Hedy: a gradual programming language

Jesús Pelay

What is Hedy?

1. Gradual
2. Multilingual
3. Built for teaching

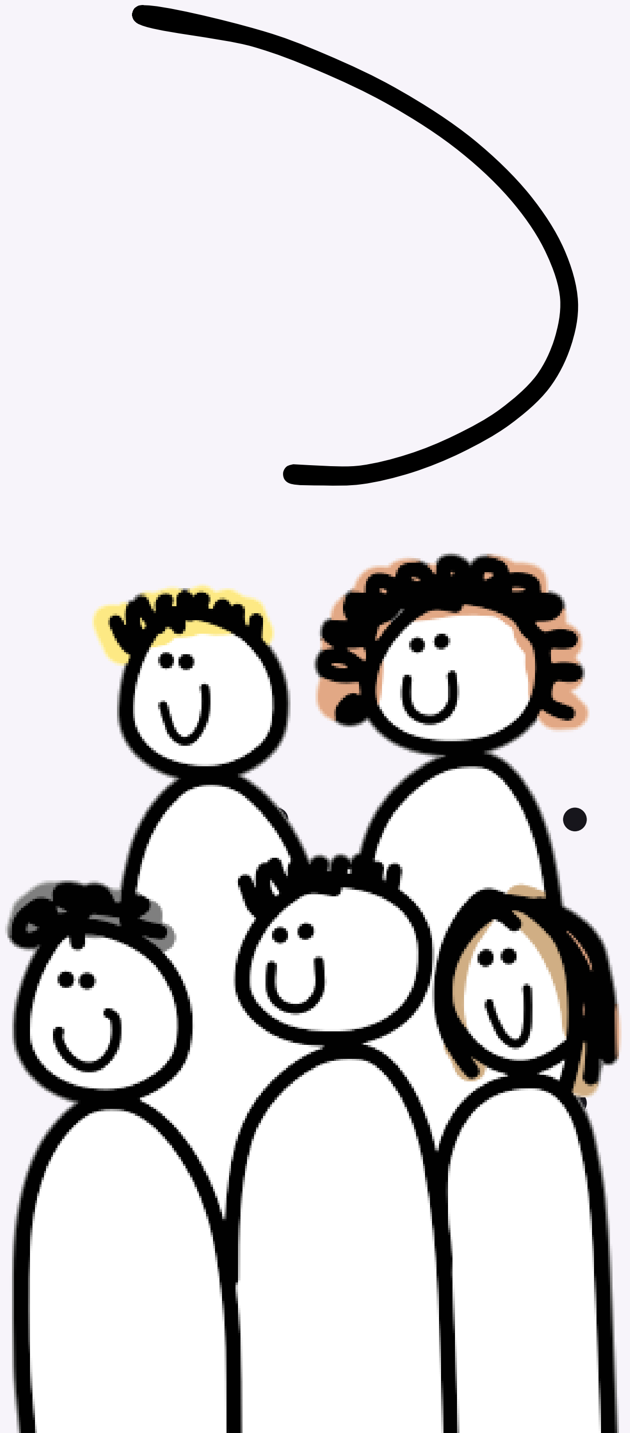
Misconceptions

1. Compilers are friends!

2. Syntax is not really an issue

3. You mostly learn alone!

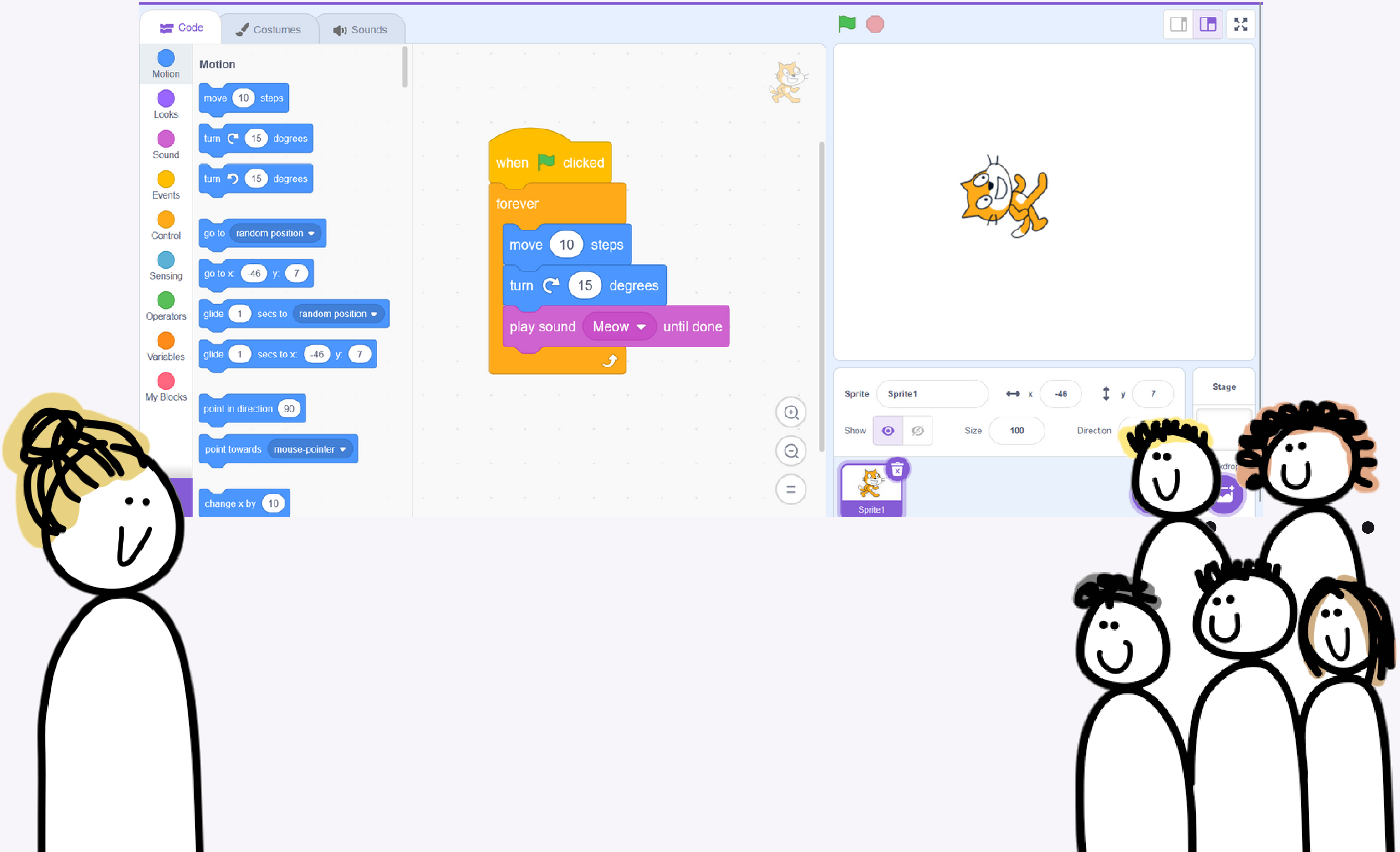
Can you teach us programming?



Of course!

Felienne Hermans

Scratch

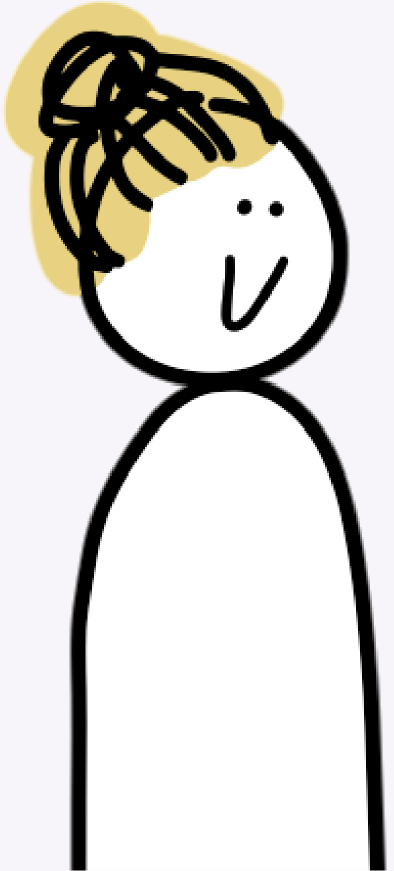


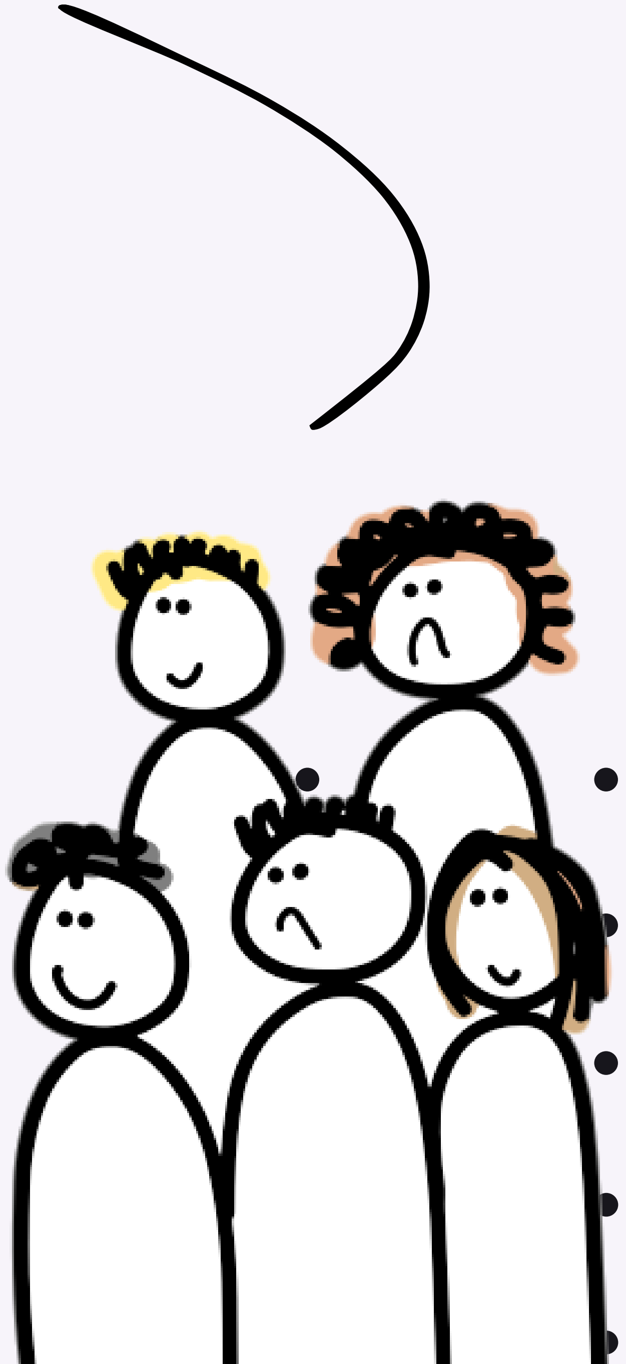
```
when 🏴 clicked
forever
    move 10 steps
    turn ↻ 15 degrees
    play sound Meow ▾ until done
```

Scratch

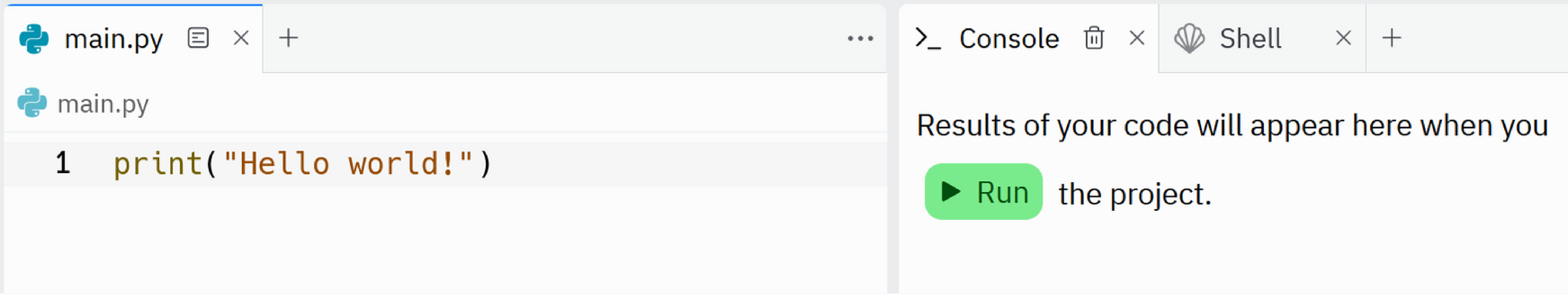
But teacher we don’t want a toy anymore!

We want textual languages!



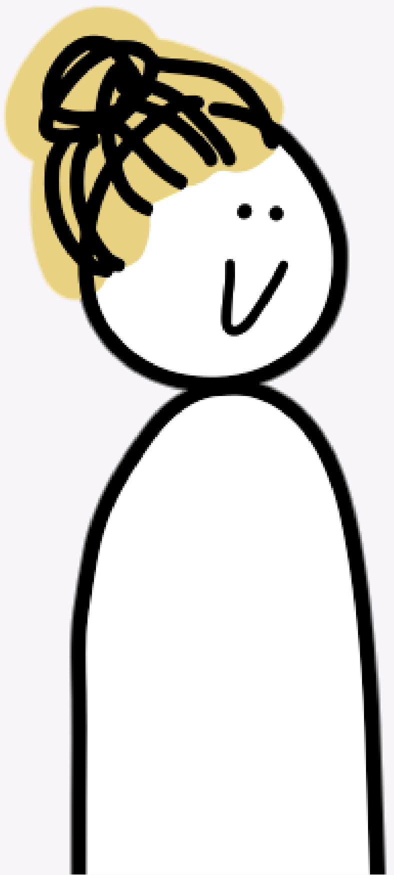


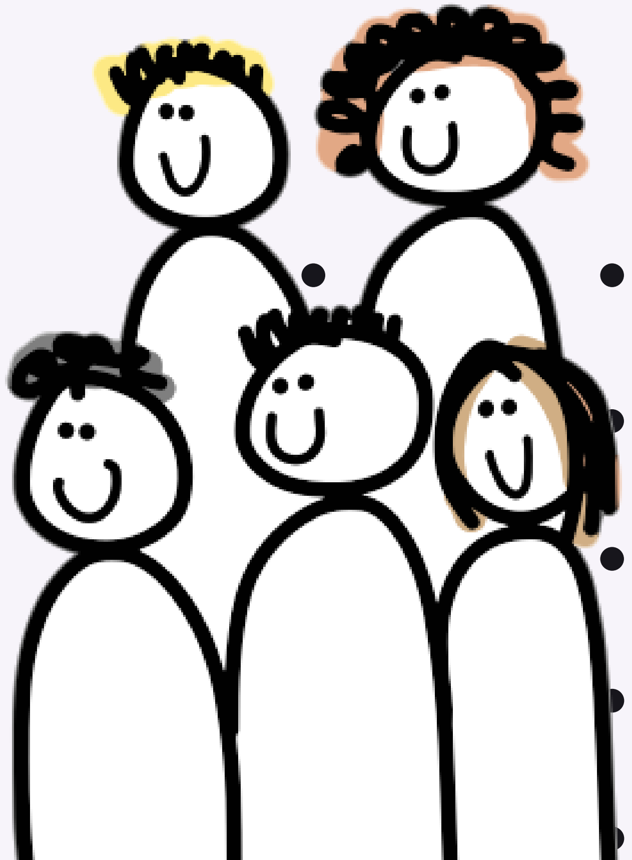
Python



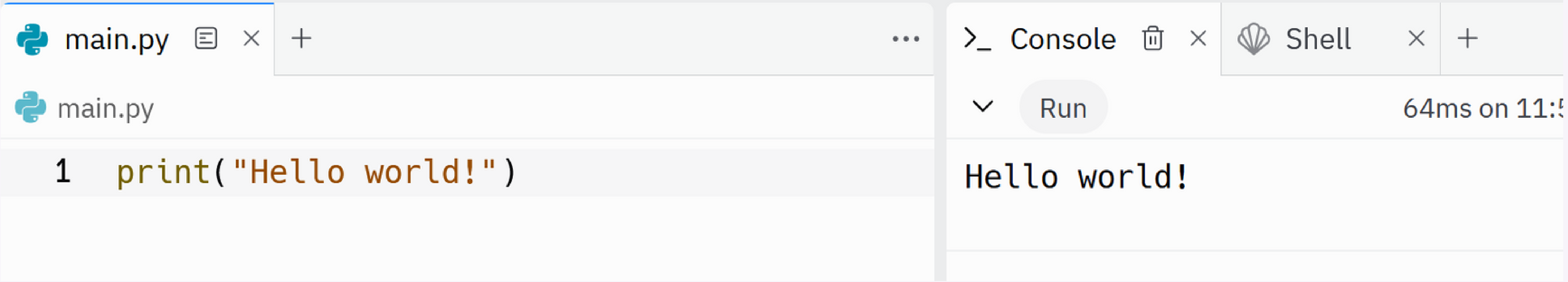
```
print("Hello world!")
```

Results of your code will appear here when you ▶ Run the project.



