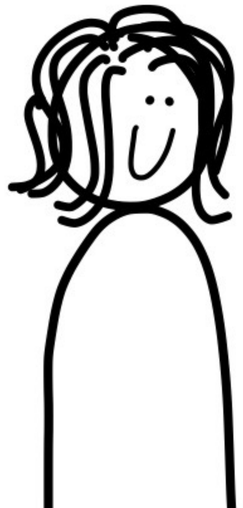
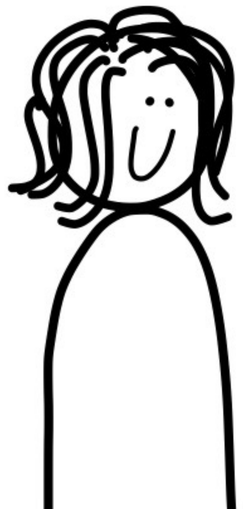
Hedy: A gradual Programming Language



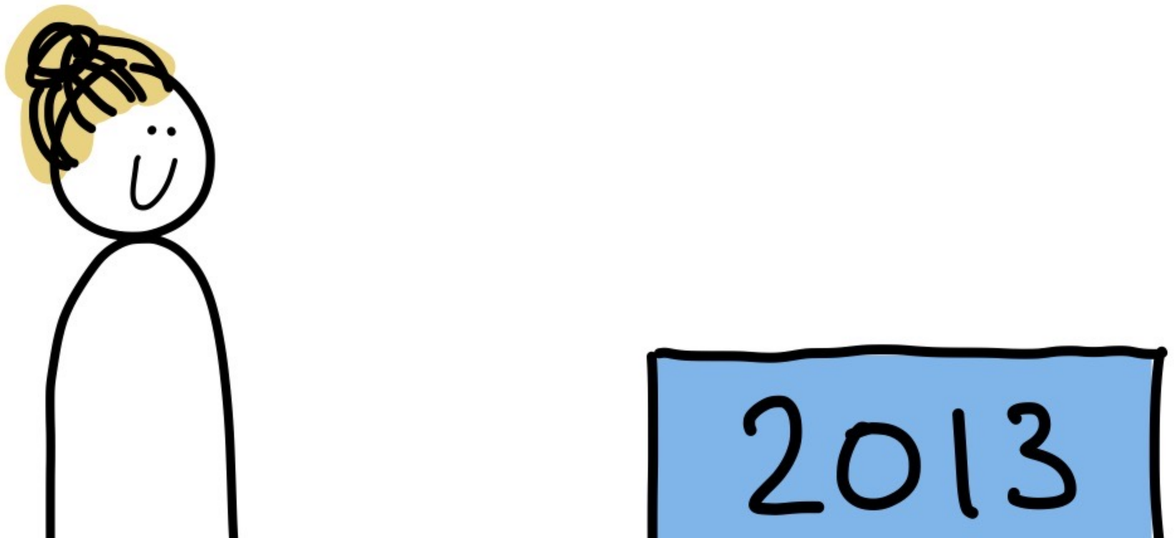
Felienne Hermans

Hedy is gradual multi lingual built for teaching



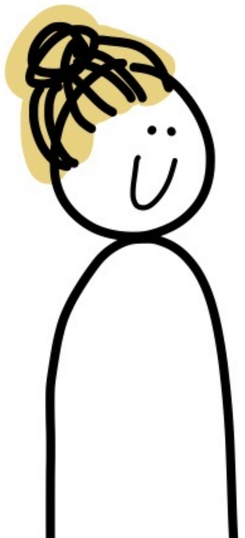
Felienne Hermans

How to teach programming?

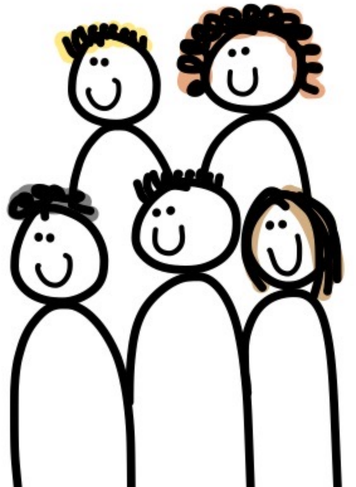


middle schoolers

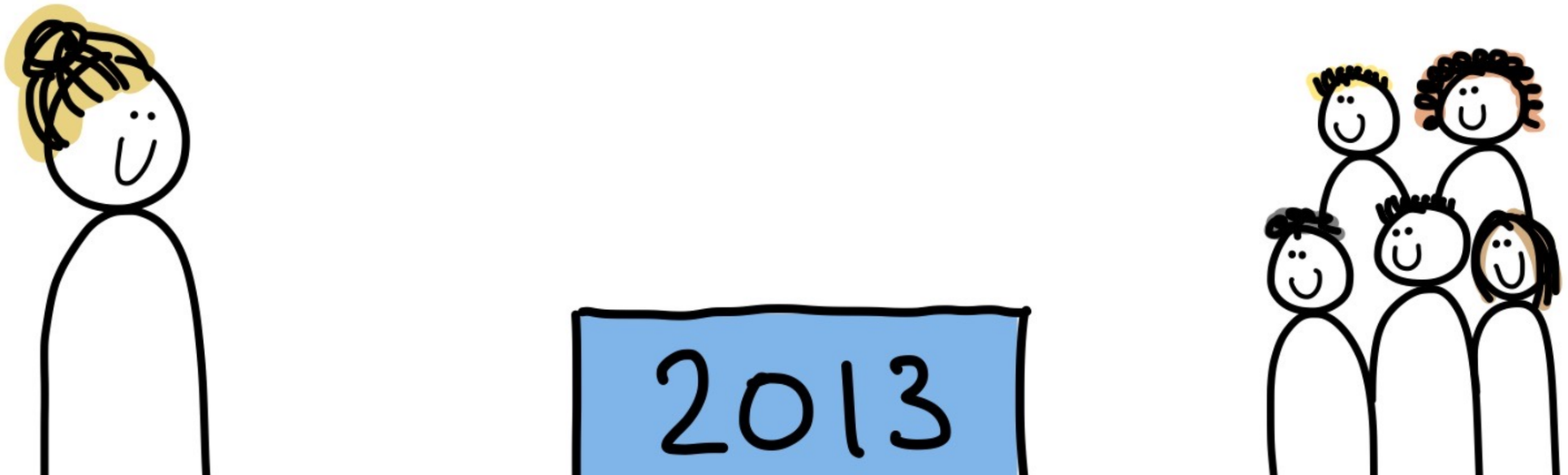
age 10 – 14



2013

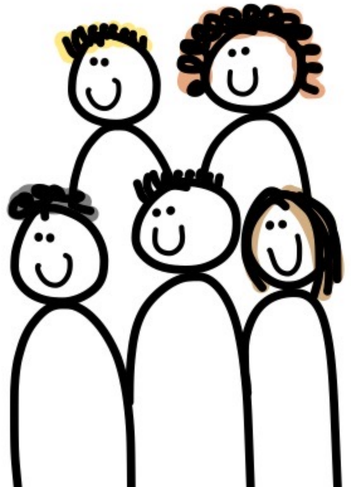


We'd love to learn programming

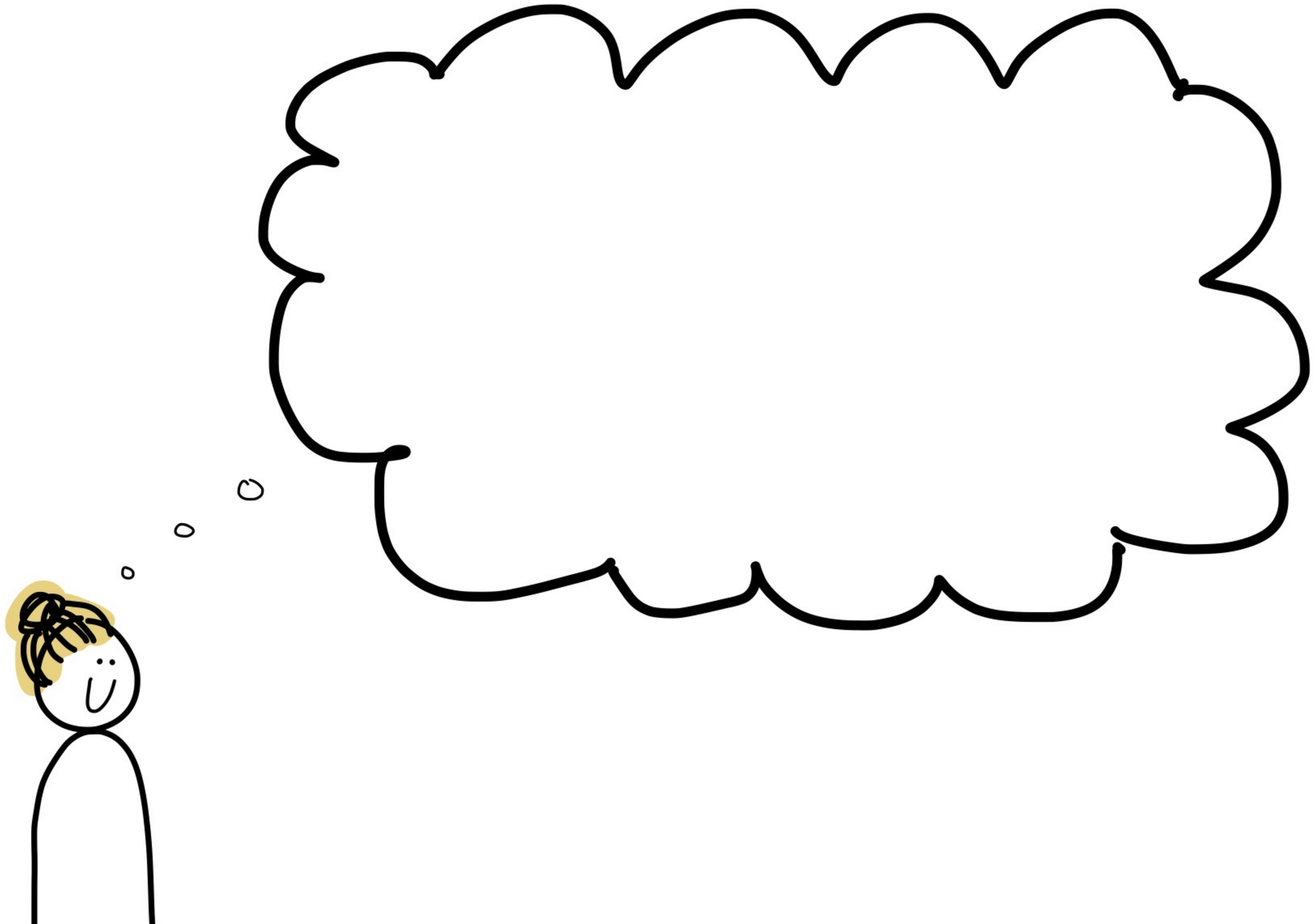


I'll teach you

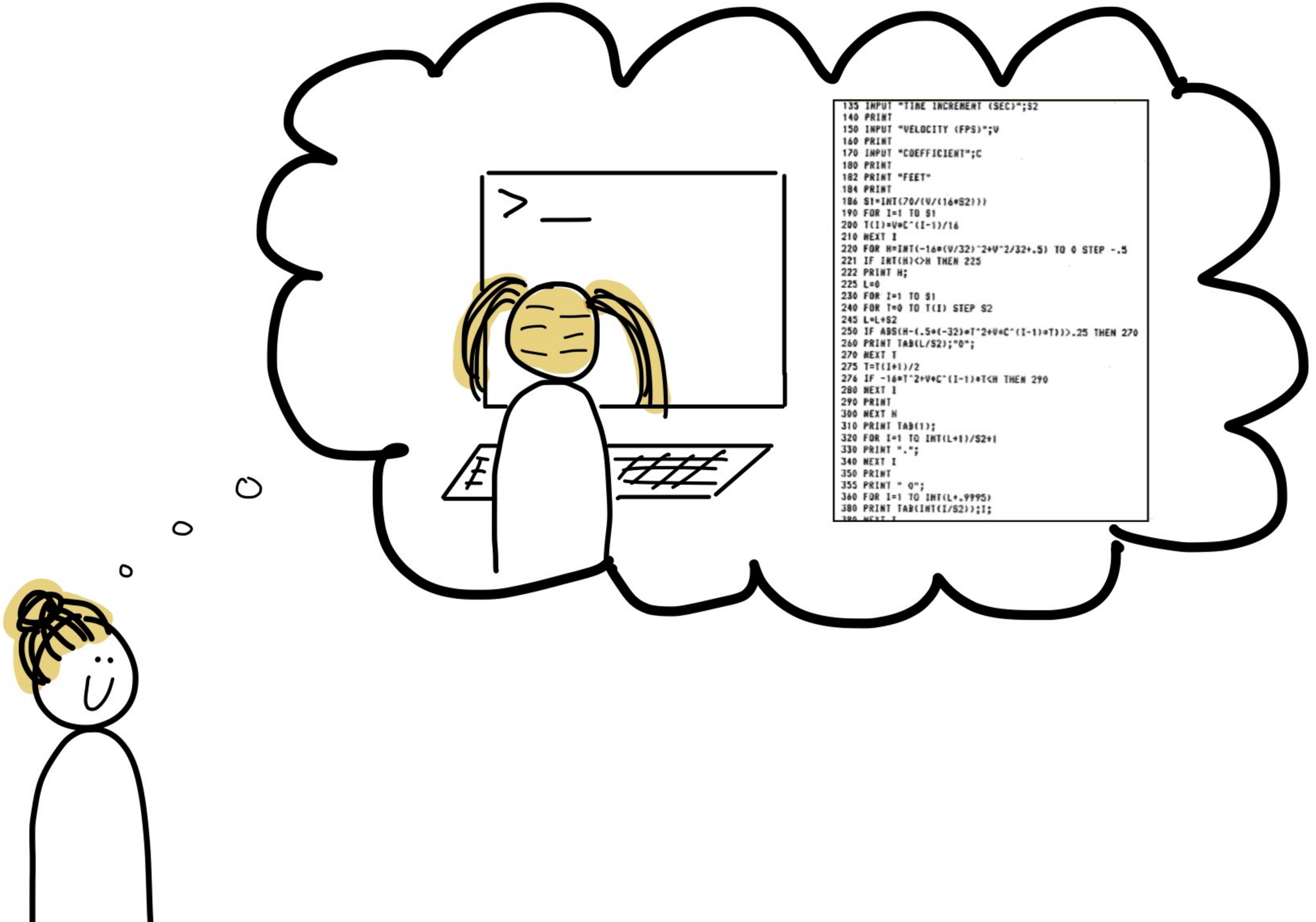
We'd love to learn programming

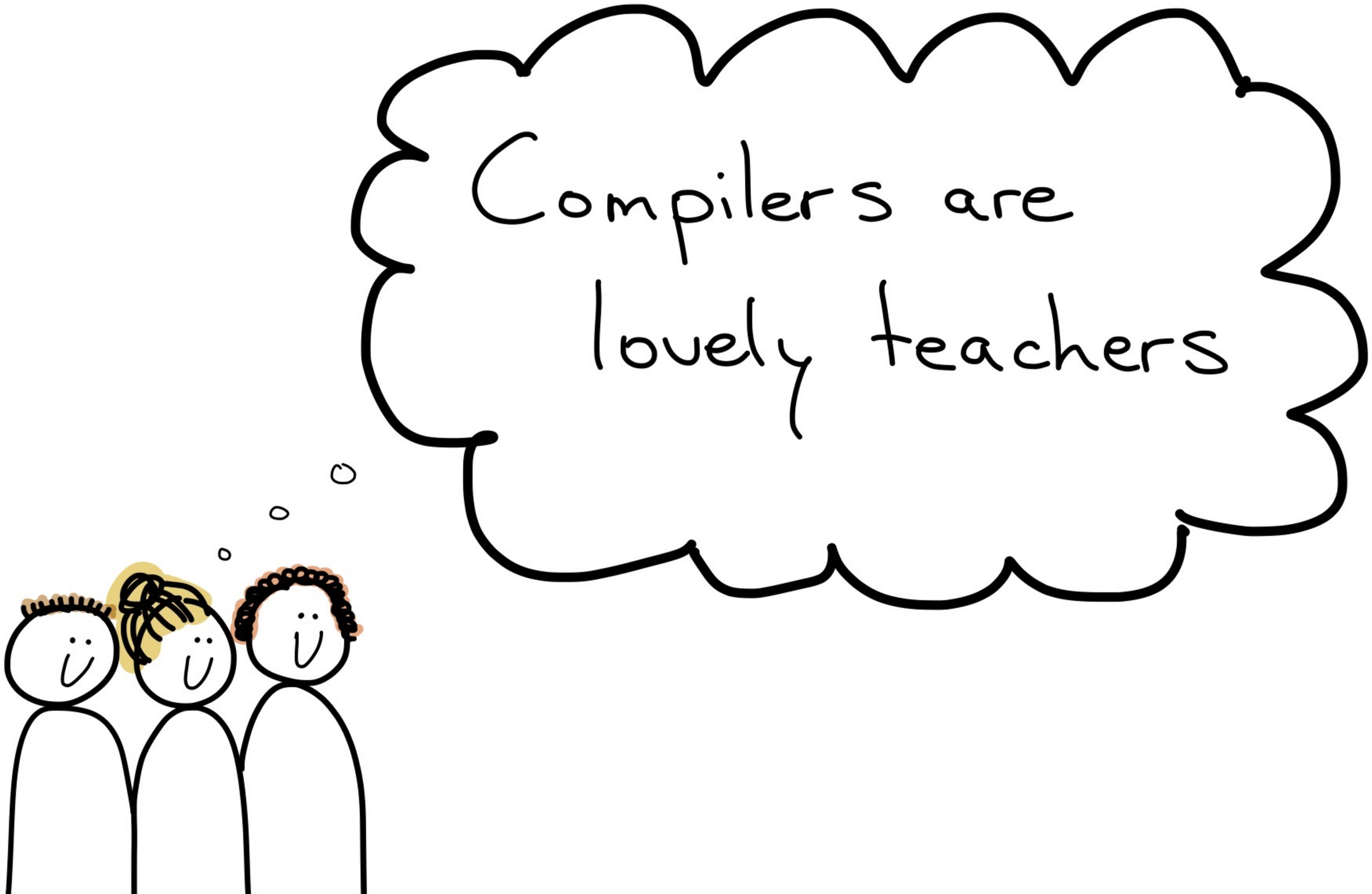


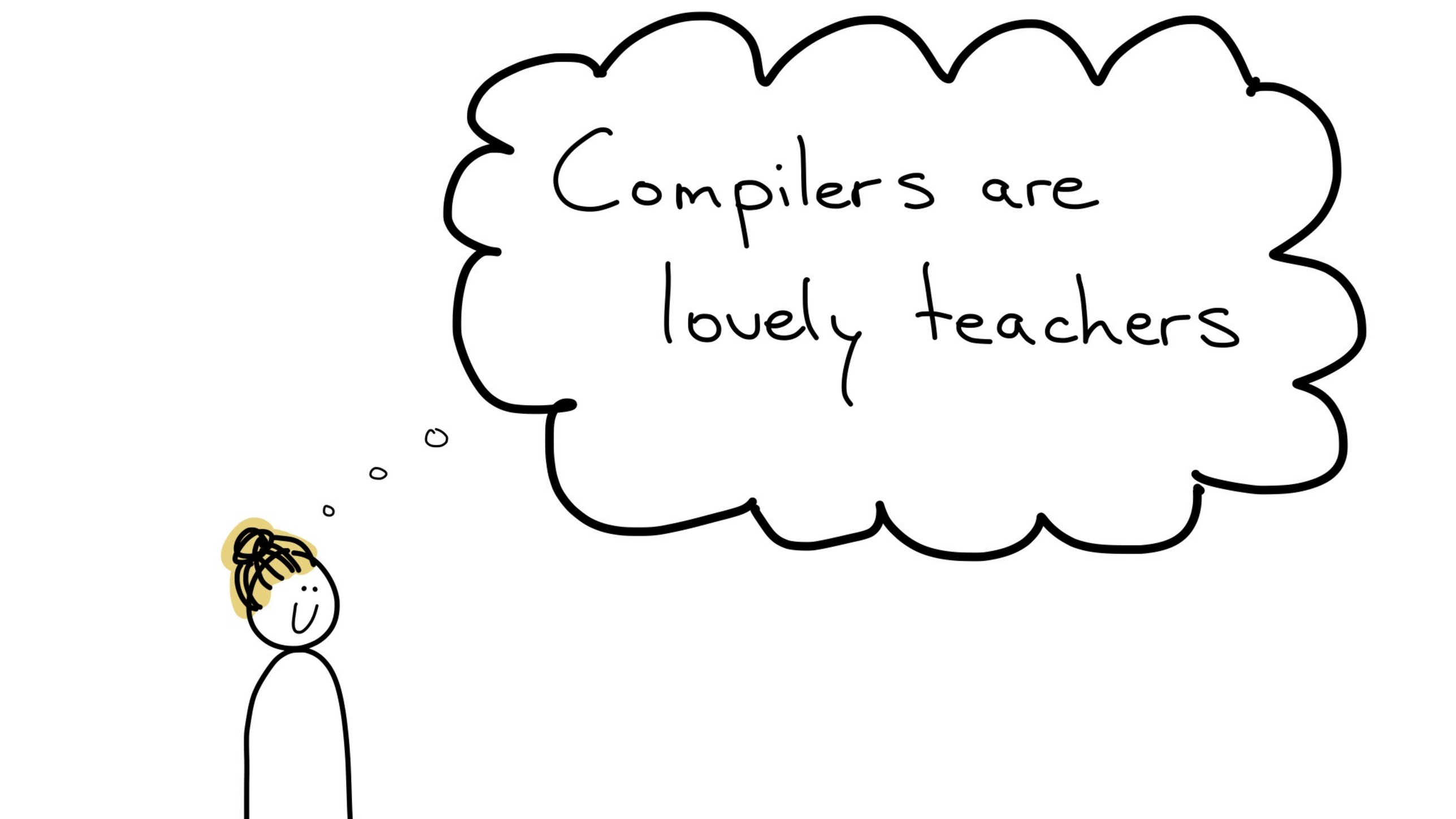
2013



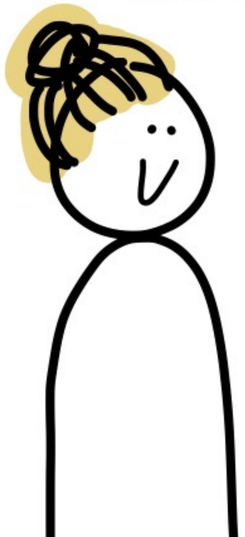

>
BASIC
COMPUTER
GAMES
MICROCOMPUTER EDITION
$7.95
101 Great Games to Play on Your Home Computer.
By yourself or with others. Each complete with
programming and sample run. Edited by David H. Ahl

