

How to read code?



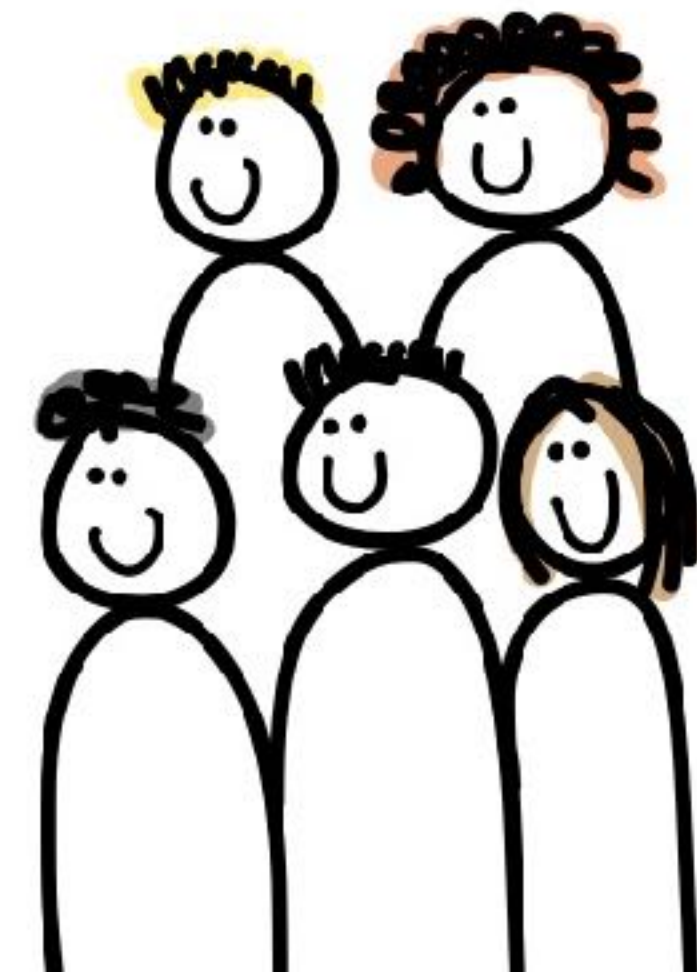
@Felienne

How to read code?



