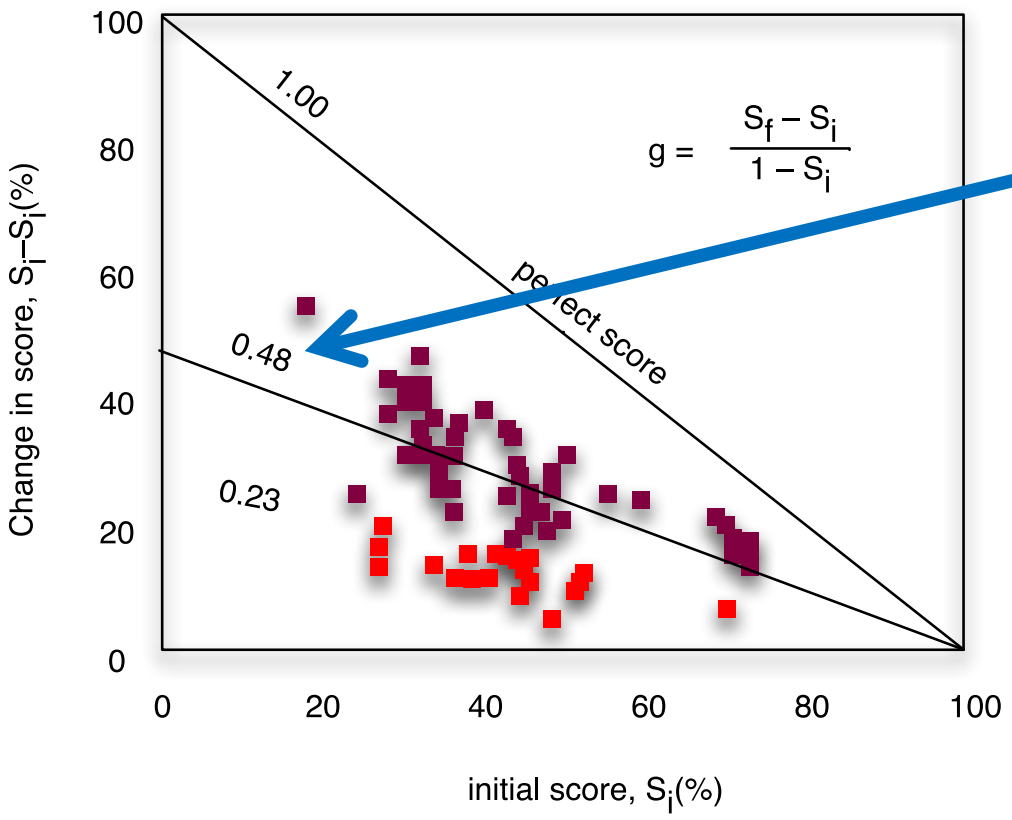
Data across many Universities



Data across many Universities



Data across many Universities



Note the overall gain!!

Learn More:
http://www.physics.pomona.edu/sixideas/sisuc.html

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So, what can we do?

Fact of Life 1: What students learn < what we teach.

Fact of Life 2: How much they learn is determined by

1. Native ability
2. Background
3. Match between their learning style and our teaching style.

Fact of Life 3: We can't do much about their ability, background, or learning style.

But we can *change how we teach*!

Source: American Society of Engineering Education: National Teaching Institute, 1997

Why do you teach the way you teach?

Is it because you teach like you were taught?

Is it because it was how you were taught?

How do you put more active learning and structure into your classes?

