How is programming taught in code clubs? Experiences, gender perceptions and learning barriers experienced by code club teachers

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About   Discover Clubs   Get Involved   {code club}   Explore Projects   Training & Events   Help

A global network of free coding clubs for 9–13 year olds

Start a club >   Volunteer >

Information for parents

13,000
active Code Clubs around the world

160
countries, from Brazil to Bangladesh

180,000
young people learning to code each week

CoderDojo   Find a Dojo   Volunteer   Start a Dojo   Resources   Login

The community of 2054 free, open and local programming clubs for young people

58,000 young people are being creative with technology with the help of 12,000 volunteers in 106 countries. Join us!
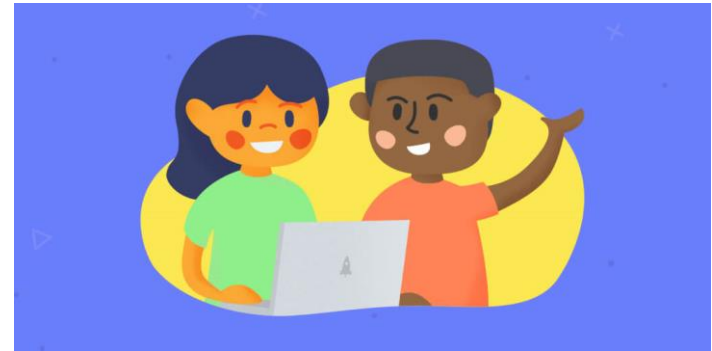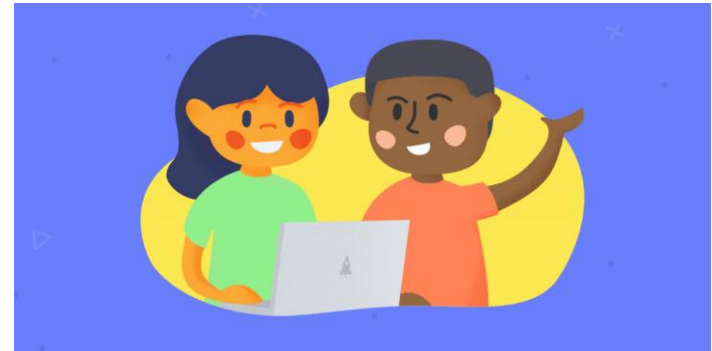
Find a Dojo   Start a Dojo

girls who code

Girls Who Code Announces Plans to Expand to 10,000 Clubs Across the United States

Learn More

Trained teacher	?
National curricula	?
School materials	?

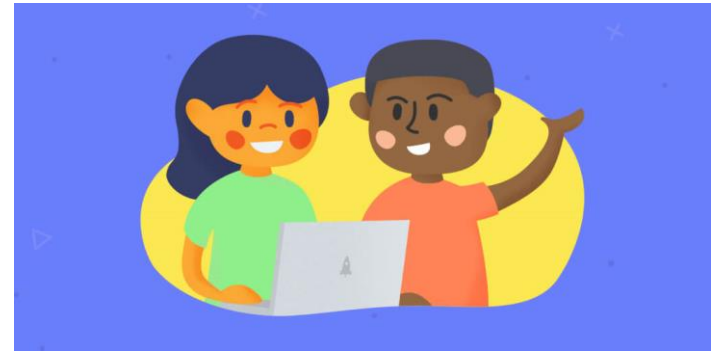| Trained teacher | ? |
| National curricula | ? |
| School materials | ? |

Motivation as a learning barrier*

Freedom of choice as a motivational factor**

* N. Dorn et al. Talking at Cross Purposes: Perceived Learning Barriers by Students and Teachers in Programming Education. WiPSCE 2018

**N. Butler et al. What Motivates a Ninja? An exploration of students' CoderDojo experience. In Cyberpsychology and Society: Current Perspectives. 2018

Trained teacher   ?

National curricula   ?

School materials   ?