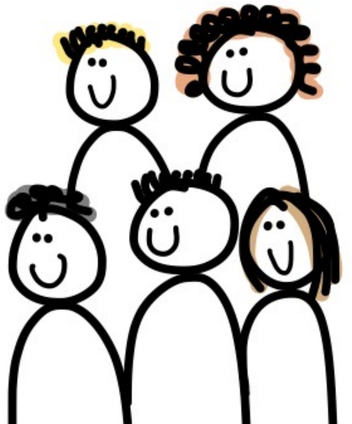

135 INPUT "TIME INCREMENT (SEC)";S2
140 PRINT
150 INPUT "VELOCITY (FPS)";V
160 PRINT
170 INPUT "COEFFICIENT";C
180 PRINT
182 PRINT "FEET"
184 PRINT
186 S1=INT(70/(V/(16*S2)))
190 FOR I=1 TO S1
200 T(I)=V*C^(I-1)/16
210 NEXT I
220 FOR H=INT(-16*(V/32)^2+V^2/32+.5) TO 0 STEP -.5
221 IF INT(H)<>H THEN 225
222 PRINT H;
225 L=0
230 FOR I=1 TO S1
240 FOR T=0 TO T(I) STEP S2
245 L=L+S2
250 IF ABS(H-(.5*(-32)*T^2+V*C^(I-1)*T))>.25 THEN 270
260 PRINT TAB(L/S2);"0";
270 NEXT T
275 T=T(I+1)/2
276 IF -16*T^2+V*C^(I-1)*T<H THEN 290
280 NEXT I
290 PRINT
300 NEXT H
310 PRINT TAB(1);
320 FOR I=1 TO INT(L+1)/S2+1
330 PRINT ".";
340 NEXT I
350 PRINT
355 PRINT " 0";
360 FOR I=1 TO INT(L+.9995)
380 PRINT TAB(INT(I/S2));I;


Compilers are
lovely teachers

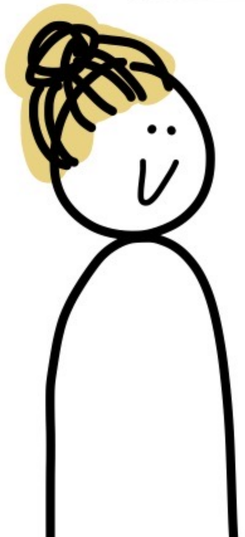

Compilers are
lovely teachers

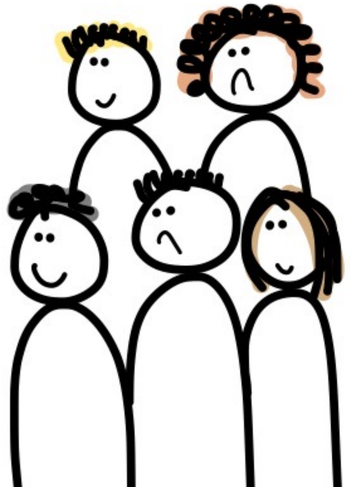

Code
Costumes
Sounds
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Motion
move 10 steps
turn 15 degrees
turn 15 degrees
go to random position
go to x: -25 y: -15
glide 1 secs to random position
glide 1 secs to x: -25 y: -15
point in direction 90
point towards mouse-pointer
change x by 10
when clicked
forever
move 10 steps
turn 15 degrees
play sound Meow until done
Sprite
Sprite1
x
-25
y
-15
Size
100
Direction
45
Stage
Backdrops
1
Sprite1



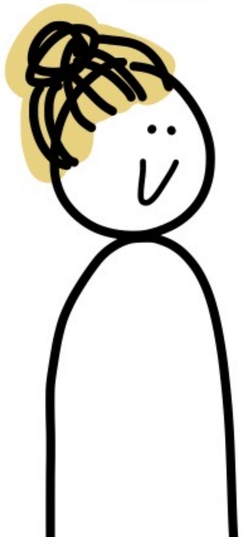


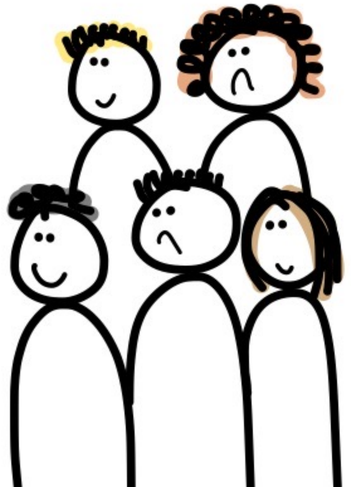

Code
Costumes
Sounds
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
move 10 steps
turn 15 degrees
turn 15 degrees
go to random position
go to x: -25 y: -15
glide 1 secs to random position
glide 1 secs to x: -25 y: -15
point in direction 90
point towards mouse-pointer
change x by 10
when clicked
forever
move 10 steps
turn 15 degrees
play sound Meow until done
Sprite Sprite1 x -25 y -15
Size 100 Direction 45
Sprite1
Stage
Backdrops 1

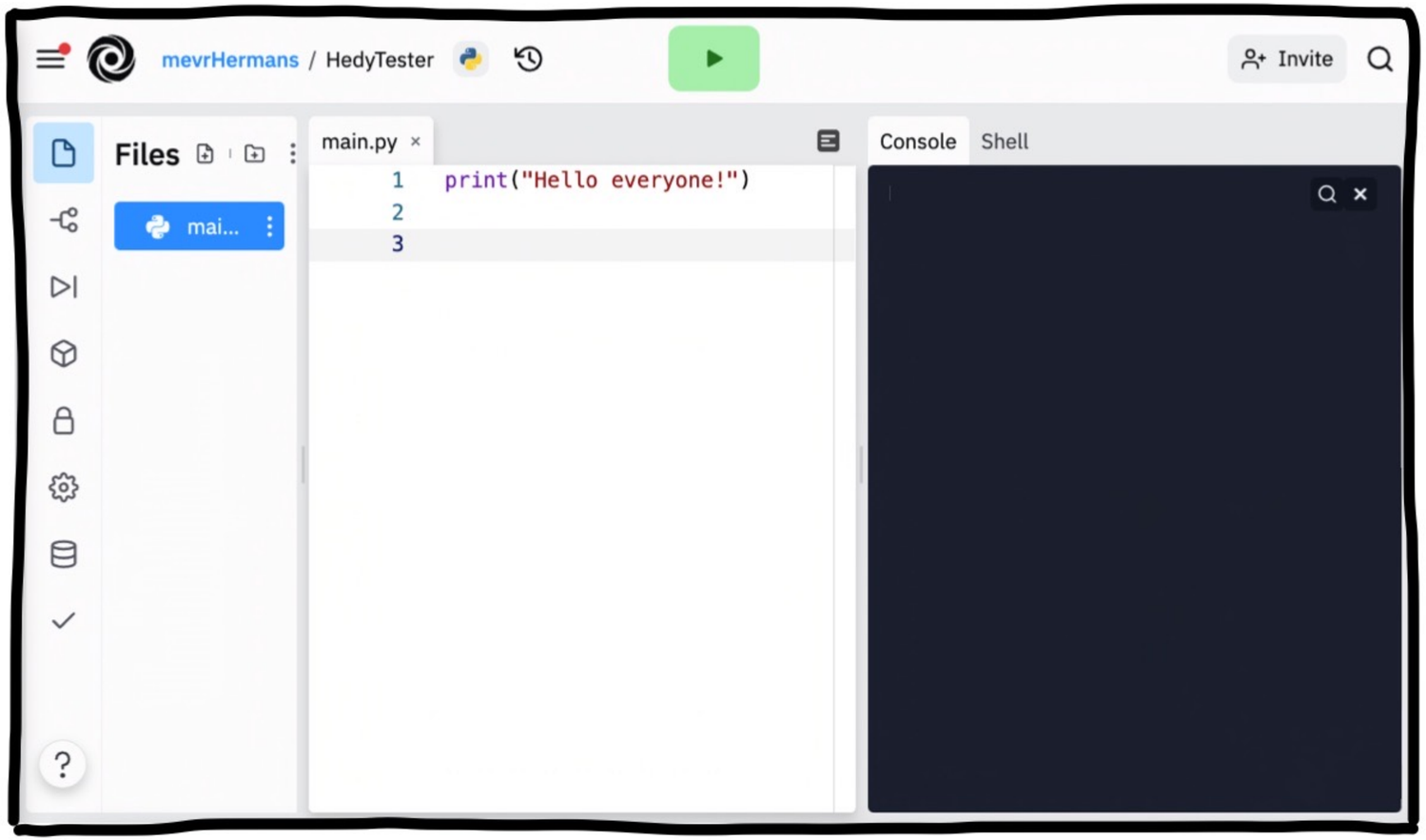


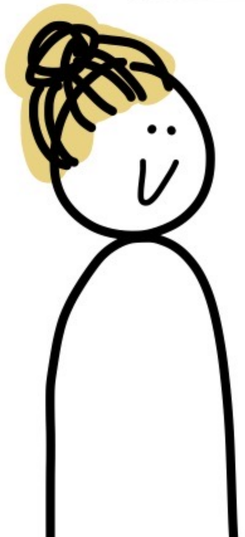


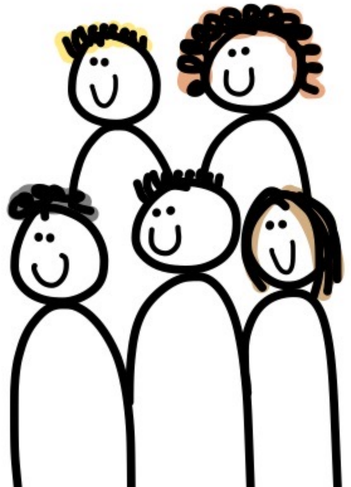
Scratch is for kids

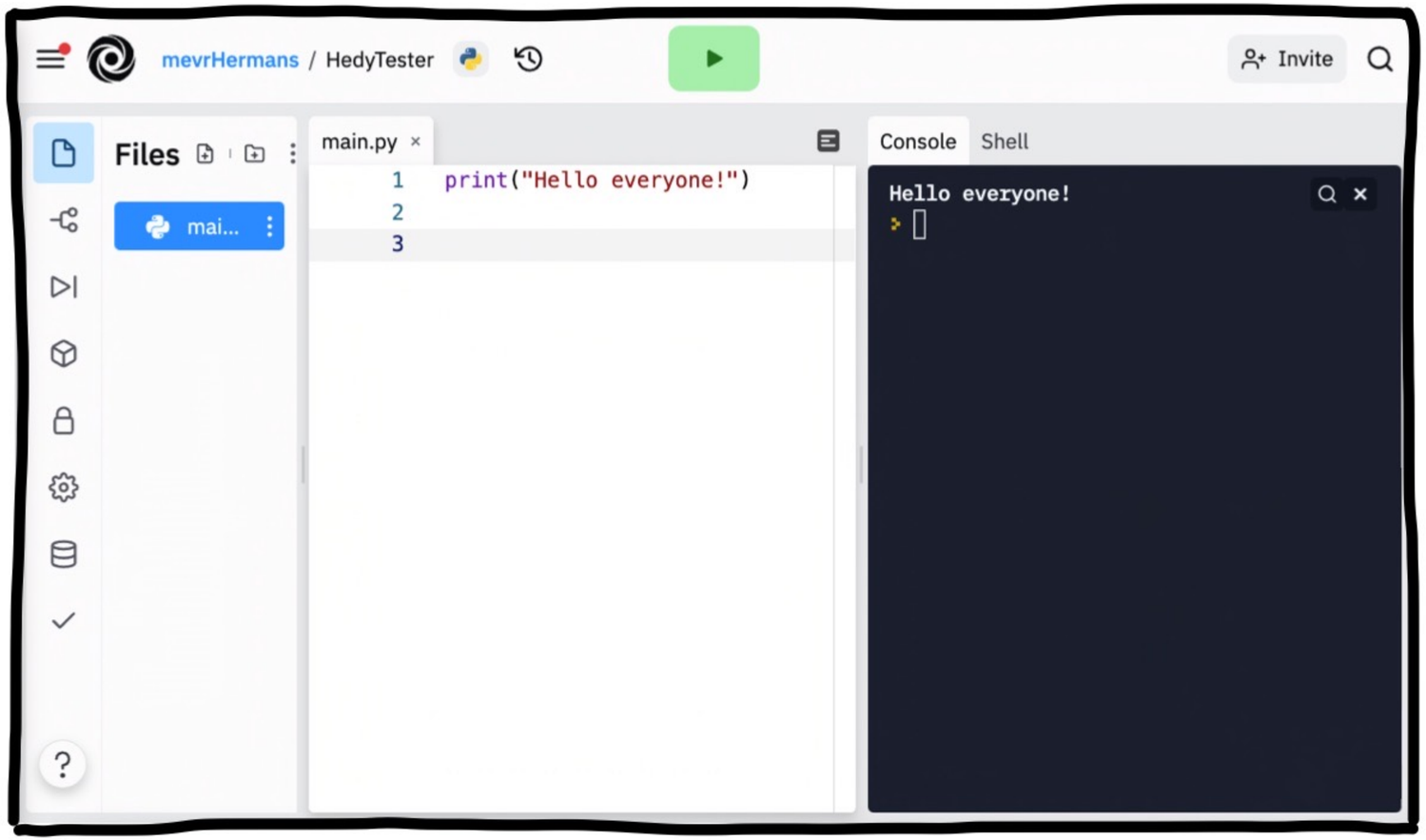


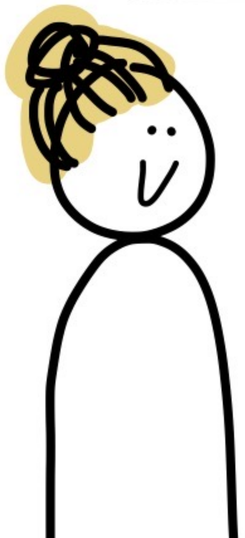


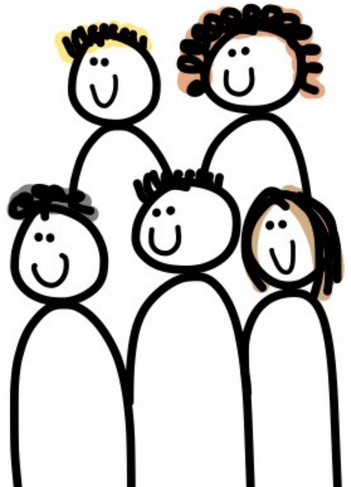

mevrHermans / HedyTester
Invite
Files
main.py
mai...
1 print("Hello everyone!")
2
3
Console
Shell

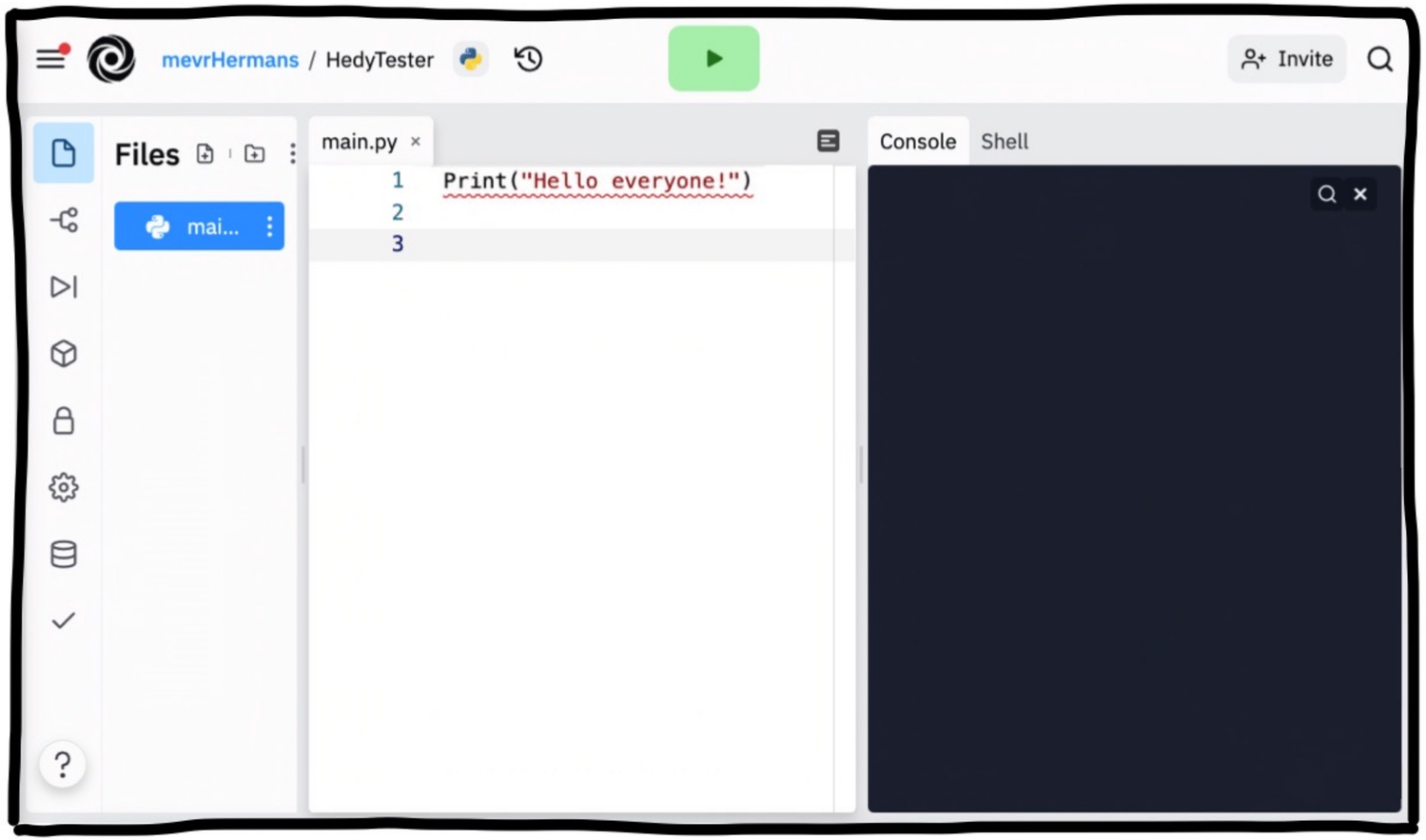


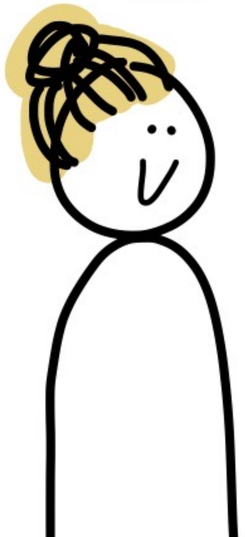


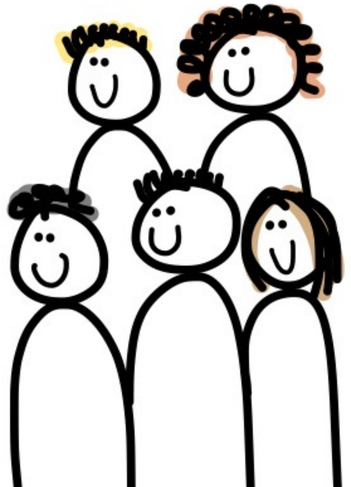

mevrHermans / HedyTester
Invite
Files
main.py
print("Hello everyone!")
Console
Shell
Hello everyone!

