In the following table, we give some different characteristics of small group learning activities, and a few examples. Typically a “small group” has 2-5 members.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Informal (sometimes called cooperative learning)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• a structured, systematic instructional strategy (Springer et al. 1999, p. 24)</td>
<td></td>
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<tr>
<td>• “tasks which are specifically designed for, and assessed in, groups” (MacBeain et al. 2004, p. 51)</td>
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<tr>
<td>Formal (sometimes called teacher-led cooperative learning)</td>
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<tr>
<td>• “the most typical form of group work” (Springer et al. 2004, p. 24)</td>
<td></td>
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<tr>
<td>• when the students come together naturally to help each other” (MacBeain et al. 2004, p. 51)</td>
<td></td>
</tr>
</tbody>
</table>

Setting

- In-Class
  - e.g. tutorial groupwork (formal), or students talking in lecture (informal)
- Out-of-Class
  - e.g. group projects (formal), or students studying together for a test (informal)

Formation

- Student-Selected Groups
- Teacher-Selected Groups
- heterogeneous groups (mix of weak and strong students) yield best results

Why Use Small Group Learning?

Group work experience is valuable. Students should learn to work in groups because scientists and researchers function most effectively in groups. (AAAS, 1990)

More effective learning. Students get more done in groups. E.g. when individuals get stuck, their peers can quickly tell them if they see a common error or misunderstanding.

Social aspects. Working in groups helps students get to know each other. This mitigates the stress of the university environment and helps build a network of friends and colleagues.

Building mature skills. Verbalization of mathematics to peers improves proof-writing skills and conceptual understanding; teaching peers and planning group projects facilitate cognitive and metacognitive growth. These skills build mathematical maturity.

Shifting the centre of learning from teacher to student. Students can obtain multiple viewpoints on the same material. It is less intimidating for students to ask questions to peers rather than to the lecturer, especially if they are unsure if the answer is “obvious.”

Students collaborate naturally. Working as a group on individual assignments is viewed as “trivial cheating” by 79% of undergraduates vs. 27% of faculty in Canada; 45% of undergraduates have done so. Arguably, students see the benefits of working together. (Springer et al., 1999)

Sample Activities From Literature

- As an ice-breaker, have students interview each other in pairs and report a unique fact about As an ice-breaker, have students interview each other in pairs and report a unique fact about each other. (Baker & Sharp, 1999, p. 9) each other. (Baker & Sharp, 1999, p. 9)
- To introduce the 5 algebraic groups of order 8, break the class into 5 teams and have each team work on a different problem. (Springer et al., 2004, p. 63)
- “a structured, systematic instructional strategy” (Springer et al. 1999, p. 24)
- “I think it is pretty good - if people in your group don’t know what they’re doing, they can explain it to everyone else and so, if the tutor doesn’t have time to go around to everybody, you can... resolve your own problems like within that time rather than wait for the tutor to come around... you save time” (D’Souza & Wood, 2005, p. 5)

Applications to “CO 456: Intro. to Game Theory”

- Use a many-player game that is relevant to the course content in order to introduce students to each other in the first class.
- Give two-part assignments, consisting of an individual-only part that builds basic tools and skills, and a collaboration-optional part that requires more insight and creativity to solve. Xin Li Hui
- When introducing impartial combinatorial games, give the students first-hand experience. Explain the rules of several such games, pair up the students, and have them play these games against each other. Debrief them afterwards to see if winning strategies were developed.
- Design group-assessed projects with multiple components that can be worked on independently. As part of the final project, have students give group presentations about papers from game theory literature.
- Ask students to create a one-page review sheet to bring to the last class. Have them critique and improve each others’ designs in small groups. Ask each group to give one tip to the rest of the class; discuss which were the most important ideas in the course.
- “I think it is very good - if people in your group don’t know what they’re doing, they can explain it to everyone else and so, if the tutor doesn’t have time to go around to everybody, you can... resolve your own problems like within that time rather than wait for the tutor to come around... you save time” (D’Souza & Wood, 2005, p. 5)

Caveats

- Group learning can enhance delivery of course material, but is not a substitute for good course content. Using small group learning successfully requires careful planning and commitment on the part of the teacher.

- If using group assessment, give students a chance to evaluate their group peers for fairness.

- Some students (e.g. mature students) may prefer that you do not use group learning, due to past experience or personal preference.

- Avoid random selection of groups; student-selected groups and teacher-selected heterogeneous groups yield better results.

- Avoid gratuitous group tasks; if the benefits of being grouped are not evident to the students, they may work individually instead.

- Completely unsupervised groups may make uncorrected mistakes. Pay attention to each group to ensure steady progress.

References


