

# Teaming in Differential Equations

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**Context:** Out of class; Differential Equations

**Keywords:** teams, mathematics project

**Student Activity Time:** 10 to 20 hours

*Students complete an open-ended project in differential equations that prompts them to reflect on their team experience.*

## Introducing the Reflection Activity

Differential equations is an interesting class to choose to implement a group project, yet this example is a practical and valuable activity for students. An open-ended group project was required for students to demonstrate the applications of differential equations to their field of interest. Students selected a partner or pair to work with for this activity. After completing the group project, the instructor gave students a reflection assignment prompting students to describe their group's process, experience, and group members' contributions. The purpose of this activity was to assist students in identifying positive behaviors for a successful group project, and to expand their understanding of the relevance of differential equations in their field of interest.

The educator assigned students the project and provided a rubric, checkpoint meetings, and sub-assignments related to the course project. Each group was required to meet with the educator twice during the 6-week project cycle to review project topic, status, and progress to date. These reporting meetings provided the educator with perspective on each group project, and in turn used that knowledge to select and sequence class topics to assist the students with their projects. The individual peer evaluation was the reflection activity within the group project. Each student submitted a one-page evaluation of the other members' performance. This included a detailed description of the work done by each team member, strengths and weaknesses of the team members, and a reflection of the student's own abilities and learning outcomes. Students were also required to evaluate another group's presentation. Essays were submitted after the oral presentation and were 10% of the project grade. For grading, specific attention was paid to the assessment of group members and the self-reflection portion.

Students experienced outcomes in a variety of areas including: team dynamics, improved help-seeking behaviors, and methods for applying mathematics in various fields. The resulting project was also useful for students who would transfer to another institution, as the project would fulfill another course requirement.

### Recreating the Reflection Activity

Description	
1	Assign students the project at the beginning of the term.
2	Allow students to pick their partner or group and identify their topic of study.
3	Meet with student teams at least twice during the term to check on progress.
4	Accept group report and meeting log at the due date.
5	Provide student teams time to present in class.
6	Accept student individual reflection assignments after the class presentation.
7	Grade student reports, presentations, and meeting logs and return student grades.

#### In the words of the Educator: Tips and Inspiration

*Keep the project open-ended in nature.* The open-ended nature of the project really helps students get the most out of the project and the reflection. I look at this project as being a capstone that touches on several of our campus-wide outcomes. Students are able to practice and demonstrate things like oral communication, quantitative reasoning, symbolic reasoning in mathematics, and critical thinking. This is the last class that most of our students take, and a good measuring stick to see if our students have learned all they were supposed to here at Green River.

*Explain the value of the project.* I tell the students when I hand this out that it is kind of a powerful little tool. There are two things: If they go on to Washington State University, they can use this project for graduation to fulfill the written project requirement. Also, several students have told me that the result of their project helped them to get a job or internship because of their experience of working on a collaborative research project. Giving them the rubric on which they will be graded helps to make the assignment clear and understand the value of each component of the assignment.

*What was the inspiration for the reflection activity?* I've been teaching for a long time, and when I first started, people didn't do group projects in mathematics. The chairs were in a line and everyone was in their own little space alone. When we started doing group work, suddenly there were people who were just hanging onto one group. I tried lots of different rubrics of graded items that required a team and the grade was distributed based on how much effort each person put in. It was a new theme for math educators to have groups, so it was discussed a lot at conferences, but it's not so new for us anymore. Now the hard part is to help students understand what a group-worthy project is, and how to work together, especially since this one is open ended. I would rather have a student write down what everyone did versus them coming to my office and say "I did all the work." Everyone writes the reflection and I have the meeting log to correspond with the individual reflections, and then I can assign a grade. Over time, I've given more details about what the reflection should include: strengths, weaknesses, and contributions.