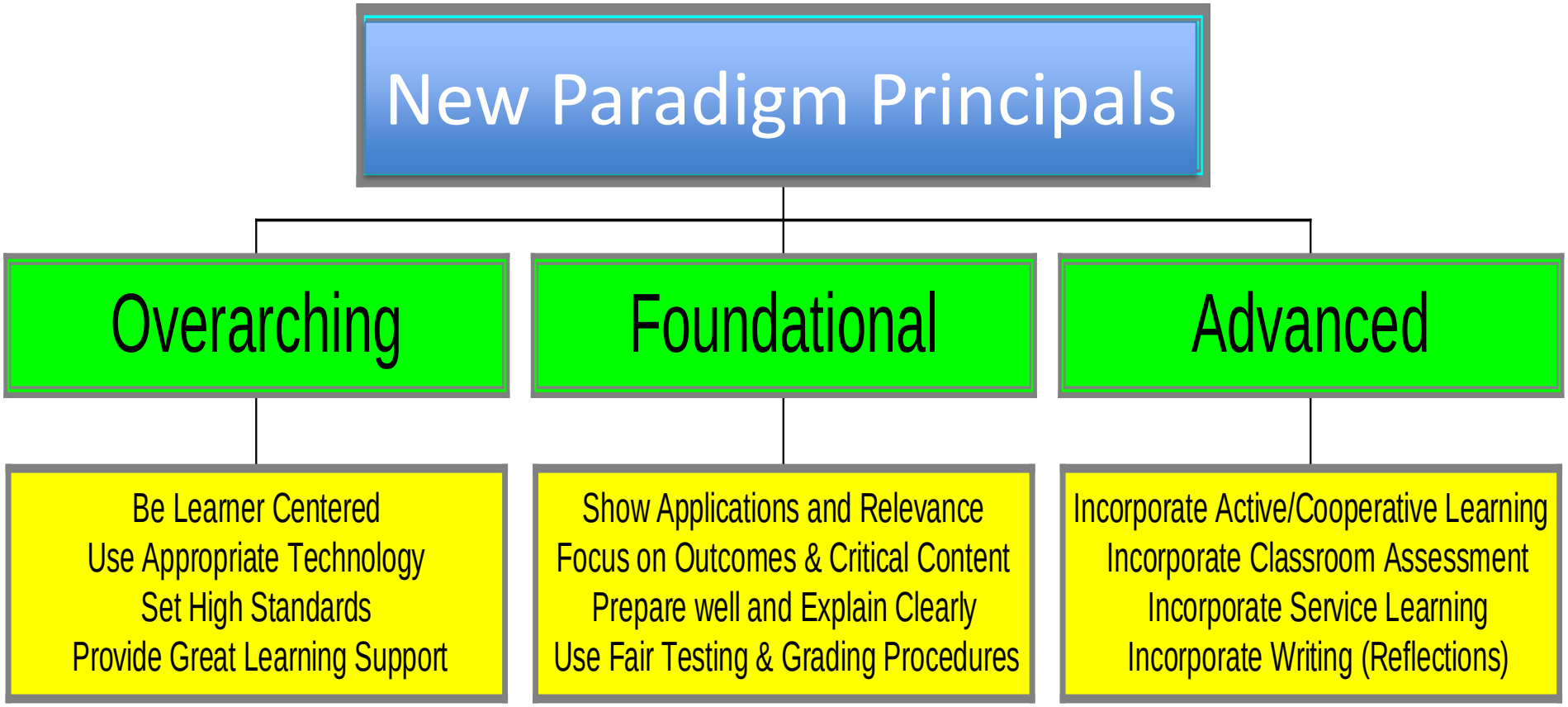
Use engineering education research to enhance student learning and explore new ways of teaching and put more active learning into your classes!

Comparison of Old and New Paradigms for College Teaching

(Adapted from Smith and Waller, 1997)

	OLD PARADIGMS	NEW PARADIGMS
Teaching assumption	Any subject matter expert can teach	Teaching is complex and requires considerable training & effort
Knowledge	Transferred from faculty to students	Jointly constructed by students and faculty
Students	Passive vessel to be filled by faculty's knowledge	Active constructor, discoverer, transformer of knowledge
Mode of Learning	Memorizing	Relating
Student Goals	Complete requirements, achieve certification within a discipline	Grow, focus on continual lifelong learning within a broader system
Relationship	Impersonal relationship among students and between faculty and students	Personal transaction among students and between faculty and students
Assessment	Norm-referenced (i.e., graded "on the curve"); typically multiple choice items; student rating of instruction at end of course	Criterion-referenced; typically performances and portfolios; continual assessment of instruction
Faculty's Purpose	Classify and sort students	Develop students' competencies and talents
Context	Competitive/Individualistic	Cooperative learning
Power	Faculty holds and exercises power, authority, and control	Students are empowered: power is shared among students and between students and faculty
Technology use	Drill and practice; substitute textbook	Problem solving, communication, collaboration

There are a collection of principals to guide your development of different teaching style.



