Student Pair Programming

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Broadening Participation in Computer Disciplines
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In essence, Pair Programming is two students, a “driver” who performs the “on computer” tasks & a “navigator” who watches and comments, working together at one computer, switching roles every 20 minutes or so.
Why Do It?

Students Do Better!

Pair programming...

• improves the quality of students’ programs, compared to students working alone
• benefits a weaker partner by providing a peer who can immediately address questions and difficulties
• benefits a stronger partner by solidifying and deepening her/his own understanding
• provides students a direct, immediate opportunity to read another programmer’s code, a skill not manifest when programming individually
• increases the number of students who successfully complete the course
• when used in CS1, leads to increased solo programming competency in CS2
Why Do It?

Increased recruitment and retention in CS majors

Pair programming...

• for most students, is more enjoyable than programming alone
• tends to engage students more actively and directly in the course
• increases students’ — especially female students’ — confidence with programming
• increases the number of introductory students who stay in computing majors
• increases the percentage of introductory students, especially women, who declare a computer science major
Why Do It?

Additional Benefits

Pair programming...

- gives students "an excuse" to get to know each other, helping to form peer support groups
- provides students experience in working in a collaborative manner
- encourages students to turn to their partners as the first option to obtain help with their programming; this rapid assistance improves productivity, increases a sense of accomplishment, and reduces reliance on course staff
- is increasingly being used in industry
For Successful Pair Programming...

- Provide regular times and a place for pairs to meet and work
- Decide how the joint work will factor into the course grade
- Explain pair programming to students and staff
- Monitor the pairs to ensure they pair program
- Intervene when a pair falters
- Have students complete questionnaires or surveys; apply the results
- Assign points for successfully completing pair programming activities
Lab Sections

- Meet regularly and often, in an appropriate setting
- Require attendance
- Have staff present to
  - Assist pairs with their work
  - Monitor pairs to ensure they pair program
  - Watch for, and perform first-step intervention with, faltering pairs
  - Evaluate students

Finding common time to meet is a friction point in pairs, significantly reduced with scheduled lab sections
Preparing the Class for Pair Programming

- Describe pair programming in lecture
- Discuss pair programming in course materials
- Direct students to orientation materials
- Prepare course staff to support student pair programming
Forming Pairs

• How do you form “good” pairs?
  – randomly
  – by matching students of similar experience levels
  – by allowing students to choose their partners

Yes, all work!
Dealing with Faltering Pairs

• Let students and staff know that problems in a pair do occur
• Provide guidance as to how partners can themselves work out their difficulties
• Have staff intervene to try and repair the partnership
• Allow for a ‘divorce’
Switching Partners

- The same pair of students can work on all assignments, or a new pair can be formed for each (group of) assignments

- Switching has advantages:
  - Allows students to experience different work styles and personalities
  - Painlessly ends a faltering pair
  - Allows ‘orphaned’ partners to again be in a pair
  - Mimics the situation in many workplaces

- Not switching has advantages:
  - Allows students to develop a deeper working relationship with their partners
  - Keeps to a minimum the time course staff devotes to forming, recording and evaluating pairings
Switching Partners

• Switching too often can
  – keep pairs from “jelling”
  – reduce productive time spent on the assignment
  – Overburden course staff with repeated evaluations of each student’s performance
Surveys and Evaluations

- Pair members evaluate each other
- Course staff evaluates pairs
- Students and staff report on their experiences
- Points are assigned for “playing well” and completing pair evaluations and surveys
Pair Programming with Limited Resources

- Instructor fills other course staff roles
- TAs fulfills lab tutor role
- Switching and pair evaluations are kept to a minimum
- If scheduled labs are not feasible, “remote pair programming” is used
- Some or all class meetings are in the lab
Check out

*Pair Programming in a Box*