Are Females Disinclined to Tinker in Computer Science?

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Motivation

Previous research shows gender-based differences in tinkering in areas such as

- Human Computer Interaction
  - e.g. (Beckwith et al., 2005), (Burnett et al., 2008)
- Early Science Education
  - e.g. (Brotman & Moore, 2008), (Jones et al., 2000), (Parsons, 1995)

Research Questions

1. What is tinkering in Computer Science?
2. Are females less likely to tinker than their male peers?

Questionnaire and Participants

- administered to undergrad CS/Computer Engineering majors
- 93 valid responses (33 female, 60 male)
- 33 closed-ended questions
- 2 open-ended questions

Questionnaire topics

- 'Tinkering behaviors' in hardware and software
  - Software: Practices in labs and assignments (15 questions)
  - Hardware: 'At home' tinkering (2 questions)
- Interest and experience with computers/programming (9 questions)
- Definition of tinkering/self-identifying as a tinkerer or a non-tinkerer

Tinkering with Hardware

More males have experience with micro-controllers/single board computers

(males 25%, females 6%, $t(88) = -2.59$, $p = .011$)

More males have experience (de)constructing a computer

(males 79%, females 30%, $t(60) = -5.15$, $p = <.001$)

Tinkering on Labs & Assignments

Males more likely to change code that is given
($t(77) = -3.23$, $p = 0.003$, $d = 0.70$)

Females more likely to attend office hours
($t(82) = 2.63$, $p = 0.010$, $d = 0.60$)

No other significant differences between genders

What does it mean to tinker with computers?

according to males…

- Tinkering associated with:
  - ‘modification’ (in 28% of M, 15% of F responses)
  - ‘taking apart/building’ (26% M, 15% F),
  - ‘customization’ (12% M, 4% F)
  - ‘deviation from intended purpose’ (14% M, 4% F)
- Males focus on the **nature** and **substance** of tinkering
- Males’ responses longer and more technical

Notes: No statistical significance (just trends)
We had fewer female responses

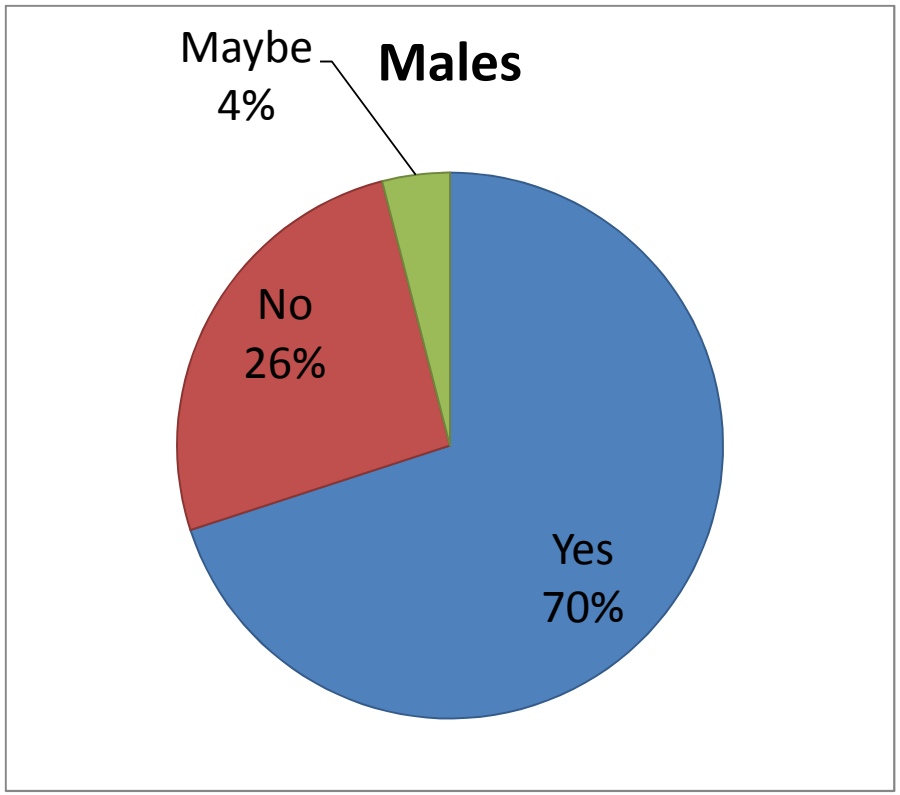
What does it mean to tinker with computers?