Mehta, S., & Danielson, S. (2000a). Next Generation Principles for Enhancing Student Learning, *Proceedings of the ASEE National Conference*, St. Louis, MO.

Explanation of These Principals

O1. Be learner-centered. We, as instructors, should know our students and keep their learning at the center of our teaching.

Take into account learning style of students!

Being learner-centered does not mean being lenient.

Learning Styles

A learning style model formulated by Richard M. Felder and Linda K. Silverman, North Carolina State University.

Four dimensions of learning styles:

active <--> reflective
sensing <--> intuitive
visual <--> verbal
sequential <--> global

What is your learning style?

How do you prefer to learn new things?

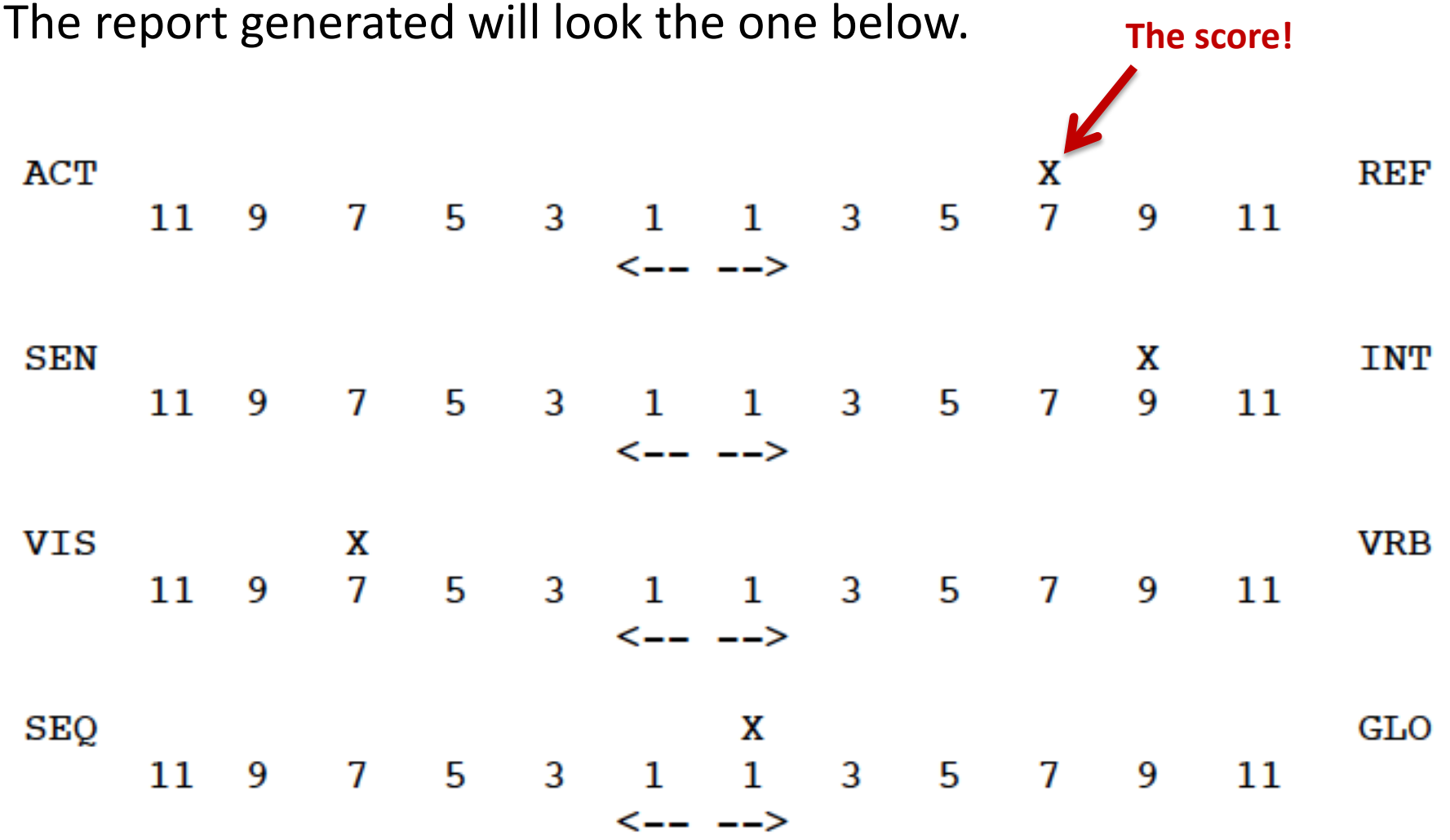
Take the Learning Style inventory, an on-line instrument that is free to use