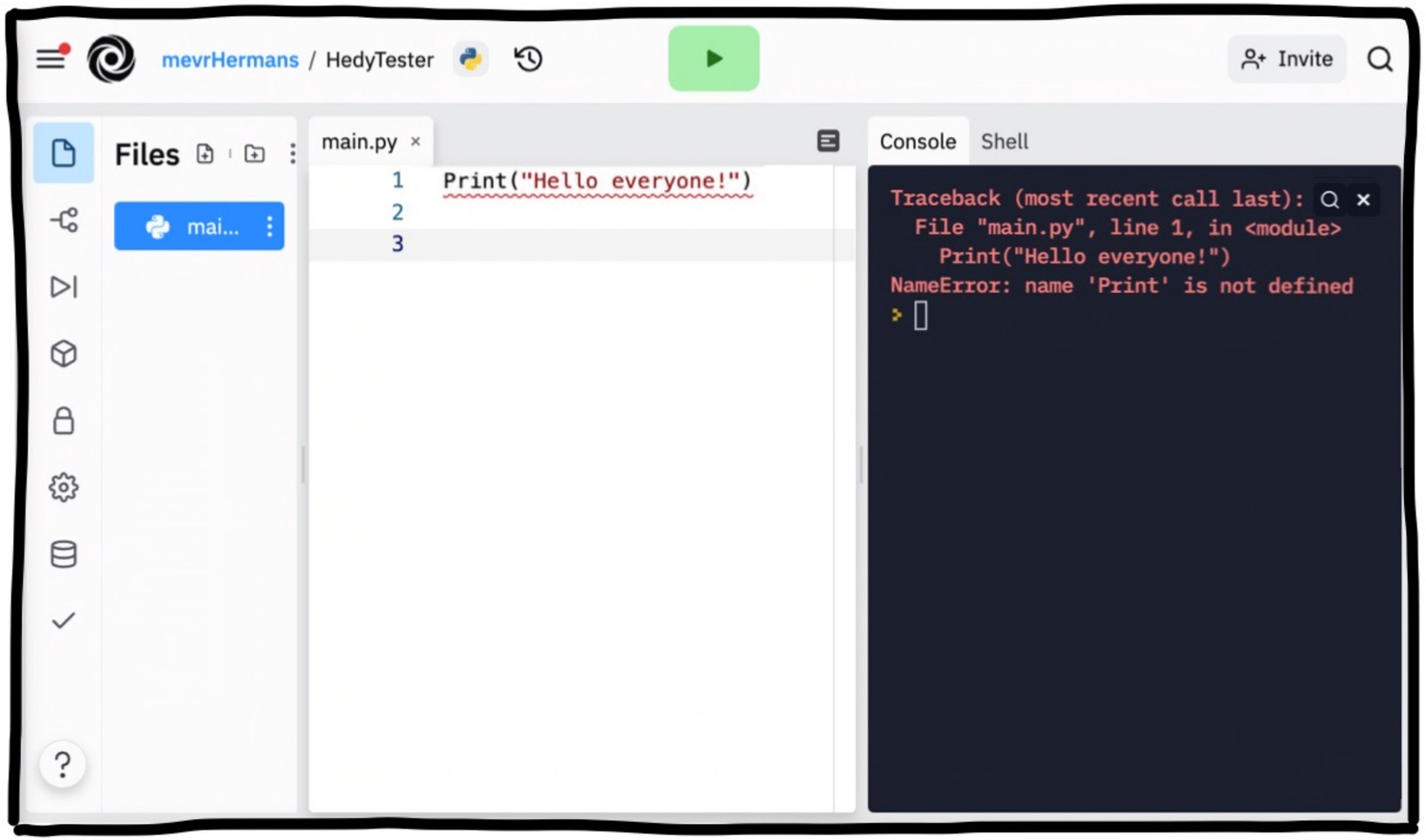


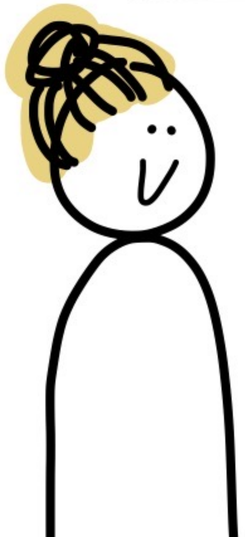


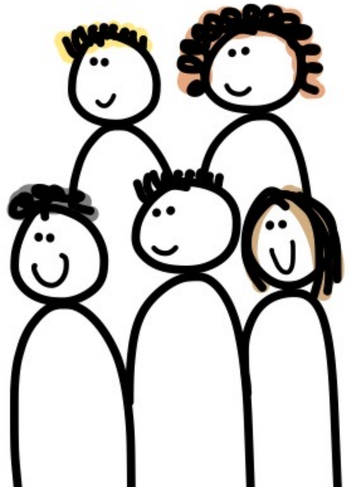

mevrHermans / HedyTester
Invite
Files
main.py
mai...
1 Print("Hello everyone!")
2
3
Console
Shell

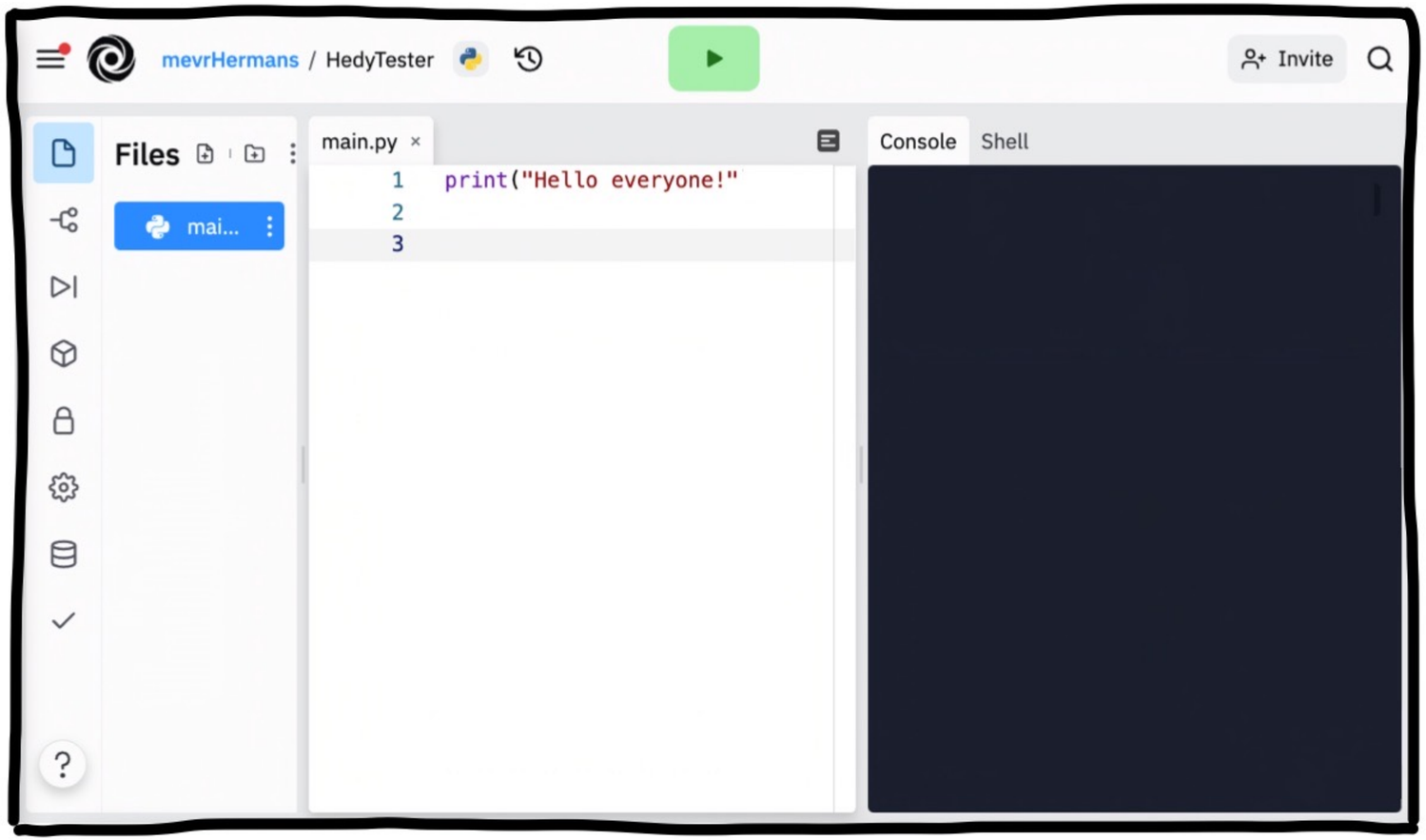


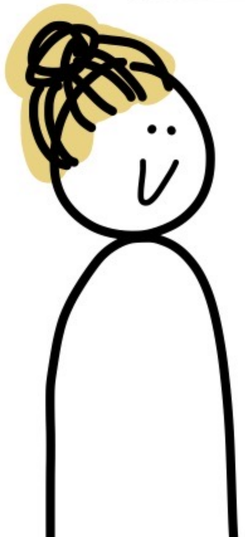


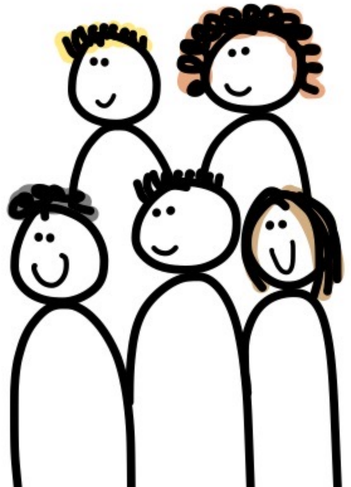

mevrHermans / HedyTester
Invite
Files
main.py
mai...
1 Print("Hello everyone!")
2
3
Console
Shell
Traceback (most recent call last):
File "main.py", line 1, in <module>
Print("Hello everyone!")
NameError: name 'Print' is not defined

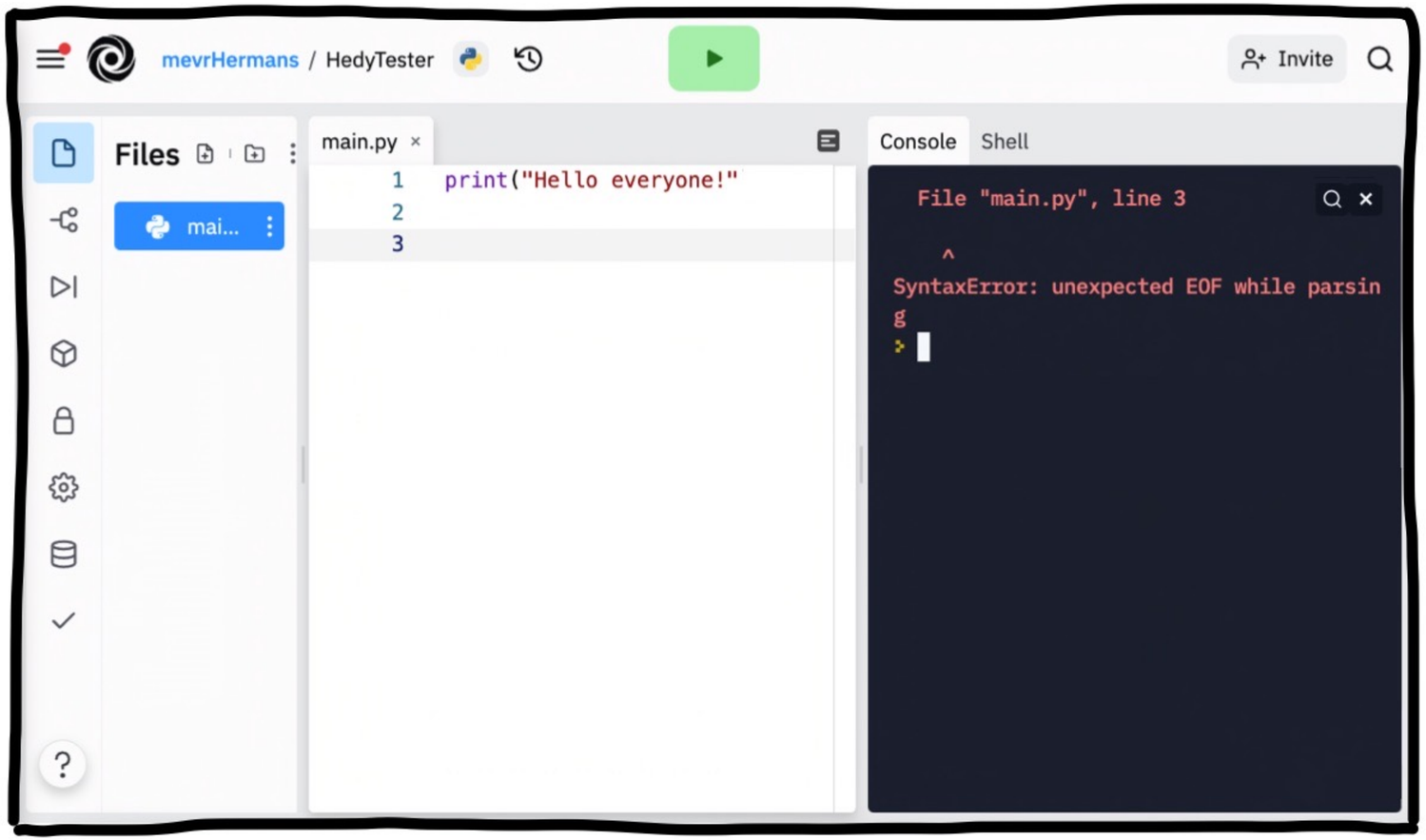


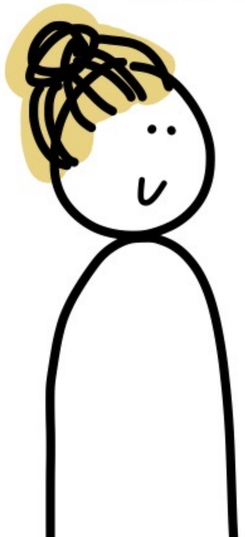


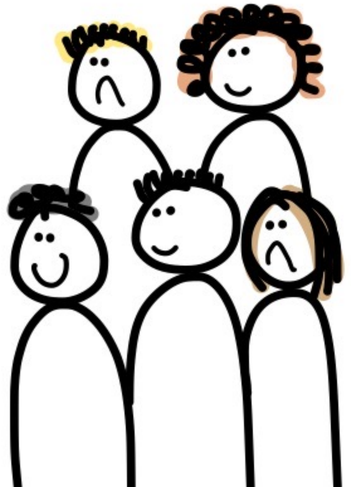

mevrHermans / HedyTester
Invite
Files
main.py
mai...
1 print("Hello everyone!"
2
3
Console
Shell

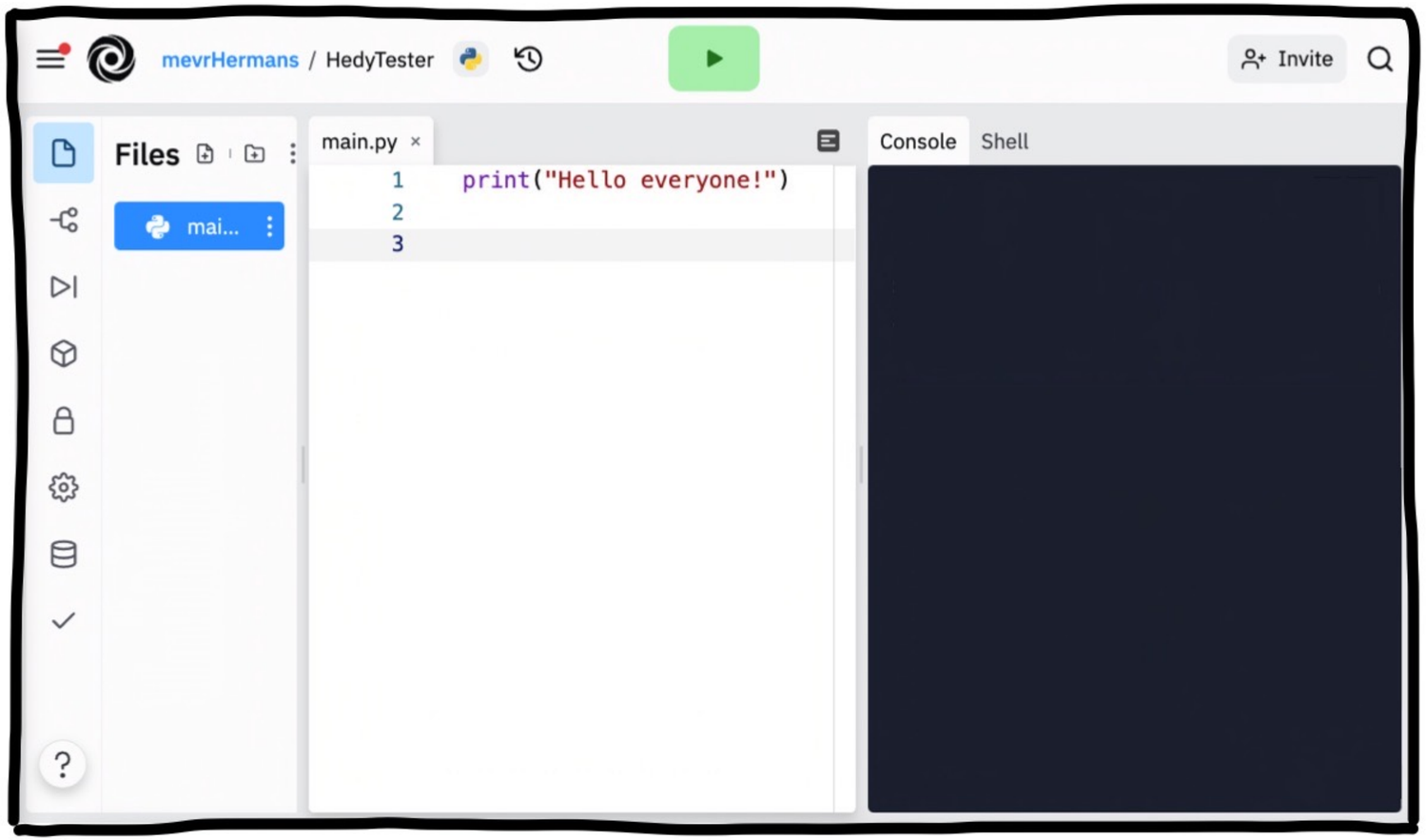


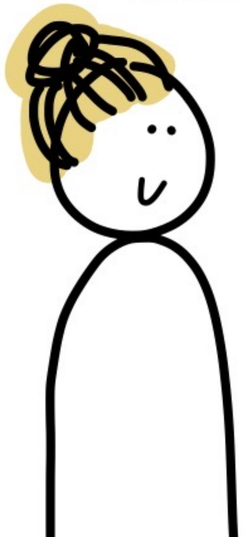


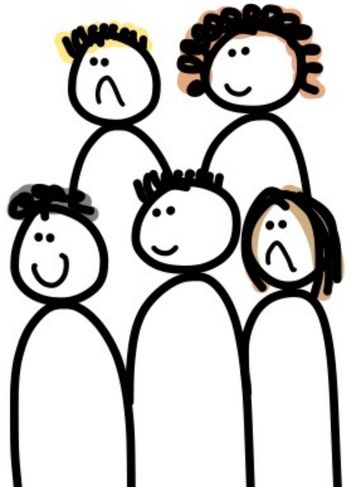

mevrHermans / HedyTester
Invite
Files
main.py
mai...
1 print("Hello everyone!"
2
3
Console
Shell
File "main.py", line 3
^
SyntaxError: unexpected EOF while parsin
g

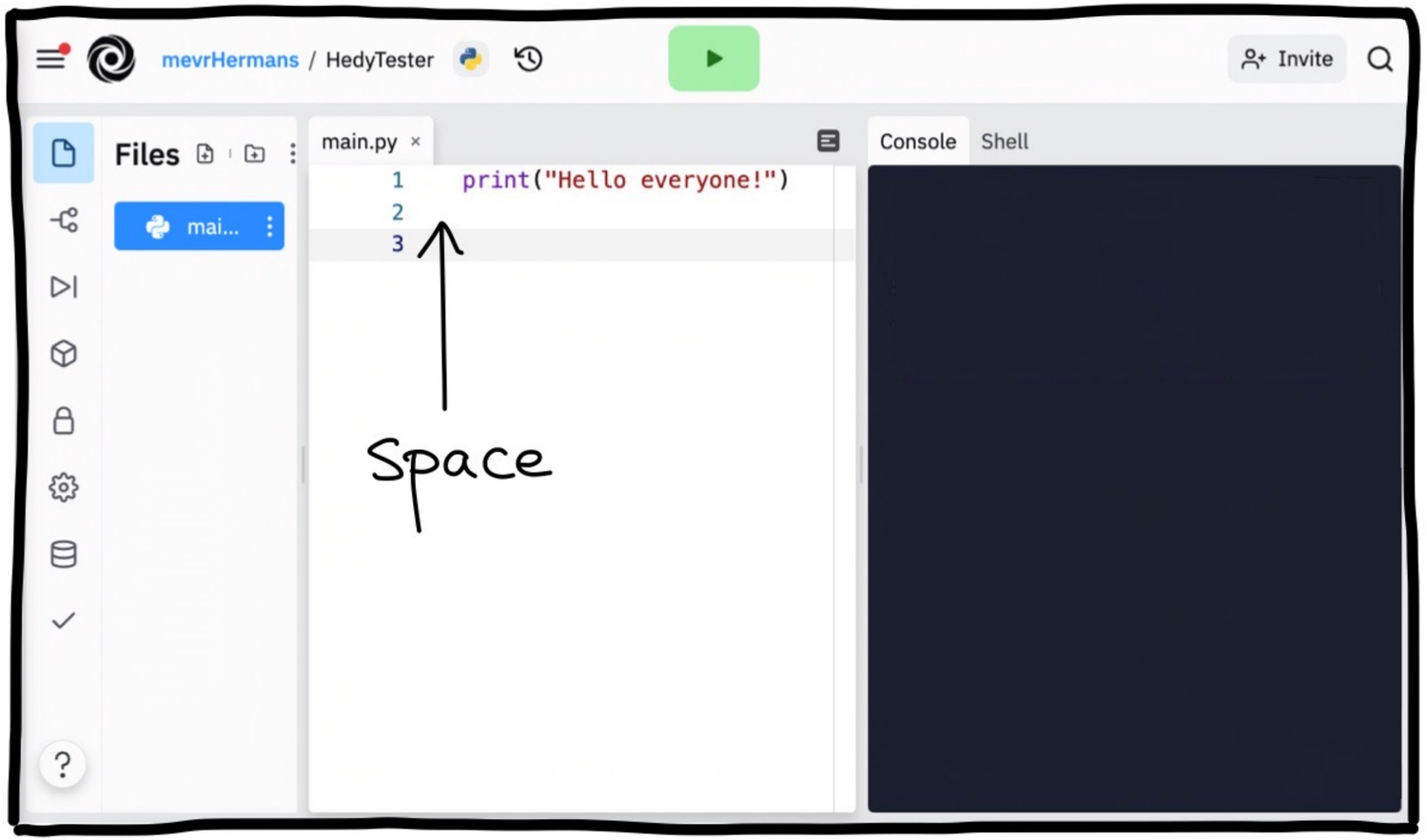


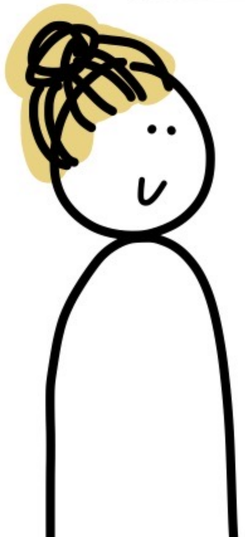


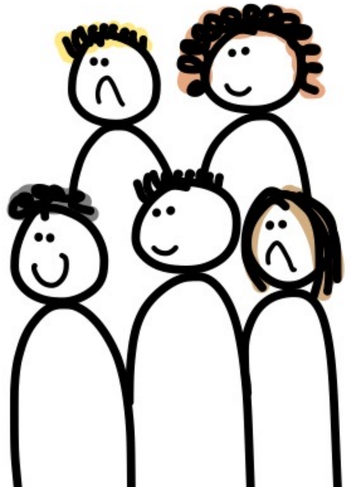

mevrHermans / HedyTester
Invite
Files
main.py
mai...
1 print("Hello everyone!")
2
3
Console
Shell