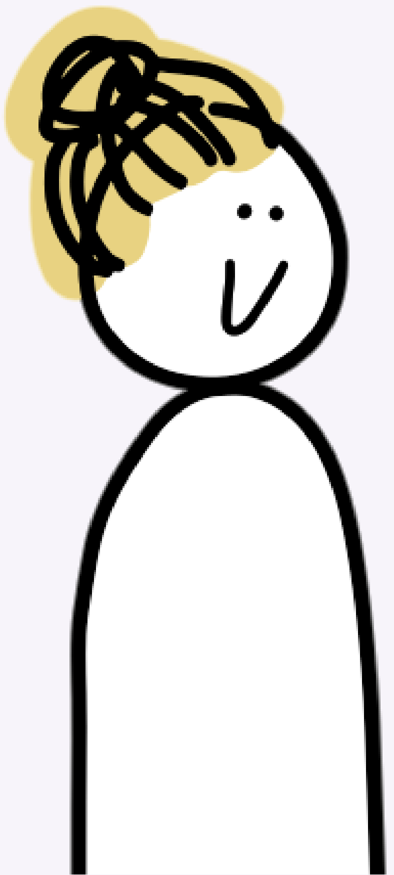


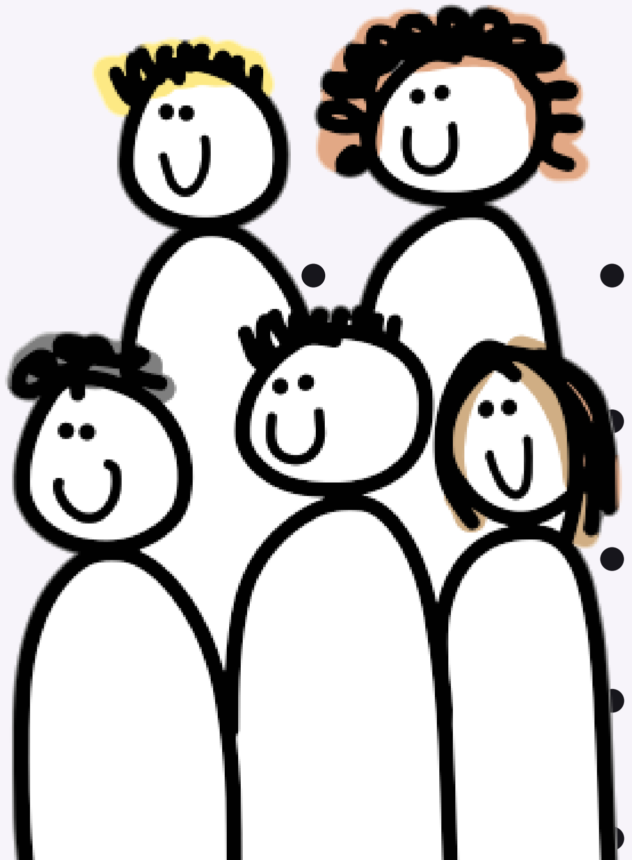
Python



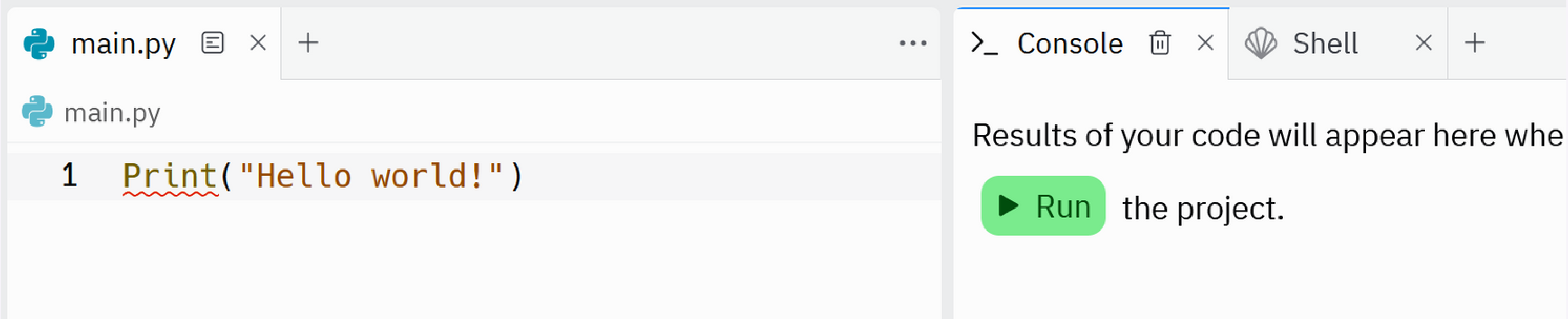
```python
print("Hello world!")
```

```
Hello world!
```





Python



```python
Print("Hello world!")
```

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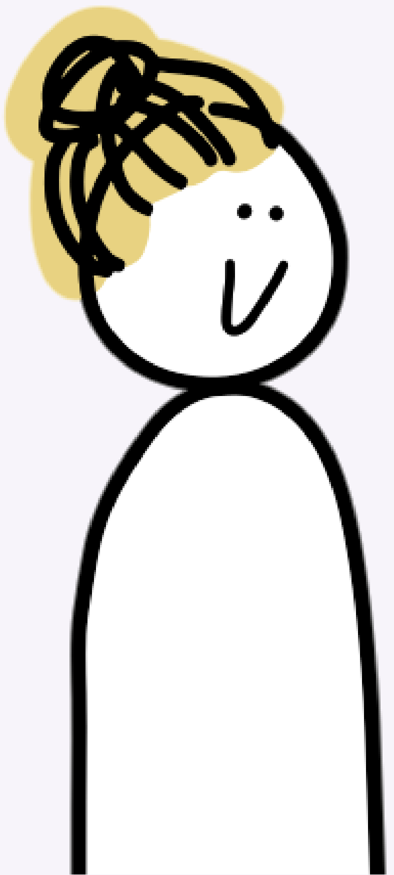
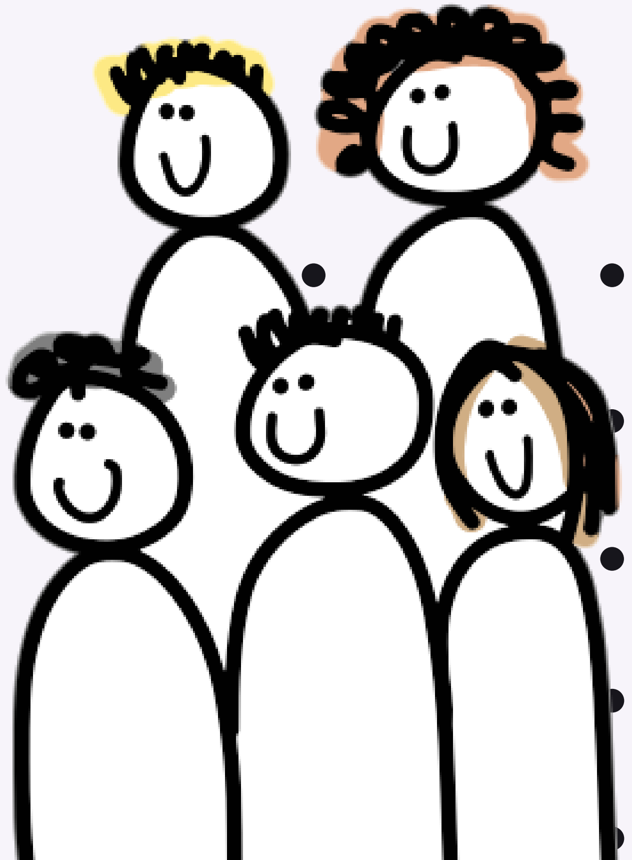
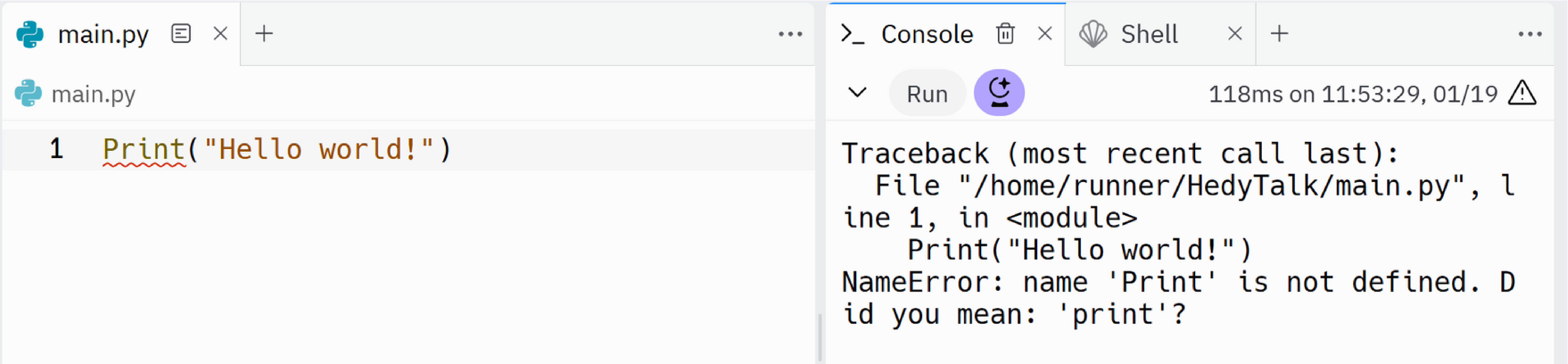
▶ Run the project.



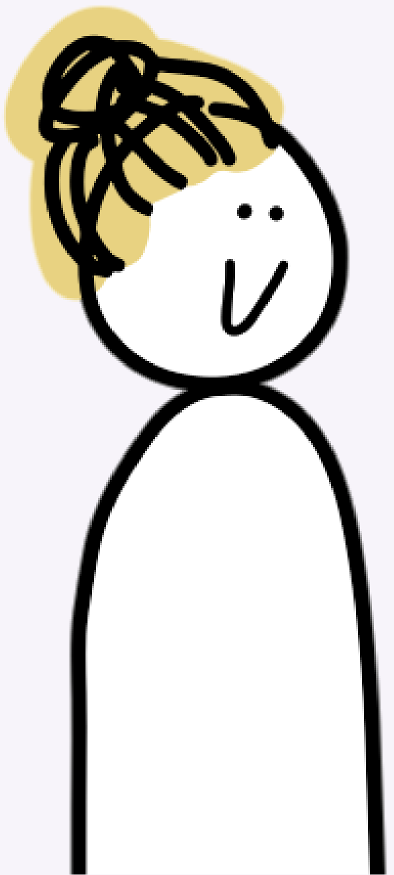


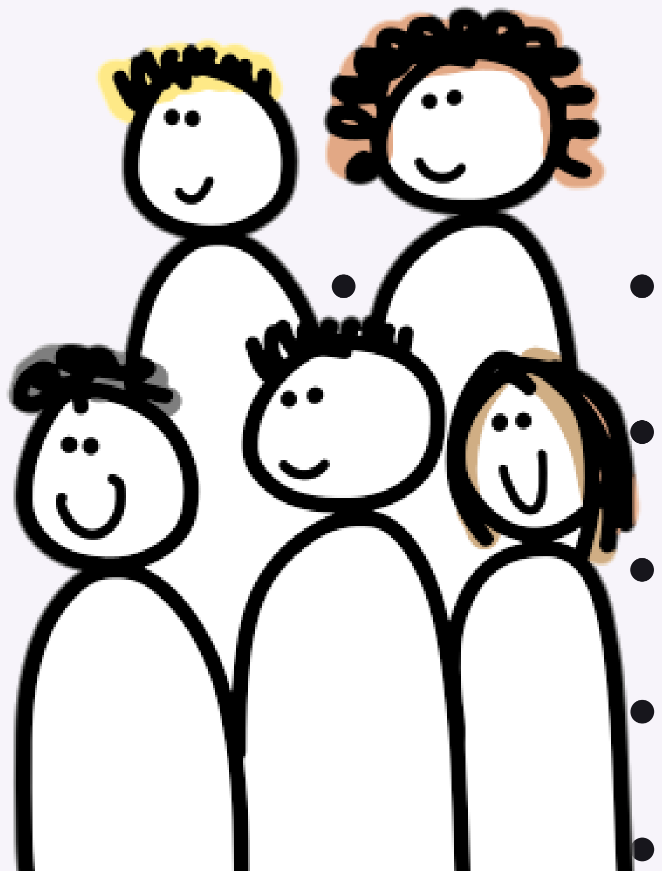
Python



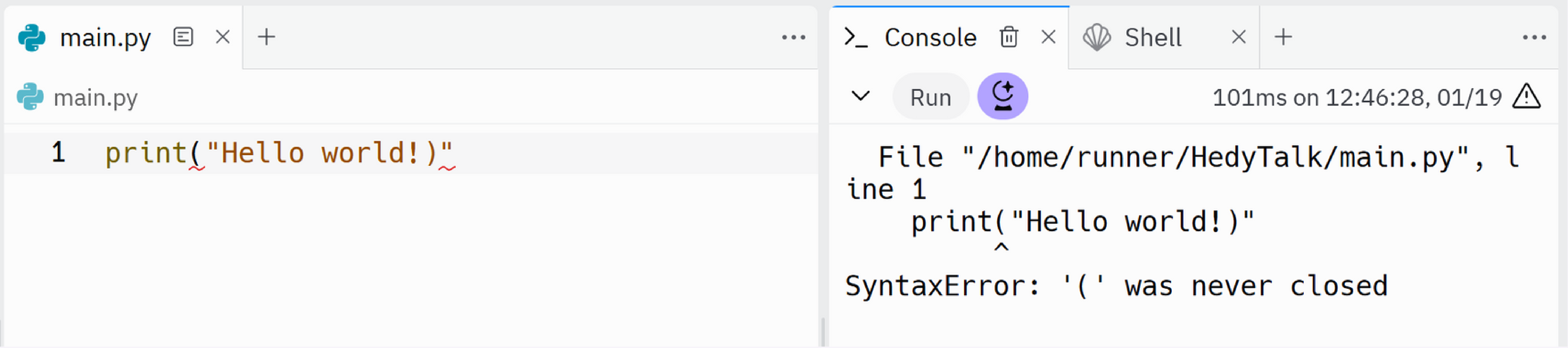
```python
Print("Hello world!")
```

```
Traceback (most recent call last):
  File "/home/runner/HedyTalk/main.py", l
ine 1, in <module>
    Print("Hello world!")
NameError: name 'Print' is not defined. D
id you mean: 'print'?
```



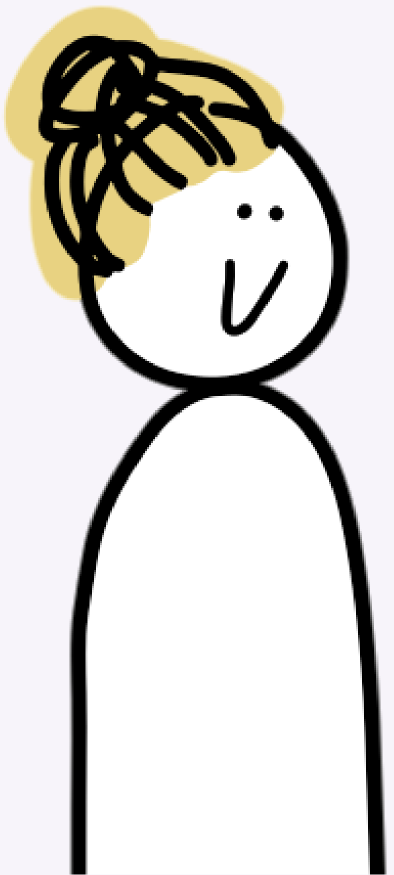


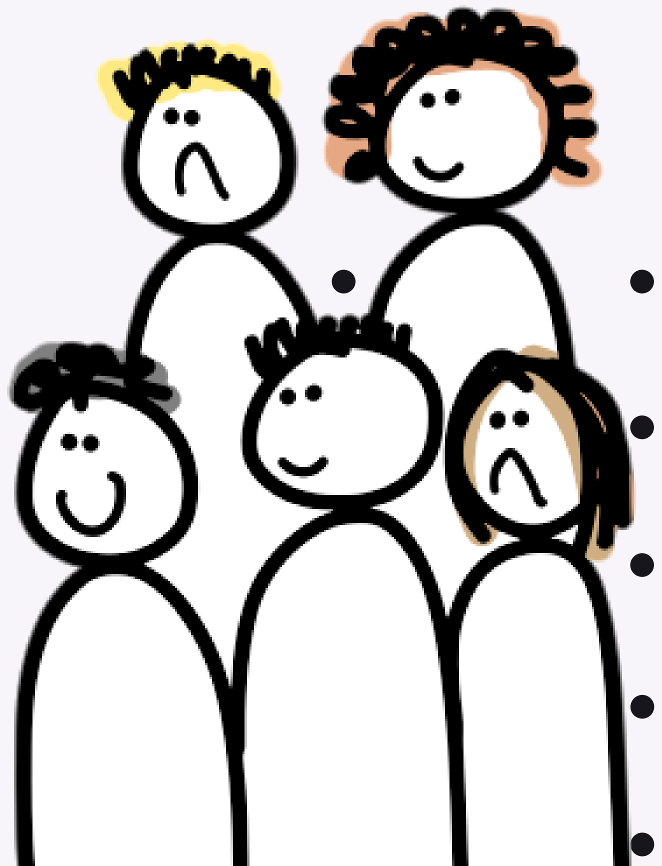
Python



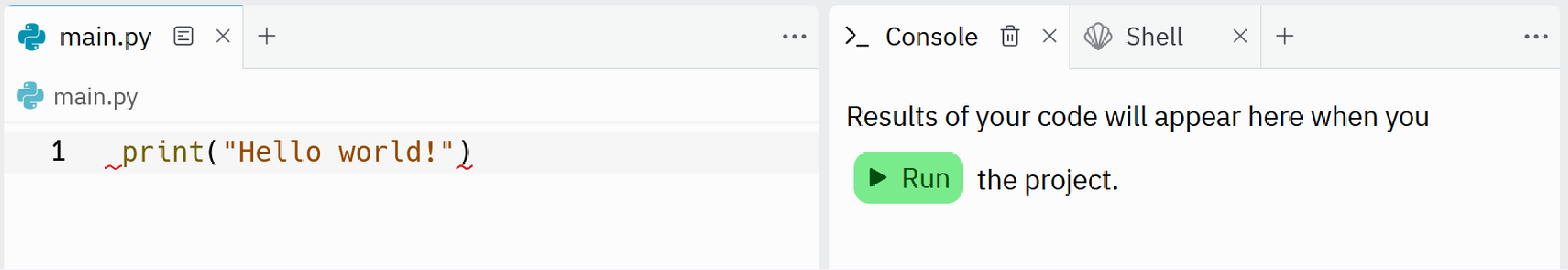
```
print("Hello world!)"
```

```
  File "/home/runner/HedyTalk/main.py", l
ine 1
    print("Hello world!)"
         ^
SyntaxError: '(' was never closed
```