Motivation as a learning barrier*   Freedom of choice as a motivational factor**

Gender differences***   ?

*** Alexandra Funke et al. 2015. Gender Differences in Programming: Research Results and Teachers' Perception. Koli Calling 2015.

1. How is programming taught at code clubs in terms of participants, lesson material and style, and assessments?

2. What **learning barriers** in programming do the teachers of code clubs identify?

3. What are the teachers' perceptions of **gender differences** among their code club students?

How do you teach coding?

Thank you for being here!

We are Fenia Aivaloglou (Open Universiteit, fai@ou.nl) and Felienne Hermans (Universiteit Leiden, f.f.j.hermans@liacs.leidenuniv.nl).

12 questions

+ 5 demographics/profile

Are you teaching programming at an out-of-school program or code club? We are interested to know your experiences! Our research focuses on the methods, materials and techniques that teachers of code clubs use. We want to understand which concepts children struggle with and which practices are the most successful in teaching them how to program. We will use your answers to the questions below for research purposes only.

This form will take about 10 minutes to fill in. Thank you for sharing your experience with us.
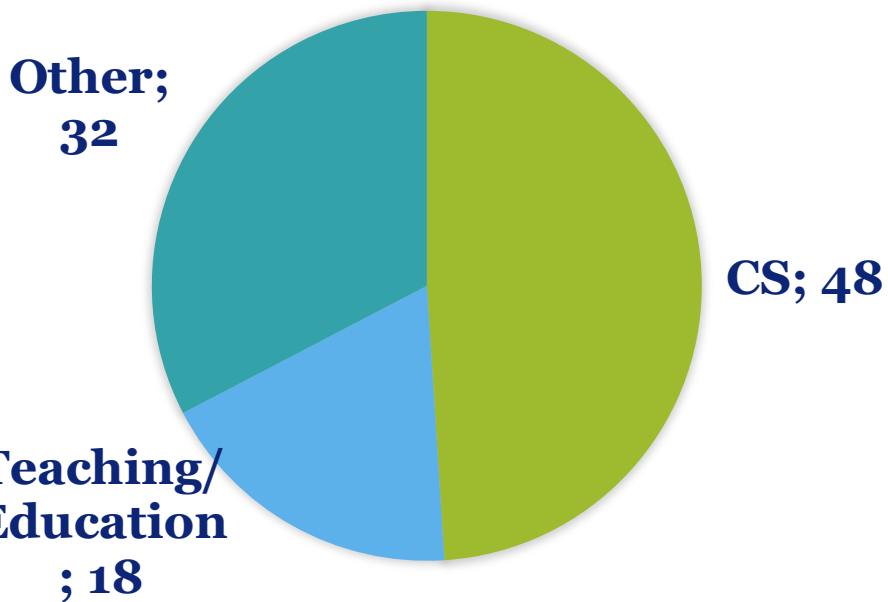
Here we go!