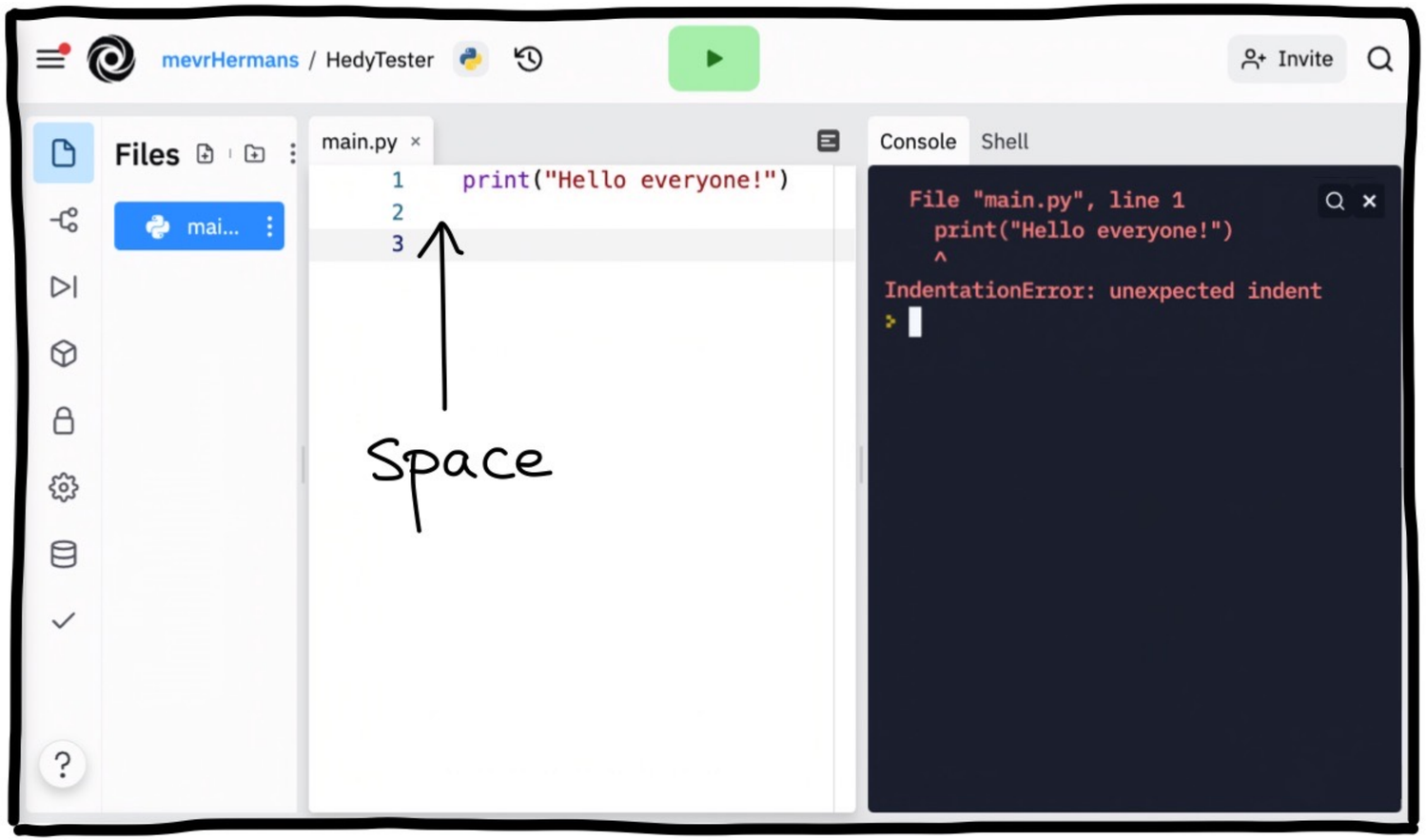


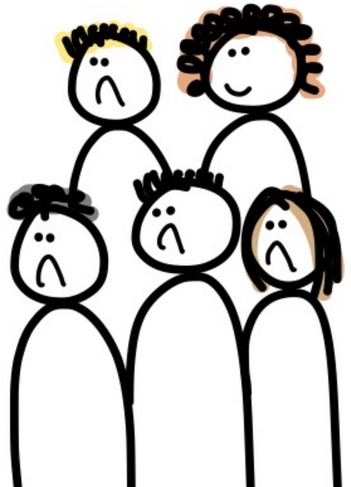


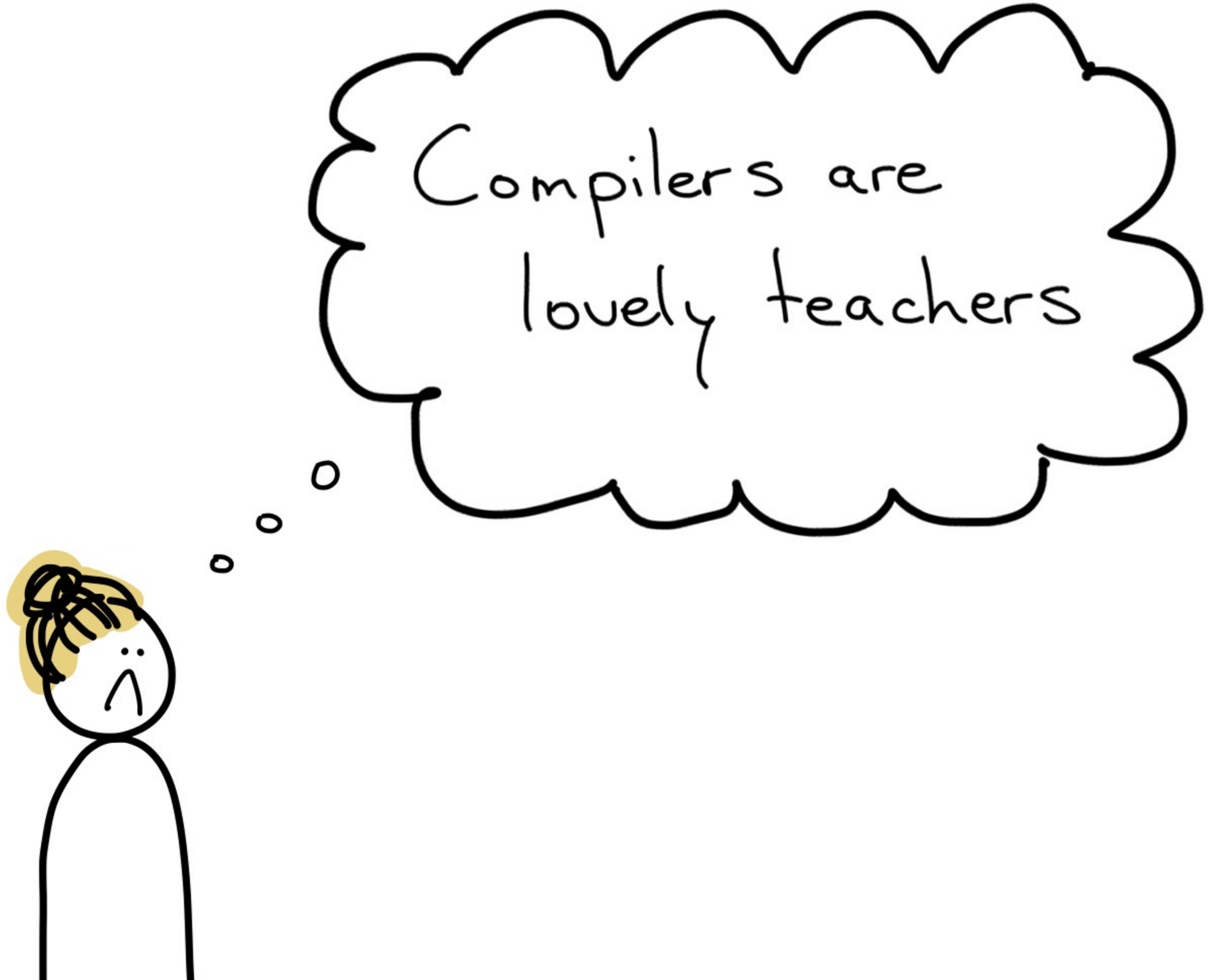

mevrHermans / HedyTester
Invite
Files
main.py
mai...
1 print("Hello everyone!")
2
3
Space
Console
Shell

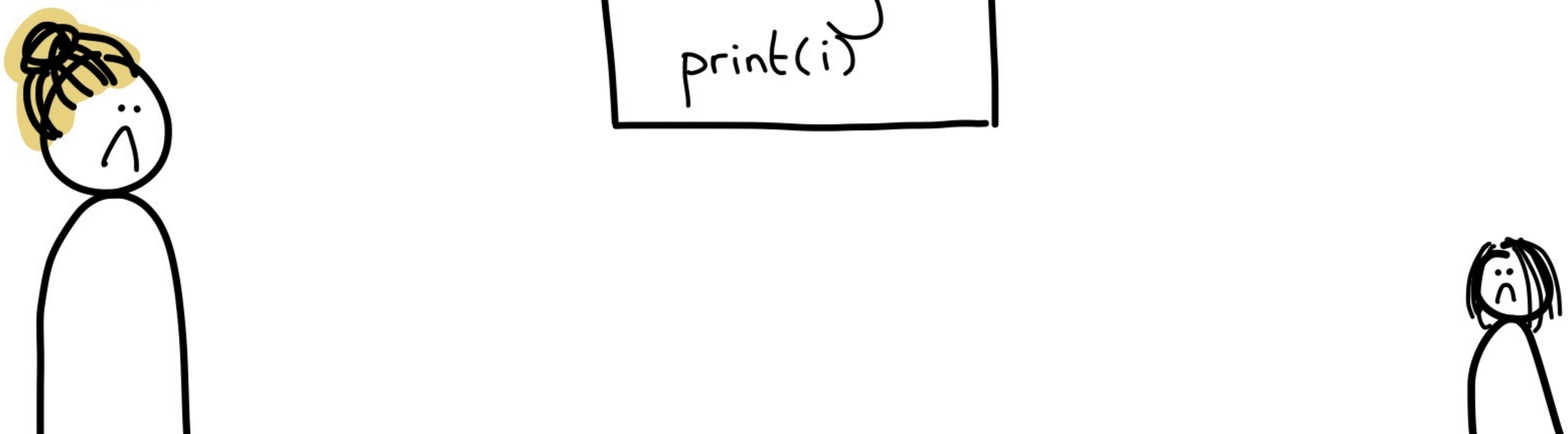





mevrHermans / HedyTester
Invite
Files
main.py
mai...
1 print("Hello everyone!")
2
3
Space
Console
Shell
File "main.py", line 1
print("Hello everyone!")
^
IndentationError: unexpected indent




Compilers are
lovely teachers


for i in range(4):
print(i)

Repetition

```
for i in range(4):
    print(i)
```

Repetition

```
for i in range(4):
    print(i)
```

Colon

Brackets

Spaces

Syntax creates cognitive load

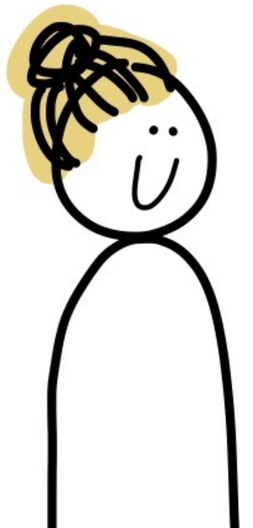
```
for i in range(4):
    print(i)
```

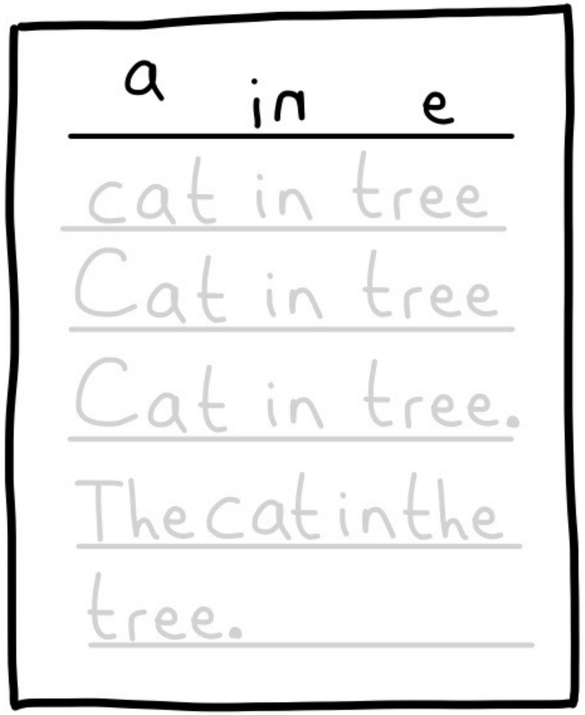
Colon

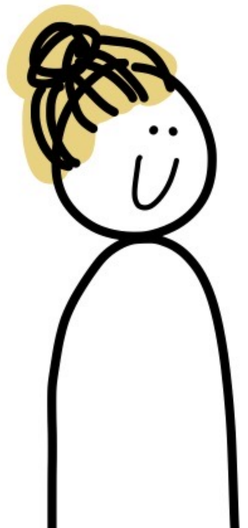
Brackets

Spaces

How do other fields manage cognitive load?




a in e
cat in tree
Cat in tree
Cat in tree.
The cat in the
tree.



a in e

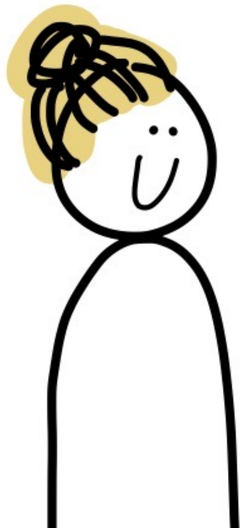
cat in tree

Cat in tree

Cat in tree.

Thecatinthe

tree.



a in e

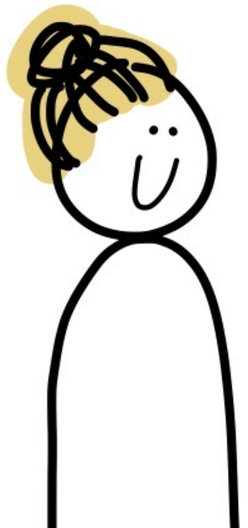
cat in tree

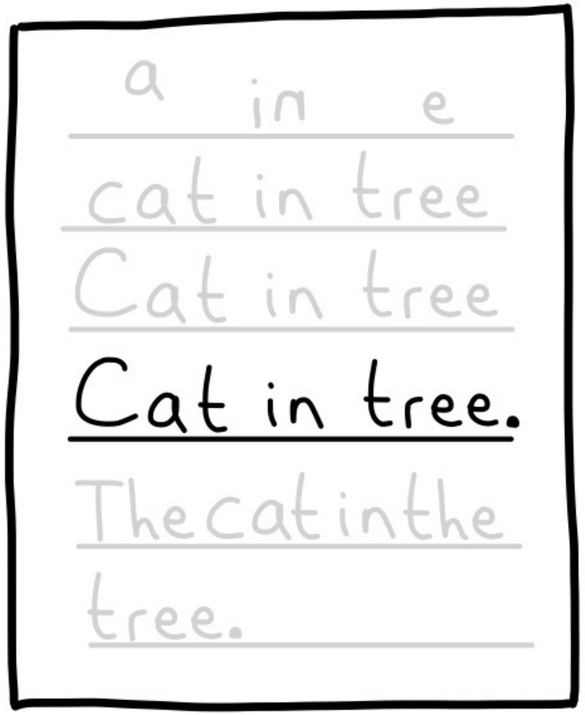
Cat in tree

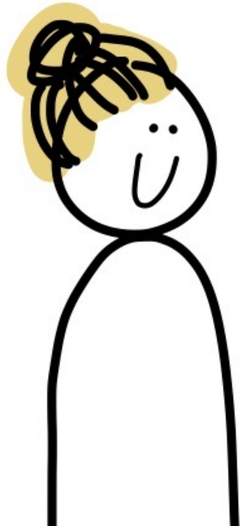
Cat in tree.

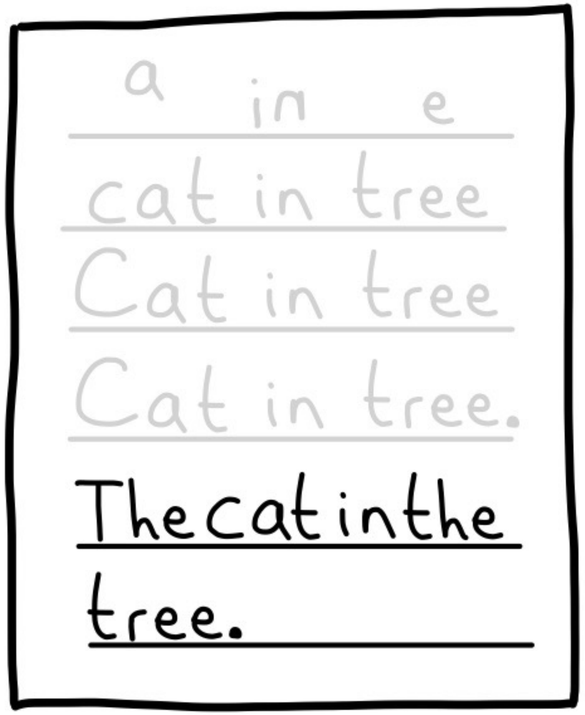
Thecatinthe

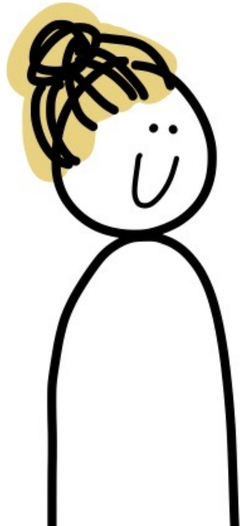
tree.



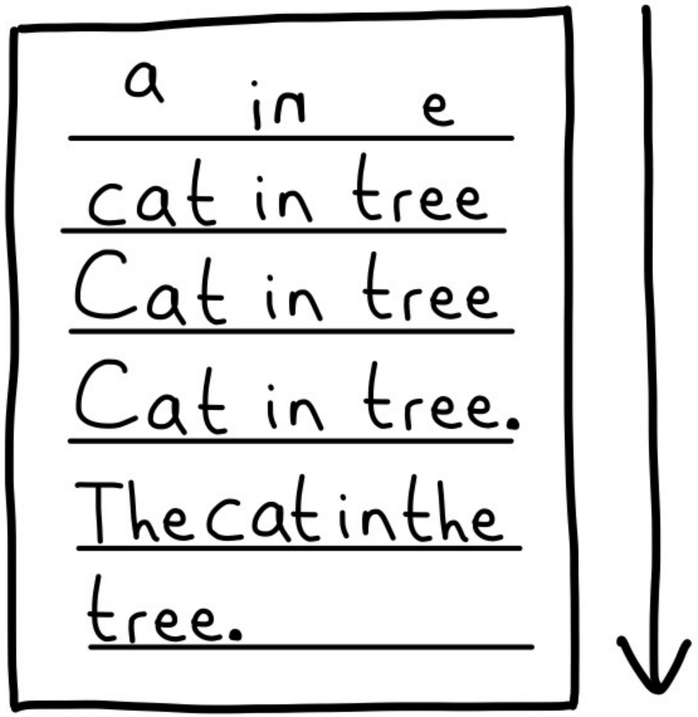

a in e
cat in tree
Cat in tree
Cat in tree.
The cat in the
tree.