Python



```
print("Hello world!")
```

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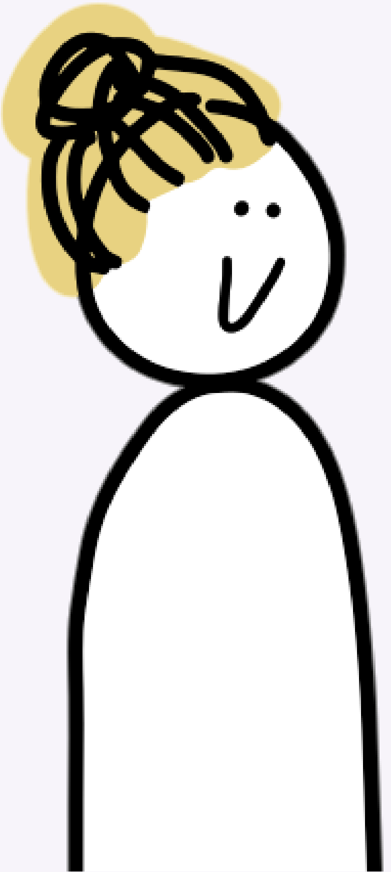
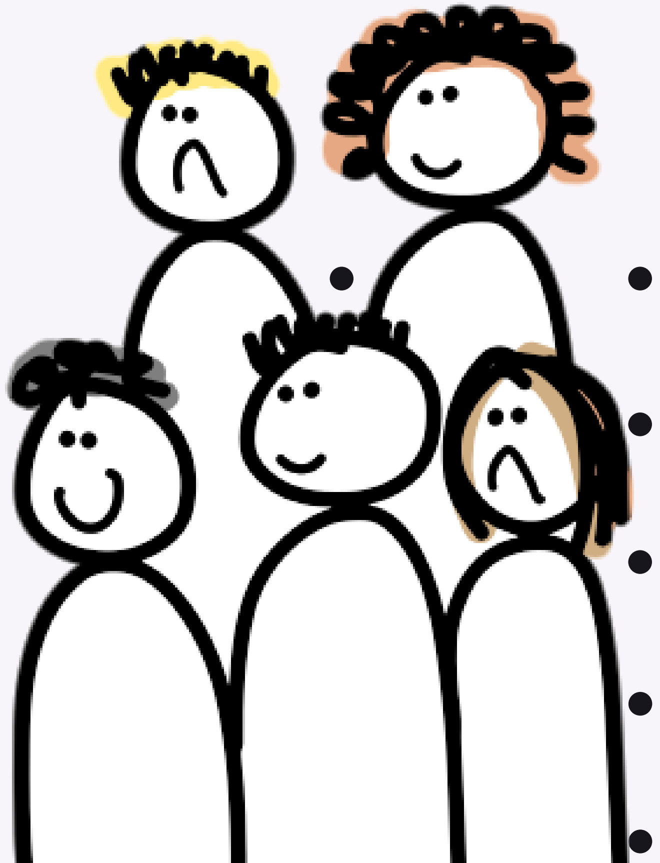
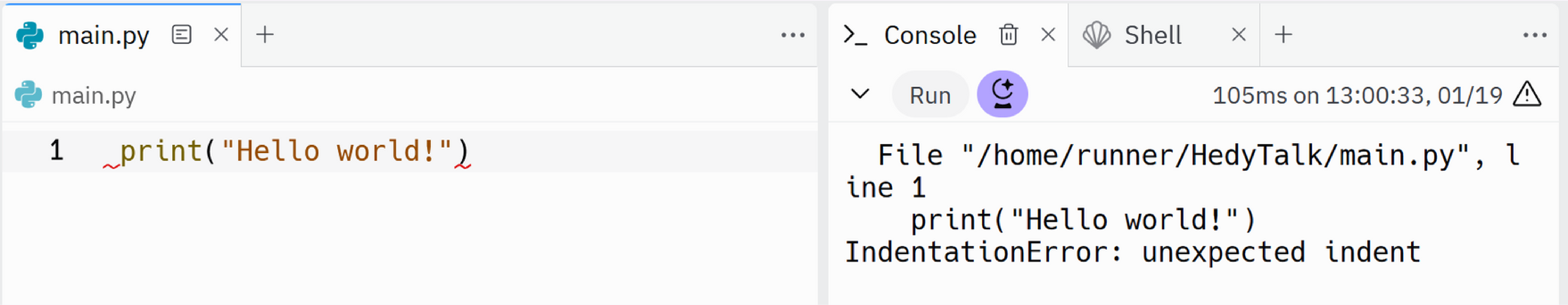


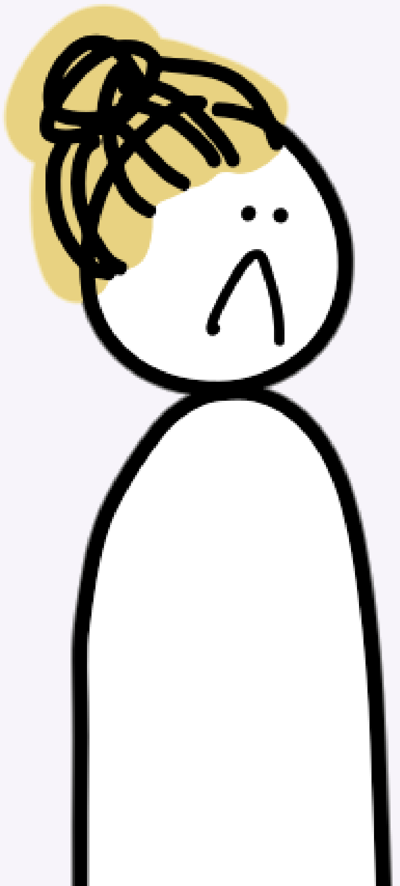


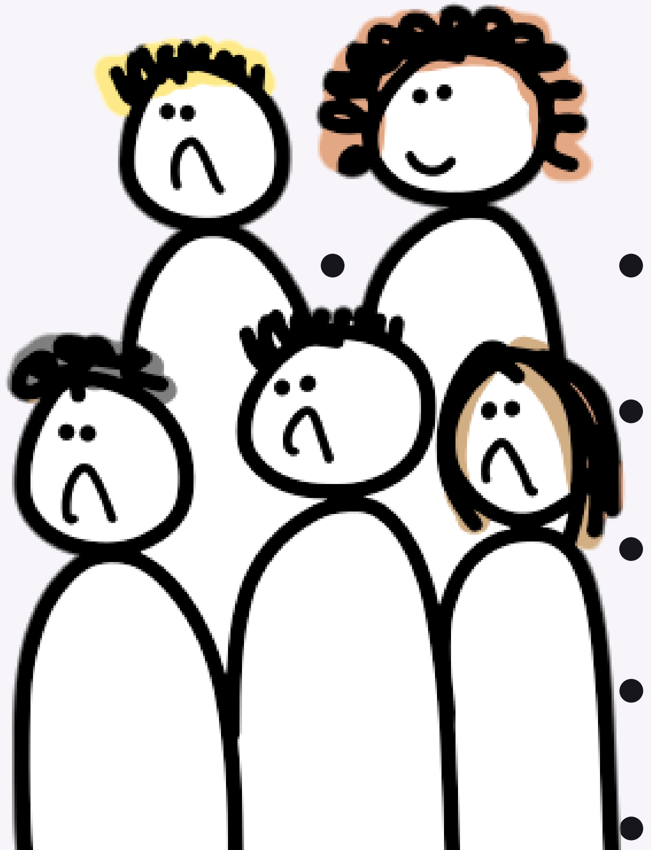
Python



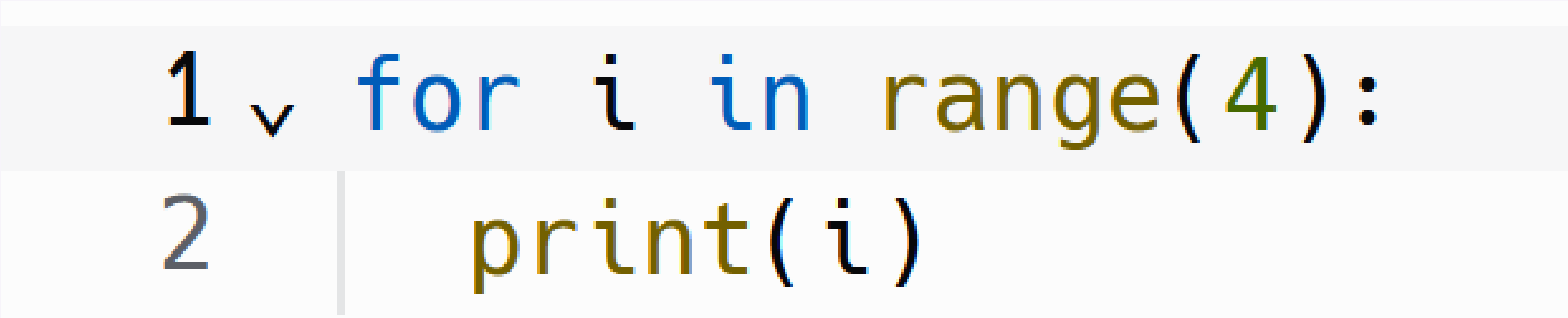
```
 print("Hello world!")
```

```
  File "/home/runner/HedyTalk/main.py", l
ine 1
    print("Hello world!")
IndentationError: unexpected indent
```