1. **How many children are in your code club?**
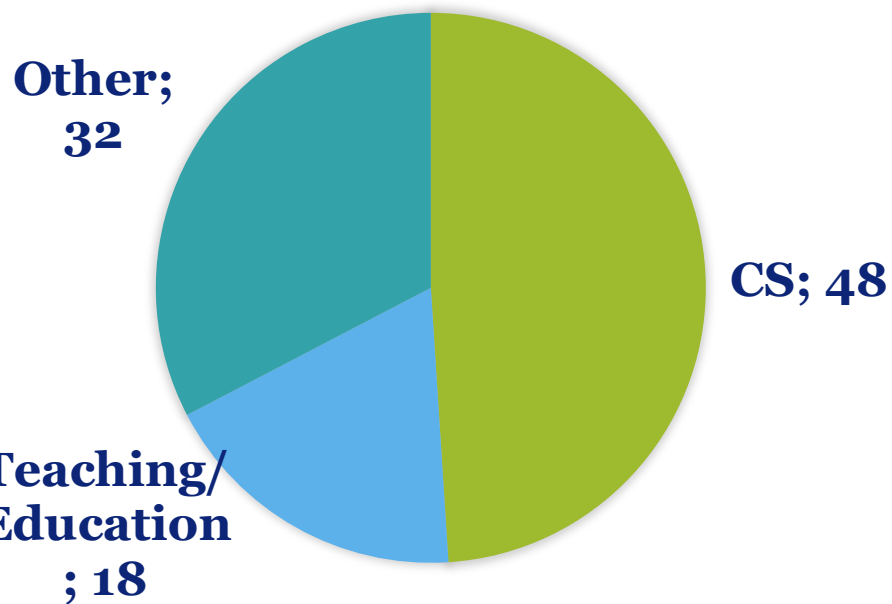
Code club instructors' profile
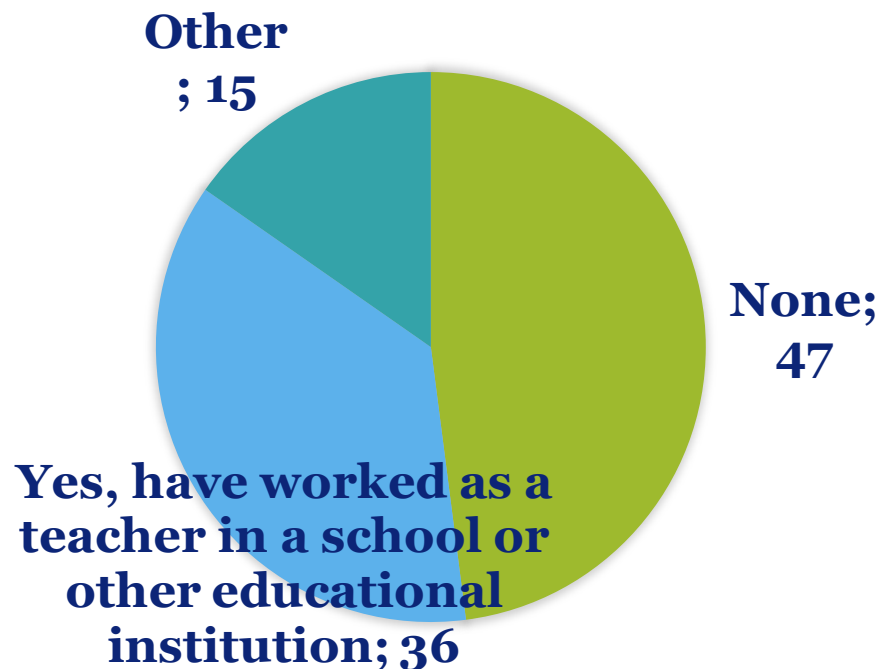
98 responses, 51% male

Main degree

Other; 32

CS; 48

Teaching/ Education ; 18

Code club instructors' profile

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Main degree

Other; 32

Teaching/ Education ; 18

CS; 48

Education experience

Other ; 15

None; 47

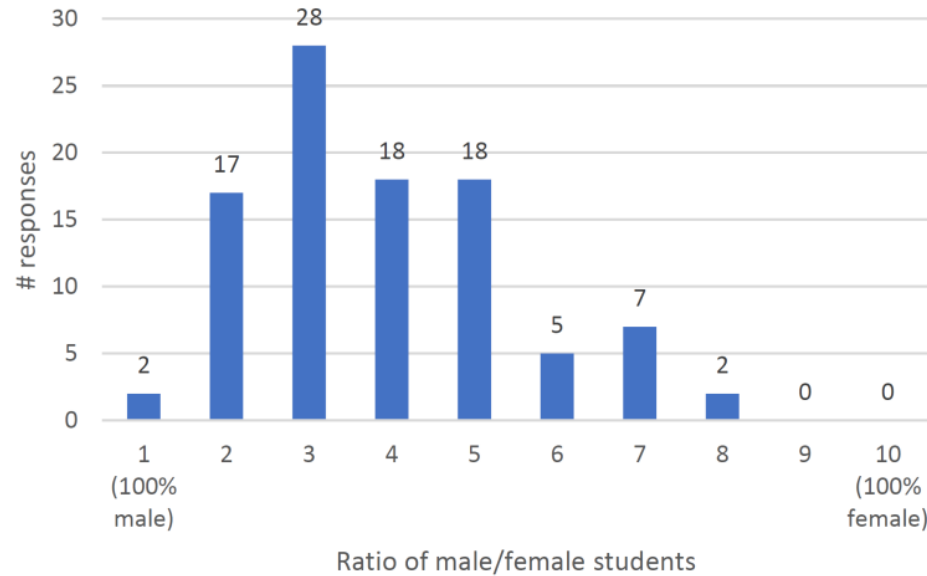Yes, have worked as a teacher in a school or other educational institution; 36