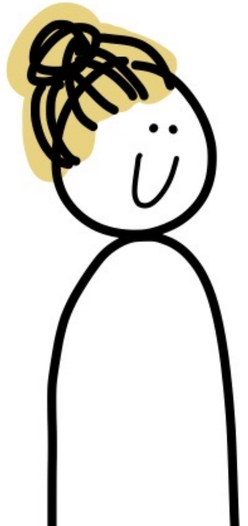



a in e
cat in tree
Cat in tree
Cat in tree.
The cat in the tree.

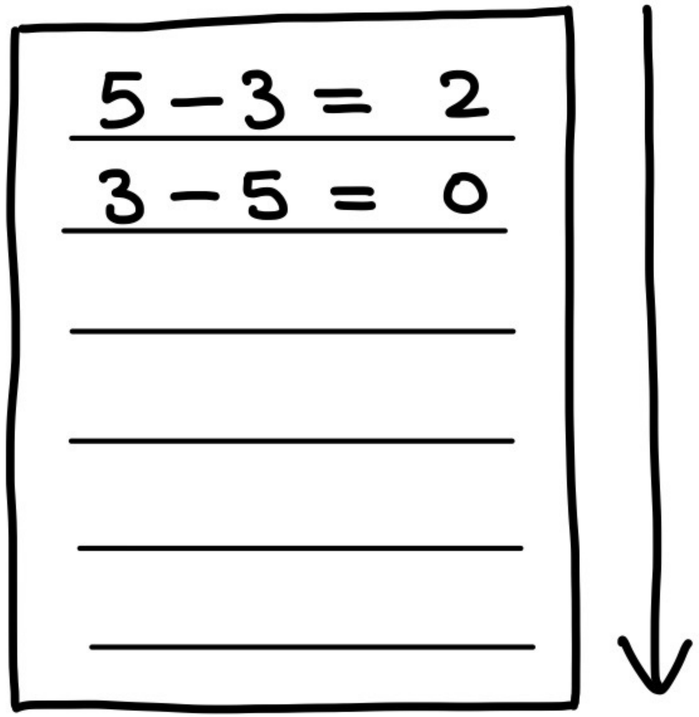


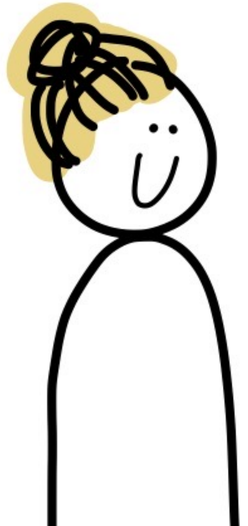
Rules gradually change



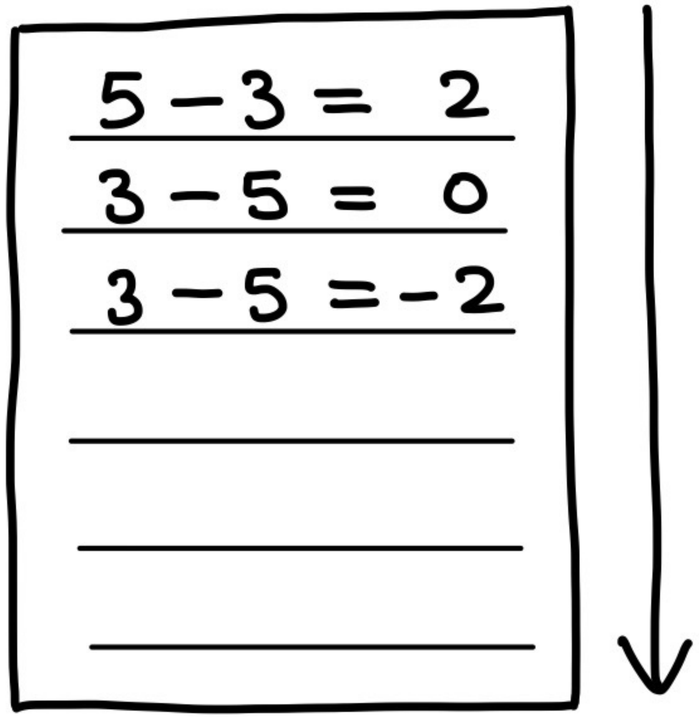


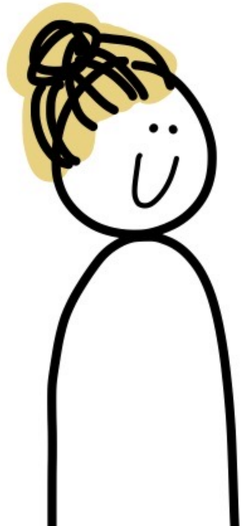
Rules gradually change in math too!



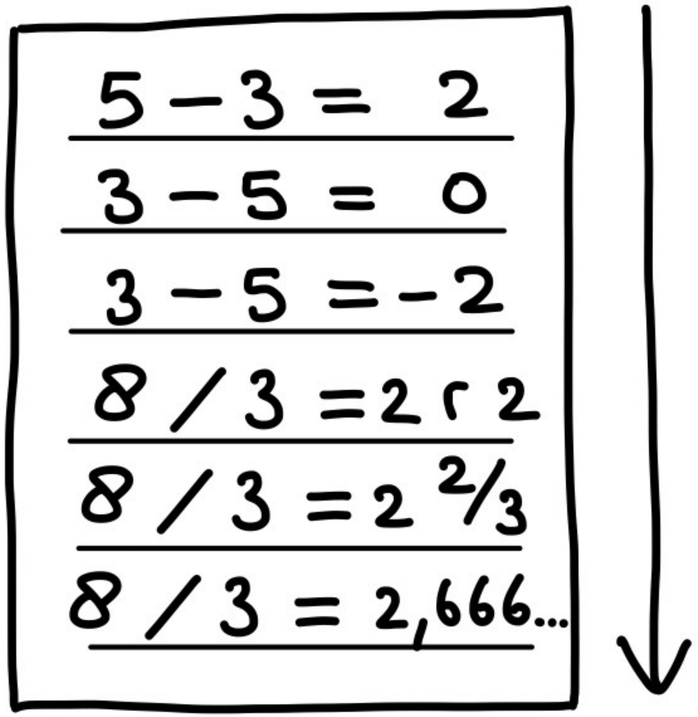


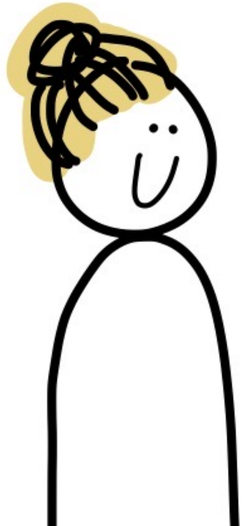
Rules gradually change in math too!





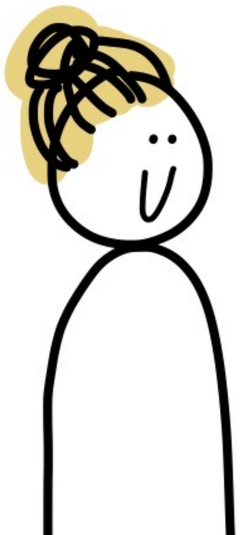
Rules gradually change in math too!





Can we teach code gradually?

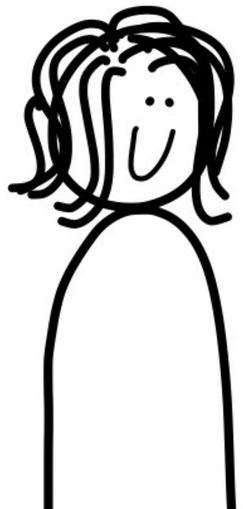
Let's look at a demo!



Hedy is gradual ✓

multi lingual

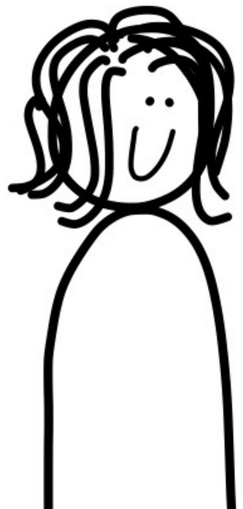
built for teaching



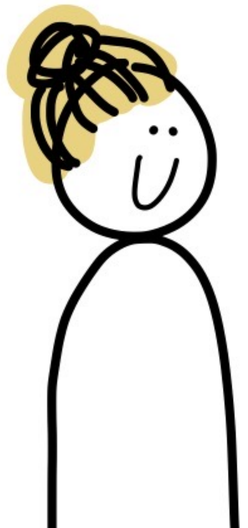
Hedy is gradual

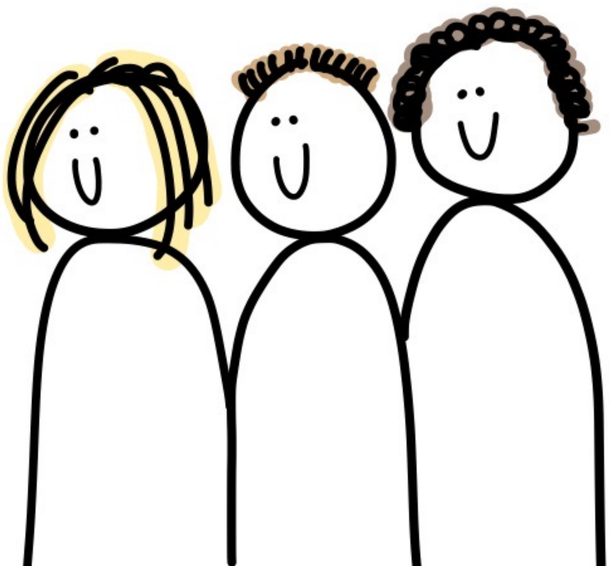
multi lingual

built for teaching



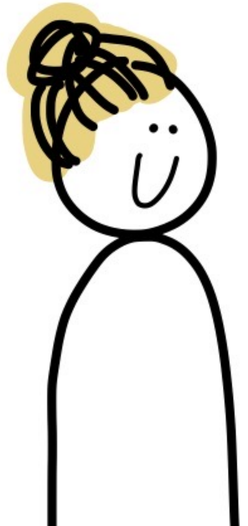
Do kids like Hedy?

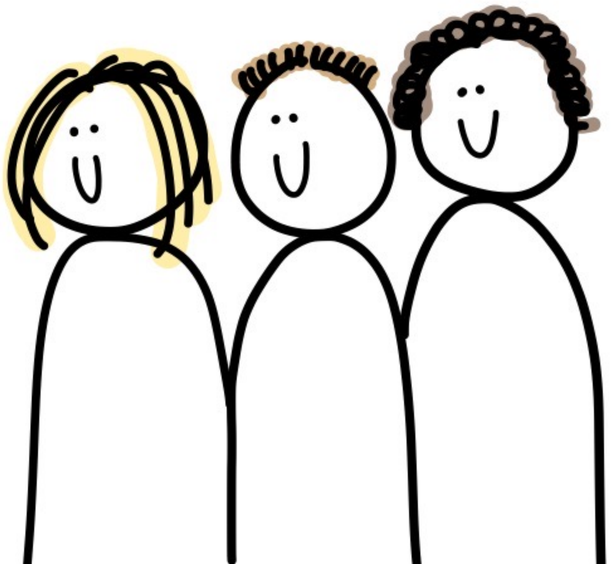




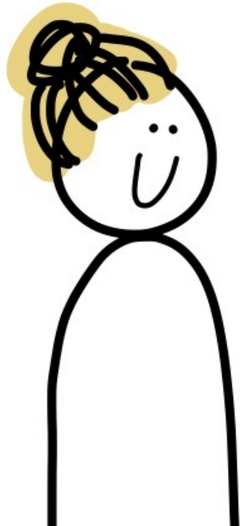
We ran a user study!

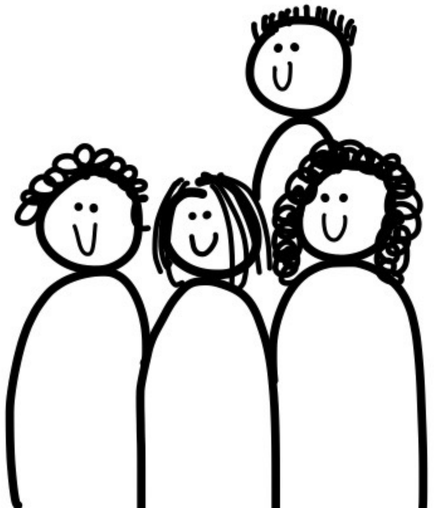
Do kids like Hedy?





3g kids





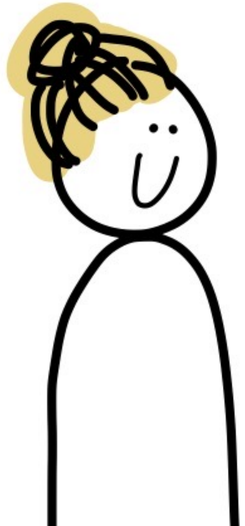
39 kids

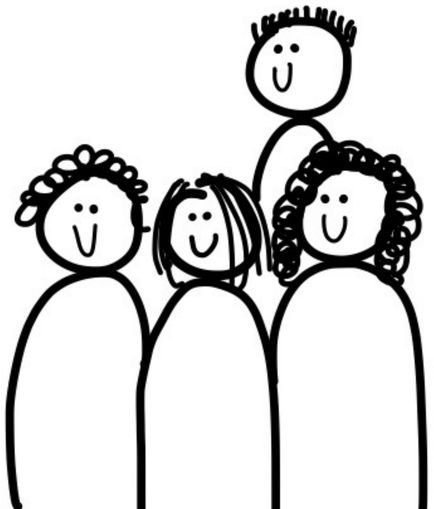
12 online lessons

Benefits, challenges & improvements

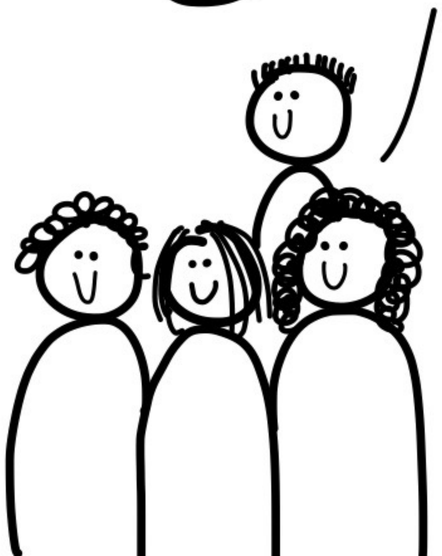
39 kids

12 online lessons



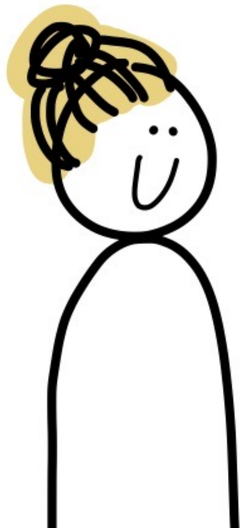


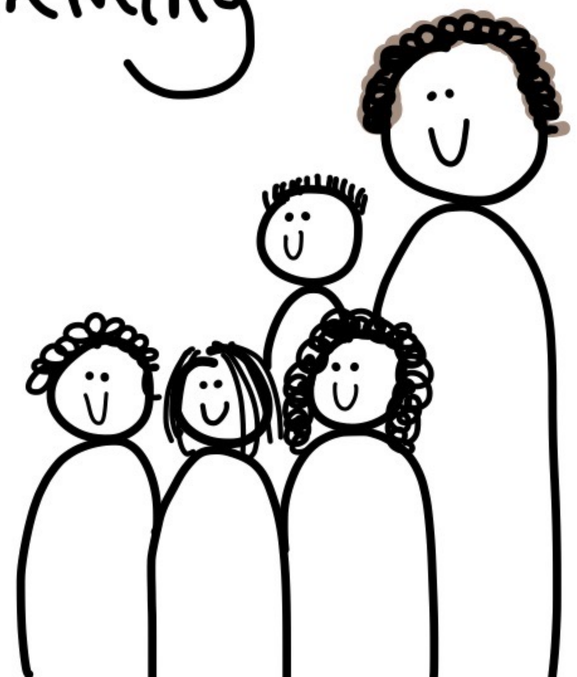
Benefits, challenges & improvements



Benefits, challenges & improvements

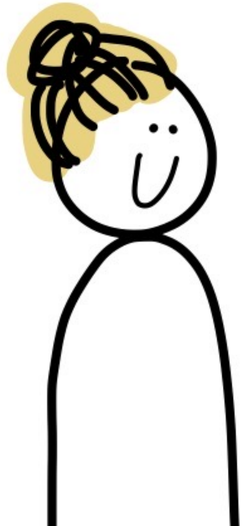
With Hedy all kids learn some programming

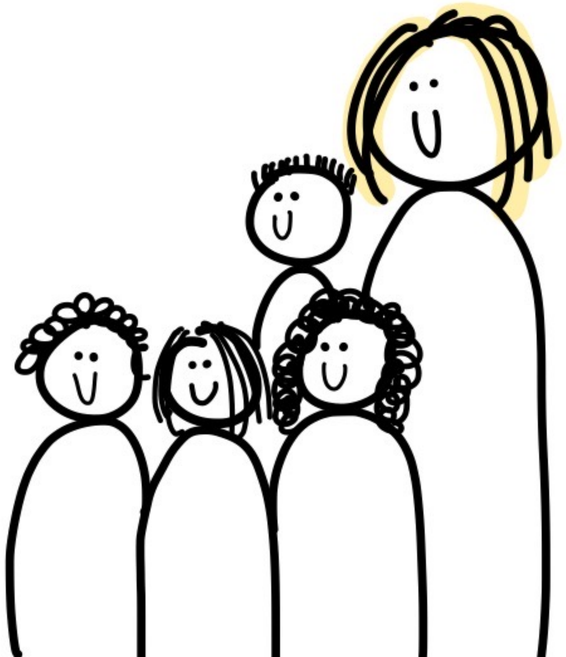




Benefits, challenges & improvements

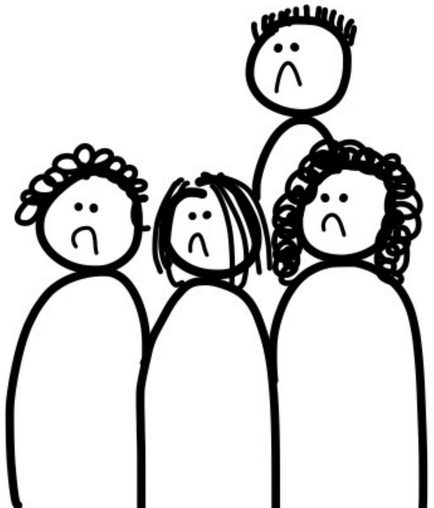
Hedy gives girls the confidence to learn programming





Benefits, challenges & improvements

Better error messages

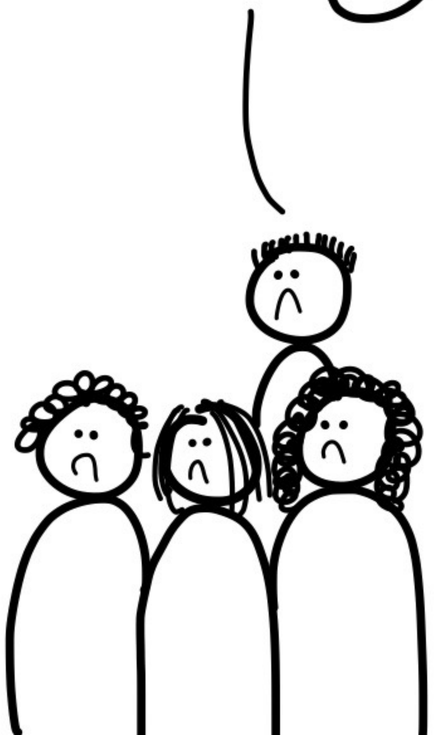


Benefits, challenges & improvements

Better error messages

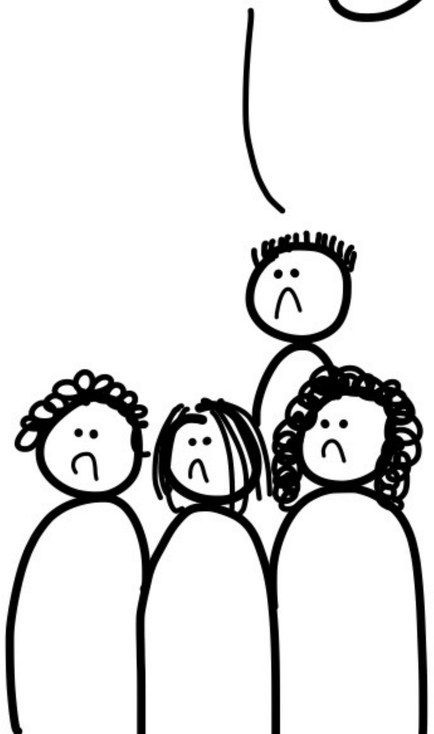
```
1 print Hello, world
```

The code you entered is not valid Hedy code. There is a mistake on line 1, at position 12. You typed ',' but that is not allowed.