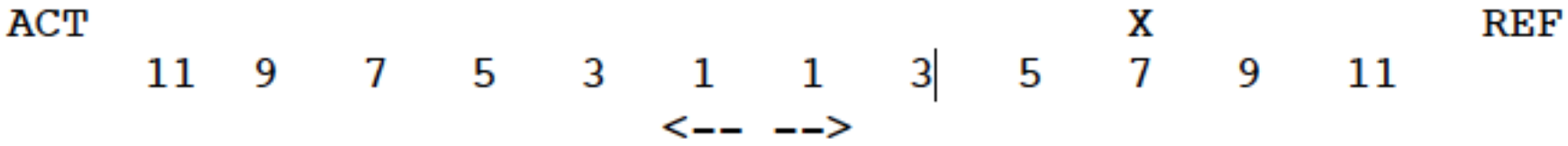
http://www.engr.ncsu.edu/learningstyles

Use the second link: The ILS Questionnaire

Write down your scores or keep them up on your computer screen!

The report generated will look the one below.





Active Style

- Retain through discussion, application
- "lets try it out"
- Like group work
- *VERY* hard to sit through lectures

Reflective Style

- Prefer to think it through first
- May prefer individual work or task
- Hard to sit through lectures

Don't let the style name confuse you.
BOTH styles retain information *longer*
when we use active learning techniques.

Which is better?

ACT X REF

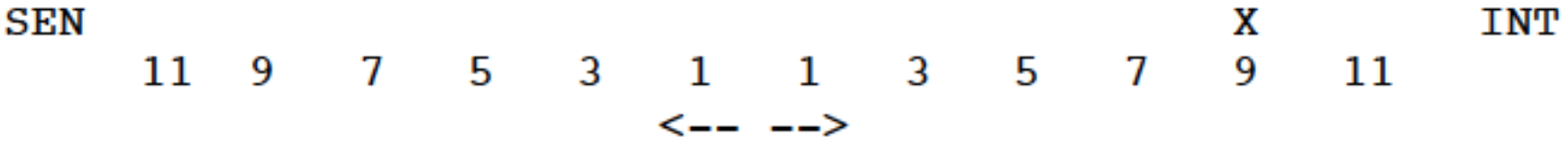
11 9 7 5 3 1 1 3 5 7 9 11

<-- -->

Everybody is active sometimes and reflective sometimes.
A balance is desirable.

If you always act before reflecting you can jump into things prematurely and get into trouble;

If you spend too much time reflecting you may never get anything done.

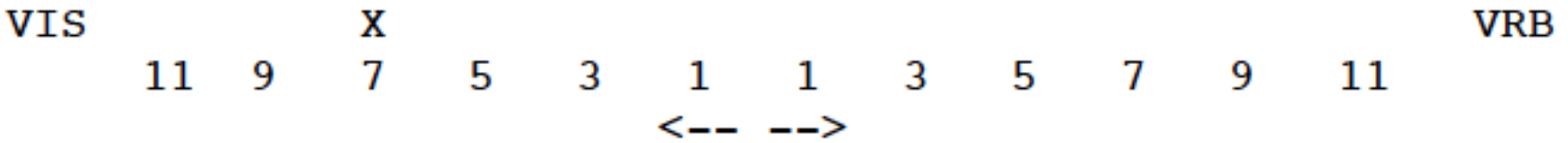


Sensing Style

- Like learning facts
- Like established methods
- Dislike surprises
- Practical & Careful
- Need real world connections

Intuitive Style

- Like to discover relationships
- Like innovation
- Bored with repetition; memorization and routine calculations
- More comfortable with abstractions and formulas
- Tend to work more quickly

