Implementation of Assigning Groups Using GroupEng

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Why Not Let Students Self-Select Groups

- Students are happier
- Less work for faculty
Self-Selected Student Groups

- Students are happier *Except* for the “other” students
- Less work for faculty *Until* teaching gets harder
Who feels left out?

- Weak students
- Loners
- Friendship circles that don’t match group size
- “Different” students
  - Disabled students
    - Women
    - Under-represented minorities
    - Foreign language students

⇒ increased risk of attrition from engineering
Teaching becomes more difficult

- Cliques form
- Class spreads apart
- Strong groups race ahead and expect more but may not fully explore early steps
- Weak groups struggle and get further behind

- Who do you teach to?
- More office hours?
Advantages of Assigning Groups

- Mixed ability teams help all learners
- Diversity of team members increases learning
  - Major, learning styles, background, skills, ...
- Class stays cohesive
- Fair teams with balanced strength
- Group selection doesn’t marginalize some students, no hurt feelings
- Group is more task focused
Avoid isolating any minority group (women, urm, …)
Form multidisciplinary groups
Ensure balanced strength groups
Mix international and domestic students
Mix learning styles within groups
Ensure each group has necessary skillset
Consider group size versus workload
Limit group size
Approaches to Assigning Groups

<table>
<thead>
<tr>
<th>By Hand</th>
<th>With GroupEng</th>
</tr>
</thead>
<tbody>
<tr>
<td>› Sort and Filter in Excel</td>
<td>› Write specification file, run GroupEng</td>
</tr>
<tr>
<td>› Good group selection takes hours</td>
<td>› Good group selection takes a few minutes</td>
</tr>
</tbody>
</table>
Create Rules for Your Class

1. List rules for assigning groups in your class.

2. Put one rule per notecard in the center of the card.

3. Prioritize the rules and order the notecards from highest to lowest priority.
Peoples have goals and criteria

Computers need rules and operations

Grouping criteria become operators and attributes
<table>
<thead>
<tr>
<th>Balance</th>
<th>Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Examples</strong></td>
<td><strong>Examples</strong></td>
</tr>
<tr>
<td>GPAs</td>
<td>Women</td>
</tr>
<tr>
<td>Test 1 scores</td>
<td>Minorities</td>
</tr>
<tr>
<td>Pre-test scores</td>
<td>Vison impaired + note taker</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribute</td>
<td>Aggregate</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
<td><strong>Examples</strong></td>
</tr>
<tr>
<td>Major</td>
<td>Project choice</td>
</tr>
<tr>
<td>Year</td>
<td>Recitation section</td>
</tr>
<tr>
<td>Skills</td>
<td>Grad or ugrad</td>
</tr>
<tr>
<td>Previous group</td>
<td>Major</td>
</tr>
</tbody>
</table>
Turn your rules into operations

For each rule

1. Chose operator
   (one of balance, cluster, distribute or aggregate)

2. Specify operand
   (category of student attributes, ex. gender)

3. Specify relevant values if needed
   (ex. What to cluster on, female)
   (ex. Equivalent values, BEE CALS = BEE ENG)

4. Write the rule at the top of the notecard
GroupEng Program

Set of Rules

Input Deck
- Input file information
- Rule information

Student Data File

GroupEng

Output
- Info on groups
GroupEng Program

- Free
- Open source
- Written in Python
- Beta test version available at www.GroupEng.org

- Starting a listserve of potential users for update notification
- Questions: klc78@cornell.edu
### Student Data File