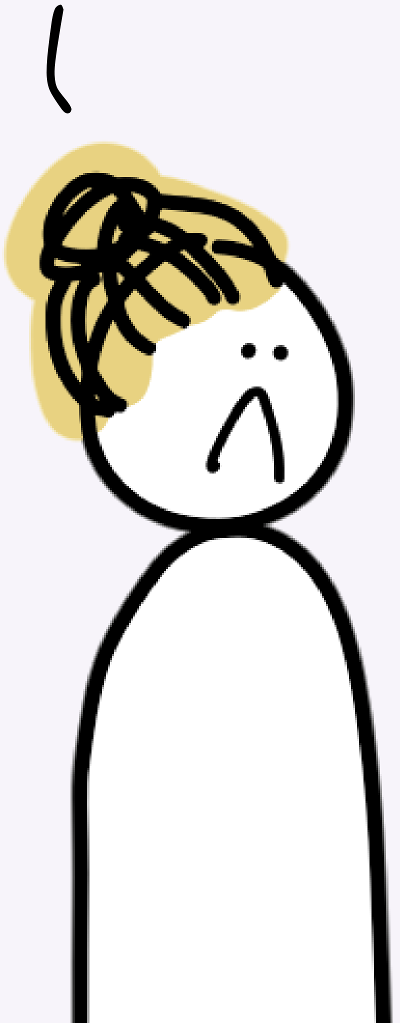




Python



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



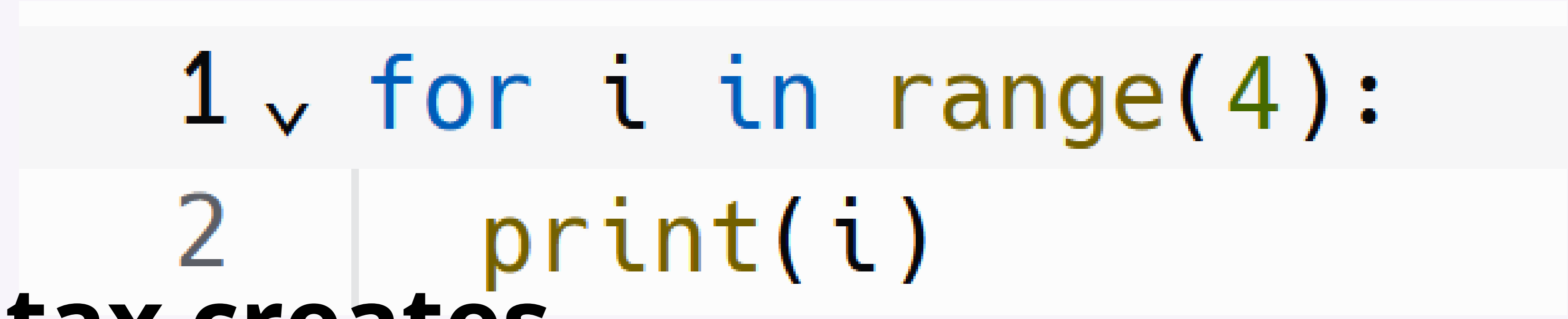
Repetition

Colon

Brackets

Spaces

Python



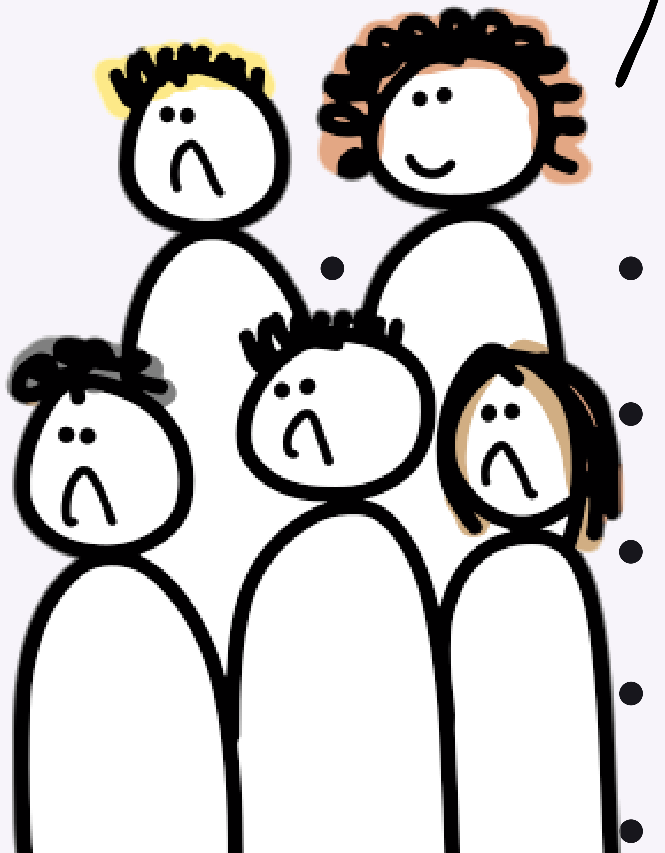
```
for i in range(4):
    print(i)
```

Syntax creates cognitive overload

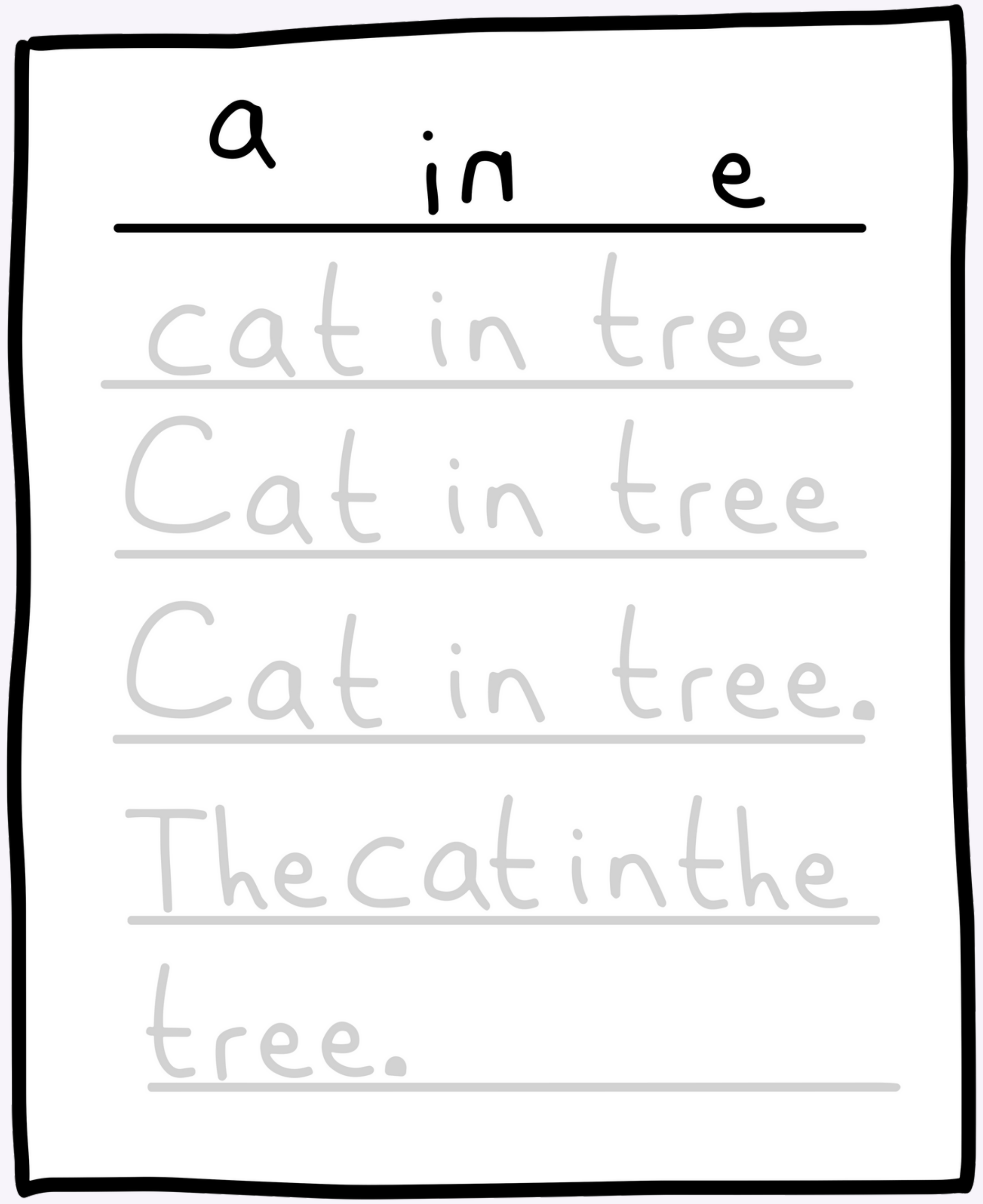
Colon

Brackets

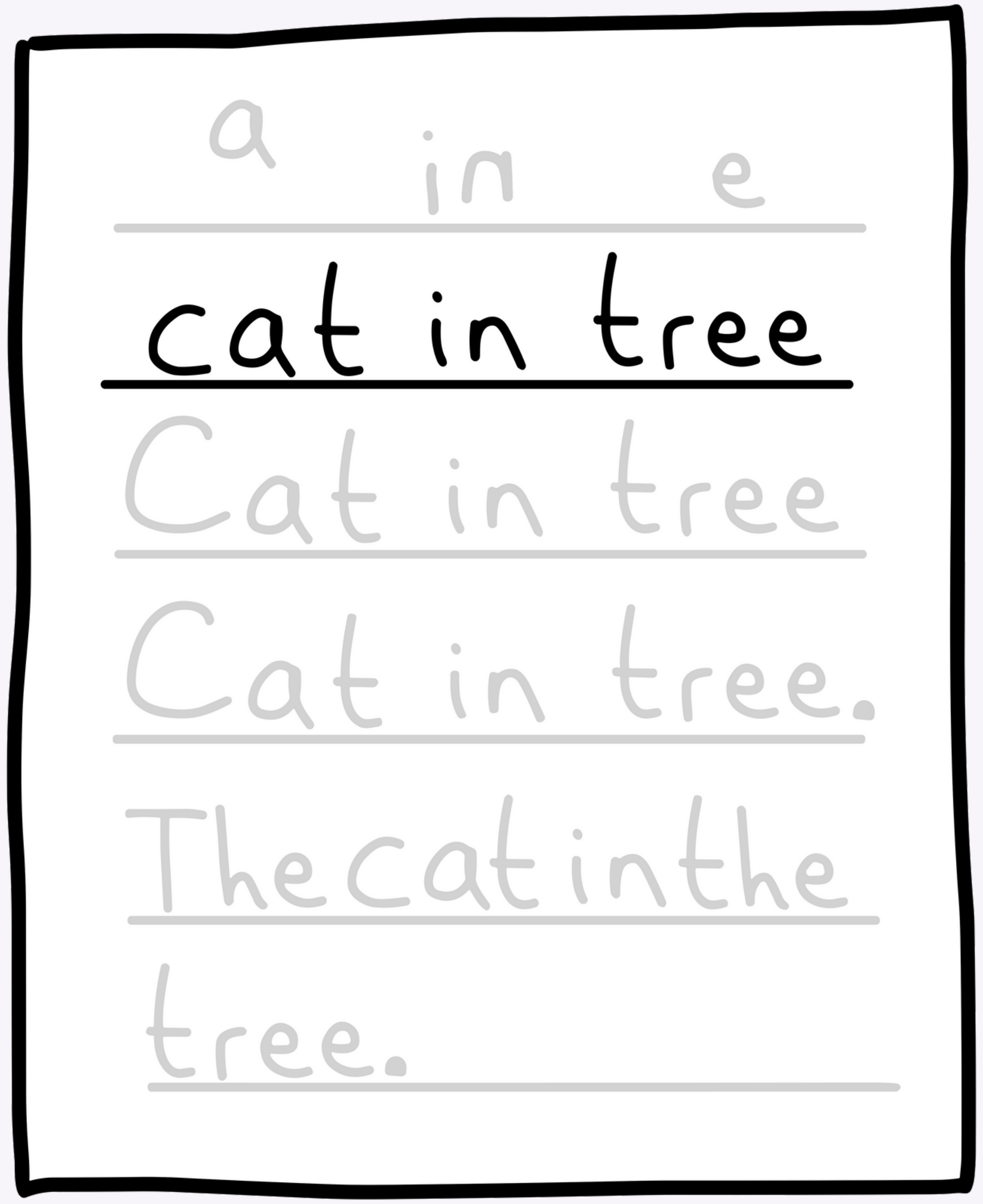
Spaces



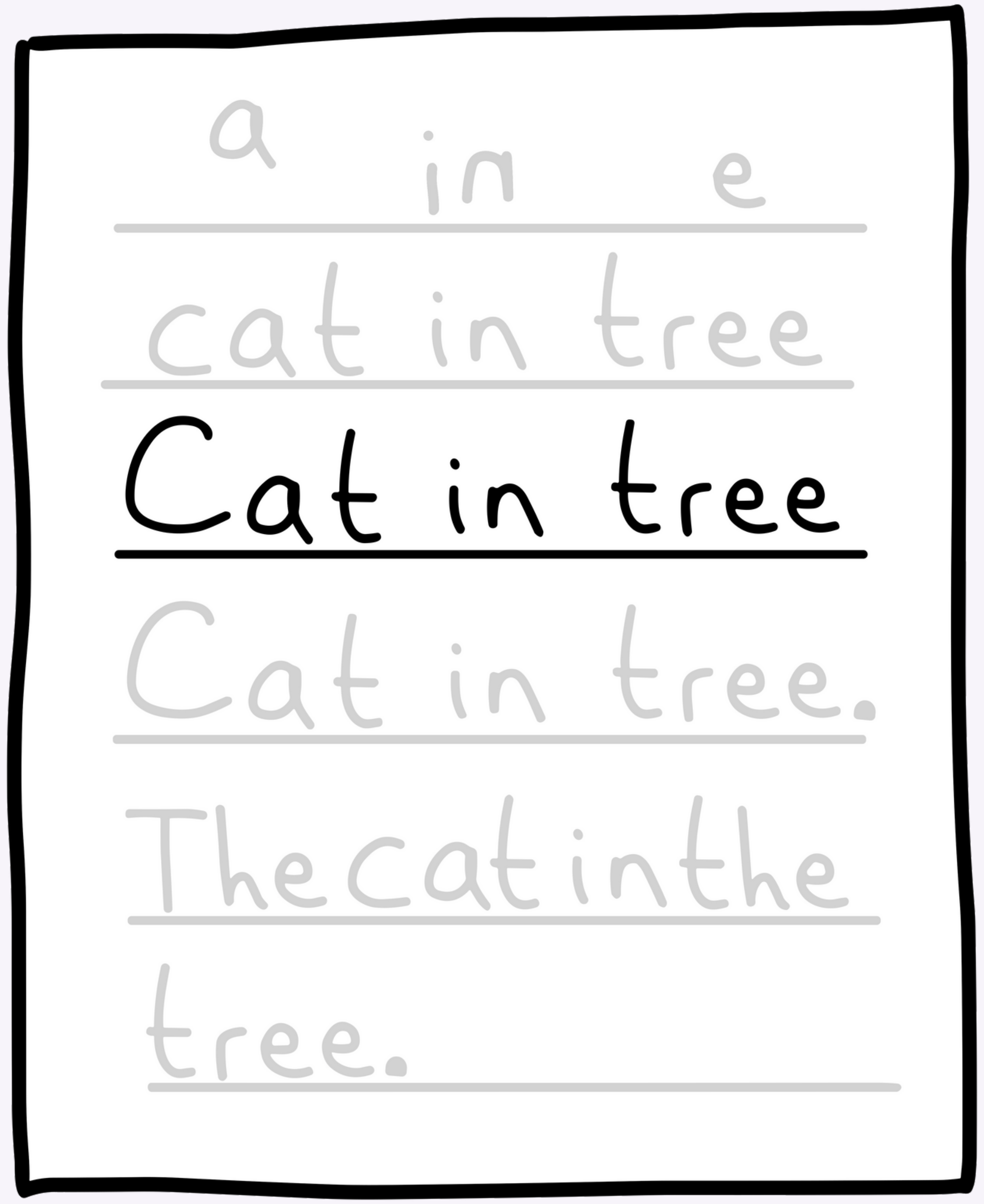
Cognitive Overload



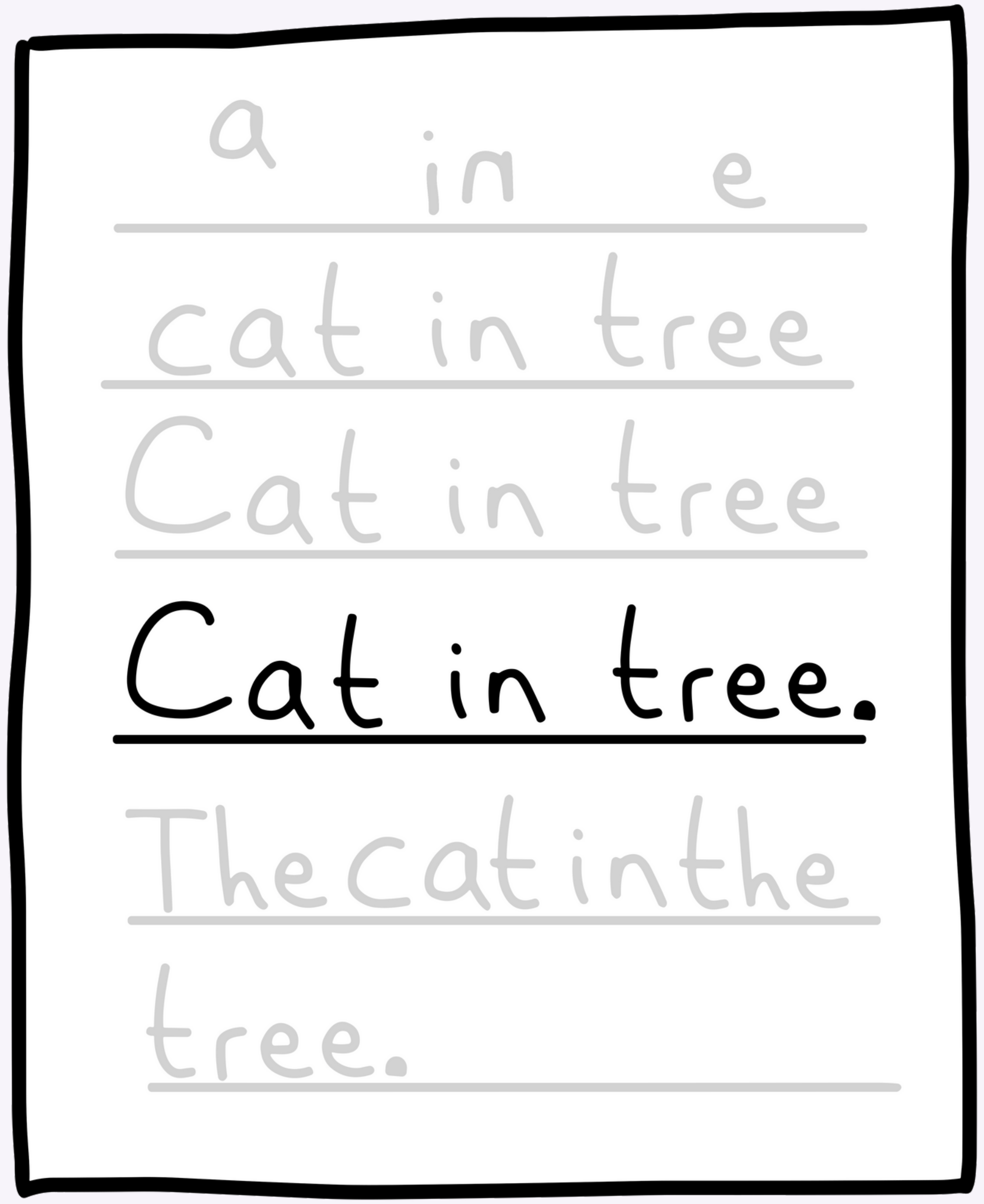
Cognitive Overload



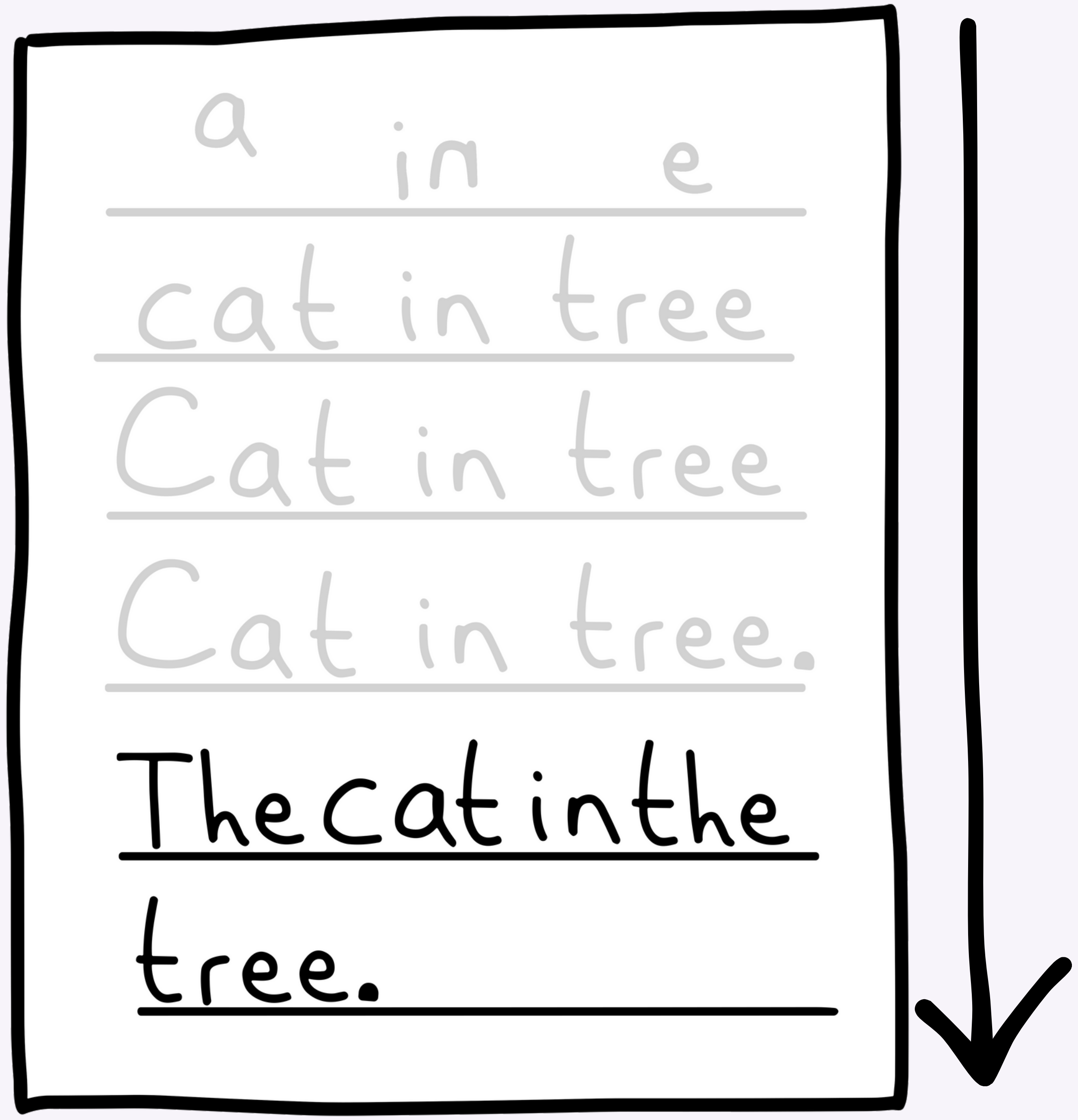
Cognitive Overload



Cognitive Overload

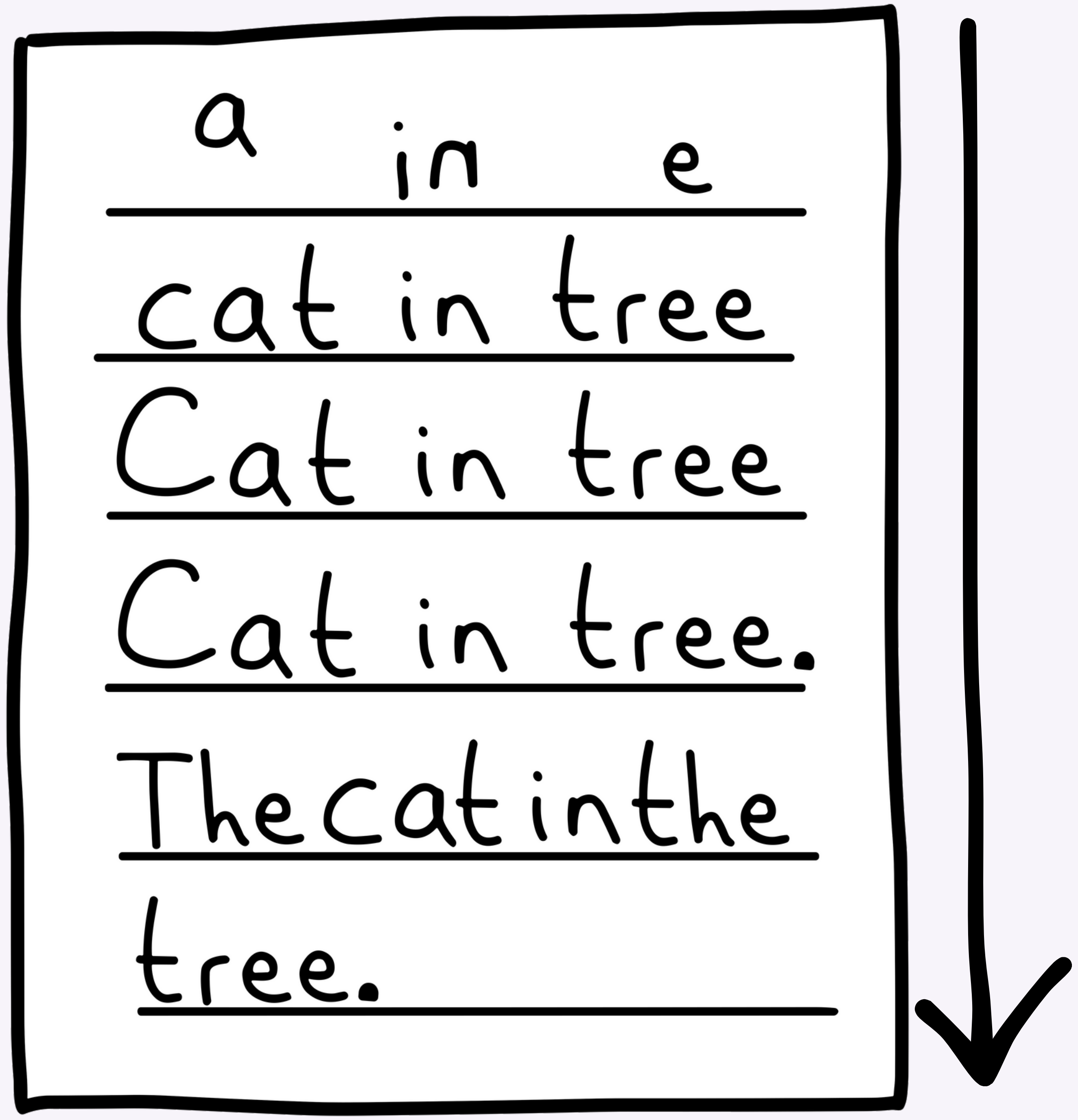


Cognitive Overload



Cognitive Overload

Rules change gradually!