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1. How is programming taught at code clubs in terms of participants, lesson material and style, and assessments?

Code club participants

	mean	min	Q1	median	Q3	max
Number of students in the code club	20,37	4	10	16	25	150
Age range: youngest student	8,53	4	7	8	9	16
Age range: oldest student	13,28	9	11	13	16	25
Percentage of female students	30%	0	20%	30%	40%	80%

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Code club programs

Independent; 22%

Country-specific programs; 11%
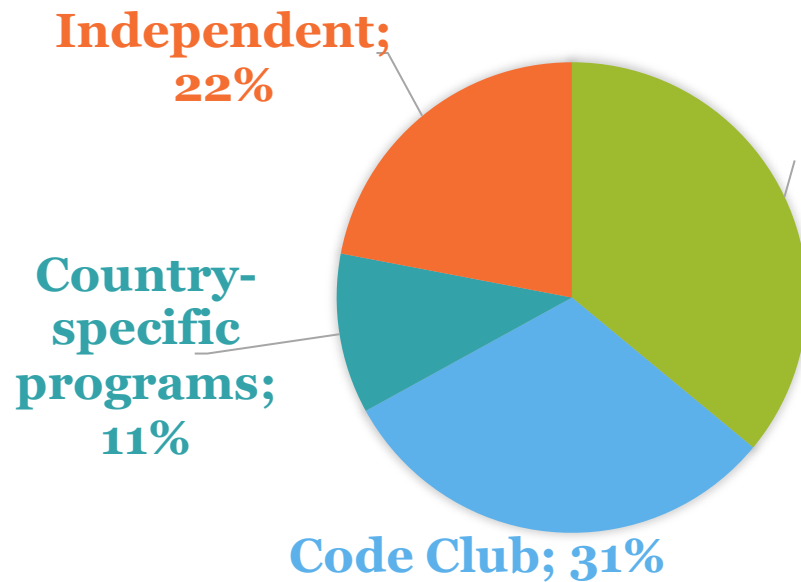
Code Club; 31%

CoderDojo; 36%

- Students: older and more often male
- Larger variety of taught languages

Taught languages (in 98 code clubs)

Scratch (in 87)
Python (48)
Arduino (17)
Mindstorms (16),
Micro:bit (15)
HTML (13)
Java (11)
JavaScript (10)
Blockly (4)
C-like languages (e.g. ArduC, RoboC or NXT-C) (3)

Others: Sonic Pi, Blender, Snap!, Swift, MBlock, Spheros, Flowol4, Crumble, Codebug, Node JS, Lightbot and A.l.e.x.

Use of lesson plans

I do not use a lesson plan: **45%**
Code.org lessons: **13%**

Code Club material / CoderDojo material
I create my own

"I plan it myself drawing on multiple sources for inspiration"

"I have my own lesson plan. Which is quiet flexible to change based on the interest and ability of my students."