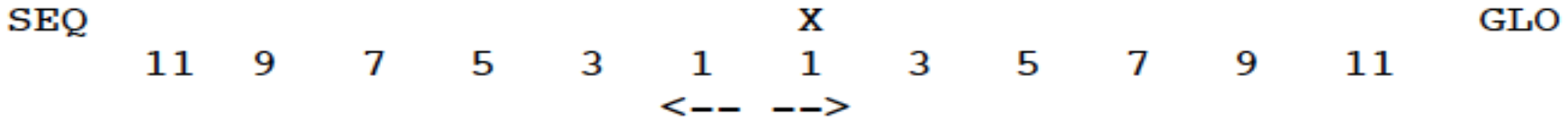


Visual Style

- pictures, flow-charts, films, demonstrations . . .
- Most people are visual learners

Verbal Style

- written and spoken words
- Many college classes are lecture and textbook based



Sequential Style

- Linear, logical steps
- Prefer things “in order”
- May be able to apply material “in part” even if comprehension is incomplete
- May have difficulty applying concepts to a new problem

Global Style

- Learn in large “jumps”
- “big picture” helps solve complex problems;
- May not be able to explain the process used
- May lack clarity of details
- Need to see connections and relationships

Explanation of These Principals

F1. Show applications and relevance of course material. Discussing applications and relevance of subject matter is perceived as one of the important factors in enhancing student learning .

Real life applications and connecting the topic to other courses in the curriculum increases student motivation and attention.

Explanation of These Principals

F2. Focus on student outcomes and critical content. Classroom materials for an individual course topic should be based on "critical content" (key points for desired student outcomes or material that students often struggle to understand) and not on a philosophy that "more is better."

Explanation of These Principals

A1. Incorporate active cooperative learning (ACL) into the classroom. Nearly 600 experimental and over 100 correlational studies have been conducted on the effectiveness of active cooperative learning or ACL to improve student learning.

Active cooperative learning (ACL)

Can you use active learning and still cover the syllabus?

Do active learning methods work in large classes?

Yes to both questions!

Active cooperative learning (ACL)

Tool #1 Concept Questions

Concept questions are conceptual multiple-choice questions that were originally designed by Eric Mazur at Harvard University for students in large physics classes.

Peer Instruction: A User's Manual
Eric Mazur **1997** New Jersey: Prentice Hall

Active cooperative learning (ACL)

Tool #1 Concept Questions

- Focus on a single concept
- Can't be solved using equations
- Have good multiple-choice answers
- Are clearly worded
- Are of intermediate difficulty

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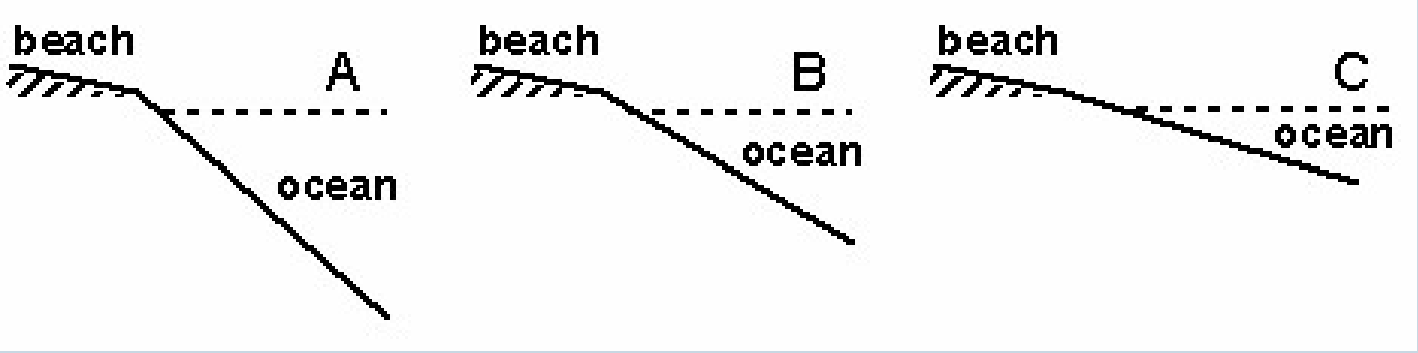
Concept Questions

Example Concept Question

At which location in the diagram below would the waves break closer to the beach?