Cognitive Overload

Rules
change
gradually
in math too!

$$5-3 = 2$$
$$3-5 = 0$$

Cognitive Overload

Rules change gradually in math too!

$$5-3 = 2$$

$$3-5 = 0$$

$$3-5 = -2$$

Cognitive Overload

Rules change gradually in math too!

$5-3 = 2$

$3-5 = 0$

$3-5 = -2$

$8/3 = 2r2$

$8/3 = 2\frac{2}{3}$

$8/3 = 2{,}666$

Cognitive Overload

Let’s teach code gradually as well!

Cognitive Overload

Let’s teach code gradually as well!

Cognitive Overload

```
print Hello
ask What's your name
eco hello
```

Level 1

```
print 'Hello'
name is ask 'What is your name?'
print 'Your name is ' name ' so pretty!'
```

Level 4

```
print('Hello')
name = input('What is your name=')
print('Your name is ', name, ' so pretty!')
```

Level 18

Design Goals

1. Concepts are offered at least three times
2. The concept is introduced as simple as possible
3. Only one aspect changes at a time
4. Syntactic elements are deferred to the latest moment
5. Concepts are interleaved
6. It’s always possible to create meaningful programs

What is Hedy?

1 Gradual ✓

2 Multingual

3 Built for teaching

What is Hedy?

1 Gradual

2 Multingual

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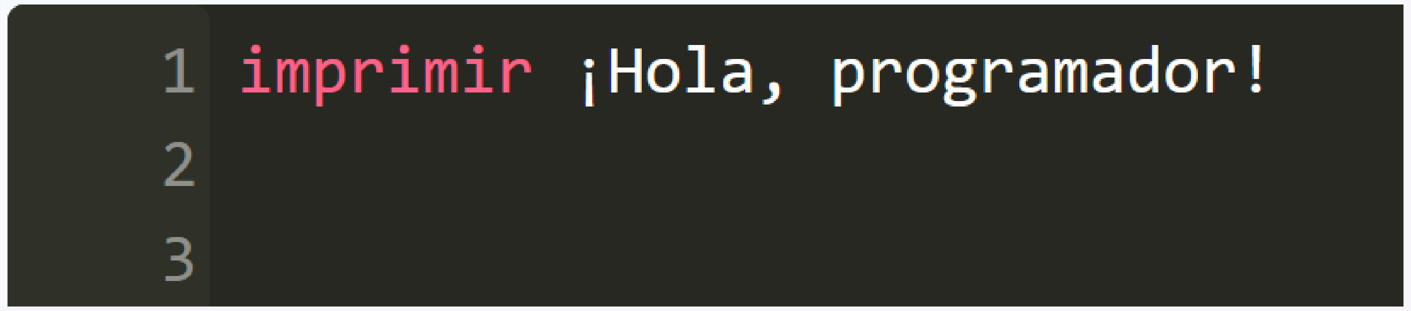
Multilingual

This is great but we'd like to program in Dutch!

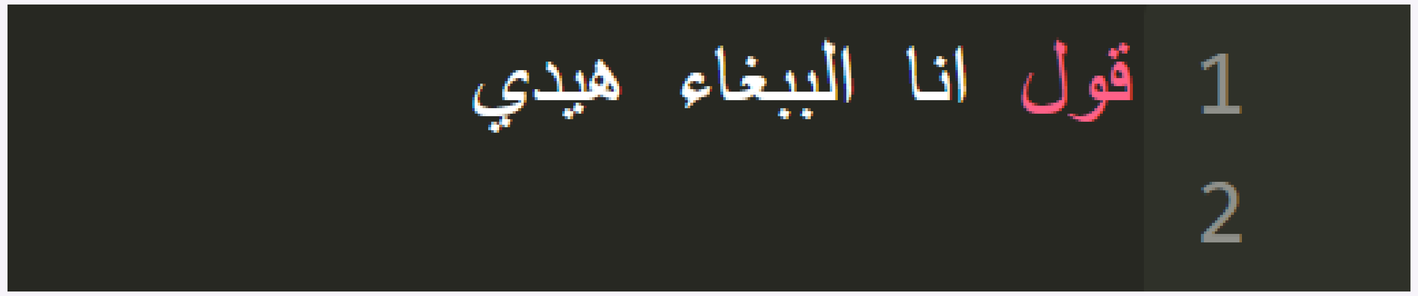
Ok!

Multilingual

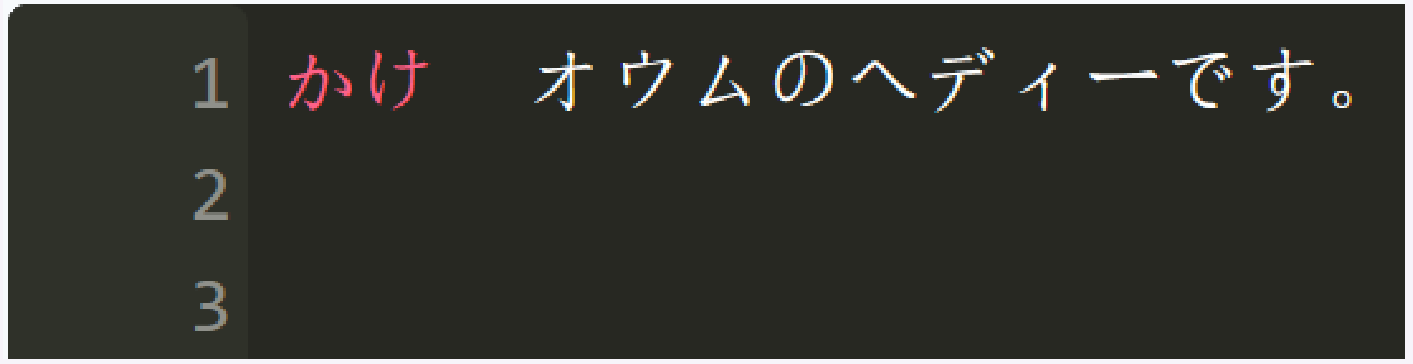
Hedy is available in
47 languages!



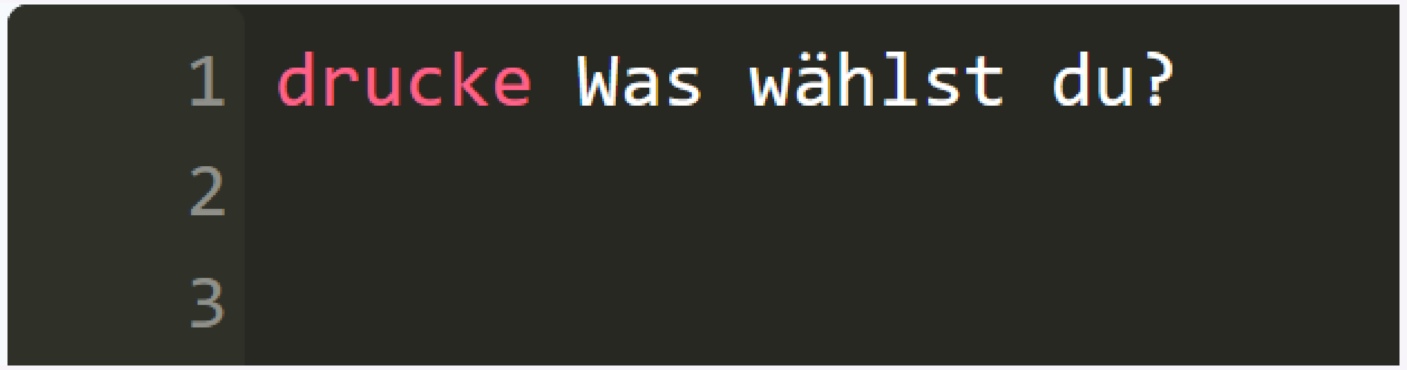
```
imprimir ¡Hola, programador!
```



```
قول انا الببغاء هيدي
```



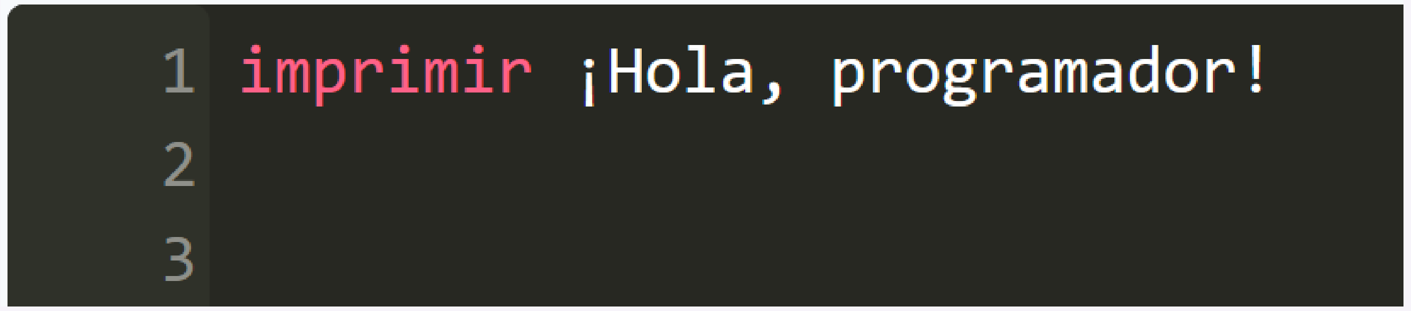
```
かけ　オウムのヘディーです。
```



```
drucke Was wählst du?
```

Multilingual

Demo time



```
imprimir ¡Hola, programador!
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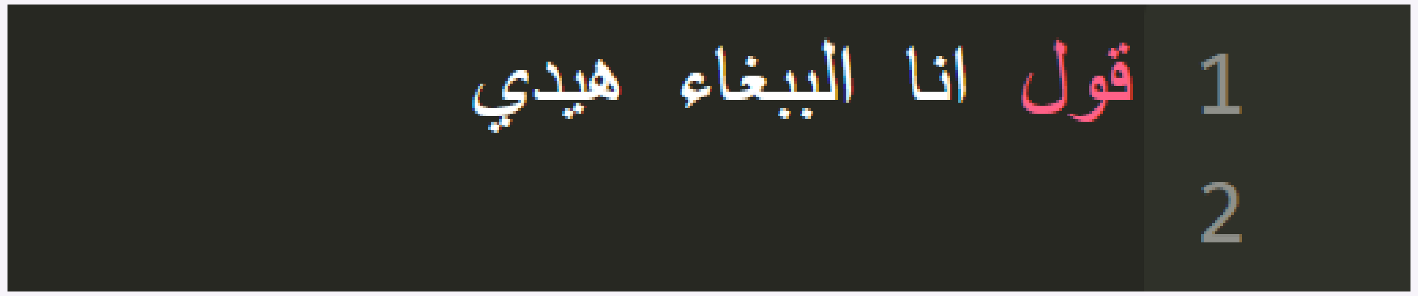
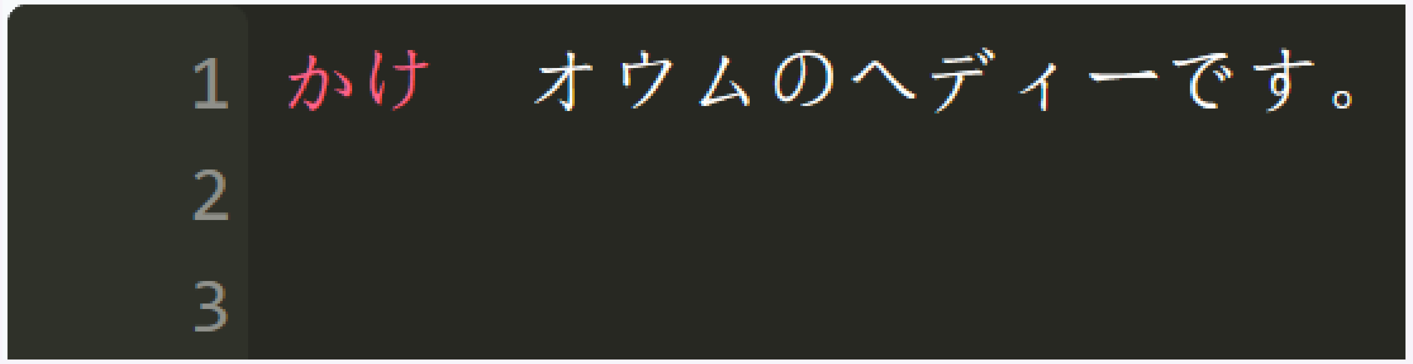


```
قول انا الببغاء هيدي
```



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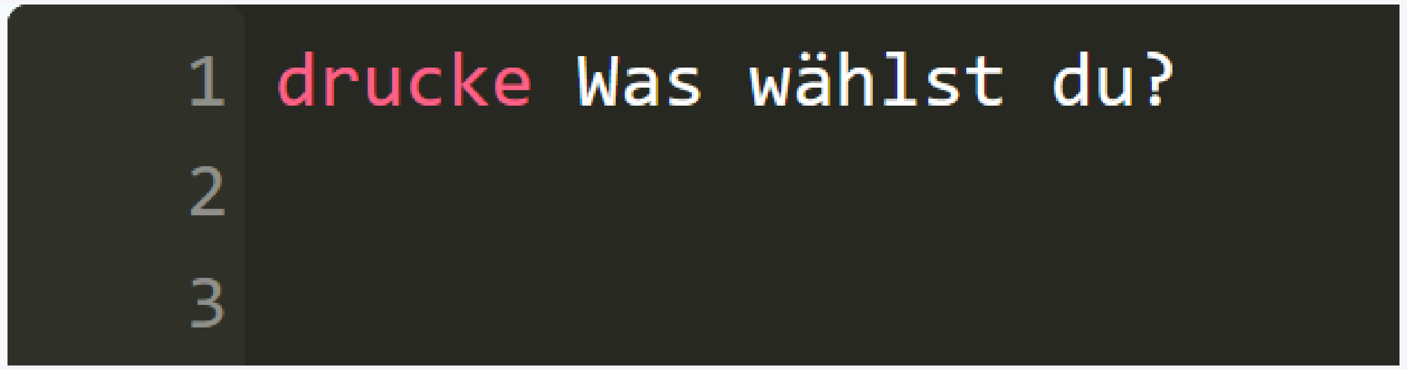


