Incorporating Teaming and/or Active Cooperative Learning into the Engineering

Jim Morgan, Texas A&M

jim-morgan@tamu.edu

Acknowledgements

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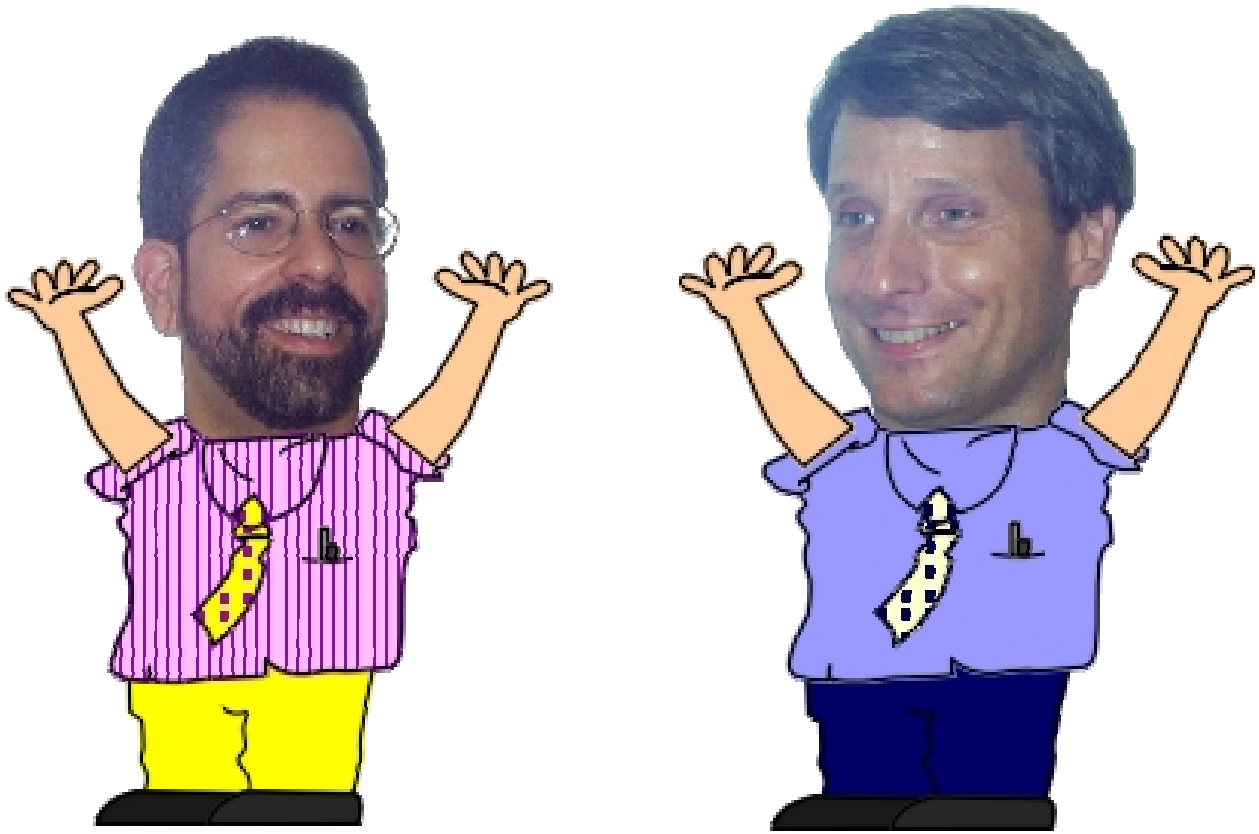
Getting Started

The Signal



What is the Signal?

- Raise your hands to inform your neighbors.
- Finish your sentence.
- **DO NOT finish your paragraph.**
- Turn towards the facilitator.

Workshop description

Participants will work in teams in an active/collaborative (or cooperative), ACL, learning environment focused on the benefits of using teams and an ACL environment in engineering classes. Topics will include experiences and results from the Foundation Coalition; techniques for incorporating ACL into a classroom; and issues surrounding the use of teams (forming teams; evaluating in-class work; evaluating out-of class work; peer assessment and evaluation; etc). Participants will learn problems as well as solutions, and will engage in the transformation of a "real" lesson plan for use by teams in an active/collaborative class.

Workshop Structure

- Use +/Δ's (Plus / Deltas).
- A + is a comment about one thing you found valuable and
- A Δ is a suggestion about how to improve something.