Style of teaching

The students work independently on their own projects, and I help if they need me: **71%**

> *"I give them an assignment and then let them work in pairs independently (answering question where they have them)"*
>
> *"they get a game with the code on paper and rebuild the game."*

I give plenary sessions addressing the students: **33%**

> *"I occasionally do a session where I will introduce something different, such as Physical Computing."*

Assessment

Giving out stickers or badges for achievements: 47%

"[...] I usually have stickers to hand out at the end of the day. But they get them just for participating."

Quizzes or tests to get feedback on student understanding: 18%

Programming competitions: 16%

Formal tests/ grading: 5%

Self-assessment

"Students self-rank their understanding of a subject on a 1 - 3 scale before we move to a new subject"

2. What learning barriers in programming do the teachers of code clubs identify?

9. **What do the students struggle with at your code club?**
Check all that apply.

- [ ] Motivation and interest
- [ ] Commitment or engagement with the lessons
- [ ] The way of thinking when programming is unfamiliar to them
- [ ] The syntax of programming languages
- [ ] Debugging and error messages
- [ ] Abstract thinking
- [ ] Concepts related to functions
- [ ] Concepts related to variables
- [ ] Concepts related to conditions
- [ ] Concepts related to loops
- [ ] Other: _____

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Difficulty	Frequency
Debugging and error messages	55 (56,12%)
The way of thinking is unfamiliar to them	45 (45,92%)
Abstract thinking	45 (45,92%)
The syntax of programming languages	30 (30,61%)
Concepts related to variables	26 (26,53%)
Concepts related to functions	23 (23,47%)
Concepts related to loops	19 (19,39%)
Concepts related to conditions	15 (15,31%)
Commitment or engagement with the lessons	12 (12,24%)
Motivation and interest	10 (10,20%)

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"dealing with the frustration of inexplicable or unwanted behaviour of a program, and finding ways to solve it."

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"sometimes children that register for my workshops are too young and find abstract thinking too difficult to really understand what they are doing.".

Some more difficulties…

- Language-specific difficulties (Scratch coordinates, lists and the project management interface)

- Concentration problems

 *students get "distracted by playing games"*

- Focus on language

  students "often become focussed on learning Scratch itself, rather than building higher-order skills"

3. What are the teachers' perceptions of gender differences among their code club students?

11. **In what ways are boys different than girls in your classes?**

	Boys	Neutral, but maybe boys	Neutral	Neutral, but maybe girls	Girls
Who is more confident?	◯	◯	◯	◯	◯
Who is more motivated to learn programming?	◯	◯	◯	◯	◯
Who seems to like programming more?	◯	◯	◯	◯	◯
Who is more persistent when something does not work?	◯	◯	◯	◯	◯
Who seems to get it more easily?	◯	◯	◯	◯	◯
Who seems to concentrate better?	◯	◯	◯	◯	◯