```
drucke Was wählst du?
```

What is Hedy?

1 Gradual

2 Multingual ✓

3 Built for teaching

What is Hedy?

1 Gradual

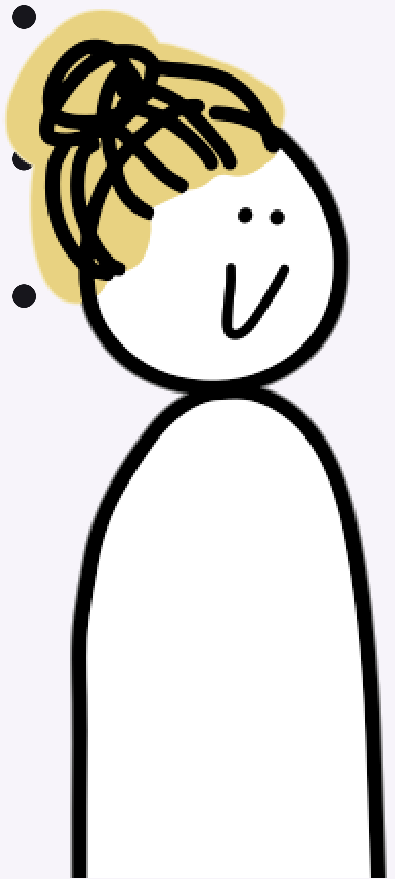
2 Multingual

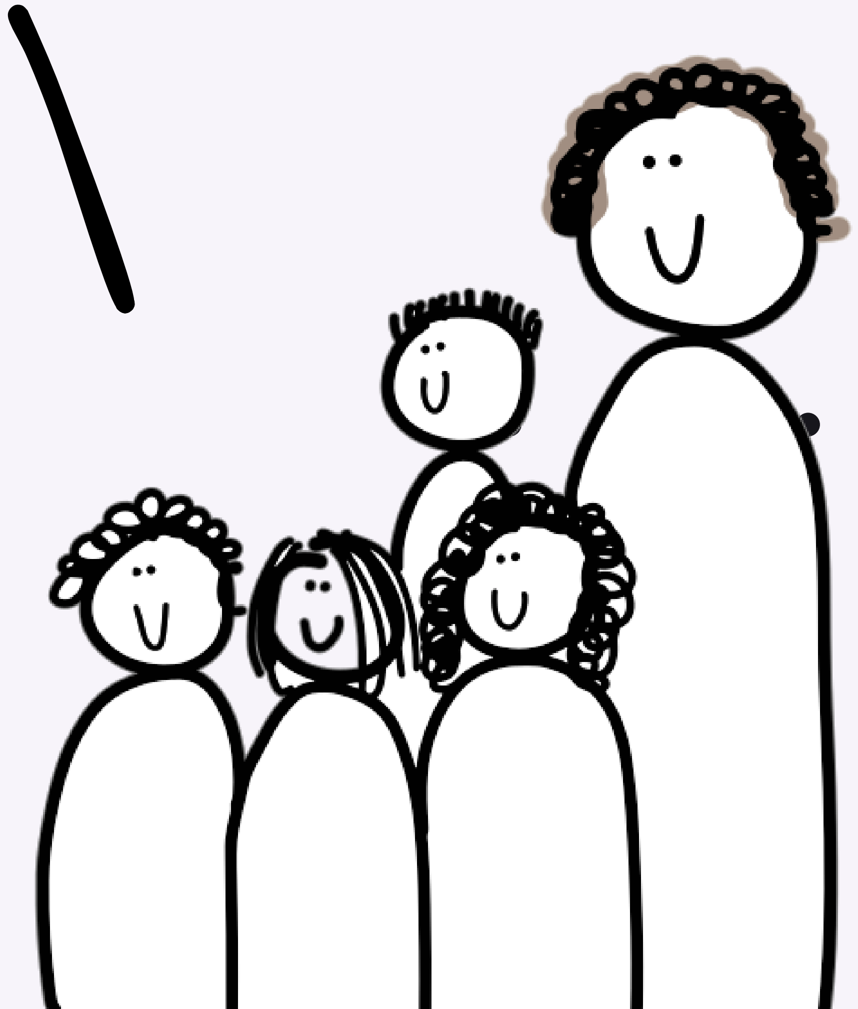
3 Built for teaching

Built for teaching

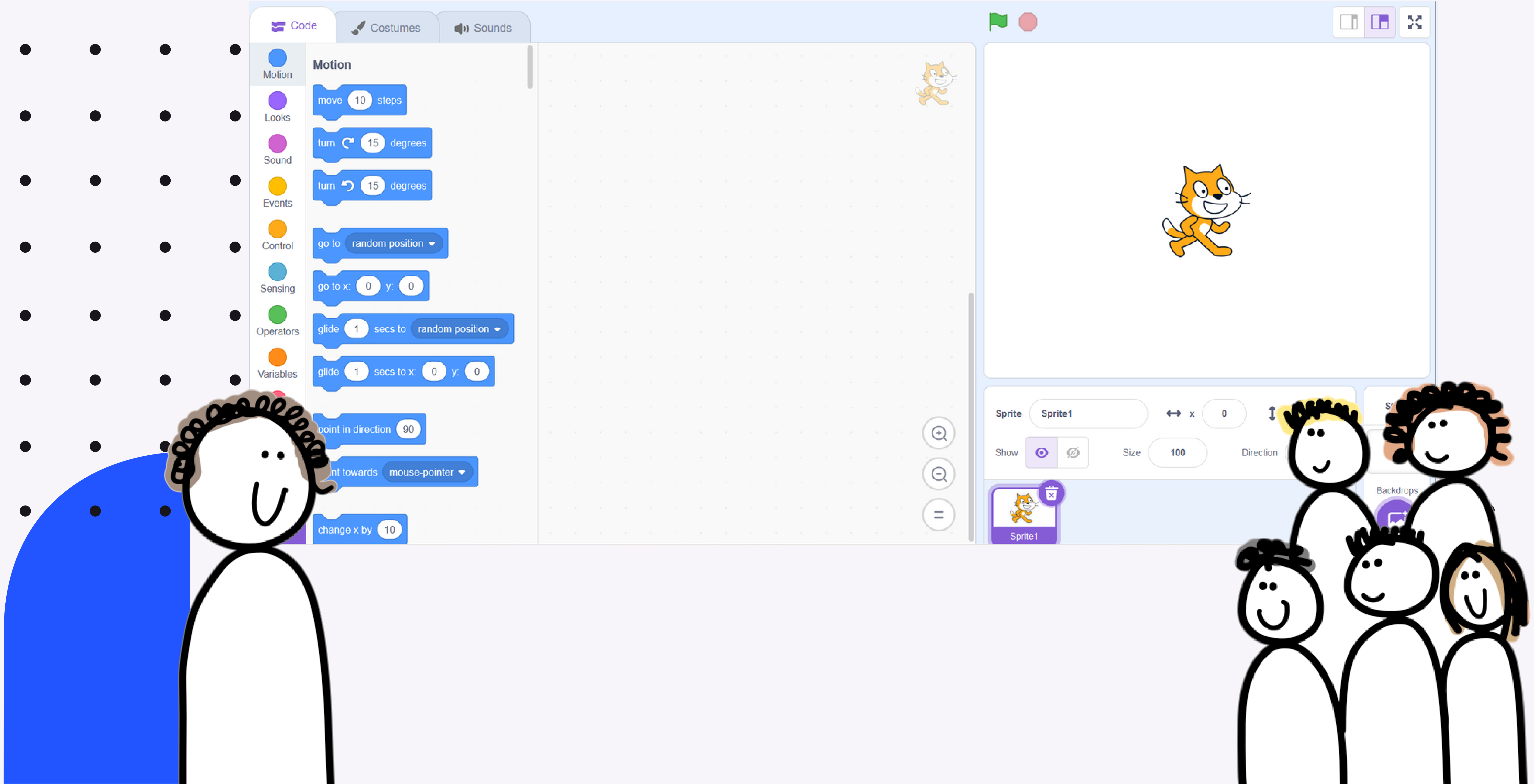
Easier to teach!

The levels are like a step-by-step guide



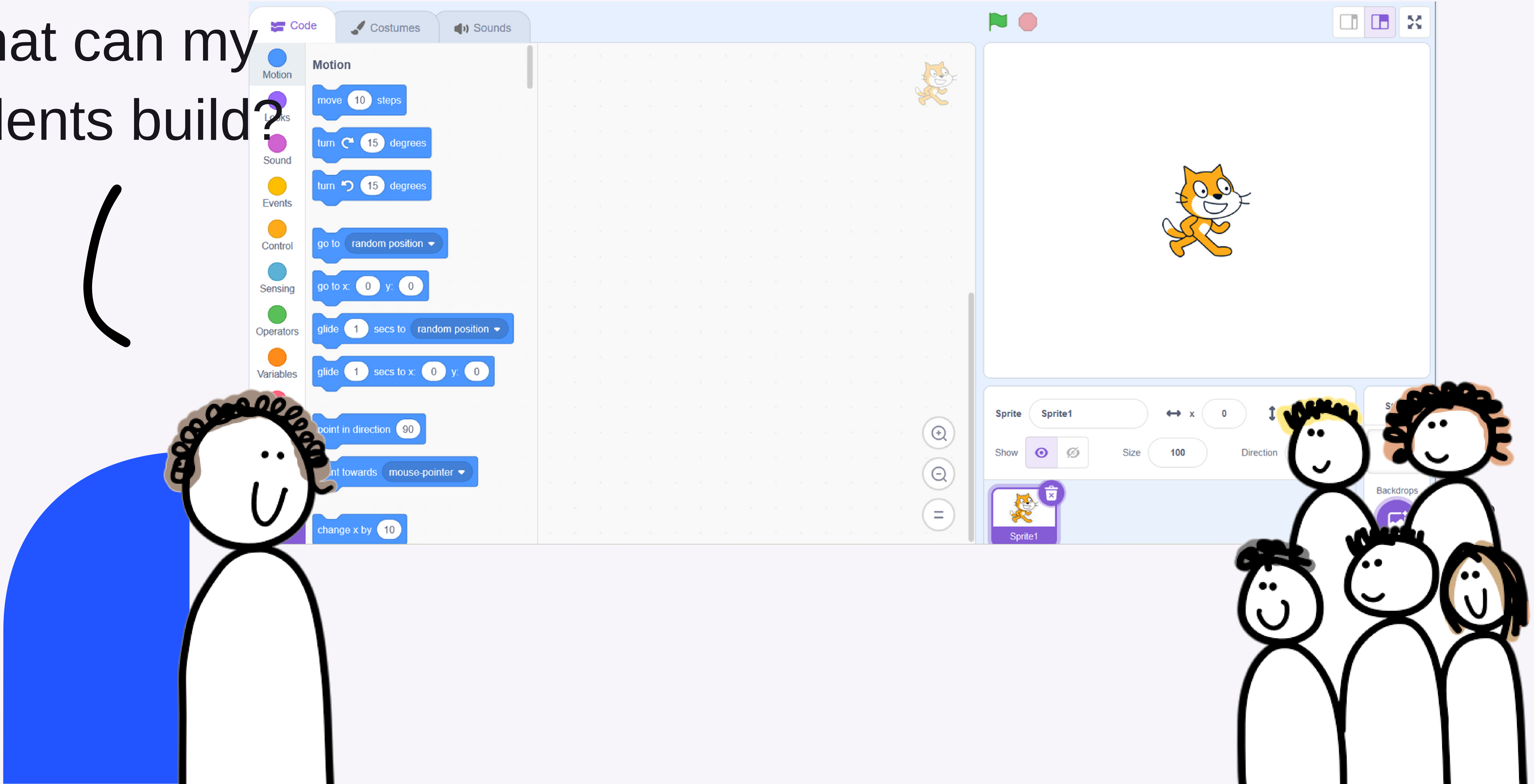


Built for teaching



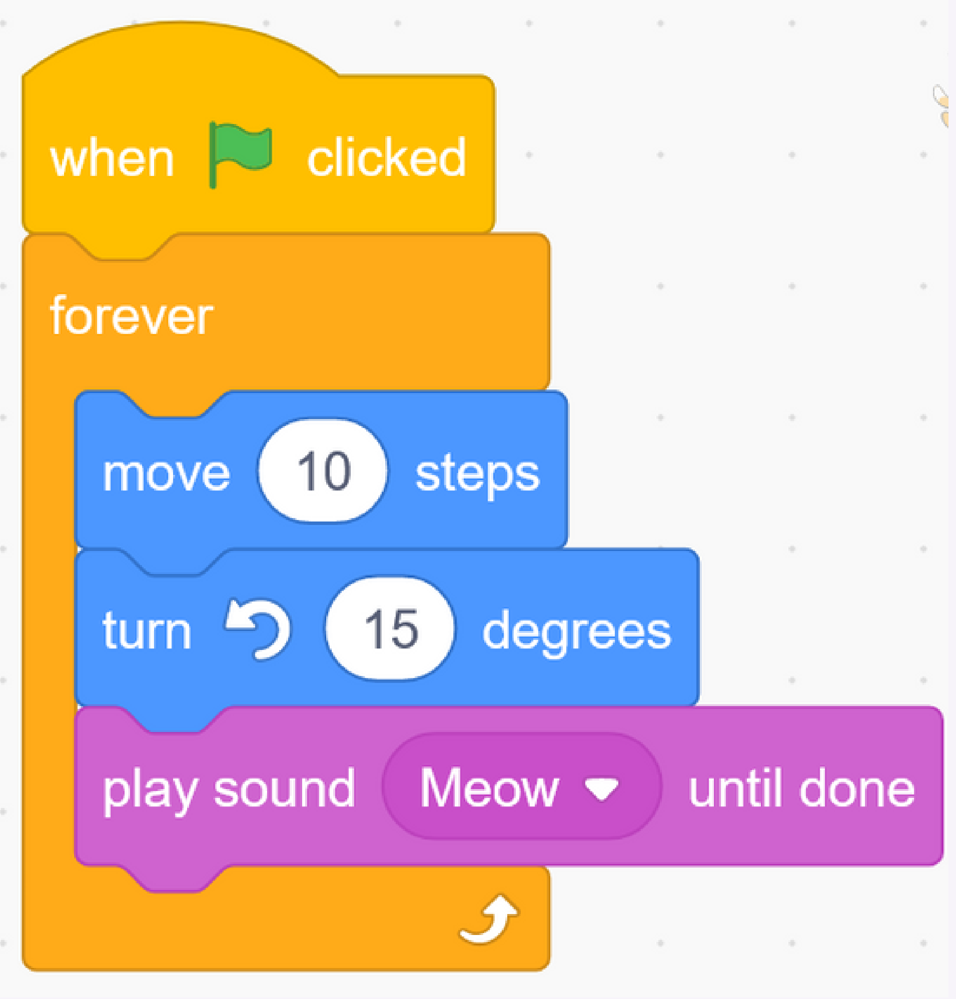
Built for teaching

What can my students build?

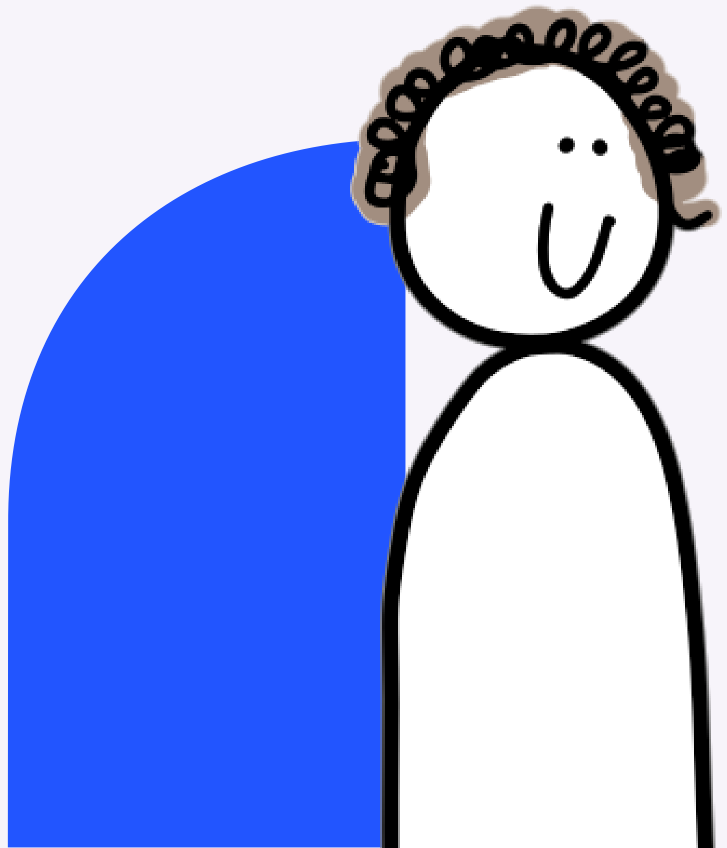


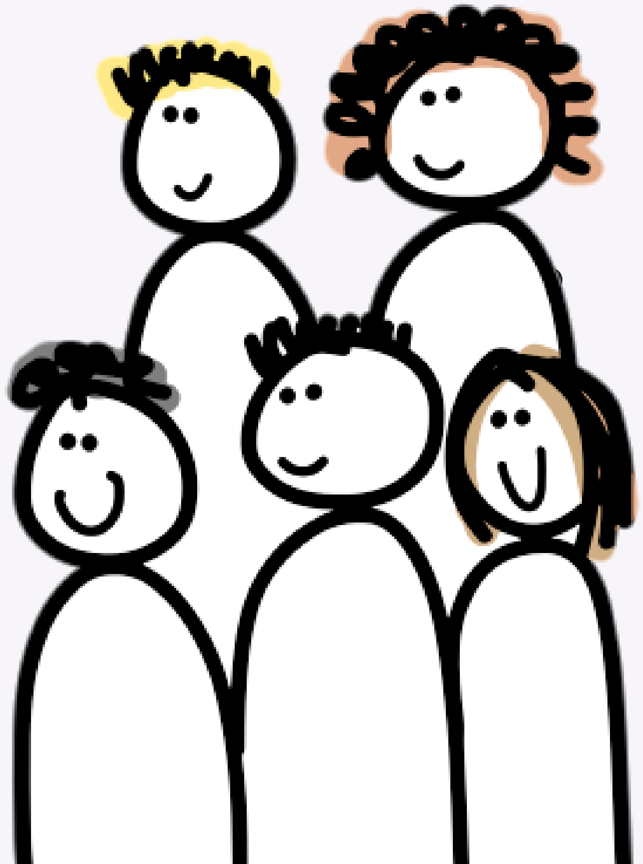
Built for teaching

Lesson!

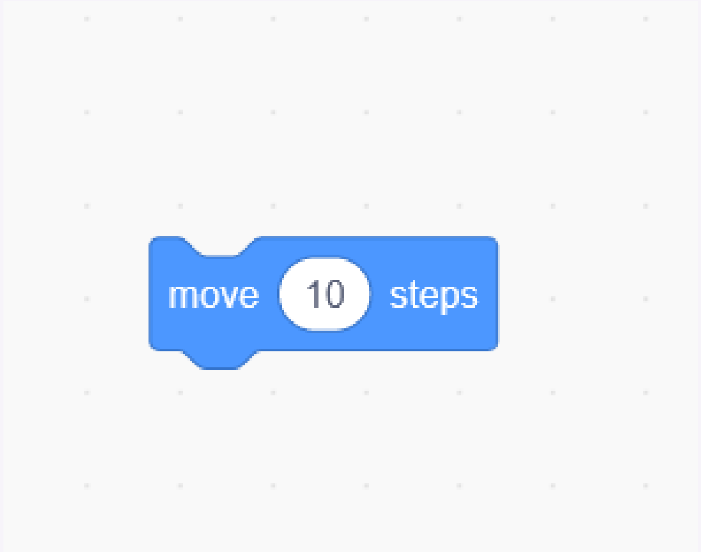