<table>
<thead>
<tr>
<th>Name</th>
<th>GPA</th>
<th>Gender</th>
<th>Ethnicity</th>
<th>Major</th>
<th>prereq</th>
<th>skill1</th>
<th>skill2</th>
<th>skill3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.02</td>
<td>M</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>y</td>
<td>y</td>
<td>y</td>
</tr>
<tr>
<td>B</td>
<td>2.93</td>
<td>F</td>
<td>-</td>
<td>3</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>y</td>
</tr>
<tr>
<td>C</td>
<td>3.21</td>
<td>M</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>y</td>
<td>-</td>
</tr>
<tr>
<td>D</td>
<td>3.19</td>
<td>M</td>
<td>B</td>
<td>3</td>
<td>-</td>
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<td>y</td>
<td>y</td>
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<tr>
<td>E</td>
<td>4.27</td>
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<td>-</td>
<td>4</td>
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<td>y</td>
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<td>y</td>
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<td>H</td>
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<td>-</td>
<td>y</td>
<td>-</td>
</tr>
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<td>K</td>
<td>3.12</td>
<td>F</td>
<td>-</td>
<td>1</td>
<td>y</td>
<td>-</td>
<td>y</td>
<td>y</td>
</tr>
<tr>
<td>L</td>
<td>3.02</td>
<td>F</td>
<td>-</td>
<td>4</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>-</td>
</tr>
<tr>
<td>M</td>
<td>3.12</td>
<td>F</td>
<td>H</td>
<td>2</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>y</td>
</tr>
</tbody>
</table>

**Save as csv file**
The Input Deck contains the following information:

- **classList**: MAE324.csv
- **ID**: Name
- **group_size**: 3+

The Set of Rules includes:

- **cluster**: Gender
  - value: F
- **distribute**: year
  - value: junior = senior
- **aggregate**
- **balance**: GPA

This information flows to the Student Data File, which is part of the GroupEng suite, and ultimately leads to output and information generation.
Run GroupEng
GroupEng Output

- Class list with group numbers
- Statistics on meeting rules
- File for posting

Groups:
- Group 1
- Group 2
- Group 3
- Group 4
Run GroupEng

2. Download GroupEng and Python
3. Save your input deck in your GroupEng folder
4. Open GroupEng.py
5. Select your input deck when prompted
6. GroupEng creates groups, output in new folder
Website

- www.GroupEng.org
  - GroupEng program
  - Instructions
  - Sample class
  - WEPAN 2011 power point presentation
  - Our WEPAN 2011 Conference Paper
Acknowledgements

- DiOnetta Jones, formerly Director, Cornell Engineering Diversity Program Office (Now at MIT), for alerting me to the problem of self-selected groups for URMs

- Jamie Joyner, Assoc. Director, Cornell Engineering Diversity Program Office: assisted with group design criteria
Questions?

After the workshop:
GroupEngEdu@gmail.com
e-mail Kathy at klc78@cornell.edu
Create Rules for Your Class

1. List rules for assigning groups in your class
2. Prioritize the rules
3. Identify the operand for each rule using one of
   - cluster
   - distribute
   - aggregate
   - Balance
4. Rewrite each rule as an operand and an attribute category
Using GroupEng

Build Rules

For each rule

Specify Rule

GoupEng Operators

Balance
Cluster
Distribute
Aggregate

Set Rule Priorities

Set of Grouping Rules

Student Data File

GroupEng

Set of groups

Info on groups
 Efficiently Assign Student Groups Using GroupEng

Thomas Dimiduk, Harvard University
Kathryn Dimiduk, Cornell University
Make Your Own Groups – Experiment with Grouping Rules

- www.GroupEng.org
- Source code and instructions
GroupEng Program

Input

Set of Rules

Student Data File

Output

Deck
- Input file information
- Rule information
- Output information

GroupEng

Info on groups
Student groups output

Groups Overall
Failures for each rule
If a balance rule
  Class strength mean
  Class strength st. dev.
  Group strength st dev.

Each group
Members
Ave strength
Broken rules?
Assigning Groups by Hand is Hard

By Hand

- Sort and Filter in Excel
- Partially meet a few criteria
- Good group selection takes hours
- Faculty don’t have the time
Define a Set of Grouping Rules

Rule 1
operator
Balance Cluster Distribute aggregate

Rule attribut
student e GPA Women Major

Rule 2
operator
student attribut

Rule 3
operator
student attribut

Set of Rules

Prioritize

...
Group Composition Affects Retention and Learning

- ABET encourages teamwork

- Education research recommends assigning groups rather than self-selecting

- Multiple research based selection criteria
  - Don’t isolate women
  - Don’t isolate minorities
  - Mixed ability groups
  - Interdisciplinary groups
  - ……