Workshop structure (continued)

- **The Issue Bin**:
  - topics that will or may be addressed later;
  - questions that can or should be deferred until the end of the workshop; and
  - items that can or should be the subject for another session.
- **Paraphrase the issue and record it on a post-it-note® where it can be viewed by others.**

Workshop structure (continued)

- **Code of Cooperation:**
  - EVERY member of the team is responsible for the team's progress and success.
  - Listen to and show respect for the contributions of other members, i.e., be an active listener.
  - CONSTUCTIVELY criticize ideas, not persons.
  - Be succinct, avoid long anecdotes and examples.
  - No rank in the room.

Questions about the Workshop

- **first individually write down**

  In the next minute . . . **specifically what do you want to know about teaming in a ActiveCooperativeLearning class?**

- **Share your list with the person sitting next to you**
- Now as a team, **assemble on flip chart, and prioritize your list** …

Selected Workshop Topics

1. .
2. ..
3. …
4. . . .
5. . . .

Exercise

AS A TEAM, spend 4 minutes discussing the following task. At the end 4 minutes, **any member of the team should be prepared to present your findings.**

Talk about the various courses in your discipline and develop a list of 5 topics that everyone on the team would have some ***minimal comfort level*** talking about in greater detail.

Exercise (continued)

AS A TEAM, you have 10 minutes to complete the task described below. Your results should be written on a single sheet of paper.

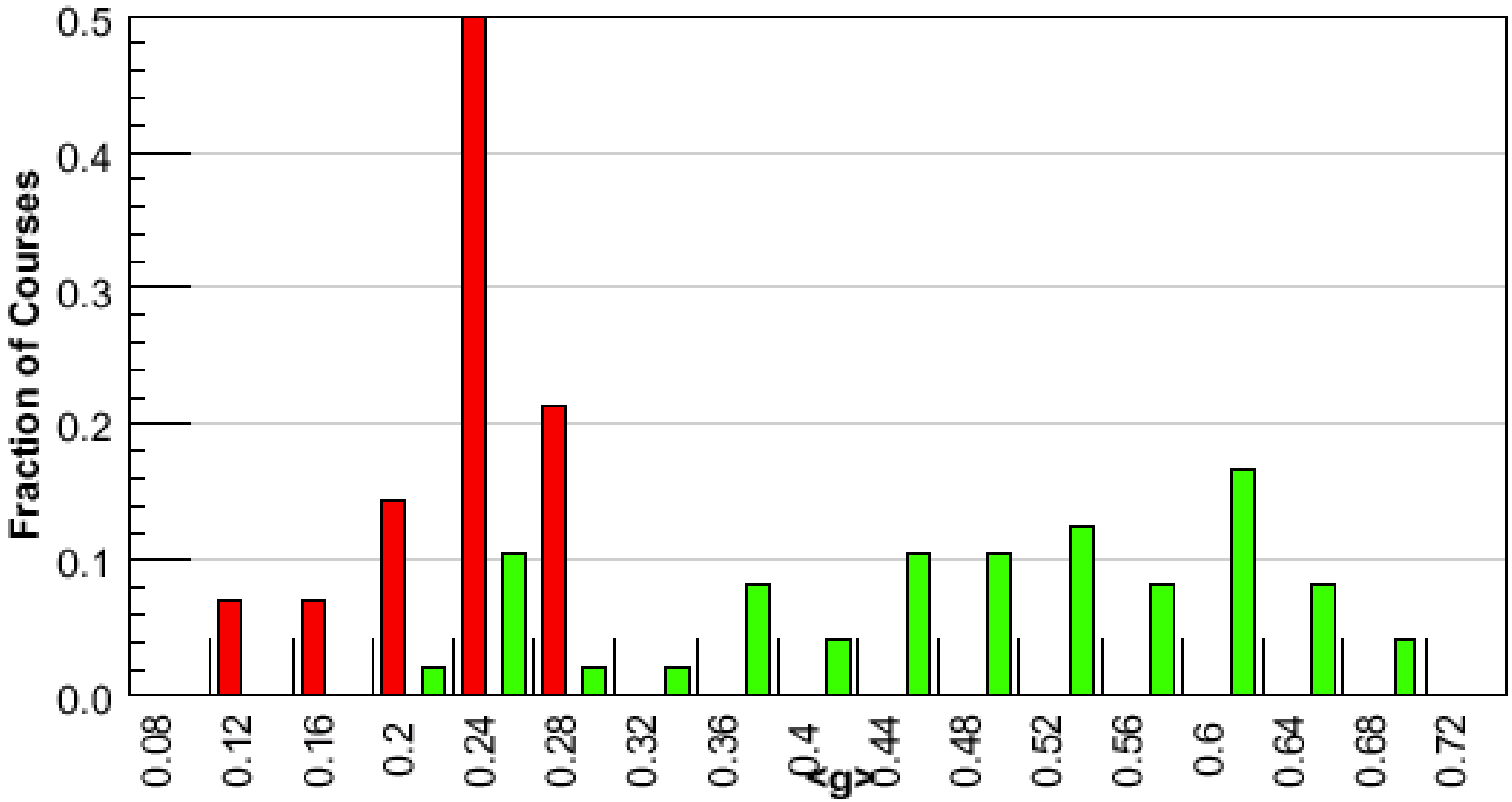
Develop a lesson **(both in content and presentation)** on your selected topic. Provide sufficient detail so that someone, not on your team, could teach the lesson without you being present. Assume you will use a "typical" lecture-style format.