2013

We'd love to learn
programming



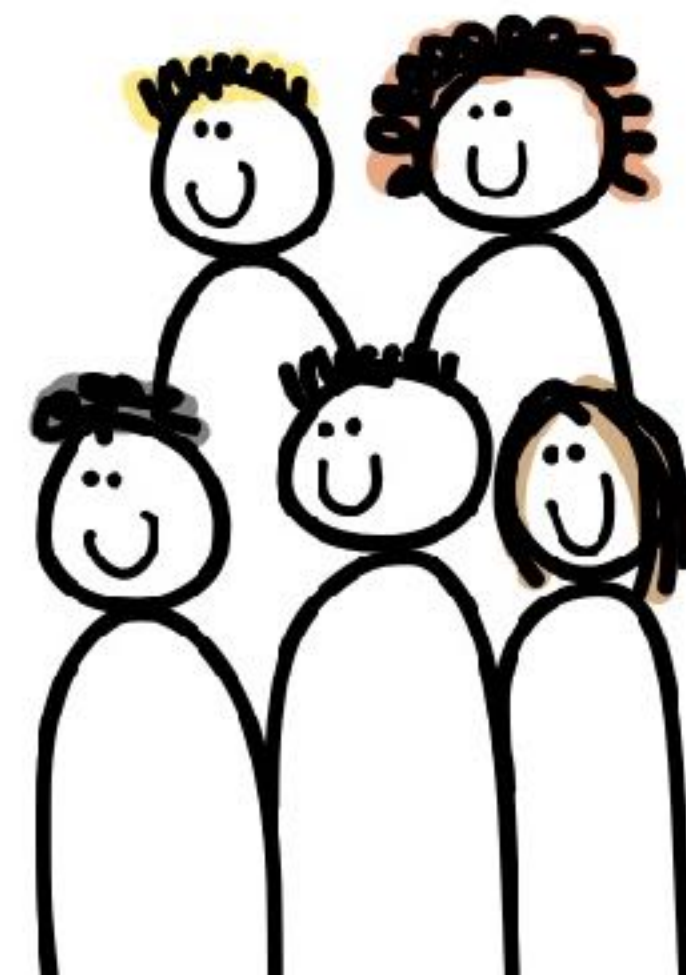
I'll teach you

/



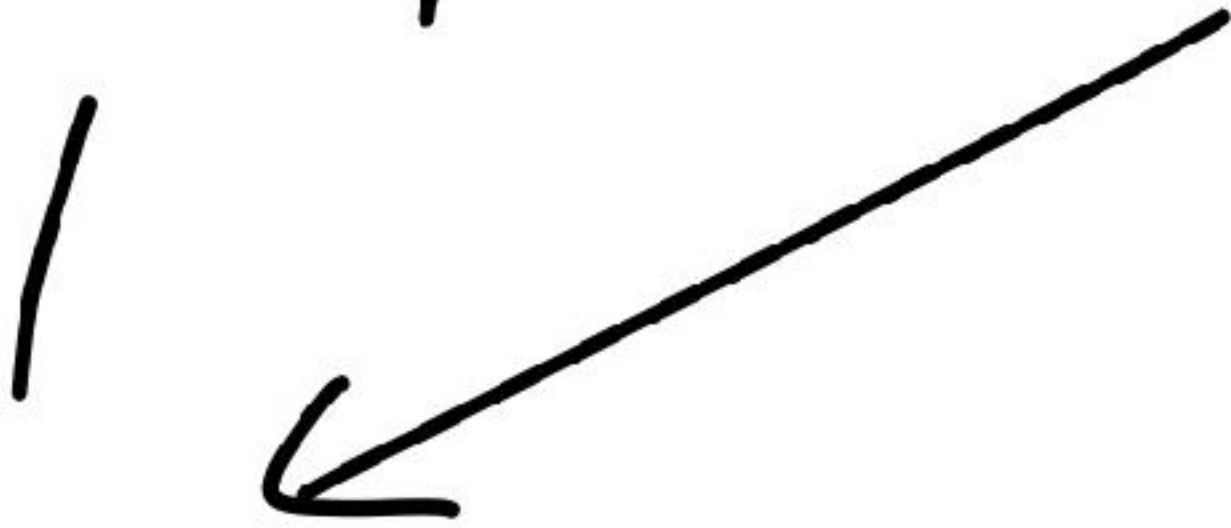
We'd love to learn
programming

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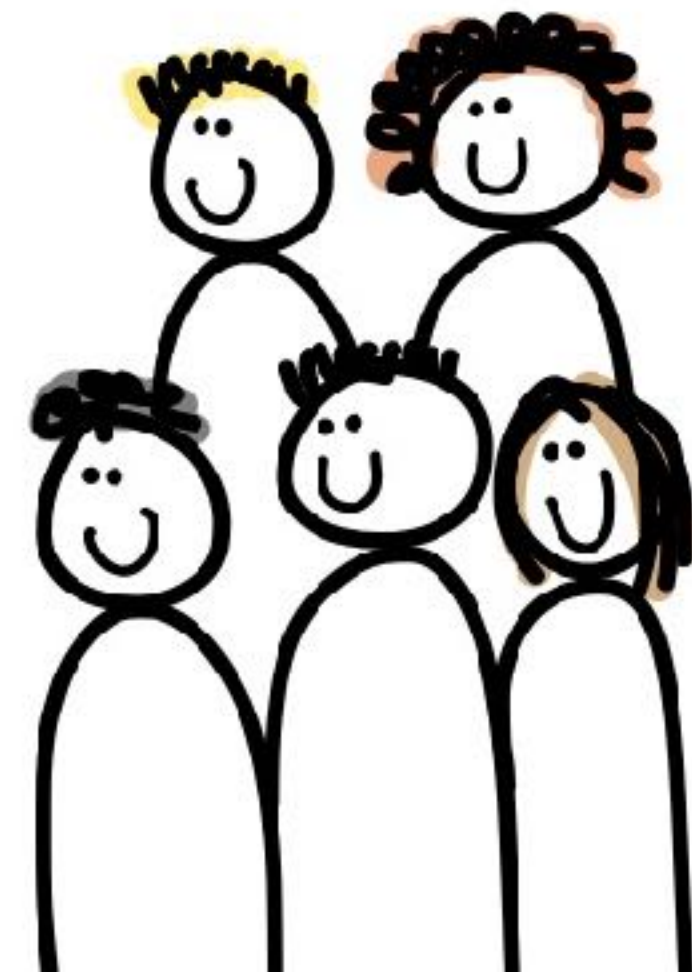