Benefits, challenges & improvements

Better error messages

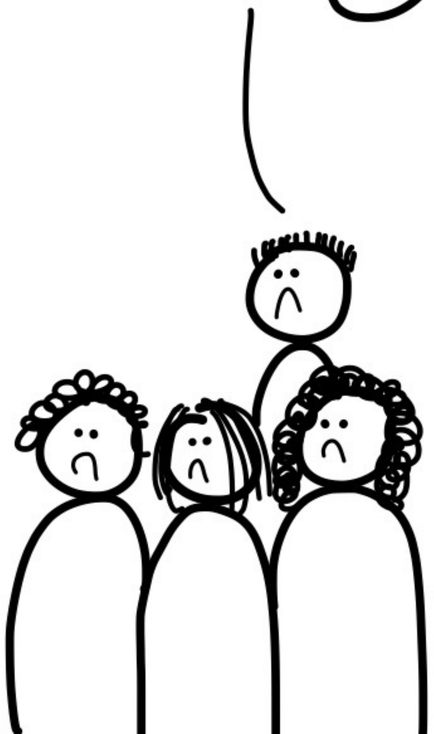


Benefits, challenges & improvements

Better error messages

```
1 name is Hedy
2 print welcome, name
3
```

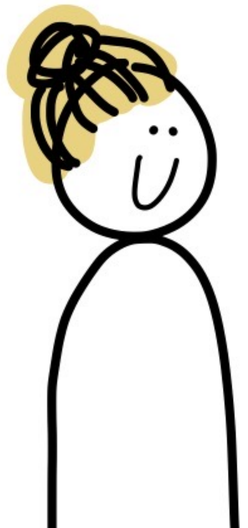
The code you entered is not valid Hedy code. There is a mistake on line 2, at position 14. You typed a comma, but that is not allowed.

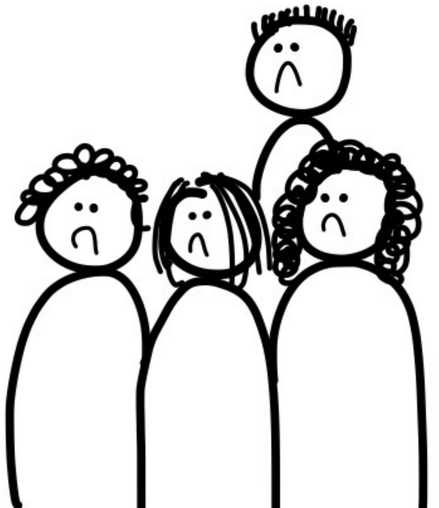


Benefits, challenges & improvements

Dutch keywords

Better error messages

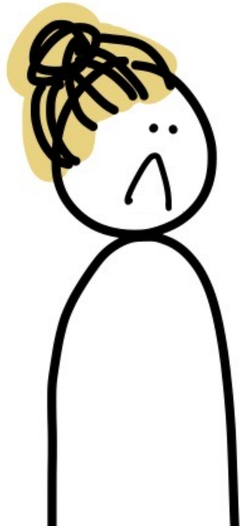




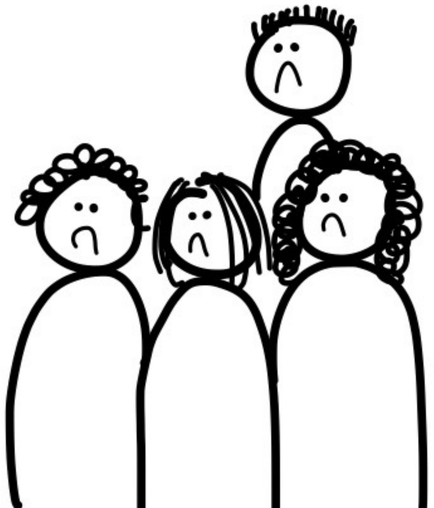
Benefits, challenges & improvements

Really?

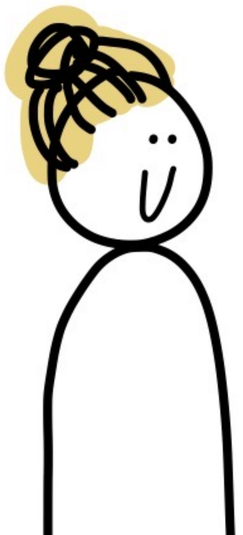
Dutch keywords



Better error messages



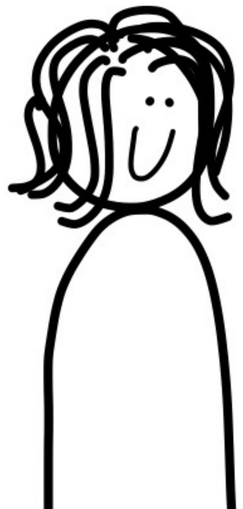
Let's look at a demo!



Hedy is gradual

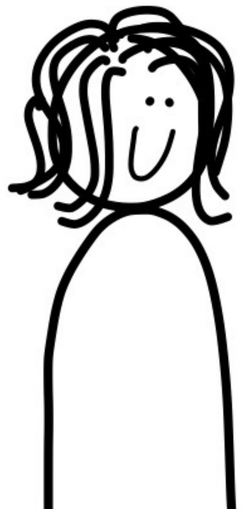
multi lingual ✓

built for teaching

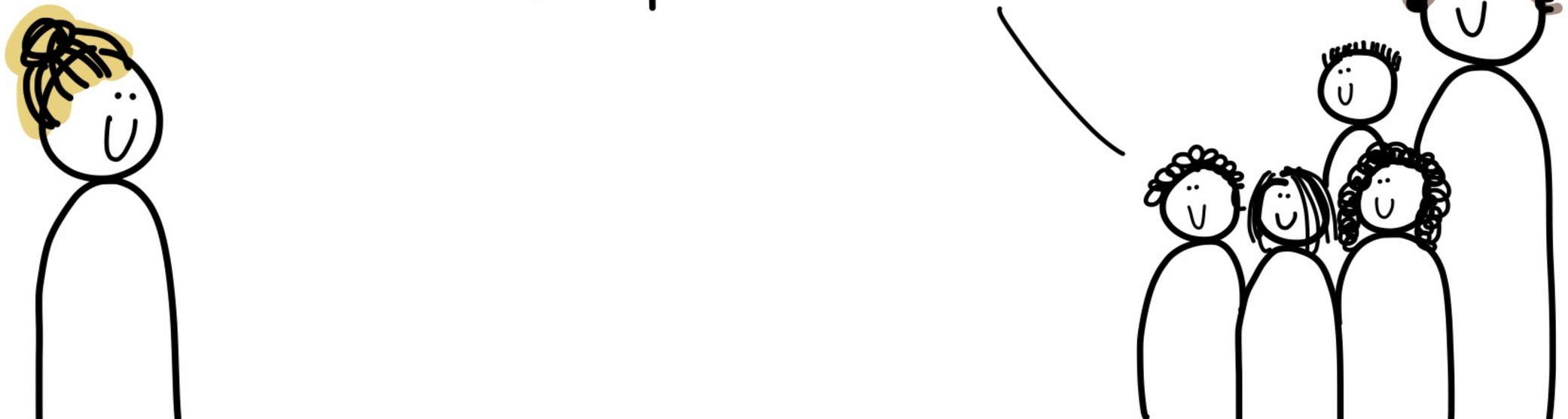


Hedy is gradual multi lingual

built for teaching

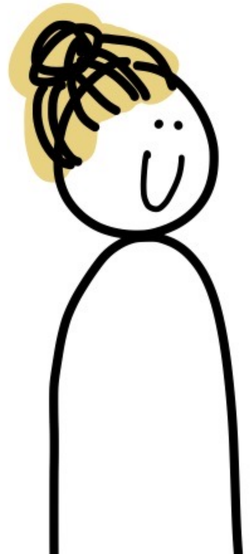


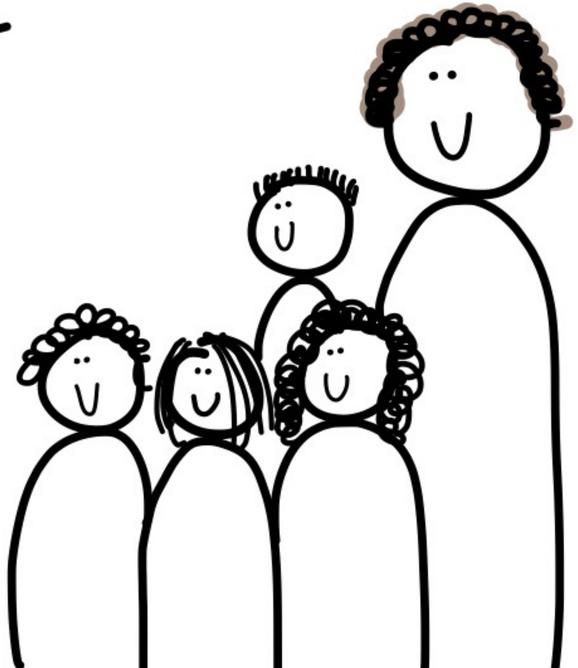
The levels are a step by step guide



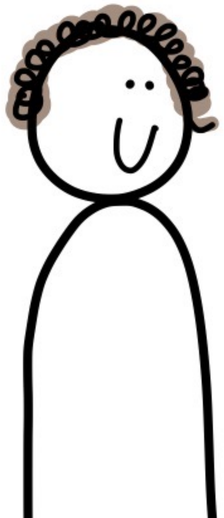
Less overwhelming for me too!

The levels are a step by step guide

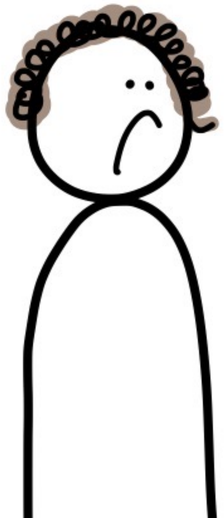





Code
Costumes
Sounds
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Motion
move 10 steps
turn 15 degrees
turn 15 degrees
go to random position
go to x: -25 y: -15
glide 1 secs to random position
glide 1 secs to x: -25 y: -15
point in direction 90
point towards mouse-pointer
change x by 10
when clicked
forever
move 10 steps
turn 15 degrees
play sound Meow until done
Sprite
Sprite1
x
-25
y
-15
Size
100
Direction
45
Stage
Backdrops
1
Sprite1

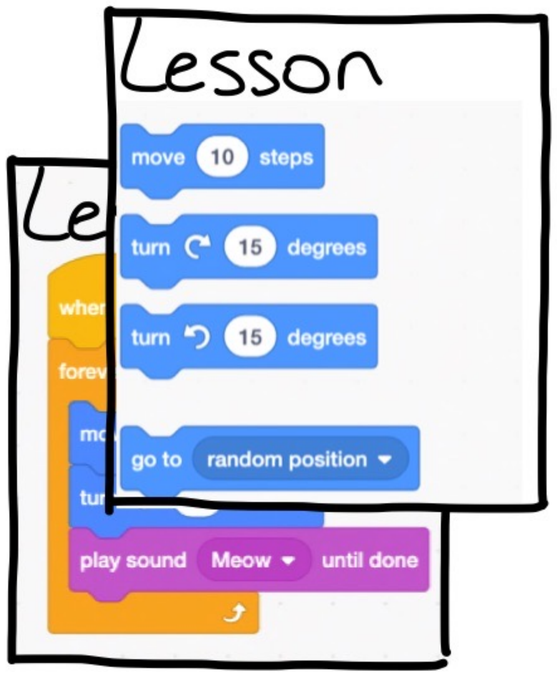


What can my students build?

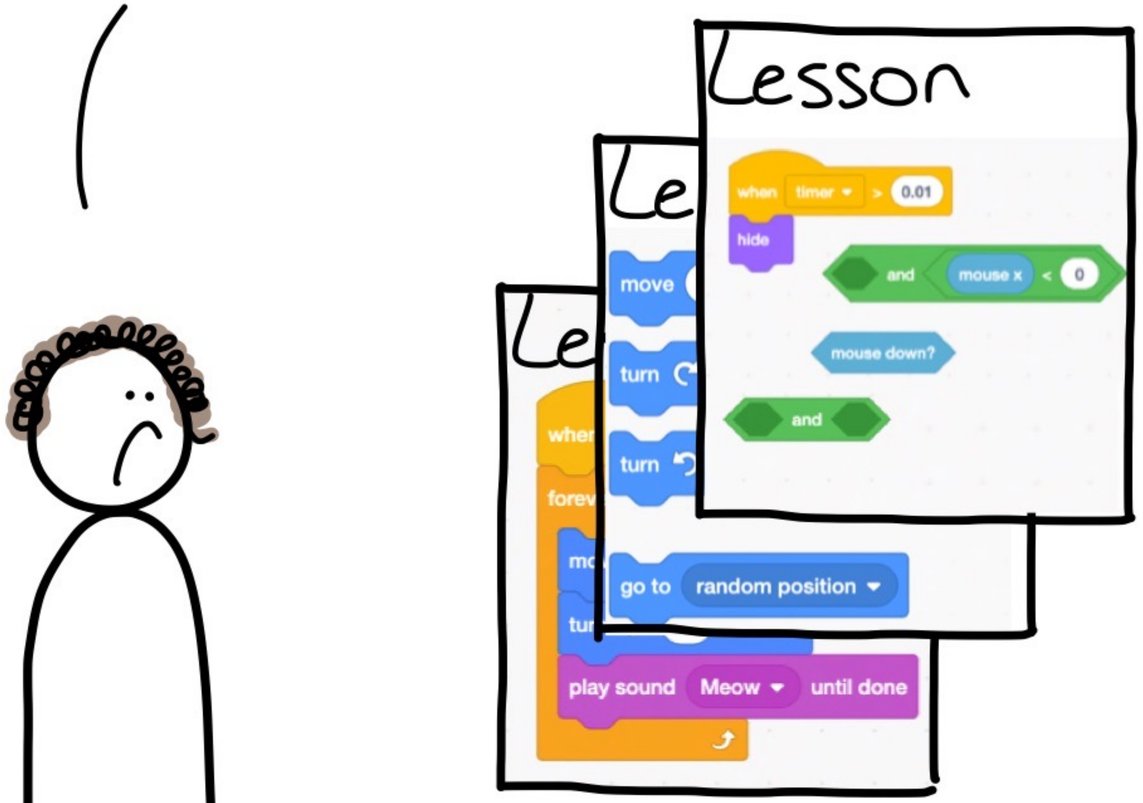


What can my students build?

What can my students build?

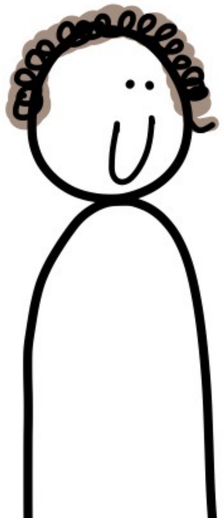


What can my students build?

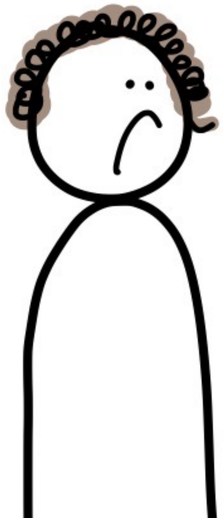


What can my students build?

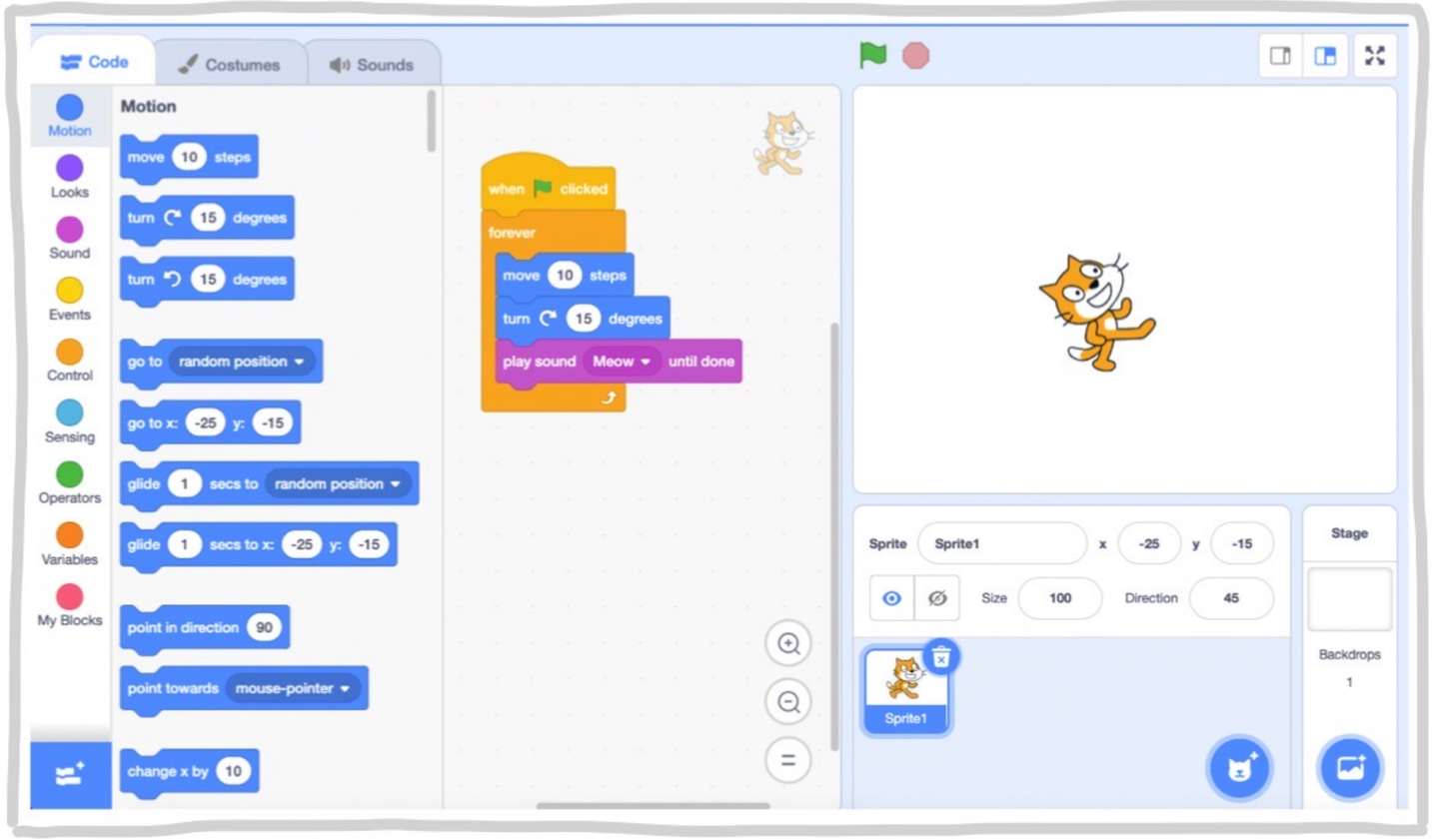
What can my students build?

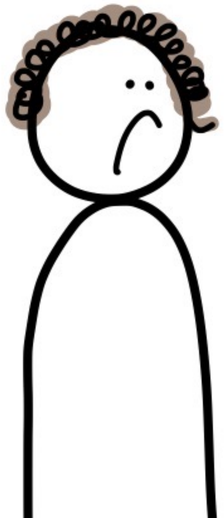


What can my students build?

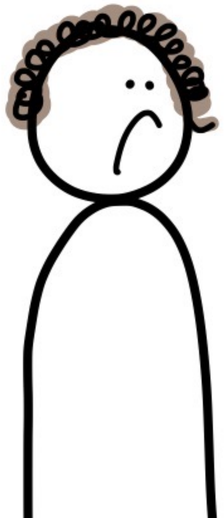


What can my students build?