ACL Problems

- Individually, list 5 problems you might have as a faculty member using ACL in class
- Share your list with the person sitting next to you
- Suggest a strategy for each problem

#1: using team activities to facilitate cooperative learning

Why Active/Collaborative?



Why does it work?

- **Cone of learning**
- **Attention span**
- **And many more**

Cooperative Learning Strategies

- *Think Pair Share*
- *Think Aloud Paired Problem Solving*
- *JigSaw*
- *Enhanced Lecture*
- *And many more*

AC(orC)Learning Resources

- http://www.clcrc.com/
- http://www.active-learning-site.com
- http://www2.ncsu.edu/. . .
  unity/lockers/users/f/felder/. . .
  public/RMF.html
- http://foundation-coalition.tamu.edu/
- http://www.psu.edu/celt/clbib.html
- http://www.wcer.wisc.edu/nise/cl1/

Definitions

- **Active Learning** - students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class.
- **Cooperative Learning** - students work in teams on problems and projects under conditions that assure both ***positive interdependence*** and ***individual accountability***.

To be active or to be cooperative (or should it be **collaborative)?**

Is / Is Not

AS A TEAM, vote on the following answers as IS or IS NOT *ACL*...

- Teacher asks questions during class. Is or is not *ACL*?
- Students form pairs to solve problems: one problem-solver, one listener. Is or is not *ACL*?

Is / Is Not (continued)

- **Teacher asks the students to present solutions to problems on the board.** Is or is not *ACL*?
- **Students work in teams during recitations.** Is or is not *ACL*?
- **While working in groups, each student is asked to individually prepare….** Is or is not *ACL*?

It Depends!!!!!

How do I know if it is ACL?

- ✓ **P**ositive Interdependence
- ✓ **I**ndividual Accountability
- ➢ **G**roup Processing
- ➢ **S**ocial Skills
- ✓ **F**ace-To-Face Interaction

ACL Elements

- **Positive Interdependence** - Team members must rely on each other to accomplish goals.
- **Individual Accountability** - Members are held accountable for doing their share of the work, as well as mastering all material.

ACL Elements (continued)

- **Group Processing** - Teams periodically reflect on what they do well as a team, what they could improve, and what they might need to do differently.
- **Face-to-Face Interaction** - Some or all work should be done by members working together.

ACL Elements (continued)

- **Social Skills** - Team members practice and receive instruction in leadership, decision-making, communication, and conflict management.

ACL Problems

- Individually, list 5 problems your students might have in an ACL class
- Share your list with the person sitting next to you
- Suggest a strategy for the top 3 problem s

Exercise

- **AS A TEAM**, use 20 minutes to:

  Redo your lesson plan to include all elements of the active/cooperative learning environment. Clearly indicate on your lesson plan the elements your are including. **Any member of the team should be prepared to present.**