12. **Which other differences have you noticed between how boys and girls learn programming?**
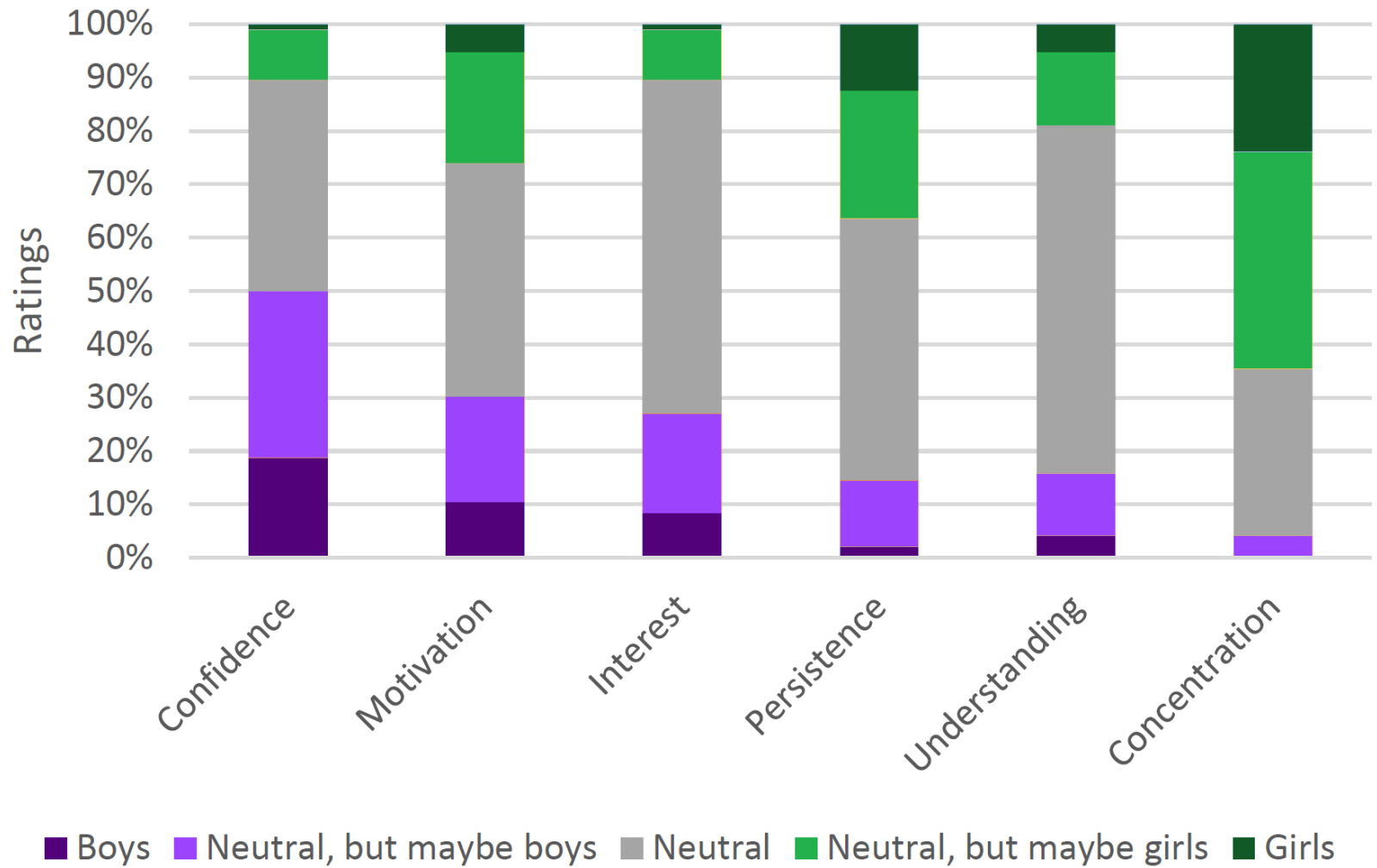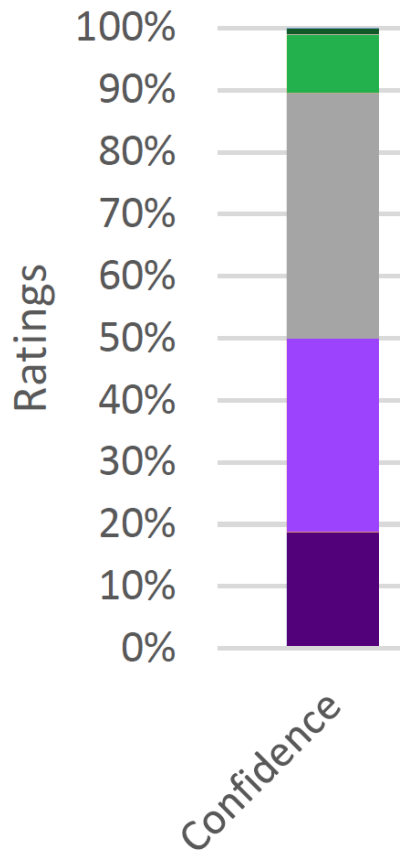
"I get initial "I will never understand this" reactions way more from girls than from boys. Completely invalidated after an hour or so of course, but still saddens me"

"Boys overestimate themselves and girls underestimate themselves."

