Guidelines for Implementing Pair Programming in the Classroom

Laurie Williams
North Carolina State University
williams@csc.ncsu.edu
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Guideline 1

- Students need training in pair programming in a supervised setting to experience the mechanics of successful pairing.
No Closed Laboratory?

• **CS1:**
  – Pair programming not advisable
  – Use for in-lab work only

• **CS2:**
  – Proceed with (extreme) caution
  – At least bond in lab + some outside work

• **CS2+:**
  – After at least one paired class
  – Bonding still beneficial, outside work fine
Guideline 2

- Teaching staff must actively engage in the management of pair interactions.
Teaching Assistant Training

• Same as student, plus . . .
• Need to be proactive in labs
  – Approach dysfunctional pairs
  – Make sure driver and navigator switch roles
• Will spend less time answering easy questions, but some time answering harder questions
  – The pairs figure out the easy things themselves
Guideline 3

- Strict attendance and tardy policies are necessary to protect students from a non-participatory partner.
Attendance and Lateness Policies

• Possibly more strict than you have been in the past
• Mandatory lecture (with a small number of unexcused absences)
  – Now, you’re impacting your partner if you get behind in the class
  – Easier to identify those who have not officially dropped but are “missing in action”
• Mandatory laboratories (no unexcused absences)
  – 10 minutes late, lose your partner + some points
Guideline 4

• When students are pair programming outside of a closed laboratory or classroom setting, instructors should provide a systematic mechanism for obtaining students’ feedback about their partners and must act upon the feedback when indications are a student is not being an equal partner.
Student discussion

• Talk to student who reported a problem
• Talk to the accused: “How did it work with you and X on the last assignment? [pause and listen . . . Generally for a confession]
• Learning moment . . .
  – Can’t wait until the last minute when you work with someone else
  – Need to surface [personal] problems as soon as possible
  – . . . .
• “I’ll be watching how it goes with your future partners . . . I expect this to not happen again."
• More lenient penalty the first time. More harsh, if continued.
Implication of non-participation

Complete a peer evaluation on your partner. We will use this peer evaluation to identify those in the class who are not doing their fair share of the homework . . . Those who do not participate in their homework may not receive full credit for the assignment. For example, if we determine you did 50% of what you should have done, your grade may be multiplied by 50% [and your partner’s by 1.50% until a grade of 100]. If you do not complete the peer evaluation, you lose (5 points).
Guideline 5

• In each course, students should be evaluated on a balance of individual and collaborative work.
Grading

• CS1-type class
  – Closed labs count for small portion of grade
  – ~10%

• More advanced class
  – Must have a passing average in both the individual portions of the class and the collaborative parts of the class to pass
Guideline 6

• Students should have different partners throughout the semester.
Pair Rotation

- Reassign several times per semester

- Good for students
  - Get to meet new people, learn about working with new people
  - If they don’t like their partner, they know they will get a new one soon

- Good for teacher
  - Multiple forms of feedback
  - Natural handling of dysfunctional pairs
Guideline 7

• Students must understand that problems with their partner must be surfaced immediately to give the instructor a chance to correct the situation.
Prompt Notification of Problems

- **Student:** problem with partner?
  - Surface the problem early & I’ll work with you
  - Surface the problem late, little I can do to help

- **Instructor**
  - Remember there are two sides to every story
  - Be non-judgmental
  - If there is a problem
    - Informal reparations to “victim”
    - Example: reduce scope of assignment while retaining all learning objectives
Guideline 8

- Pairs should be able to comfortably sit next to each other as they work, and both should have easy access to the monitor, mouse, and keyboard.
Lab Setup
Guideline 9

• Make assignment for pair programmers more challenging than assignments for solo programmers.
Summary

• There is a cost and a benefit to any pedagogical technique

• If you learn from our experiences
  – the costs should outweigh the benefits
  – the students will have a good learning experience
  – life will be easier for you

• What guidelines would you like to share?