Team Building in Engineering Projects Courses

Integrated Teaching and Learning Program and Laboratory
University of Colorado at Boulder

Building Effective Teams

From herding cats… To teams that fly!
A Group is not a Team

- Dominance
- Suspicion
- Floundering
- Reluctance
- Rush to accomplish

A Well-oiled Team

- Strive for common goal
- Accountability
- Mutual respect
- Commitment
- Interdependence
- Trust
- Communication
Design-and-Build Courses

• First-Year Engineering Projects
  – Hands-on introduction to engineering
  – 13 sections per year

• Invention and Innovation
  – Junior-level technical elective
  – Entrepreneurial emphasis

Stages of Team Development

I. Forming
II. Storming
III. Norming
IV. Performing

B. Tuckman, 1965
Forming Stage: Team Needs

- Team selection
- Break the ice
- Deep dive to practice working as a team

Polite
Getting to know each other
Limited tangible results

What’s in a Name?

- Name exercise first day of class
- Thereafter... use first names for all
- Reinforce name use by all
Team Formation

- Balance skills and knowledge
- Balance social styles
- Leadership
- Project preference
Forming Stage: Team Activities

- Social styles workshop
- Team dynamics activities
- Group logic challenges
- Introductory design project

Early Design & Creativity Project

- Intense design and build experience
- Short duration
- Reveals individual strengths and weaknesses early on
- Peer evaluation
Peer Evaluations That Count

- Mythical $1,000 bonus
- Rationale for decisions
- Twice per semester
- Factored into grade (each 5%)
- Very revealing
- One-on-one feedback/coaching session

Forming Stage: Coaching

- Become familiar with individual strengths and weaknesses
- Encourage interaction
- Observe and provide early feedback
- Model teamwork
- Be candid
Forming Stage: Evaluation

- Found a Social Group
- Found a Study Group
- Recognize Own Strengths/Weaknesses

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Pre-Test, Retro-Test, Post-Test

Storming Stage: Team Needs

- Conflict
- Struggle with differences
- Divisive

- Identify root causes of problems
- Understand and value individual differences
- Ability to resolve conflict
- Differences → creativity
Storming Stage: Team Activities

- Preliminary design review
- Extensive brainstorming
- Grapple with open-ended design
- Focus on *what*, not *how*
- Productive use of time
- Warts ‘n all…

Storming Stage: Coaching

- Take action: daily individual and team intervention
- Coach for time and task management
- Coach for understanding – valuing the diversity among team members
**Storming Stage: Evaluation**

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**Neutral Agree Strongly Agree**

- Can Resolve Conflict
- Can Work With Different Styles

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**Norming Stage: Team Needs**

- Appreciate differences
- Work through conflict
- Become task-focused

- Develop expectations about team norms
- Experience a range of team roles
- Team cohesion
- Friendships develop
**Norming Stage: Team Activities**

- Critical design review
- Structured decision analysis
- Focus on *how* to create product
- Learning new skills: CAD, electronics, manufacturing
- Divide and conquer (trust)
- Chop wood…

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**Norming Stage: Coaching**

- Touch base daily - but don’t hover
- Encourage multi-tasking
- Convince team how large their wood pile is: time to *get real*
- Serve as consultants
- Get out of their way
Norming Stage: Evaluation

- Know Team Roles
- I'm Best at Performing
- Understand Team Roles
- Support Team Leadership

Pre-Test
Retro-Test
Post-Test

Norming Stage: Evaluation

- Comfortable Asking Team Members' Help
- Prefer Teamwork to Working Alone

Pre-Test
Retro-Test
Post-Test
Performing Stage: Team Needs

- Increased autonomy
- Experience success
- Intrinsic rewards: accomplishment, friendship; “we rock!”
- Closure

- Trust
- Goal agreement
- Creative confrontation
- Innovative problem solving
- Collective pride of accomplishment

Performing Stage: Team Activities

- Product construction
- Huge time investment
- Showcase at Design Expo
- Final presentation
- 2nd peer evaluation (5%)
- Celebrate their success!
Performing Stage: Coaching

- Encourage and nurture
- Feedback
- Celebrate small successes
- Feed ‘em

Performing Stage: Evaluation

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Performing Stage: Evaluation

![Bar chart showing evaluation results for Team Leadership and Common Goal Achievement across Pre-Test, Retro-Test, and Post-Test stages.](chart)

Conclusion

- Teaching teamwork is hard work
- Intervention: effective teams don’t just happen
- Team needs change during the process
- Students and instructors must persevere
- Student rewards: creative solutions, models the real world, makes learning fun
- Faculty rewards: intimacy, shared success, challenging, coaching makes teaching fun
Thank You!

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