Classroom Management

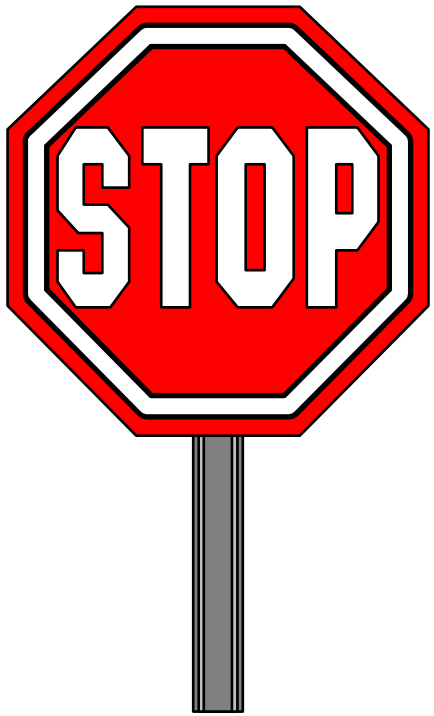
- Use of +/Δ and *issue bin*;
- Use check for understanding;
- How you order the team to do reporting;
- Move around in the classroom;
- Handing out assignments;
- Collecting assignments;
- How you give instructions;

Classroom Management (continued)

- Make students ask their team members for help before you answer questions;
- Sponge activities;
- Getting control of the class;
- Provide learning objectives;
- Using other teams to help slower teams;

Classroom Management (continued)

- **Time management:**
  - Understand what your purpose of the exercise is:
    - **Do nothing and explain what your purpose was**
    - **Give additional time;**
    - **Complete as out-of-class work;**
    - **Use teams that have made more progress; and**
    - **Use sponge activities**.


STOP

Exercise
Readiness Assessment Test A.K.A. RAT

AS A TEAM, take 5 minutes to provide a written to answer the following questions:

- What are the 5 elements of Active/Cooperative Learning?
- Provide a 1 sentence description for each element.

Closed Book / Closed Notes

Exercise (continued)
Readiness Assessment Test A.K.A. RAT

INDIVIDUALLY, take 5 minutes to provide a written to answer the following questions:

- What are the 5 elements of Active/Cooperative Learning?
- Provide a 1 sentence description for each element.

Closed Book / Closed Notes

If this was YOUR class

- **Let's assume that the quiz is worth a total 20 points:**
  - You might count the team component as 25% (5 points).
  - The remaining points would then be used to score the individual component.
- **What other options do you have with regard to implementation?**

RAT Options

- **There are probably countless variations on the same concept. The idea is to try to keep the students from 2nd guessing you and being held less accountable:**
  - Just give an individual RAT.
  - Give an individual RAT followed by a team RAT and only use the team grade.
  - Give a team RAT followed by an individual RAT and randomly select one student's work to count as the team grade.
- **What else can you do?**

Team Problems

- Individually, list 5 problems you might have as a faculty member using teams
- Share your list with the person sitting next to you
- Suggest a strategy for each problem

Why Teams (part 1)?

- ✓ **P**ositive Interdependence
- ✓ **I**ndividual Accountability
- ➢ **G**roup Processing
- ➢ **S**ocial Skills
- ✓ **F**ace-To-Face Interaction

Teaming

Why Teams (continued)?

- **Industry wants:**
  - teamwork skills
  - communication skills
  - negotiation skills
  - conflict resolution skills
- **Provides support system for student**s
- **& more, better reasons**
  - More Learning Styles can be reached,&
  - Higher levels of learning are possible
- **and Fewer papers to grade**

Using TEAMS

- Start most classes with a

Readiness **A**ssessment **T**est

- Some to individuals, then teams
- Some to teams, then individuals
- Sometimes give the lowest individual score to all members of the team

Using TEAMS

- Start *some* examples with *ThinkPairShare* on possible approaches to solving a problem
- *After* a report out and discussion
- Sometimes complete as second exercise . . .
- Sometimes leave solution for homework . . .

Using TEAMS

- **Start some classes with an exercise**
- **first individually write down**

  if I only answer one question . . . specifically what don't you understand

- Now as a team, **assemble and prioritize your list** …

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  if I only answer one question . . . **specifically what don't you understand**

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  YOU WILL BE SURPRISED !!!!

Using TEAMS

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  if I only answer one question . . . **specifically what don't you understand**

- Now as a team, **assemble and prioritize your list** …

  THEY WILL BE SURPRISED !!!!