```
when 🏳 clicked
forever
    move (10) steps
    turn ↺ (15) degrees
    play sound (Meow ▾) until done
↻
```

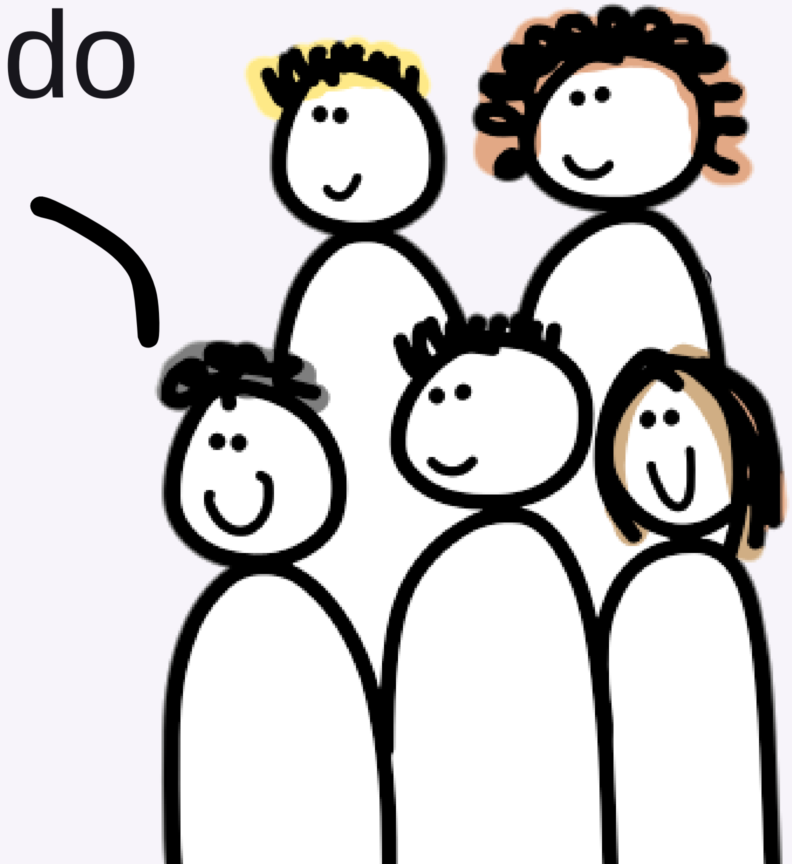




Built for teaching

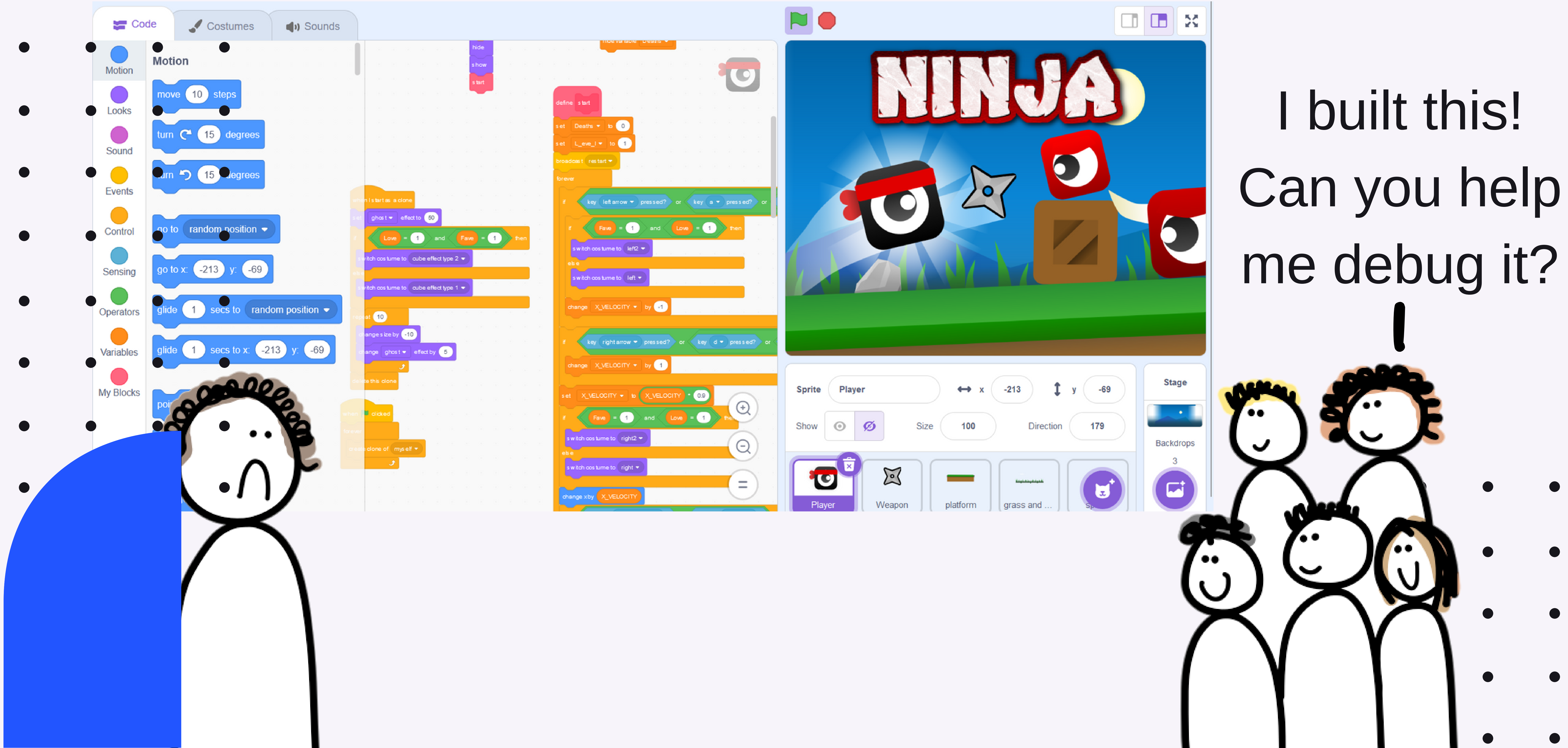


move 10 steps



What do I do now?

Built for teaching

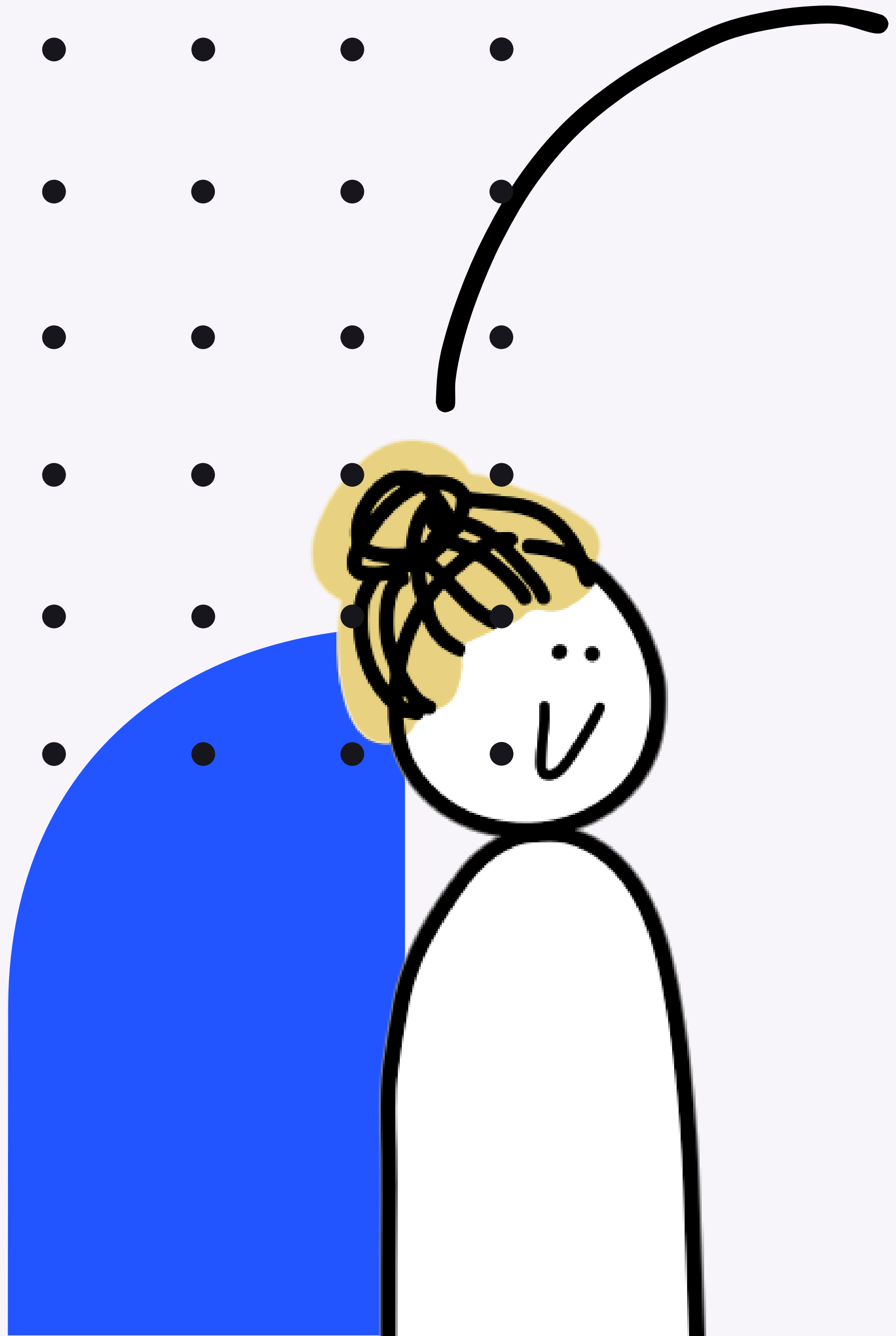


Sprite Player x -213 y -69

Show Size 100 Direction 179

I built this!
Can you help
me debug it?

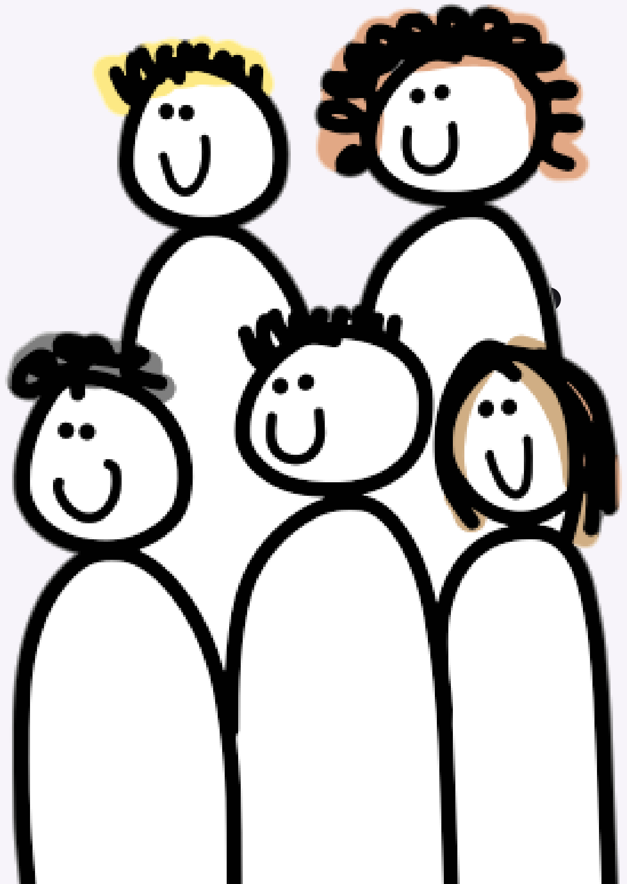
Built for teaching



Adventures!

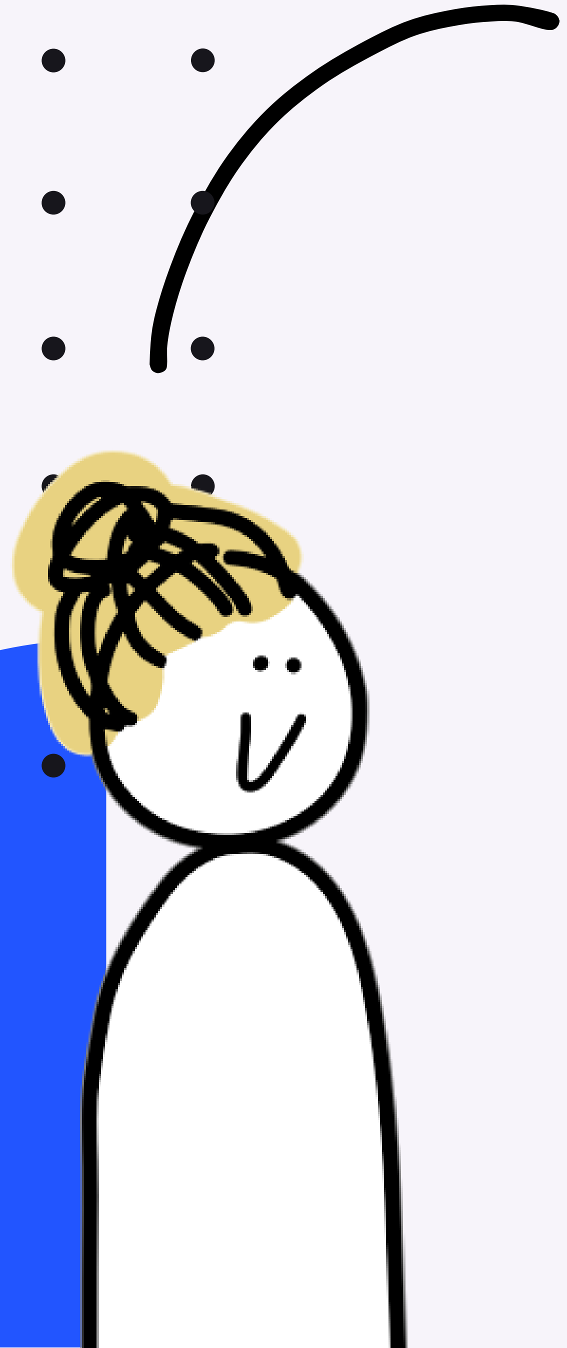
Classes!

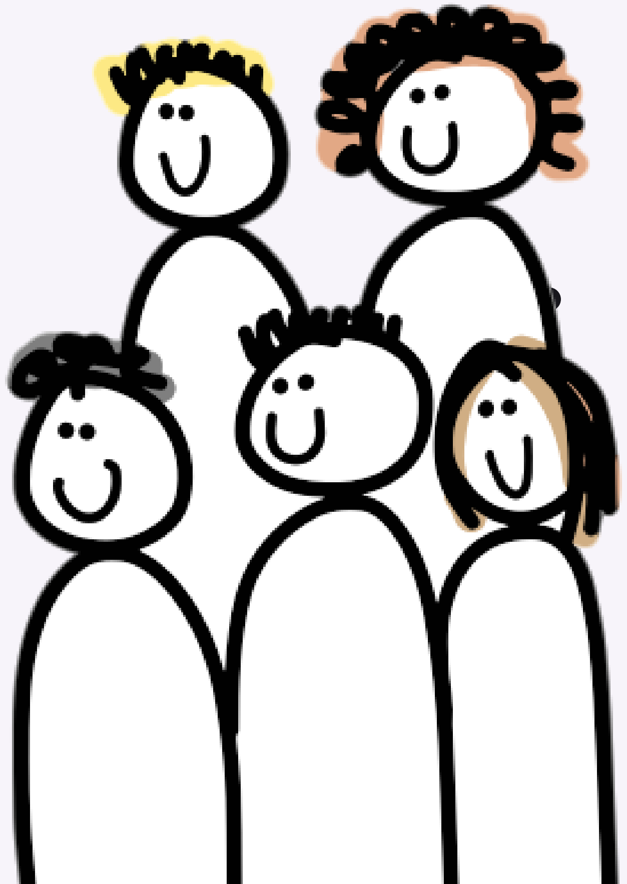
Quizzes!



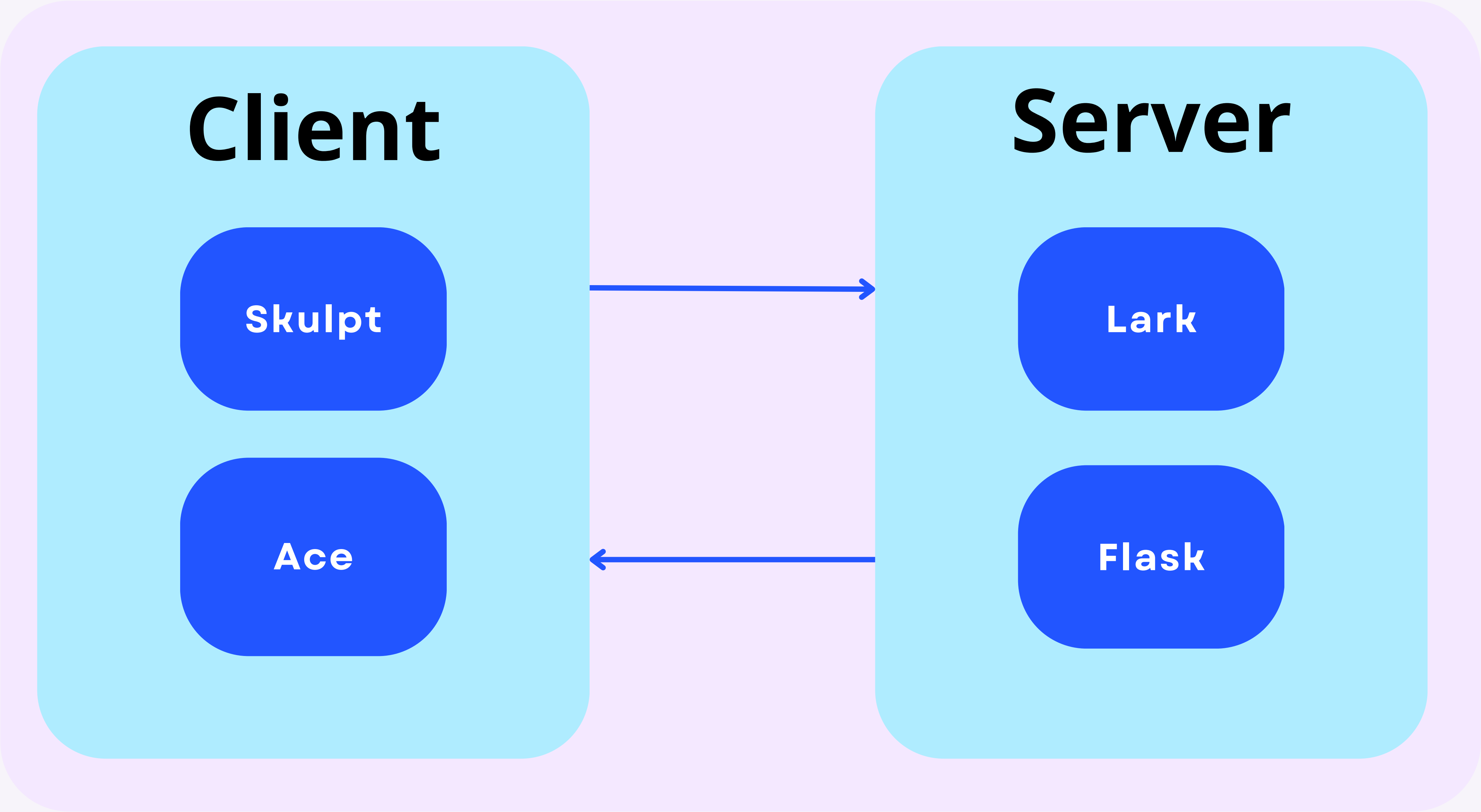
Built for teaching

Customizable too!

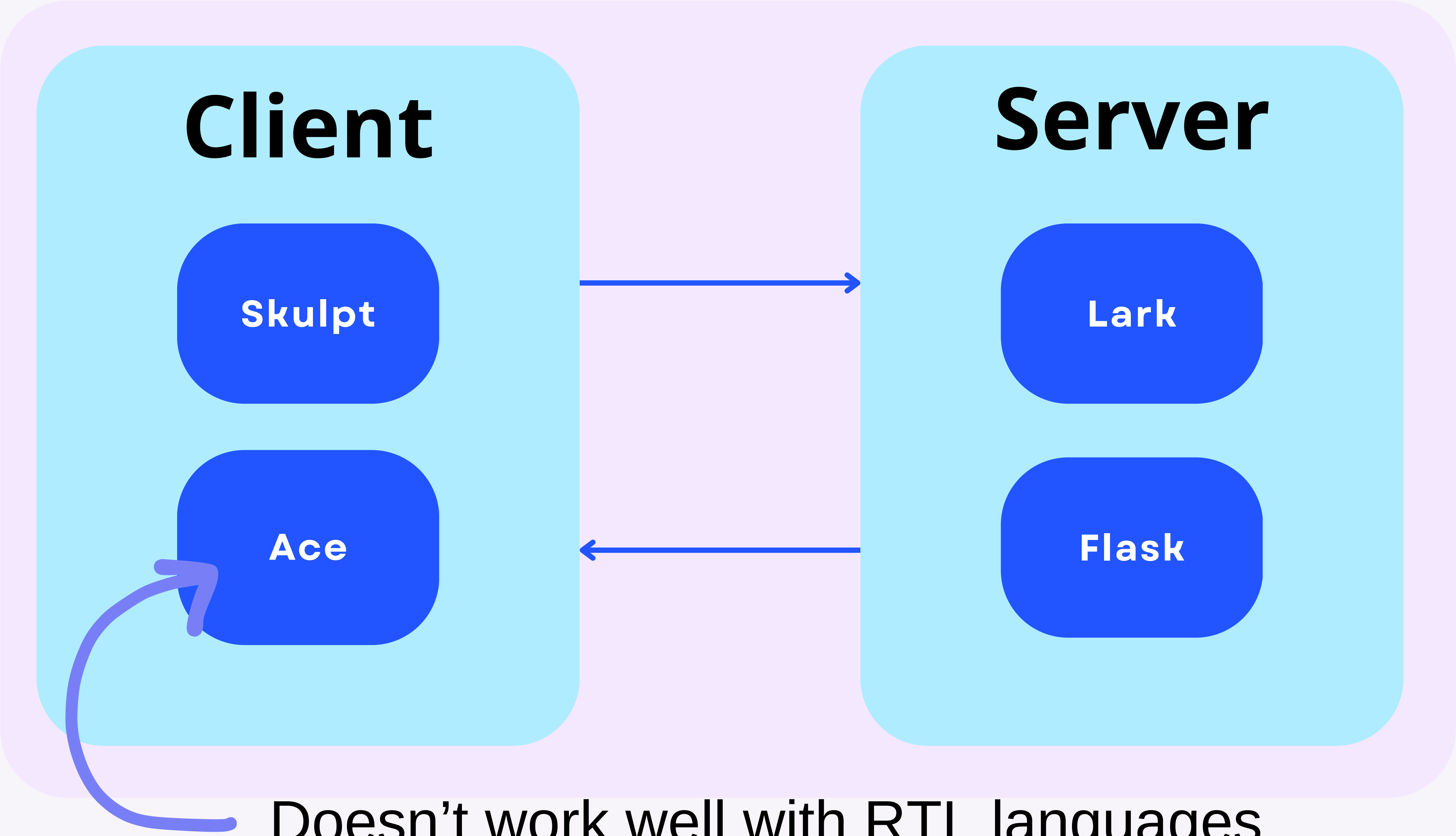




Architecture

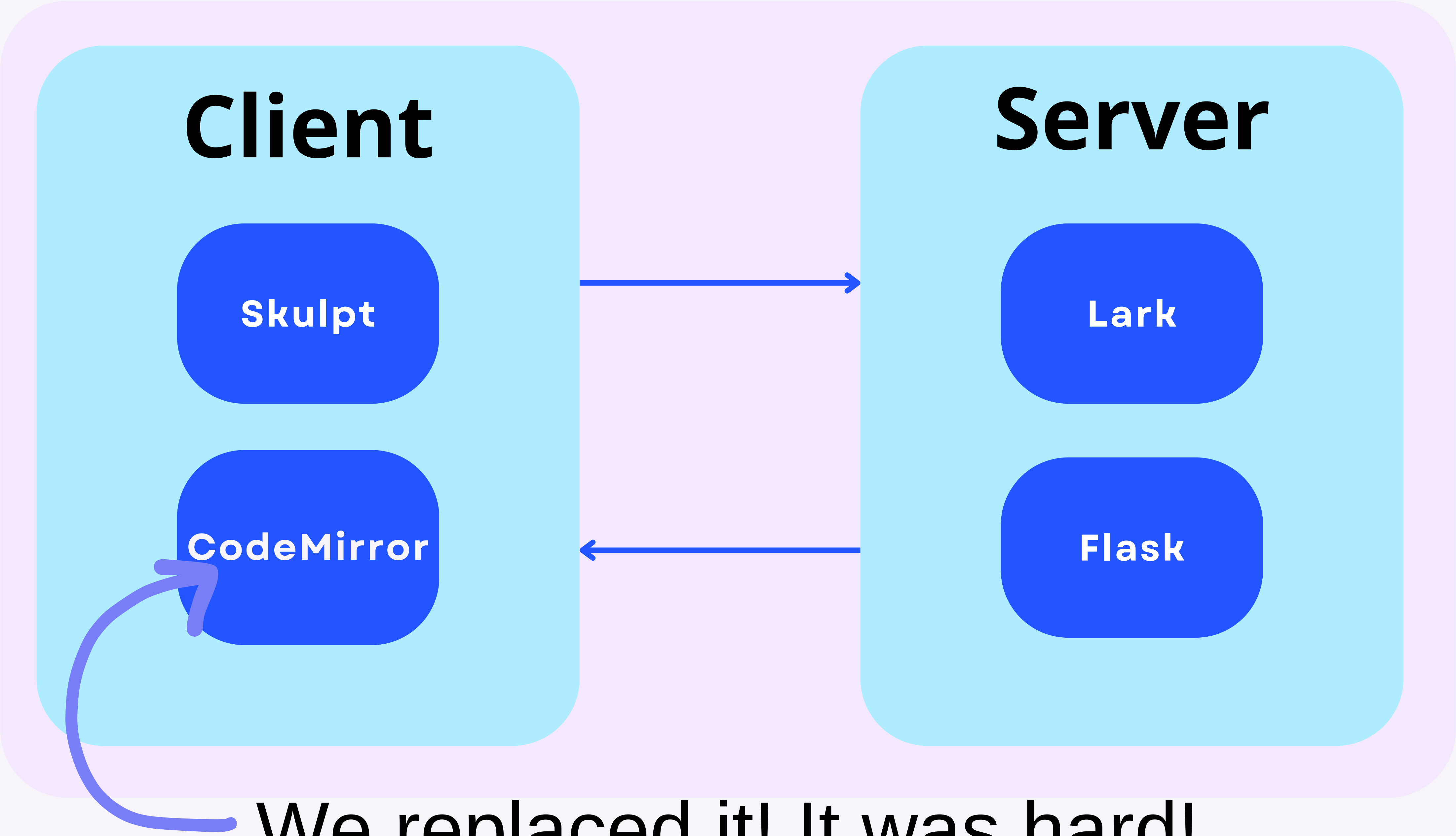


Architectural Challenges