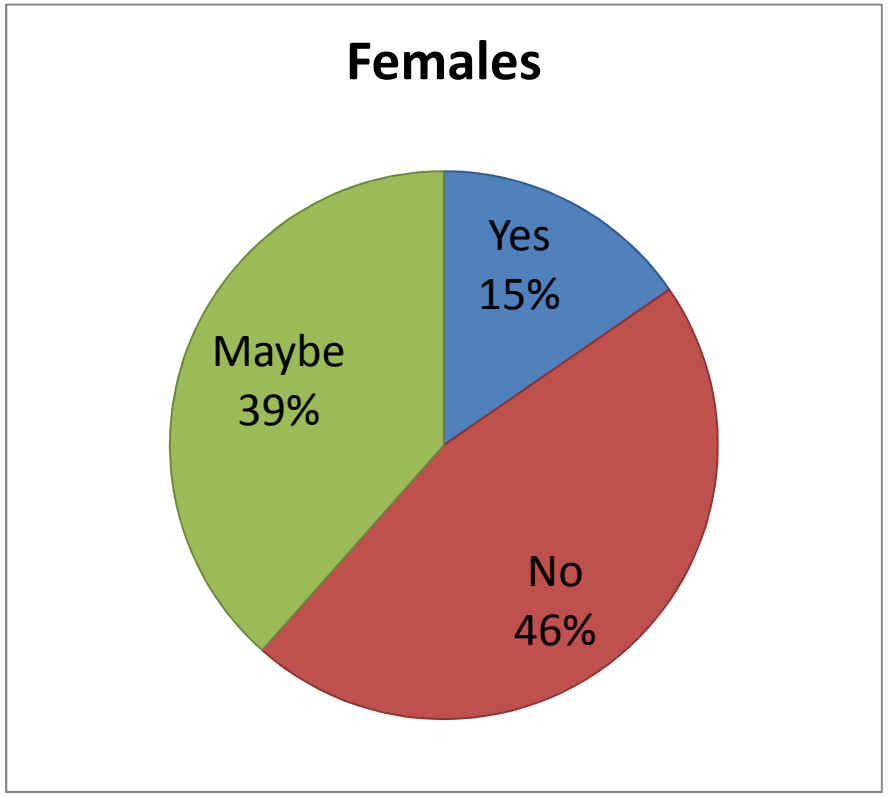
according to females…

- Tinkering associated with:
  - ‘improvement’ (in 23% of F, 12% of M responses)
  - ‘understanding’, (30% F, 16% M)
  - ‘playing around’ (35% F, 18% M)
  - ‘exploration’ (31% F, 22% M)
- Females focus on **motivation** and **general purpose**
- Females’ responses briefer

Notes: No statistical significance (just trends)
We had fewer female responses

Are you a tinkerer?





Factors that could affect tinkering behaviors

Factors effecting tinkering behaviors

1. Risk taking
   - Known to vary with gender (Gustafson, 1998), (Burnett et al., 2008)
2. Confidence
   - Related to applied problem solving (Vermeer, Boekaerts, & Seegers, 2000)
3. Goal Orientation
   - Females look for purpose in Computing (Fisher, Margolis, & Miller, 1997)

Further Research

- Further explore the meaning of tinkering in CS
- Investigate beneficial/detrimental tinkering behaviors