Team Problems

- Individually, list 5 problems your students might have in teams
- Share your list with the person sitting next to you
- Suggest a strategy for the top 3 problem s

Ten Common Team Problems

1. Floundering
2. Overbearing participants
3. Dominating participants
4. Reluctant participants
5. Unquestioned acceptance of opinions as facts
6. Rush to accomplishment
7. Attribution
8. Discounts and "plops"
9. Wanderlust: digression and tangents
10. Feuding members

From Scholtes, Peter R., The Team Handbook, Joiner Associates (1988)

Common Team Problems (Student's Perspective)

- One of my teammates never comes to class.
- One of my teammates never participants
- No one comes to our meeting prepared to work
- One of my team members is very rude
- Most of my teammates just want to rush to accomplishment.

Solutions

- **Forming Teams**
- Team Training
  - roles, stages, tools
  - clearly establishes expectations
- **Code of Cooperation**
  - clearly establishes expectations
- **Peer Evaluation**
  - provides motivation

Effective Teamwork

- The use of roles
- The development of a Code of Cooperation
- The use of agendas for planning meetings
- The use of minutes to keep a record of assigned action items
- The use of a process check for continuous improvement
- The use of the check for understanding to make sure everybody is “on the same page”

Effective Teamwork

- The use of contact before work to provide time for non task related discussions
- The use of the issue bin to provide time for discussion of items not in the agenda
- The definition of decision-making processes to be included in the agenda
- Development of effective listening skills
- Ability to give and take effective constructive feedback to team members

Team Roles

List three roles teams must include to be successful

Team Roles

KEY TEAM ROLES INCLUDE: Meeting Coordinator, Recorder, Timekeeper, Encourager/ gatekeeper, Devil's Advocate.

Roles should rotate among team members.

Important Roles

- **Meeting Coordinator** - coordinates and prepares for meetings and ensures all necessary resources are available for the meetings.
- Recorder - responsible for doing the writing during team exercises and provides copies of said material.
- Time Keeper - responsible for keeping track of time, as well as keep the team moving so that they finish the task at hand.

Important Roles (CONTINUED)

- Encourager/ Gatekeeper - encourages all the other team members to actively participate and holds back the verbose, dominate members. Also reminds the team when they are getting off task.
- Devil's Advocate - takes a position opposite to that held by the team to ensure that all sides of an issue are considered. This responsibility should be undertaken by all team members.

Some Rules About Roles

- **Initially:**
  - Rotate the roles on a regular basis until everybody has held a different position;
  - Hold the students accountable for knowing and using their assigned roles;
  - Design tasks that require students to make use of their roles; and
  - Have students do process checks to evaluate their role effectiveness.

Rules About Roles

- Rotate all roles until everybody has played each role
- At this time decide if the Meeting Coordinator role could be effectively rotated
- All other roles should be rotated

Facilitator-Teacher

- Focuses on the team's process;
- Evaluates process performance;
- Continually develops personal skills in facilitating and group processes;
- Learns a variety of techniques to control digressive, difficult, or dominating participants, to encourage reluctant participants, and to resolve conflict among participants; and
- Learns when and how to employ these interventions and how to teach such skills to team members.

Team Facilitation

- Bring code of cooperation.
- Individually write your goals for the class.
- Individually +/Δ your actions towards achieving these goals.
- Plus/delta yourself and your team members on the code of cooperation.
- Set individual actions for the future.

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Code of Cooperation

The agreed upon rules governing the behavior of team members, as well as any appropriate rewards and sanctions.

- It sets a norm for acceptable behavior for each team member and represents how the team members will interact with one another;
- It should be developed, adopted, improved and/or modified by all team members on a continuous basis;
- It should be easily accessible to team members.

Code of Cooperation

- **Individually list 3 things that MUST be on your team code of cooperation**
- **Now share lists with the person sitting next to you**
- **Add at least 1 item to your combined list**

Ten Commandments* An Effective Code of Cooperation

1. *Help each other be right, not wrong.*
2. *Look for ways to make new ideas work,not for reasons they won't.*
3. *If in doubt, check it out! Don't make negative assumptions about each other.*
4. *Help each other win, and take pride in each other's victories.*
5. *Speak positively about each other and about your organization at every opportunity.*
6. *Maintain a positive mental attitude no matter what the circumstances*
7. *Act with initiative and courage, as if it all depends on you.*
8. *Do everything with enthusiasm; it's contagious.*
9. *Whatever you want; give it away.*
10. *Don't lose faith.*
11. *Have fun!*