Doesn’t work well with RTL languages

Architecture Challenges



We replaced it! It was hard!

Architecture Challenges

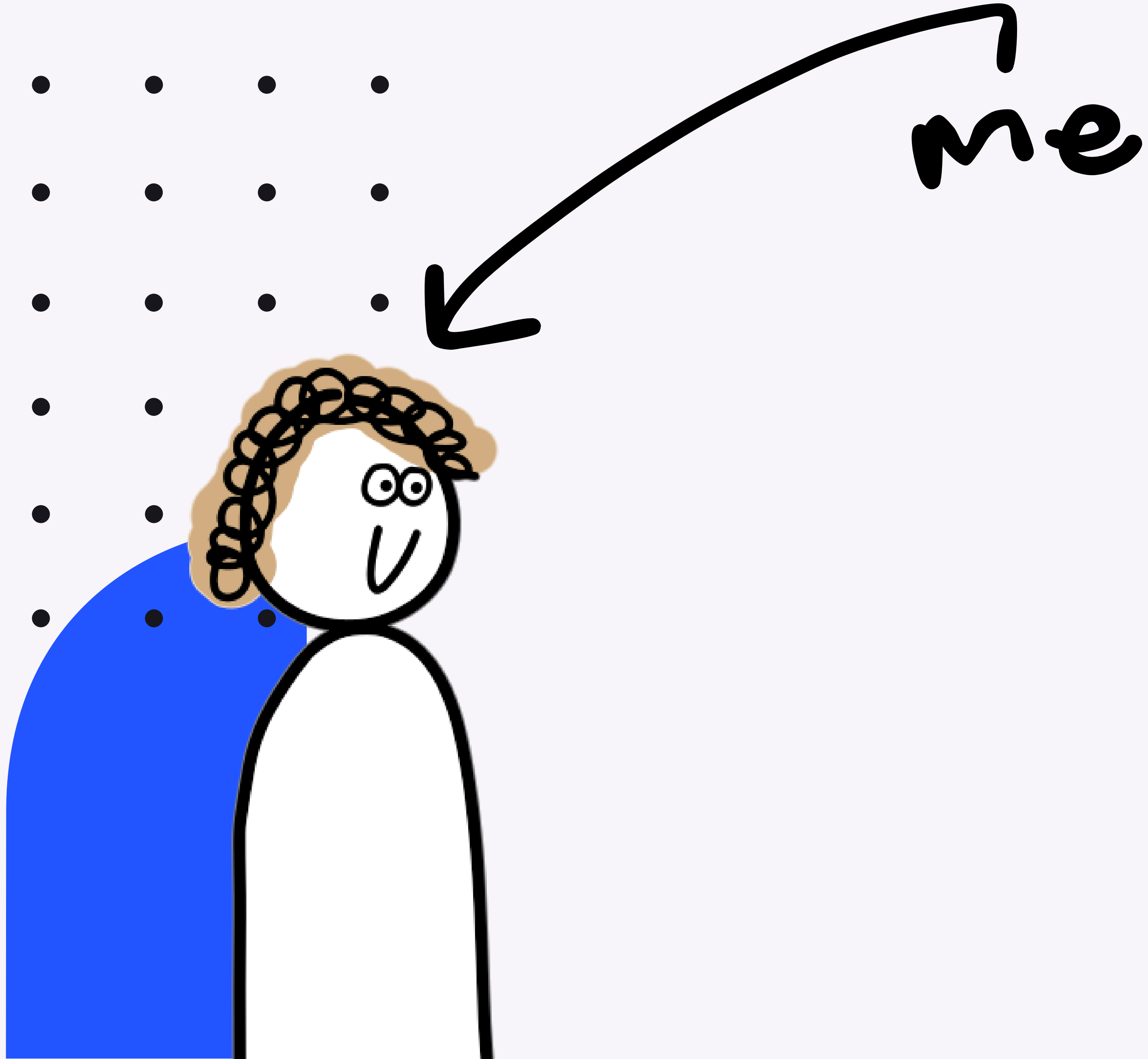
```
program: _EOL* (command _EOL+)*
command?
command: print | ask | echo |
error
print: _PRINT (text)?
ask: _ASK (text)?
echo: _ECHO (text)?
```

X18 X47

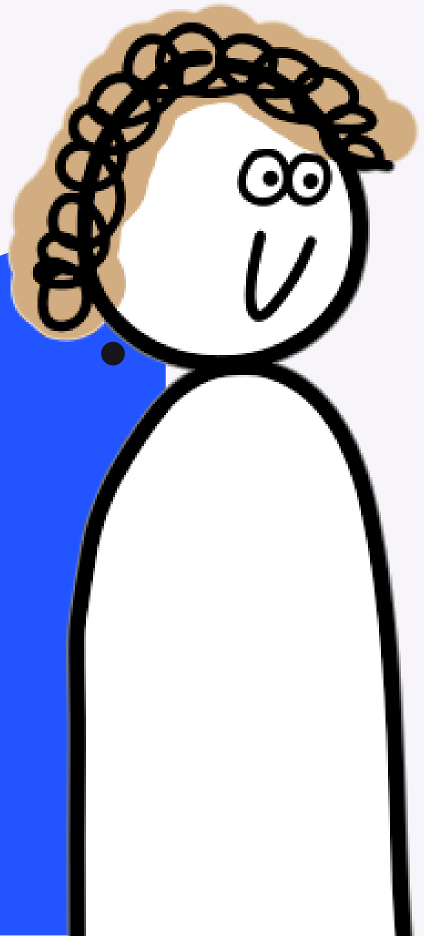
```
@top Program { eol* (Command
eol+)* Command? }
Command {
  Print | Ask | Echo | Play |
Turtle | ErrorInvalid
}
Print { print+ Text+ }
Play { play+ Text+ }
Ask { ask+ Text+ }
Echo { echo+ Text* }
```

Parser generators are not made for gradual multilingual languages!

Open Source



Open Source



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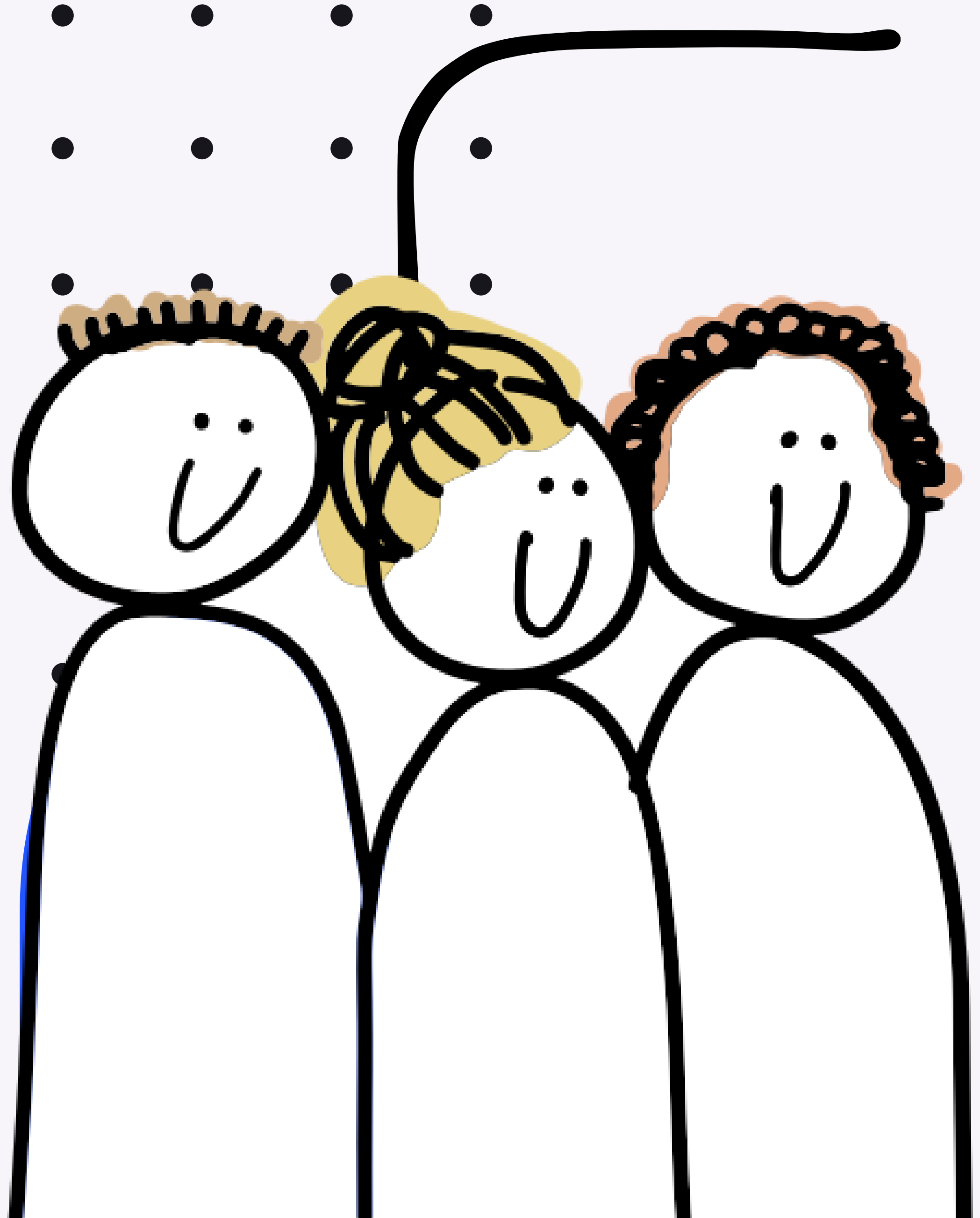
Come join us!



github.com/hedyorg/hedy

hedy.org