The Use of Distributed Pair Programming in Teaching Programming

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Context

• Important universities around the world are offering online courses
Context

- Pair programming presents good results in different levels of teaching programming
Context

How can we use distributed pair programming in teaching programming?
What is Pair Programming?

• Agile practice from XP method
• Two developers work in the same computer
• Driver: controls the keyboard and the mouse, developing the task
• Observer/Navigator: reviews and identifies logical and syntactical errors.
PP in teaching programming

• QP1: What is known about the use of pair programming and the use of distributed pair programming?

• QP2: Under what conditions pair programming works?

• QP3: Under what conditions distributed pair programming works?
PP in teaching programming

• Code quality
  • Less defects
  • Few grammatical and logical errors

• Performance
  • Better grades

• Learning
  • Motivation
PP in teaching programming

• Productivity
  • Time to do a task
  • Smaller amount of questions by the students

• Different personality types
  • No significant effect
  • More studies are needed
And how about Distributed Pair Programming?

- Challenges
  - Communication
  - Collaboration
- Support: Tools
  - Sharing PC screen
  - Sharing audio/vídeo
## Different types of programming

<table>
<thead>
<tr>
<th></th>
<th>Local</th>
<th>Distributed</th>
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<tbody>
<tr>
<td>Individual</td>
<td>Individual Programming (Traditional)</td>
<td>Distributed individual programming</td>
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<tr>
<td>Pair</td>
<td>Pair programming</td>
<td><strong>Distributed pair programming</strong></td>
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<tr>
<td>Group</td>
<td>Local Group Programming (Dojo)</td>
<td>Distributed group programming</td>
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# DPP in teaching programming

<table>
<thead>
<tr>
<th>Study</th>
<th>Independent variables</th>
<th>Dependent variables</th>
<th>Type of data collection</th>
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<tr>
<td>[Hanks 2005]</td>
<td>PP x DPP</td>
<td>Performance</td>
<td>Grades Survey</td>
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<td></td>
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<td>Trust</td>
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<td>[Zin et al. 2006]</td>
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<td></td>
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<td>Code quality</td>
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<td></td>
<td>Productivity</td>
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DPP in teaching programming

- [Hanks, 2005]
  - To evaluate a DPP tool in an introductory programming course
  - 112 Students, 57 used DPP and 55 co-located
  - Both type of pairs had similar grades
  - Survey: trust level between distributed pairs and co-located was statistically similar
DPP in teaching programming

- [Zin et al., 2006]
  - To evaluate DPP effectiveness
  - 156 Students
  - Survey: DPP helped in the trust and learning
  - Limitation: asynchronously pairing through a DPP tool
DPP in teaching programming

• [Edward et al., 2010]
  
  • To evaluate DPP effectiveness in the curriculum of a Computer Science course
  
  • 100 students from an introductory course in Computing
  
  • Activities were divided into two sessions: the first use PP with co-located pairs and the second using DPP
  
  • Survey: PP had a range of 80-90% of approval by the students, while DPP had a slightly lower approval (72-80%)
  
  • There is a difference in relation to the methodology between PP and DPP, but the use of a specific tool is feasible was to adopt DPP
DPP in teaching programming

- [Zacharis et al., 2011]

  - DPP effectiveness on student performance and motivation in an introductory course on Java

  - 129 students, 65 Co-located and 64 used DPP

  - Based on LOC/h, DPP 50% fewer defects

  - Survey: with DPP students had more motivation and satisfaction
The lessons we learned...

- Lesson 1: The adoption of DPP needs the support of specific tools
- Lesson 2: DPP promotes good results in student’s performance, trust, motivation, and satisfaction
- Lesson 3: There is a need to further investigate aspects of DPP, such as the difference in personality between the students, code quality, and productivity
The lessons we learned...

• Lesson 4: A good way to adopt DPP is by session

• Lesson 5: There is a need to assess the instructor role in DPP

• Lesson 6: There is a need to assess the importance of DPP in education as a strategy to improve student’s ability in DSD
Final considerations

• DPP showed some similar benefits from PP such as academic performance (grades), motivation, trust, and learning satisfaction

• Code quality is one of the variables most investigated in PP in teaching, presenting good results, but there is no evidence for this in DPP yet

• Personality is a key aspect in PP, but we need more investigation in DPP

• In DPP, we need to explore more the relation between cultural aspects, personality, and collaboration
Our proposal

• To assess how teaching programming through the DPP practice may contribute to the training of professionals in order to get them better prepared to work in GSD context