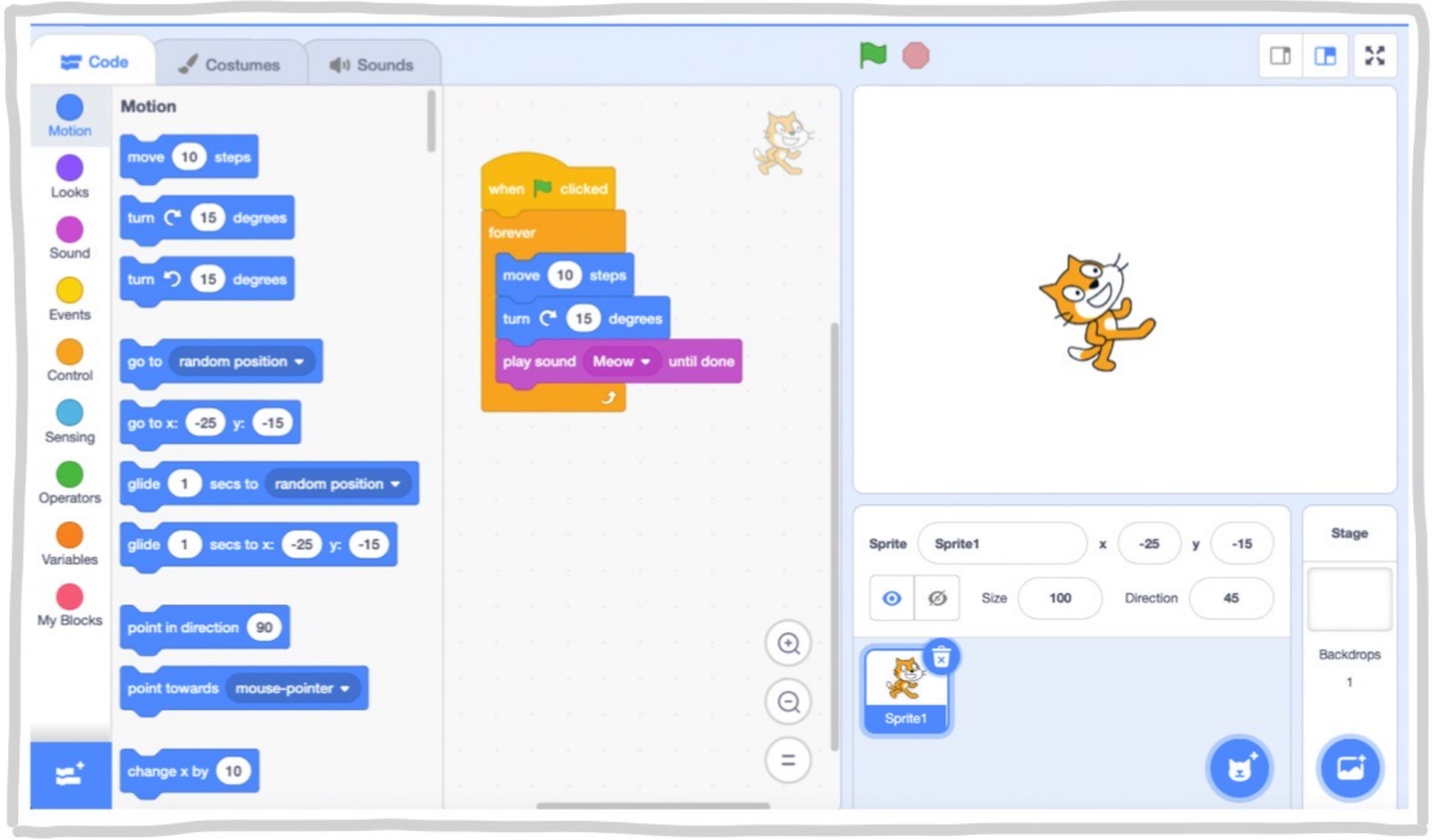


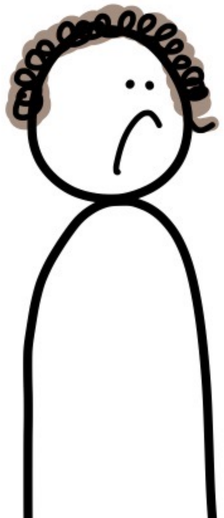


What can my students build?

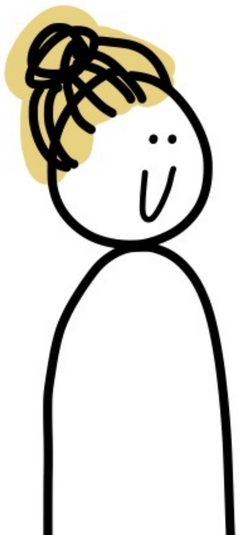


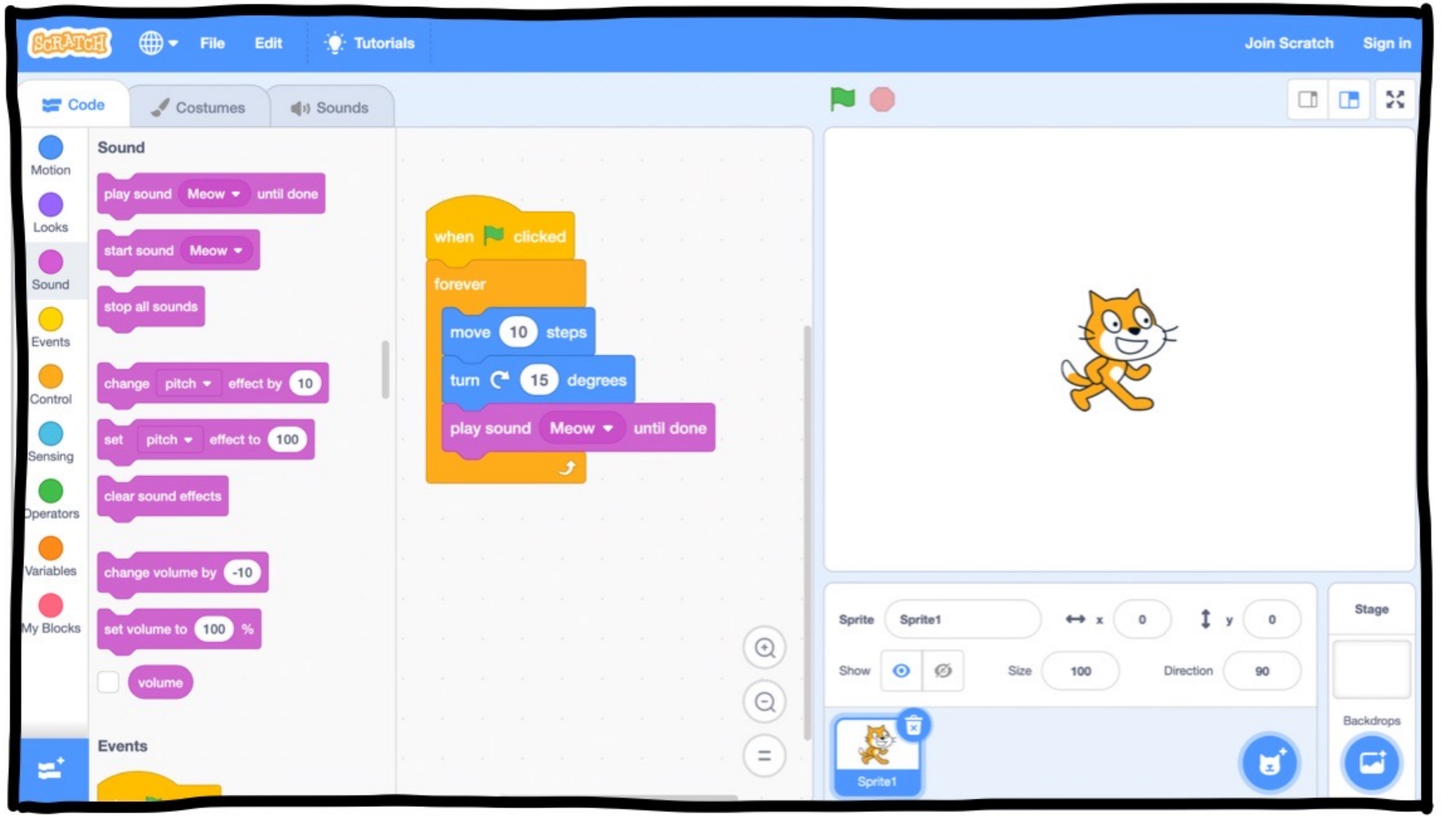
What can my students build?

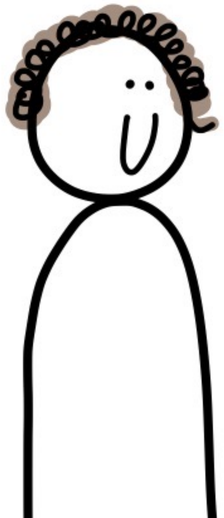




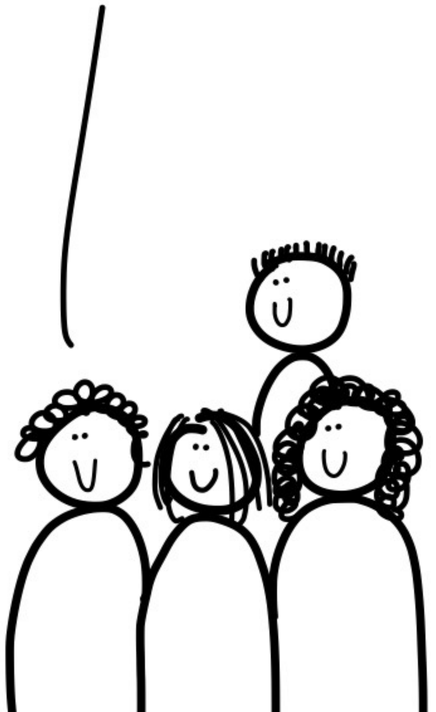
Aduentures

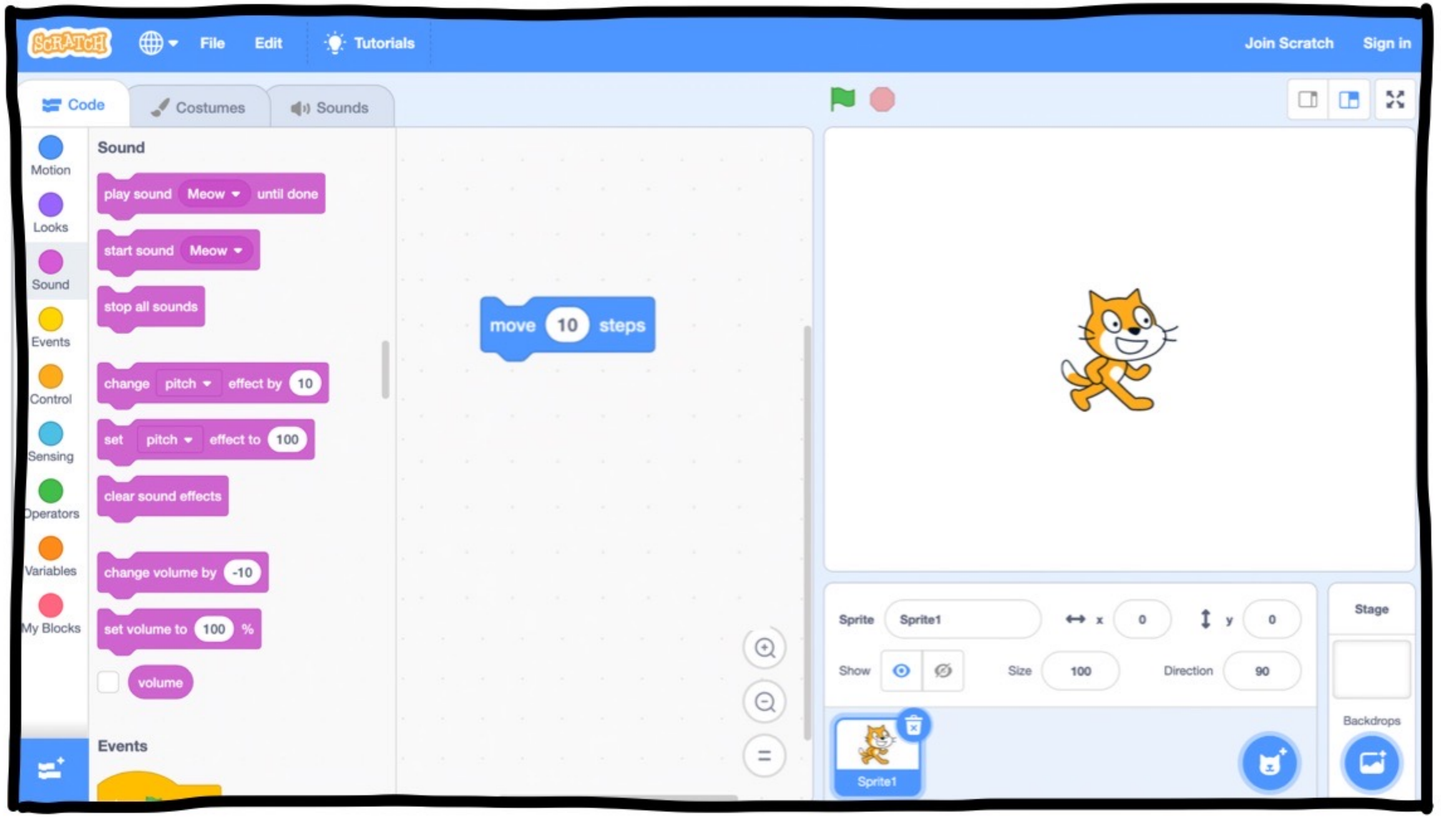



File
Edit
Tutorials
Join Scratch
Sign in
Code
Costumes
Sounds
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
Sound
play sound Meow until done
start sound Meow
stop all sounds
change pitch effect by 10
set pitch effect to 100
clear sound effects
change volume by -10
set volume to 100 %
volume
Events
when clicked
forever
move 10 steps
turn 15 degrees
play sound Meow until done
Sprite
Sprite1
x 0
y 0
Show
Size 100
Direction 90
Stage
Backdrops
Sprite1

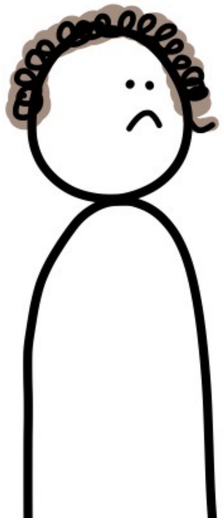


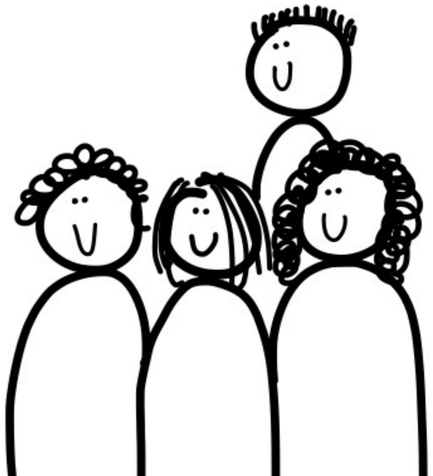
I did it!

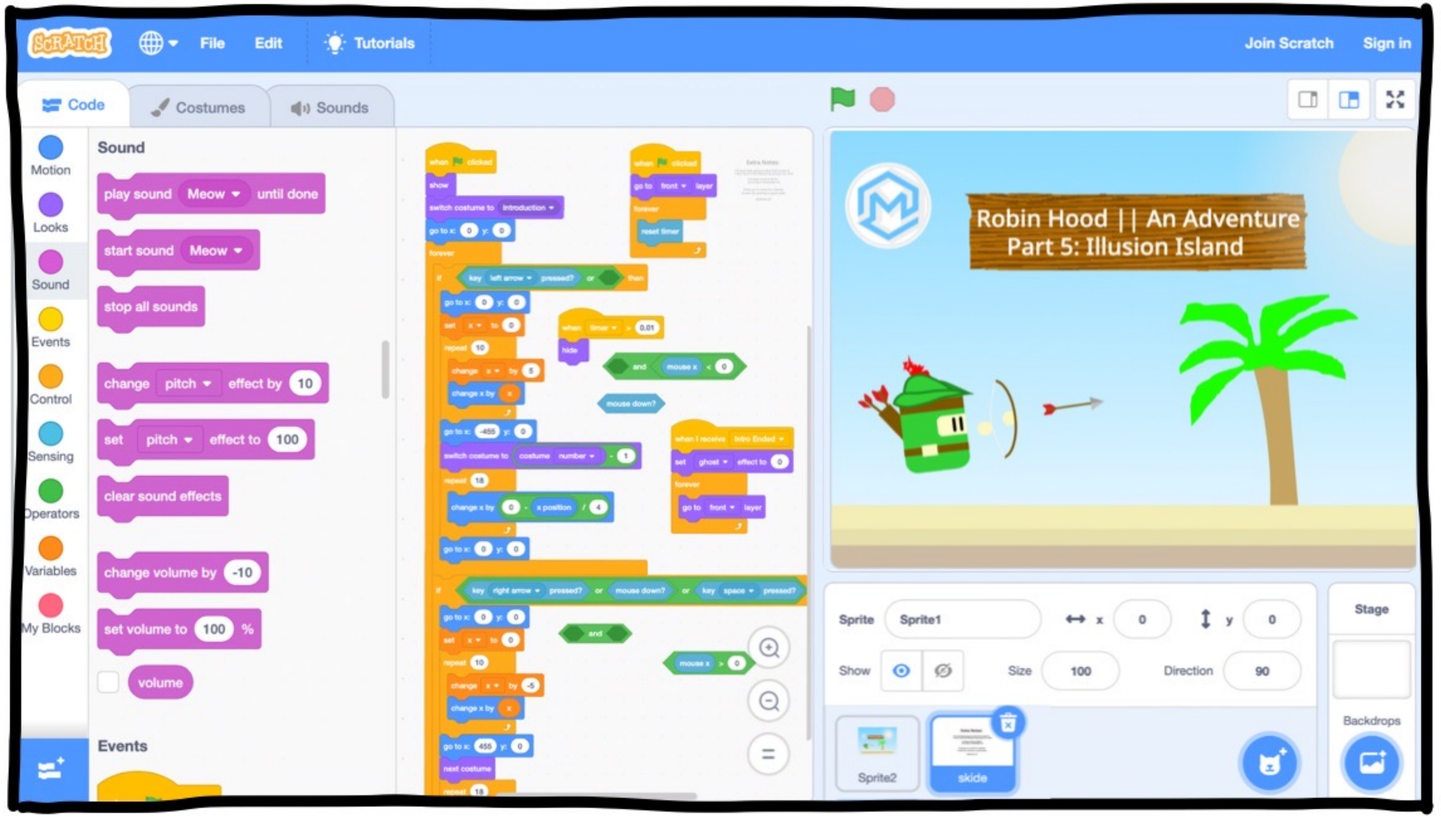


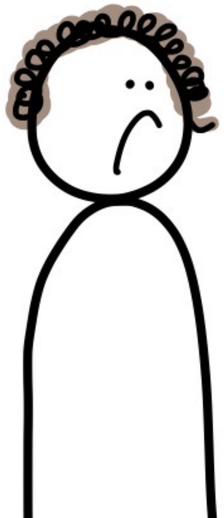


What do I do now?

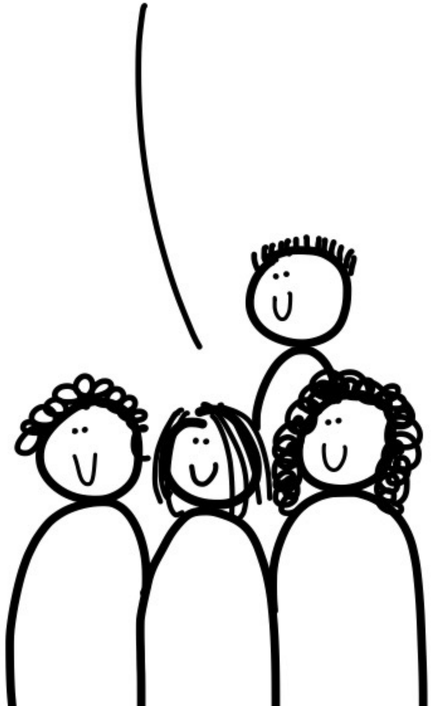





File
Edit
Tutorials
Join Scratch
Sign in
Code
Costumes
Sounds
Motion
Looks
Sound
Events
Control
Sensing
Operators
Variables
My Blocks
play sound Meow until done
start sound Meow
stop all sounds
change pitch effect by 10
set pitch effect to 100
clear sound effects
change volume by -10
set volume to 100 %
volume
Events
Robin Hood || An Adventure
Part 5: Illusion Island
Sprite
Sprite1
x
0
y
0
Show
Size
100
Direction
90
Stage
Backdrops
Sprite2
skide



I built this!