a. A
b. B
c. C

http://serc.carleton.edu/introgeo/interactive/conctest.html

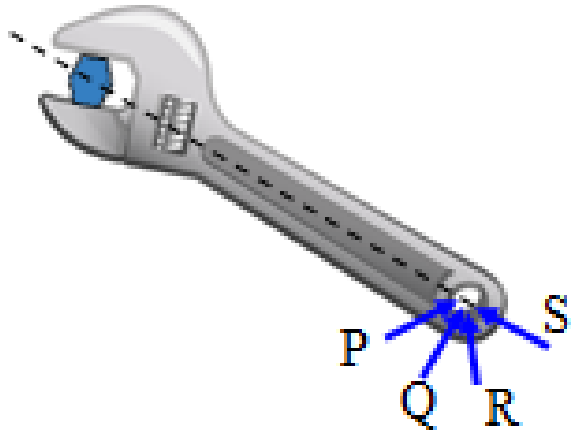
Concept Questions

Example Concept Question

1. If a force of magnitude F can be applied in four different 2-D configurations (P,Q,R, & S), select the cases resulting in the maximum and minimum torque values on the nut. (Max, Min).

A) (Q, P) B) (R, S)

C) (P, R) D) (Q, S)



Prentice Hall, Teaching Materials for *Engineering Mechanics: Statics*, Hibbeler, 14th Edition, 2015.

Using Concept Question

Ask question and have students respond with no discussion—only their own thoughts

Then use peer instruction (student to student) and have students discuss their answers.

Then re-ask the question and have students respond with their answers.

T-P-S activity!

Using Concept Question

How to get or record student responses?

- Use Flash Cards
- Use re-usable answer sheets
- Use clicker technology

Concept Question

2. Give the most appropriate reason for using three significant figures in reporting results of typical engineering calculations.

A) Historically slide rules could not handle more than three significant figures.

B) Three significant figures gives better than one-percent accuracy.

C) Telephone systems designed by engineers have area codes consisting of three figures.

D) Most of the original data used in engineering calculations do not have accuracy better than one percent.

Prentice Hall, Teaching Materials for *Engineering Mechanics: Statics*, Hibbeler, 14th Edition, 2015.

Active cooperative learning (ACL)

Tool #2 Interactive Lecture Demonstrations

Interactive Lecture Demonstrations engage students in activities that confront their prior understanding of a core concept. The activity can be a classroom experiment, a survey, a simulation or an analysis of secondary data.

http://serc.carleton.edu/introgeo/demonstrations/index.html

Active cooperative learning (ACL)

Tool #2 Interactive Lecture Demonstrations

Interactive Lecture Demonstrations introduce a carefully scripted activity, creating a "time for telling" in a traditional lecture format.

Tool #2 Interactive Lecture Demonstrations

Predict the outcome of the demonstration. Individually, and then with a partner, students explain to each other which of a set of possible outcomes is most likely to occur.

Experience the demonstration. Working in small groups, students conduct an experiment, take a survey, or work with data to determine whether their initial beliefs were confirmed (or not).

Reflect on the outcome. Students think about why they held their initial belief and in what ways the demonstration confirmed or contradicted this belief. After comparing these thoughts with other students, students individually prepare a written product on what was learned.

Tool #2 Interactive Lecture Demonstrations

Effective interactive lecture demonstrations require that instructors:

- Identify a core concept that students will learn.
- Chose a demonstration that will illustrate the core concept, ideally with an outcome different from student expectations.
- Prepare written materials so that students can easily follow the prediction, experience and reflection steps.

Tool #2 Interactive Lecture Demonstrations

The web site http://serc.carleton.edu/introgeo/demonstrations/examples.html

has a large number of peer-reviewed examples of interactive lecture demonstrations (the physics examples are often related to engineering)

Explanation of Principals

A2. Incorporate classroom assessment. Both faculty and students need to monitor learning on a continuous basis and be prepared to take additional learning measures, if necessary.

Explanation of These Principals

A2. Incorporate classroom assessment.

"The assessments should provide students with opportunities to revise and improve their thinking, help students see their own progress over the course of weeks or months, and help teachers identify problems that need to be remedied."

How people learn: Brain, Mind, Experience, and School (expanded edition), 2000. National Academy Press, Washington, D.C.

Explanation of These Principals

A2. Incorporate classroom assessment. **C**lassroom **A**ssessment **T**echniques (CATs) are important tools for monitoring learning. Several CATs like the Minute Paper, Muddiest Point, and One Sentence Summary are suggested by Angelo and Cross (1993).

