PLAYING CUPID IN CAPSTONE DESIGN:
Effective technology for assisting team formation

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ABSTRACT
"TeamBuilder" modified dating software helps reduce intra-team conflict in Georgia Tech's Industrial and Systems Engineering capstone design.

More than 1/3 of teams reported significant intra-team conflict in our high-stress Senior (capstone) Design course. Up to 10% of students were unable to find teams at all; when grouped into teams, their achievement was more than a full letter-grade lower. Investigation revealed that incompatible goals, interests, and work styles, and the lack of a diverse set of skills and abilities, were the primary culprits. So, we created "TeamBuilder", a modification of open-source online dating software to help students build better teams. As a result, intra-team conflict metrics have been significantly decreased.

SYMPTOMS
Team-related issues were causing serious problems in our mandatory Senior (capstone) Design course.

35% of teams self-reported significant discord

- Usually due to mismatches in desired goals/level of effort
- Senior Design requires 1000+ hours of team effort (many teams do twice that)
- Some teams were barely on speaking terms by the end; in one team, a knife was pulled in a Senior Design argument!

Up to **10%** of students were unable to find a team on their own

- Must be assigned to a combined team by course coordinator
- Assigned teams' performance in Senior Design averages **1.1 GPA points lower** than other teams

Many teams stockpiled people with similar skill sets

- Lack of diverse abilities and backgrounds hurt even the teams that stockpiled academic stars

INVESTIGATION
What causes intra-team conflict?
(Source: analysis of thousands of peer evaluations, informal followup interviews)

What leads to conflict?

- Differing project interests, goals, work ethics
- Incompatible work styles
- Lack of complementary skill sets & elective experiences
- Lack of training in having productive disagreements without them getting personal

What makes a infeasible team?

- Inability to attend the same section of the course
- Class, work, and activity schedules don't allow for team work sessions, client visits, etc.

TEAM FORMATION (BEFORE)
Approximately 300 students per year need to self-divide into teams of size 6-8.

- Senior Design is required for all ISyE seniors
- Students are responsible for finding their own teams of 6-8
- 98% of students are unable to find a complete team on their own
- The way teams were formed, it was very hard to avoid conflict triggers

Teams are usually formed as trees:
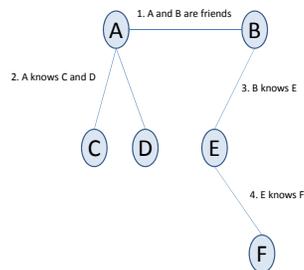
EFFECTIVENESS
Significant improvements in "danger" metrics

- **Students unable to find a team**
  Before: 5-10% per semester
  After: 1-2%

- **Achievement of assigned teams**
  Before: 1-2 teams/semester, 1.1 GPA points (more than one full letter grade) lower
  After: 1-2 teams every 4 semesters, no change in relative GPA

- **Fraction of teams self-reporting significant effort mismatch**
  Before: 35%
  After: 17%

- **Anecdotal evidence of skill complementarity[1]**
  Before: 4-5 poor teams each semester, 1-2 good teams
  After: 1-2 poor teams, 5-6 good teams

[1] Based on anecdotal evidence from team self-reports and written faculty advisor comments. For most of the 23-27 teams each semester, no anecdotal evidence was available.

TEAM FORMATION (AFTER)
It's a lot like finding a compatible date!

So... we modified open-source online dating software to create "TeamBuilder":

- Allow teams up to size 6-8 (not just 2 people)
- Changed questions to be appropriate for Senior Design
  Personal details (since some students have stated preferences like "not be the only female on my team"
  Time preferences, work styles, and goals
  Project interests
  Academic/professional background (which of our five tracks are they pursuing, other majors or minors or certificates, semesters of co-op/internship experience, international experiences, GPA
- Include search capability for:
  Matching schedules
  Similar project interests, goals, work ethics
  Compatible work styles
  Diverse skill sets & backgrounds among teammates
- Avoid spammers & trespassers

We also enlisted the help of an outside expert to provide on-demand team counseling during the semester.

ISSUES TO RESOLVE
How can we increase (honest) participation?

Some students don't realize the importance of good team-building.

- Many students find 1-3 friends to be their teammates, and use TeamBuilder to fill out the rest of their team.
- Not all of the "partial team" enters details on TeamBuilder, so finding the right matches is hard.
- Some students don't take the time (approx. 5 minutes) to answer all the questions, because they don't realize (until later) the importance.

Students have reported being misled by others overstating experience, courses, goals, GPA, etc.

Students have requested additional features, like chat, team pages, etc. that are currently under development.

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