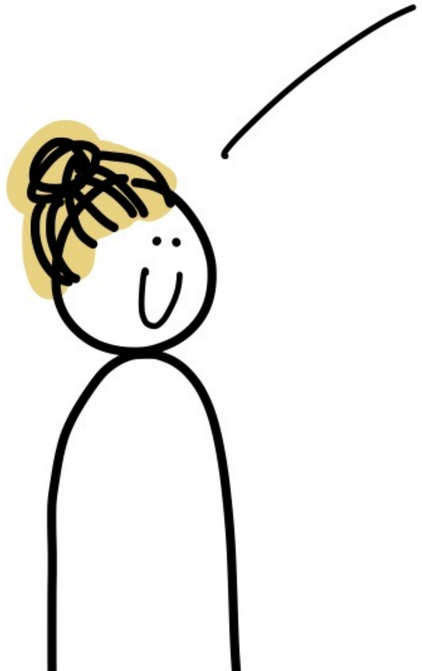

Customization

Hedy

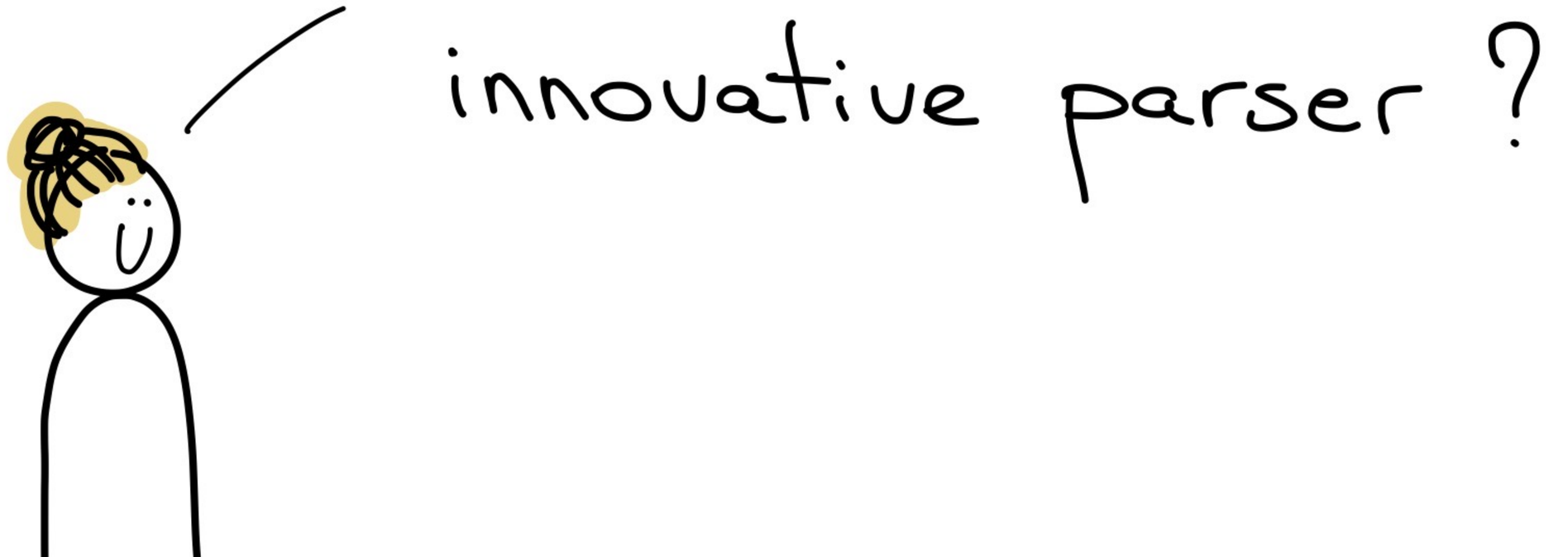
Named after

Hedy Lamarr

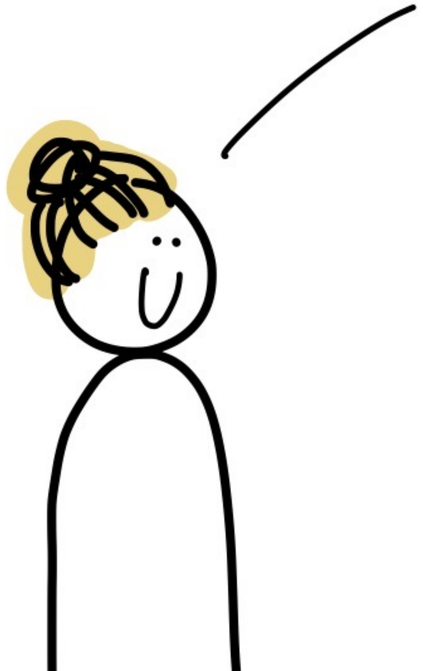
We love your help!



Hedy is gradual



Hedy is gradual



ELSEVIER

Journal of Computer Languages

Available online 20 September 2022, 101158

In Press, Journal Pre-proof

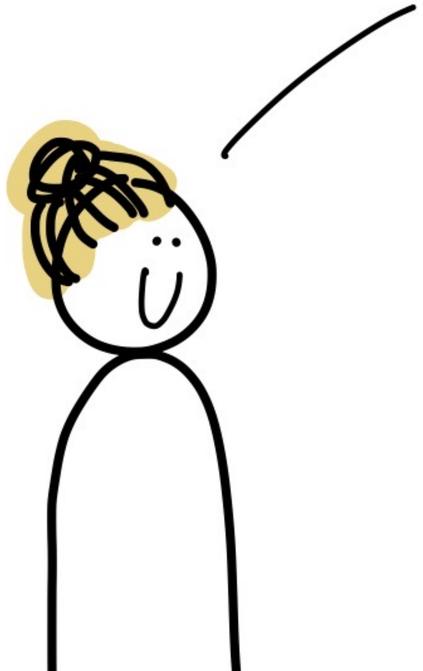
Design, implementation and evaluation of the Hedy programming language

Marleen Gilsing [a], Jesús Pelay [b], Felienne Hermans [a, c]

Show more

https://doi.org/10.1016/j.cola.2022.101158

Hedy is gradual



ELSEVIER

Journal of Computer Languages

Available online 20 September 2022, 101158

In Press, Journal Pre-proof

Design, implementation and evaluation of the Hedy pro

Marleen Gilsing [a], Jes

Show more

+ Add to Mendel

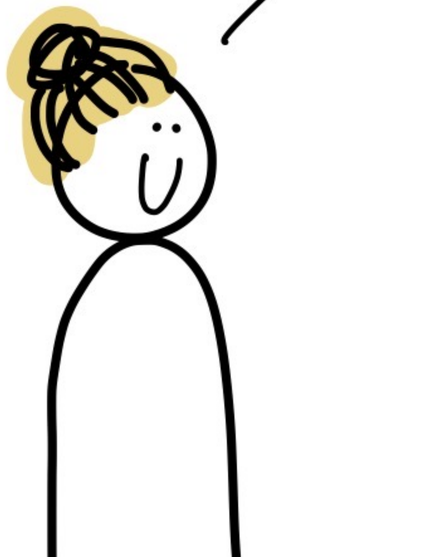
https://doi.org/10.10

Highlights

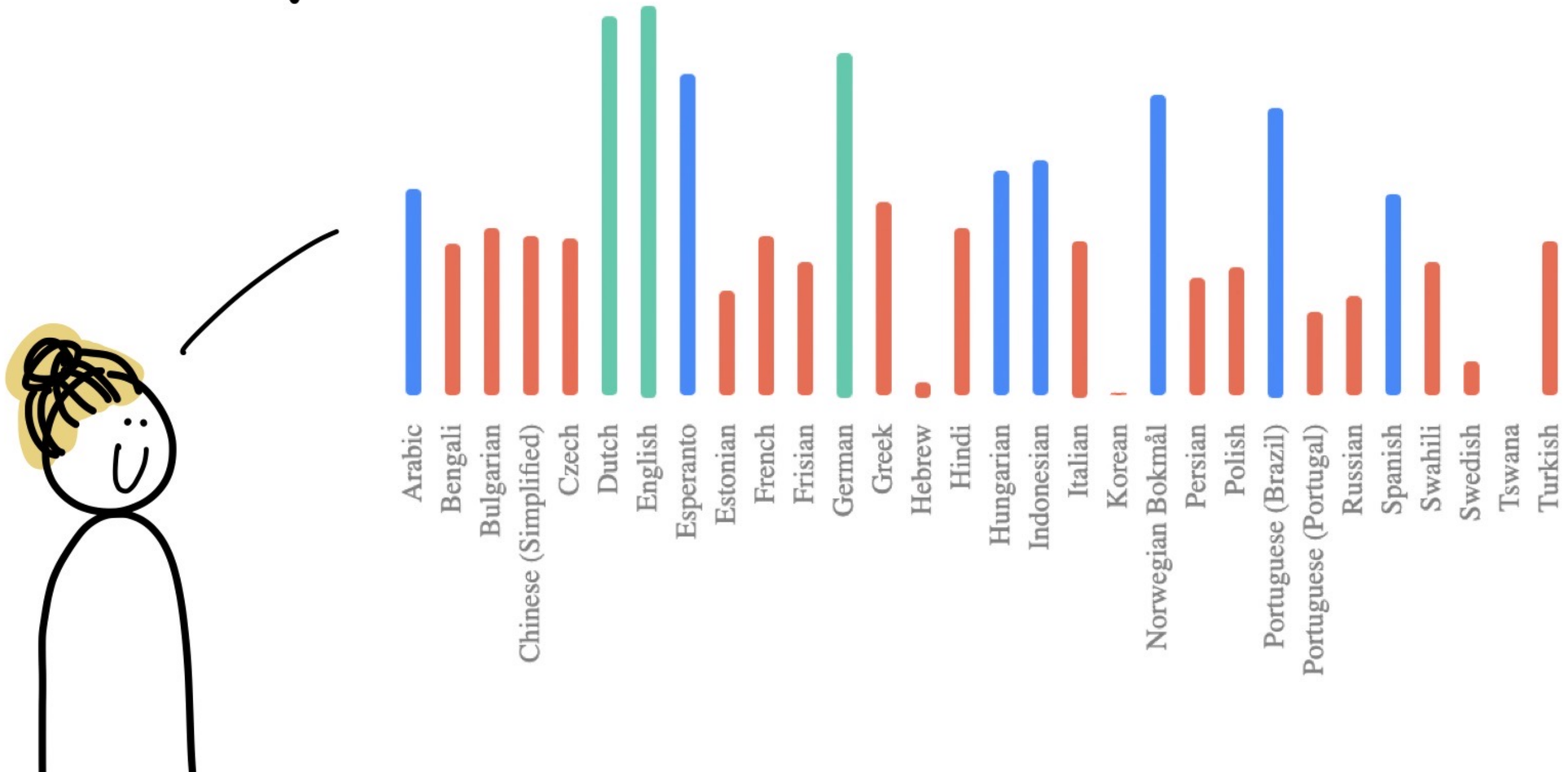
- Details the full implementation of Hedy; the first gradual language for programming education.
- Introduces an EBNF extension used for merging partial grammars to enable gradual language implementation.
- Describes the first user study on Hedy.

Hedy is multi lingual

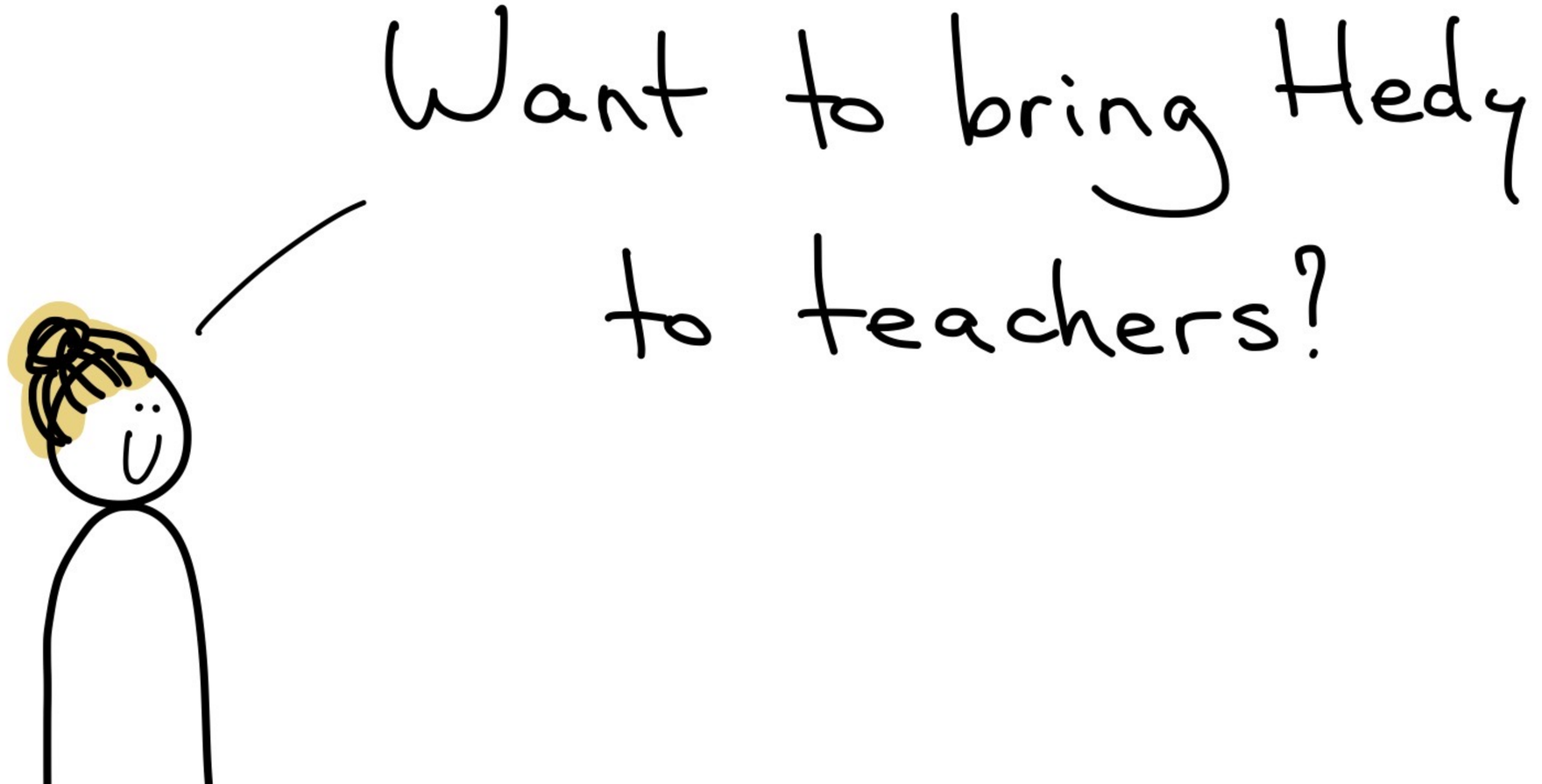
Want to add or extend translations?



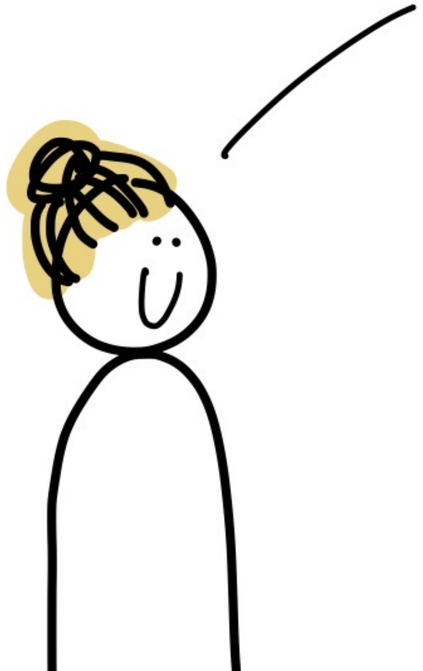
Hedy is multi lingual

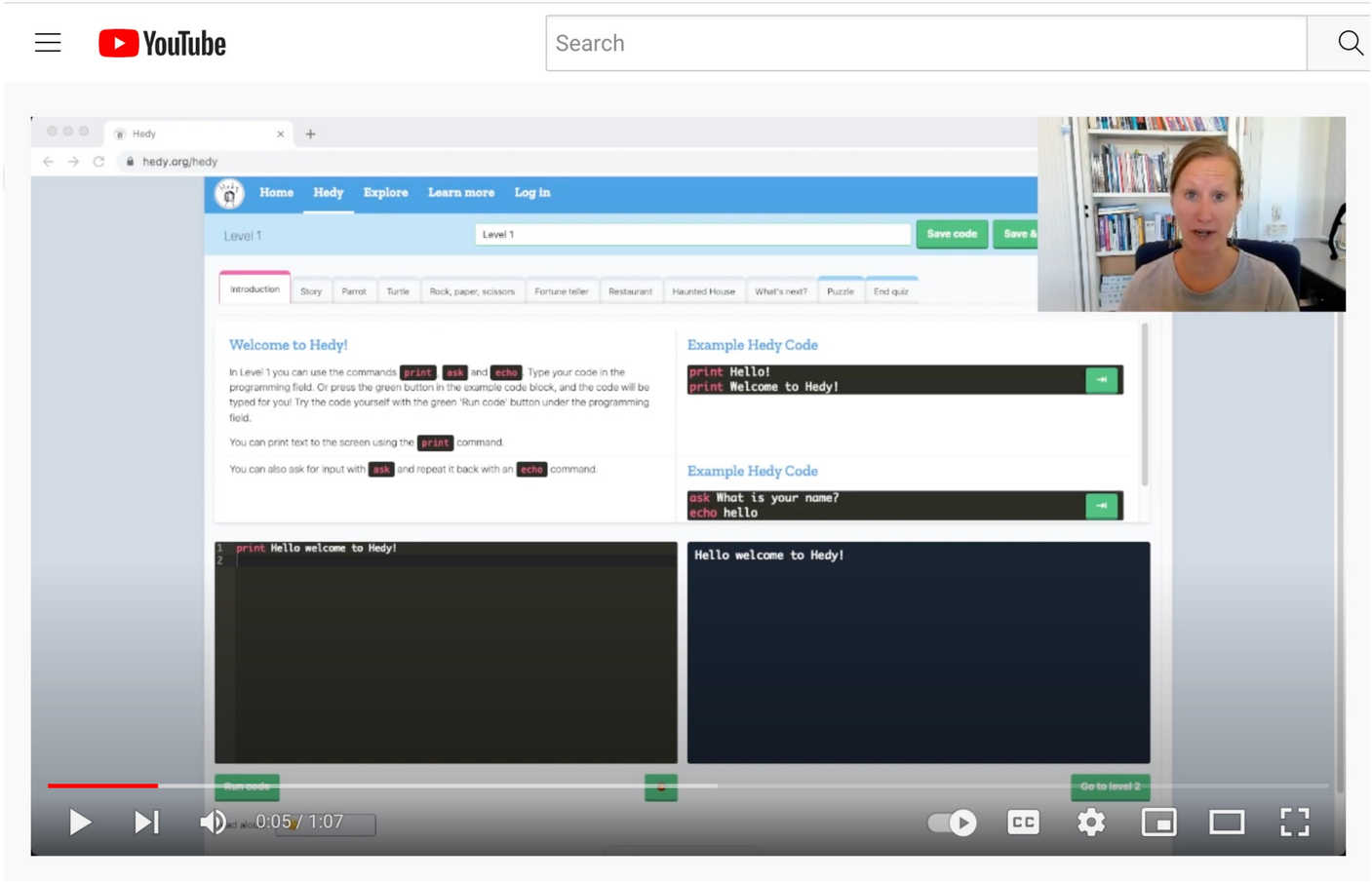


Hedy is built for teaching



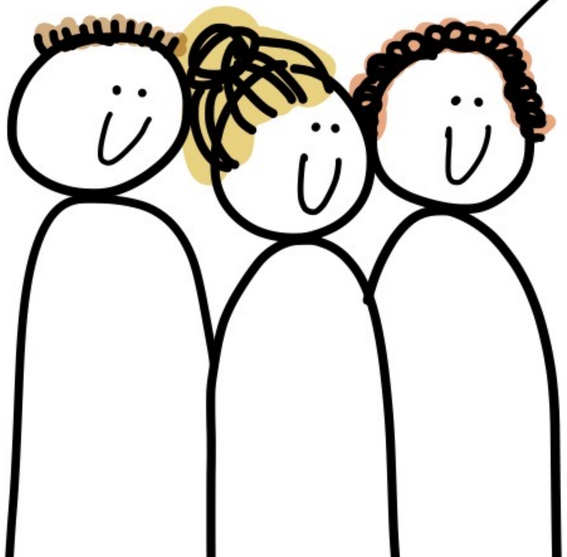
Hedy is built for teaching





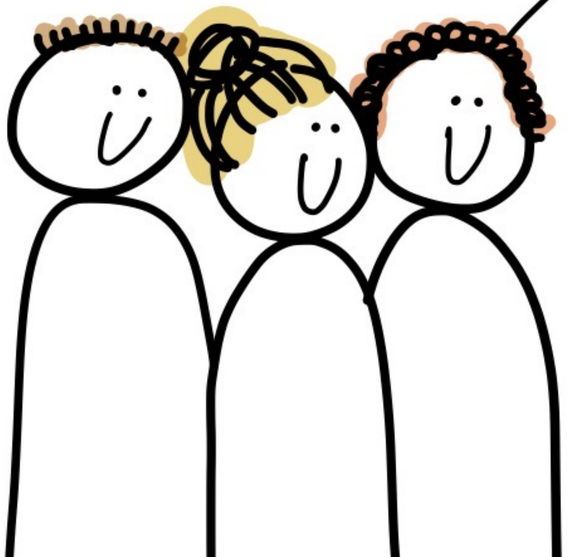
Hedy Community

Join us!

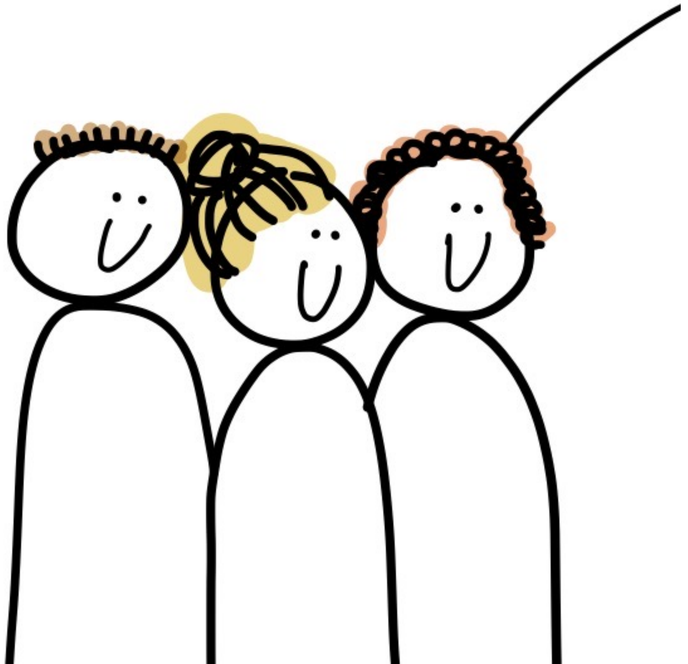


Hedy Community

Join us!



www.hedy.org/join



Guido van Rossum
@gvanrossum

Just discovered Hedy, a gradual programming language. It's a new idea on how to teach programming to beginners. Very cool! hedycode.com @hedycode

1:53 AM · Mar 30, 2022 · Twitter Web App

139 Retweets **14** Quote Tweets **691** Likes