* ***Ford Motor Company***

Code of Cooperation

Example from a Student Team

- **Come to class having read assignment.**
- **Be on time for class and team meetings.**
- **Contribute to team efforts on quizzes and classes.**
- **Ask questions of our team and profs to increase understanding of material.**
- **Help teammates understand material being covered.**
- **Avoid procrastination.**

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Evaluating TEAMS

- **Tell them early** announce format 1st day
- **Give them practice** before it counts
- **Include feedback**
- **Include peer evaluation**

Evaluating TEAMS

- **Peer evaluation is only part**
- **I count peer as a multiplier**

i.e., each student receive between 70% and 110% of there team grade depending on peer evaluation); team average remains unchanged

- **Some use Bonus Points**

e.g., each student can give up to n points to anyone [on team or in class]; cannot keep any; no one can receive > ?

Evaluating TEAMS

- Format is not important
- Peer Evaluation is

Evaluating TEAMS

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- Peer Evaluation is

Essential

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Five stages of Team Development

- **FORMING (orientation) - Tentative interactions; polite discourse; concern over ambiguity; and self-discourse.**
- **STORMING (conflict) - Criticism of ideas; poor attendance; hostility; polarization; and coalition forming.**

Five stages of Team Development (continued)

- NORMING (cohesion) - Agreement on procedures; reduction in role ambiguity; revise Code of Cooperation based upon current experiences; and increased "we-feeling".
- PERFORMING (performance) - Decision making; problem solving; mutual cooperation; high task orientation; and emphasis is placed upon performance and production.
- ADJOURNING(dissolution)

Forming TEAMS

- NOT student formed
- better if not random
- not hard to (re)form
- heterogeneous
- DIVERSE

Forming TEAMS

- Data is available
- →admissions data
  - 1st semester data
  - High school data
- → 1st day student survey
- → observant assistants

Forming TEAMS

- Learning Styles
- LifeStyles
- Behavioral Profiles
- Personality Profiles
- etc, etc, and so forth

Forming TEAMS

- Rank order by whatever

→ GPA, Math/Science Completed

→ size of high school

→ rank in high school class

→ AP credit [or # of math/science courses]

→ SAT . . . [or whatever you correlate to success]

Forming TEAMS

- Combine from one from each quarter [or from two lists]
- Pair women & minorities
- Minor adjustments if team score is too high or too low

Process Check

- Use **+**/**Δ**'s (Plus / Deltas).
- A **+** is a comment about one thing you found valuable and
- A **Δ** is a suggestion about how to improve something.

Issue Bin

- **The Issue Bin**:
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Solutions

- **Team Training**
  - roles, stages, tools
  - clearly establishes expectations
- **Code of Cooperation**
  - clearly establishes expectations
- **Peer Evaluation**
  - provides motivation

Resources

- **Teams**

http://www1.eas.asu.edu/~asufc/teaminginfo/teams.html

http://www.inov8.psu.edu/teams/cover.htm

- **Learning Styles**

http://www2.ncsu.edu/unity/lockers/users/f/felder/public/ILSpage.html

http://www.active-learning-site.com/vark.htm

http://www.hcc.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/lernstyl.htm

- **Personality (or Character or Temperament) Profiles**

http://www.keirsey.com/

- **Behavioral Profiles** [DiSC (Dominance influence Steadiness Conscientiousness), LifeStyles, etc]

Resources

- **How People Learn: Brain, Mind, Experience, and School,** John D. Bransford, Ann L. Brown, and Rodney R. Cocking, Editors; Committee on Developments in the Science of Learning, National Research Council, National Academy of Sciences, 1999

http://bob.nap.edu/html/howpeople1/index.html

- **Interactive-engagement vs. traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses,** Richard R. Hake, Indiana University,

http://carini.physics.indiana.edu/SDI/ajpv3i.pdf

- **these and other Resources for Innovative Teaching**

http://coalition.tamu.edu/eapo/classinvo8.html

GRADING TEAMWORK

- See also:

http://www.inov8.psu.edu/teams/eval.htm

D.B. Kaufman, R.M. Felder, and H. Fuller, "Accounting for Individual Effort in Cooperative Learning Teams." *Journal of Engineering Education, 89*(2), 133-140 (2000).

For More Information

Jim-morgan@tamu.edu

Froyd@ee.tamu.edu

http://www.foundationcoalition.org