

# Learning from Pair Programming

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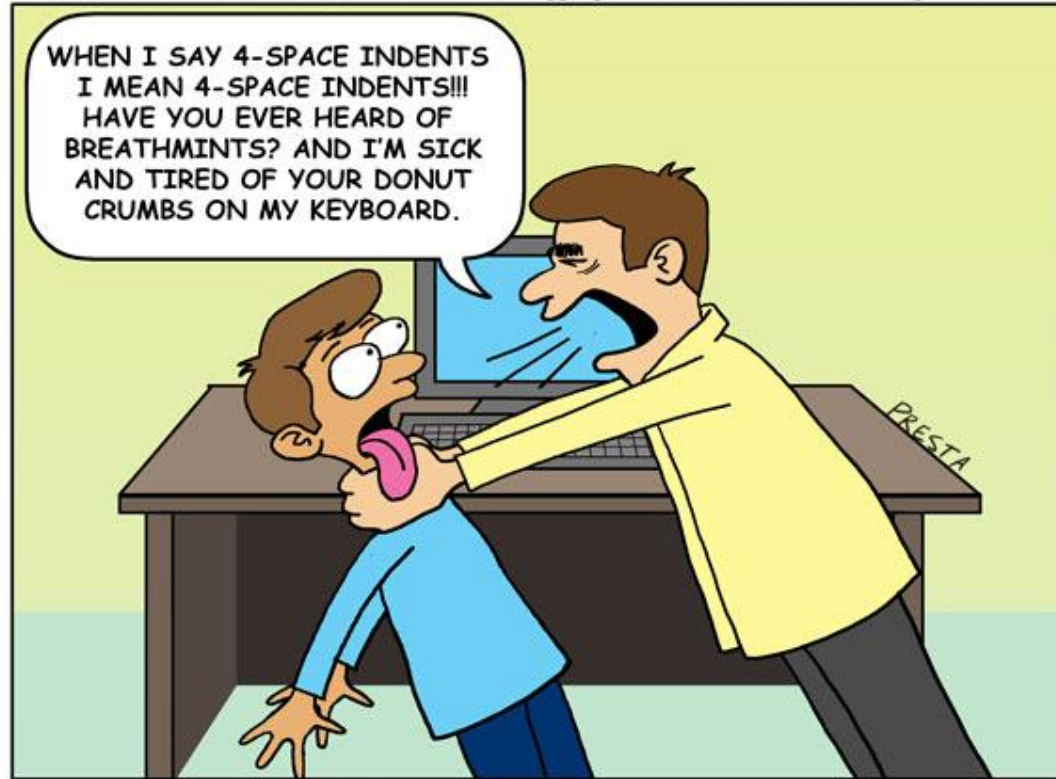
# What is Pair Programming?

- Extreme Programming (Beck, 1999)
- Roles
  - Driver
  - Navigator



# Benefits

- Improvement of code quality
- Time efficiency
- Increase of student confidence, satisfaction
- Student retention



The dark side of pair programming.

# Let's be focused

Is there any real evidence of learning from Pair Programming?

What is the learning gain from Pair Programming?

# Related Work

- Hanks et al(2011) - Literature review on PP in education
  - How the PP led educational benefits?
- Hannay et al(2009) - Meta-analysis of the effectiveness of PP
  - Increase of effect on quality, duration and effort
  - How effort is measured is not clear

# Evidence of Learning from PP

- Improvement on course grade
  - Does student learn better by PP activity?
  - Has the course grade improved for PP compared to sole programmer?
- Student perspective on learning
  - Does student feel that they have learned more by PP activity?

# Course result in introductory course

- Nagappan et al (2003)
  - more self-sufficient, perform better on projects and exam
  - more likely to get C or better
  - No clear evidence if the programming skill or understanding of concept is improved by PP
- McDowell et al. (2002)
  - higher completion rate on final exam
  - Still not clear!



# Learning language by PP

- Owolabi et al. (2004)
  - VAT as pre and post test to measure skills on Visual-Basic .NET
  - No significant improvement in quizzes, final exams, and course grade
  - Gender was not a matter

# Research at UoA

## Mendes et al(2005 & 2006)

- Intermediate CS course
- Students perform better on programming exercises
- Higher exam scores
- But... students who have better knowledge might be volunteering for PP

## Nicolescu & Plummer (2003)

- Distributed Computing course
- Midterm and final exam results as learning improvement
- Is it good way to measure?
  - Too short term to show internal validity
- Better performance but not on written exam
- Nagappan et al(2003) supports the type of question matters!

# Student Perspective on PP

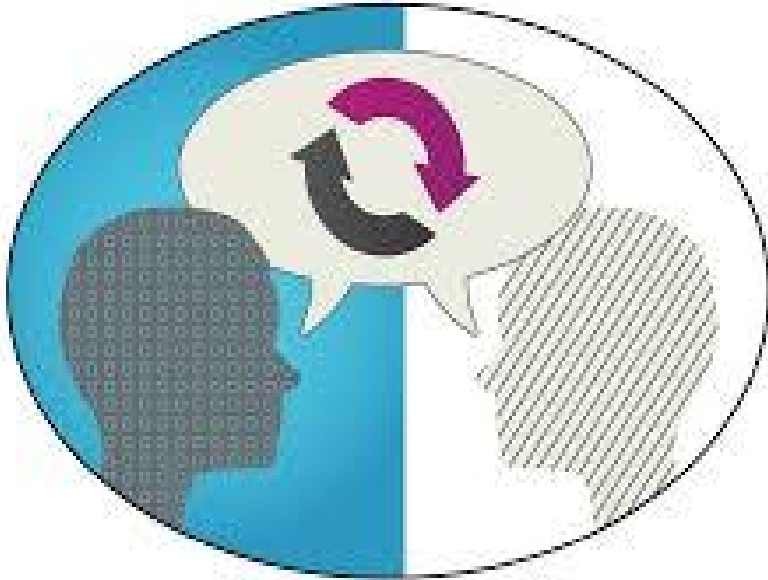
## Nagappan et al (2003)

- Getting feedback immediately
- Focus on important issue rather than correcting minor error

## Nicolescu & Plummer (2003)

- Do you think you have learned more than you had worked on your own?

# Learning Gain from PP



## Knowledge Transfer

- Software development process
- For both navigator and driver

## Motivation

- Peer pressure

## High order thinking skills

- For both expert and novice

## What the CTO expects

Careful, your loop can throw an Exception because of your type constraint!

Indeed, thanks!



## What usually happens

Oh hey, try this one!  
"9gag crazy cat"

No, wait, this one is hilarious, look!



# Implication of Pair Programming

Preston (2006)

- Five critical attributes
- Observing different roles and give feedback

Williams (2007)

- Set regulation and curriculum for PP
- Training and evaluation

# Questions?