

# 2Learn2Learn/ORTOP

Training for Collaborative Problem Solving  
Skills and Group Dynamics



2008 summer/fall





# Agenda

- Our Premise
- Four Stages of Small Group's Life
- Creative Exercise to move through Stages 1-2
- Two Problem-Solving Skills to teach kids for stages 2-4
- Your Questions, Group Introductions

# Four Stages of Group Life: Forming, Storming, Norm'ing, Performing



- Forming and Storming are testing period of groups: struggle for **status** must be resolved or on-going struggles will disrupt task
  - Normal despair of coaches: My group will never overcome its dysfunction or struggles!!
- Norm'ing and Performing: team gels and excels

# The Task realm and the Social realm



- Every team has a Social Realm AND a Task Realm:
  - Task Realm: programming and building robots.
  - Social Realm: attitudes toward individuals and the group.
    - Adolescents construct status by binary ideas: “cool/nerd,” “good/poser,” “smart/stupid,” etc.
- Status struggles have to do with the Social Realm, and fans the “Storming” Stage
- Coaches tend to over-manage the task realm, and be “hands-off” on the social realm; REVERSE EMPHASIS is needed.

# Status Struggles: Ignore at Your Peril!



- Status is based on “performance” deemed valuable by the peer group. . .
  - . . .from programming to Ipod playlists
  - Coaches can assign jobs, but the group confers status
- Status is slow to change, once established.
  - Low status kids can resent high-status kids, and may drop or be pushed from the group.
- Limited resources of Robotics compounds status struggle
  - few laptops, single medium of Lego’s



# Solution

1. Coach expands activities in which one can perform impressively and gain status
2. Coach identifies positive skills and traits observed in each kid, creating a “list”
  - Coach vocalizes and kids hear this list constantly
  - Kids *may* assimilate this “list” and incorporate into their status system.



# Creative Exercise: Why and How

- Why: Generate a “list” of individuals’ skills, personality strengths that *may* help distribute status
- What: Set up a non-Lego, complex creative group task, that enables the coach to observe and make notes about individual aptitudes, behaviors, skills.
- When: ASAP!
- How: Be a quiet, keen observer during the exercise, taking notes. Do not intervene. Allow kids’ skill-sets to become apparent.



# Creative Exercise Outcomes

At conclusion of creative production, coach names and affirms unique intellectual and social skills possessed by individuals (“You’re a detail person!”)

- Coach presents affirmations/list, and gets more input from team:  
Writes on a large board
- Coach shows a second list of possible jobs for team members, asks for team input on job descriptions, asks individuals to choose . . .
  - job that relates to their skill-set
  - Place jobs and skill “list” on team website to record/reinforce
- What other creative exercises could work?
  - Desired: non-Lego, an outcome that matters (has to be eaten, worn, lived in, etc)
  - Non-desired: limited range of skills needed, activities kids already have mastered, “loaded” with negative issues



# Possible Group Jobs

- **Meeting Manager:** runs meeting, works for inclusion of all voices
- **Webmaster:** records decisions, on-going problems; posts to team website
- **Stuff Manager:** meeting time-keeper, schedules tasks and plans resources (team errands, car-pooling, snacks, etc)
- **Scaffolder:** divides and delegates robot problems (“divide and conquer”); summarizes what has been tried/solved, what’s next to try.
- **Research Manager:** directs all research and discovers research resources and field visit sites
- **Design Manager:** style-master for all non-robotic creations, such as display boards, t-shirts, reports



# Last Stages: social predictability gives rise to collaborative creativity



- Norm'ing stage: Status issues resolved, kids understand and rely on each other
  - Individuals adjust their behavior to each other.
  - Team develops fluid work habits, generates rules, commitments and accountability, etc.
  - Feedback begins to flow easily, non-defensively.
- Performing stage: high group loyalty
  - Intense task focus
  - Celebrations of group life
  - Sadness as group disbands

# Behavior that fosters the Norm'ing Stage



- Group abides by implicit and explicit social rules.
- TAPPS and Scaffolding can serve as social rules
- Coach/mentor should train team in TAPPS and Scaffolding *asap*.
- Encourage team to devise its own rules of group life, in addition to TAPPS and Scaffolding.



# TAPPS

Thinking Aloud Pair Problem Solving



# TAPPS works!



- TAPPS improved speed of problem-solving (21%), application of learned skills to new situations (10%), and recognition of faulty hypotheses (20%).  
(Johnson and Chung, “The Effect of TAPPS on the Troubleshooting Ability of Aviation Technician Students”)
- Nobel Laureate Carl Wieman leaves research to focus on science teaching that emphasizes pair problem-solving
- TAPPS is “extreme programming,” the preferred method of work among many computer scientists.

# How to do TAPPS



*Problem Solver* vocalizes **every** thought, including. . .

- *confusions*
- *positive and negative “self-talk”*
- *personal connections to the problem*
- *visual approaches (draws on paper).*

*Listener* encourages constant vocalization, offers

- *encouragement*
- *doesn't impose his idea of a solution, but follows the PS's ideas*
- *counters negative self-talk*
- **flags** *misunderstandings or errors (not, “That’s wrong!”)*
- *if needed, suggests alternative ways of addressing problem*

*Roles will be switched for optimum effect.*

# Scaffolding: Getting the Whole Team to Collaborate



- Scaffolding is creating a structure for solving a complex problem
  - like a scaffold enables a worker to accomplish various tasks (scraping, spackling, painting, washing) in a complex “problem” of repair
  - Similar to FLL’s “divide and conquer”
  - The work of “dividing” is a specialized job, accomplished by a “superbright,” or More-Experienced Kid (ME)



# Scaffolding: Your team's roles

1. The ME (More-Experienced Kid)
  - Acts as TAPPS PS, thinks through complex problem out loud, preferably with paper and pencil
  - “Divides” : structures problem as set of distinct, individual problems
  - Delegates each distinct problem to each LE or TAPPS pair
2. The LE (Less-Experienced Kid)
  - Solves his/her problem alone or in TAPPS pair

Demo/role play for 3-4: The Robot Dance



# Training your Team in TAPPS



1. Demonstrate TAPPS with another adult ASAP, when introducing a new skill/problem to students.
  - Emphasize “This is the way we’ll problem-solve, as much as possible, because TAPPS works”
2. Then, solve a second, related robotics problem, calling on one student to act as Problem-solver to your Listener
3. Have entire team practice in pairs, using simple robotics problems or fun problems; feedback-discuss with team and provide rewards for good work and insights.
  - *Affirm and incorporate team’s nuancing of TAPPS*
4. Model TAPPS dialogue in all your interactions with students!

# Training your Team in Scaffolding



1. Introduce Scaffolding after TAPPS begins to take hold, and individual status is stabilizing (e.g. the group has settled on who is “expert” at Robotics)
2. Explain “scaffolding,” as metaphor, possibly showing a funny scaffolding video from YouTube
3. Help them implement their first scaffold, encouraging the leader to talk through problem out loud, seek feedback from team, write tasks down for all to see, delegate to all.
4. Reward them when done!
5. Repeat process ASAP, and gradually be more hands-off.



# The Coach: Trainer *and* Artist

- Trainer: Power of Repetition!
  - Rule of “21” – repeat, affirm, reward “the list” or any desired behavior 21 times/meetings
- Artist: Alert and intuitive to . . .
  - Choosing the right *word* that captures a child’s special gifts and traits
  - Choosing the right *moment* to intervene to teach/model TAPPS and Scaffolding