Classic CATs that Assist Active Learning

Minute Paper

Muddiest Point

One Sentence Summary.

What is the Minute Paper?

A concise note (taking one minute!), written by students (individually or in groups), that focuses on a short question presented by the instructor to the class, usually at the end of the session.

Why Use the Minute Paper?

The Minute paper provides real-time feedback from a class to find out if students recognized the main points of a class session—or were confused by them!— and so help the instructor craft changes for the next class.

What is the Muddiest Point?

Give students two to three minutes to answer the following question:

What was the muddiest point in today's lecture?

You may need to explain what “muddy” means in this context. Just like muddy water (water with soil in it), you are asking what is not clear to students.

Why Use the Muddiest Point?

Allows you to collect written feedback about what students are not understanding in lecture.

Gives students more involvement in their learning!

What is the One Sentence Summary?

Students summarize the main idea and vital details in one sentence.

Use at the beginning of the lesson to activate what students knew before or as a closure activity at the end of a lesson.

Can be completed orally, used as a journal entry, or written on a post-it note.

Why Use the One Sentence Summary?

Allows you to summarize, describe, sequence, compare and contrast and show problem/solution.

One-Sentence Summary Template

Description

A _____ is a kind of _____ that _____.

Sequence

_____ begins with, continues with _____ and ends with _____.

Compare/Contrast

____ and ____ are similar in that both ____, but _____ while _____.

Cause/Effect

_____ causes _____.

Problem/Solution

_____ wanted _____ but _____ so _____.

Do you teach based on what you want to accomplish in a given course?

The Teaching Goals Inventory (TGI)

- A self-assessment of instructional goals developed by Angelo and Cross
- Purpose:
  - help teachers become more aware of what they want to accomplish
  - locate **classroom assessment techniques (CATs)** to assess how well they are achieving their teaching and learning goals

The Teaching Goals Inventory (TGI)

Categorizes things taught in a class into 6 skill clusters:

- Higher Order Thinking Skills,
- Basic Academic Success Skills
- Discipline-Specific Knowledge and Skills
- Liberal Arts and Academic Values
- Work and Career Preparation
- Personal Development

Each of these may require a different assessment method!

The Teaching Goals Inventory (TGI)

Do your personal teaching goal inventory assessment and generate/save the report it generates for you!

http://fm.iowa.uiowa.edu/fmi/xsl/tgi/data_entry.xsl?-db=tgi_data&-lay=Layout01&-view

Complete this inventory for a specific class you teach and bring the syllabus tomorrow!

The Teaching Goals Inventory (TGI)

I took the TGI for a 2nd year Engineering Mechanics course.

Cluster	Goals Included in Cluster	Percent Rated "Essential"	Mean Rating
I. Higher Order Thinking Skills	1-8	25%	3.38
II. Basic Academic Success Skills	9-17	0%	3.11
III. Discipline-Specific Knowledge and Skills	18-25	38%	3.63
IV. Liberal Arts and Academic Values	26-35	0%	1.50
V. Work and Career Preparation	36-43	13%	2.88
VI. Personal Development	44-52	0%	2.11

Teaching goals I rated as essential for this course.

Goals You Rated "Essential"

2. Develop analytic skills
3. Develop problem-solving skills
18. Learn terms and facts of this subject
19. Learn concepts and theories in this subject
20. Develop skill in using materials, tools, and/or technology central to this subject
39. Develop a commitment to accurate work

These results can help me choose classroom assessment tools!

Assessing Skill in Problem Solving

19. Problem Recognition Tasks
20. What's the Principle?
21. Documented Problem Solutions
22. Audio- and Videotaped Protocols

Assessing Prior Knowledge, Recall, and Understanding

1. Background Knowledge Probe
2. Focused Listing
3. Misconception/Preconception Check
4. Empty Outlines
5. Memory Matrix
6. Minute Paper
7. Muddiest Point

Assessing Skill in Analysis and Critical Thinking

8. Categorizing Grid
9. Defining Features Matrix
10. Pro and Con Grid

From*: Classroom Assessment Techniques: A Handbook for College Teachers*, by Thomas A. *Angelo* and. K. Patricia *Cross* (San Francisco: Jossey-Bass, 1993

Course Outcomes—The Link to Teaching Goals!