Ratings

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

Confidence

■ Boys ■ Neutral, but maybe boys ■ Neutral ■ Neutral, but maybe girls ■ Girls

"Girls tend to stay on-task more, whereas some boys can be easily distracted"

"Girls most often seem more eager and have a longer attention span which helps them think and work on a problem longer and more thoroughly".

Concentration
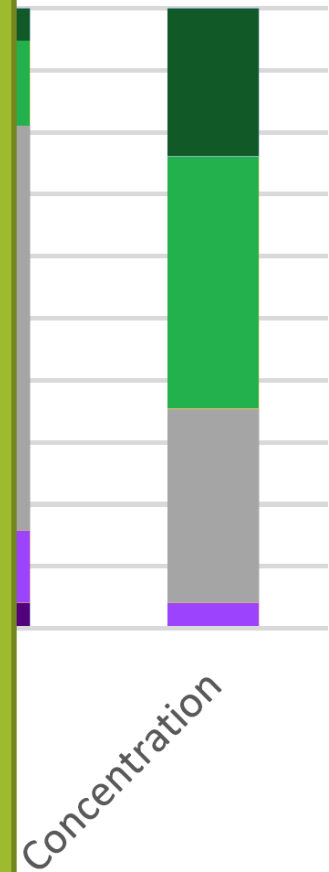
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Some more differences...

Preferred type of projects

"Girls seem to tend to like the more creative assignments, like computationally generated drawings whereas the boys tend to be more interested in the robots/less 'drawing'-like exercises."

Some more differences...

Preferred type of projects

Didactic preference and responsiveness to instruction

"Boys just start blindly without reading lessons and then run into trouble pretty quickly, then call for help. Girls tend to focus more, start reading and ask questions when they're really stuck."

Some more differences…

Preferred type of projects

Didactic preference and responsiveness to instruction

Collaboration skills

"Girls are more likely to help each other before asking me for help. Boys tend to ask for help from me first. Boys seem to work more independently where girls like group work."

Some more differences...

Preferred type of projects

Didactic preference and responsiveness to instruction

Collaboration skills

Grit and focus

"Girls have more grit to finish the puzzle and are more precise"

"[...] Some boys rush through without really understanding what they are doing. [...] All of the girls in my club have always been more careful and methodical. They seem to want to understand what they are doing more and don't mind taking their time.".

Some more differences...

Preferred type of projects

Didactic preference and responsiveness to instruction

Collaboration skills

Grit and focus

Familiarity and prior knowledge

"Boys tend to have more experience/knowledge, so they meet fewer problems"

"Initially, girls are more hesitant to experiment and play around with the computers, and more scared of 'spoiling' them."

Code club instructors told us that...

Setting and instruction

Half of the instructors: CS background & no education experience

Mostly male students

Great variety of languages

Rare: plenary sessions & formal assessments

Perceived learning barriers

Debugging and error messages

Unfamiliar way of thinking / abstraction
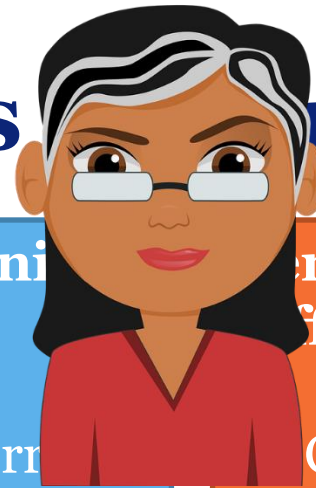
Variables & functions

Not: commitment or motivation

Perceived gender differences

↓ Confidence
↓ Familiarity and prior knowledge

↑ Persistence
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↑ Collaboration skills
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How is programming taught in code clubs? Exploring the experiences and gender perceptions of code club teachers

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