Student-Centered Learning

Using Group Work to Engage Students

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Traditional Mathematics Pedagogy: Teacher-Centered

I tell you how to do this.
I show you the procedure.
Now you do it 20 times for homework.
Traditional Mathematics Pedagogy: Teacher-Centered

“I told my students everything they needed to know and they still failed!”
Reform Mathematics Pedagogy: Student-Centered

• “Guide on the Side” and NOT “Sage on the Stage”
• Students gain a voice of authority without relying on the teacher for affirmation.
• New paths of communication:
  ✓ Student to student(s)
  ✓ Student(s) to teacher
  ✓ Student(s) to class
  ✓ NOT JUST Teacher to class
Group Work: What it DOESN’T Mean

• Hand out a worksheet and hope students stay in class and work on it.
• Have students do #1-19 odd with a partner.
• Ask students to work on some problems but never collect it or provide feedback.
• Give students so many problems to work on that it is impossible to finish in the class time.
Elements of Quality Group Work

• Would not be possible to complete individually
• Group members RELY on each other to complete the work
• Group members engage with each other and with the content
• Teacher is there for formative evaluation of individuals and groups
Teacher Role

- Circulate constantly
- Engage with groups constantly
- Watch for common misconceptions
- Look at student work for a variety of solution methods to share with the class
- Ask students if they would be willing to share
- Make a list of students who will show work
Give an example of each of the following or thoroughly explain why no such example exists.

1. A function that is always increasing.
2. A function that is always decreasing.
3. A function whose domain is _____ and that is always decreasing.
4. A function whose domain is___ and that is always increasing.
5. A function whose domain is ____ and whose range is just the number 6.
Example

1. Students complete the tasks in a small group.
2. Each group posts their work for others to look at (Gallery Walk).
3. Groups will be assigned to evaluate the work of a different group and decide if their work “Meets” or “Does Not Meet” the criteria.
4. Groups can be graded on their own work and on their ability to correctly “grade” the other group.
Strategies for Grouping

• Low Medium High abilities together
• Group by Ability
• Random Groups
• Self-Select Groups
• Group for a Day
• Group from one test to the next
• Group for the entire semester
Group Grades

• Students grade the performance of other members of the group according to a rubric
• Group average becomes part of each group member’s grade
• Group turns in one product—all members get same grade
Suggestions for Designing Learning Activities

• Scaffolded Problem Sets—students can actually LEARN the content from the careful design of the problem set
• Tasks are higher up in Bloom’s Taxonomy—more than recalling a fact or replicating an example.
• Tasks involve multiple representations (graphical, algebraic, application) and/or use of technology
• Students share their solutions with the class.
Consider the following types of functions:

- Quadratic
- Absolute Value
- Square Root
- Cubic
- Cube Root

Study your function. Provide the equation and graph for the parent function. How did you get this graph? Provide a table of points you plotted. Describe the domain and range of your function. Where is your function increasing, decreasing?
• Ask students to get into groups of 5.
• Have them number off from 1 to 5.
• Have the 1’s get together, 2’s get together,… The 1’s will study quadratics, 2’s will study the absolute value function, 3’s will study…
• After some time, have them go to their original groups and teach the other members about their function.
Strategies for Varied Worktimes

- Mini Classrooms
- Meets or Doesn’t Meet (Criteria)
- Jigsaw
- Use the Padcam
- Pencast/Camtasia lesson for homework
- Mix it up
- Quiz — Group Quiz
- Start early on in the semester
Where can I get help?

- Course coordination meetings
- Departmental, College, and University Teaching Showcases
- Faculty Development Workshops
- [http://home.nau.edu/facdev/](http://home.nau.edu/facdev/)
  - Books
  - Articles
  - Workshops
Questions?