I'll teach you

Doesn't know anything
about teaching



2013

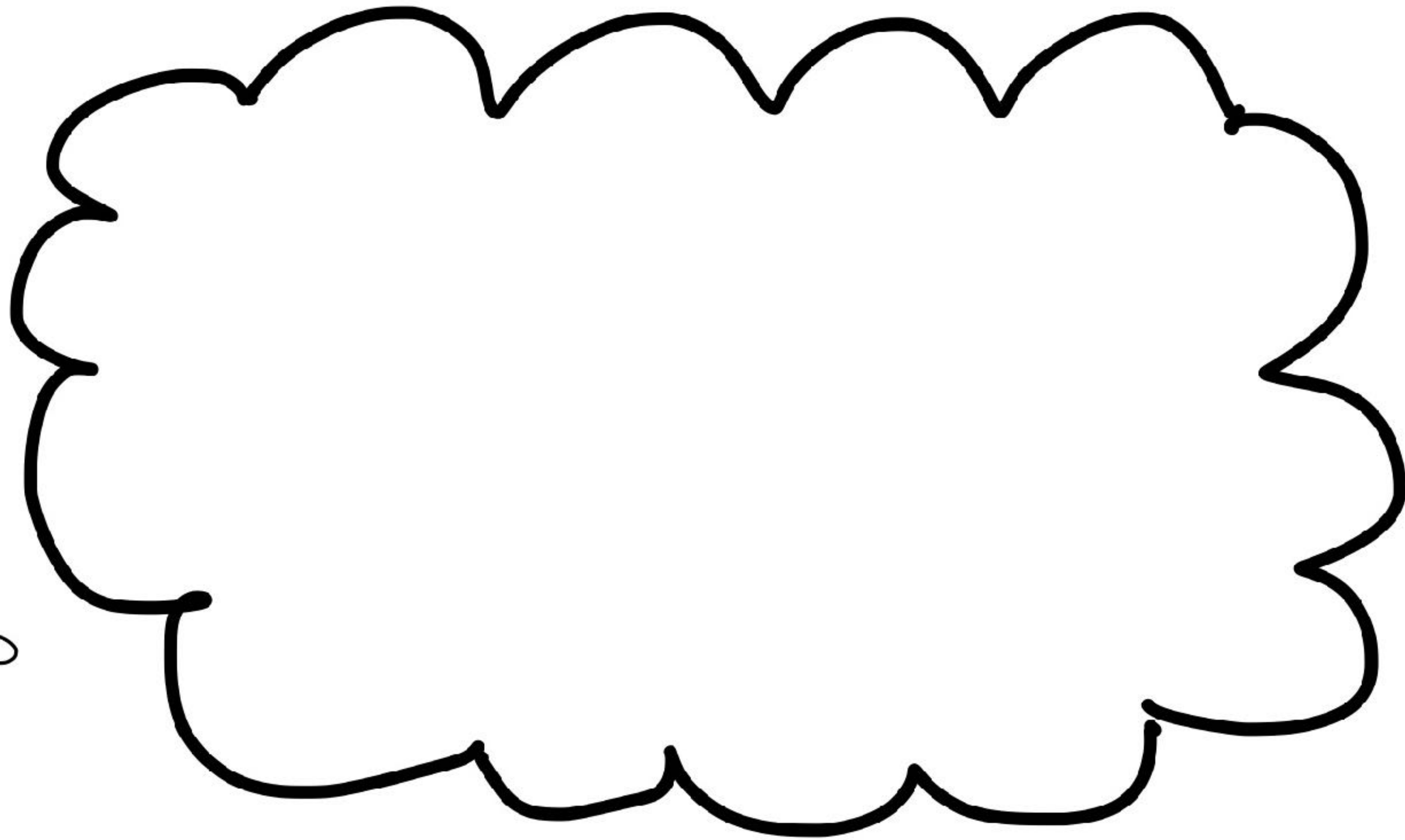




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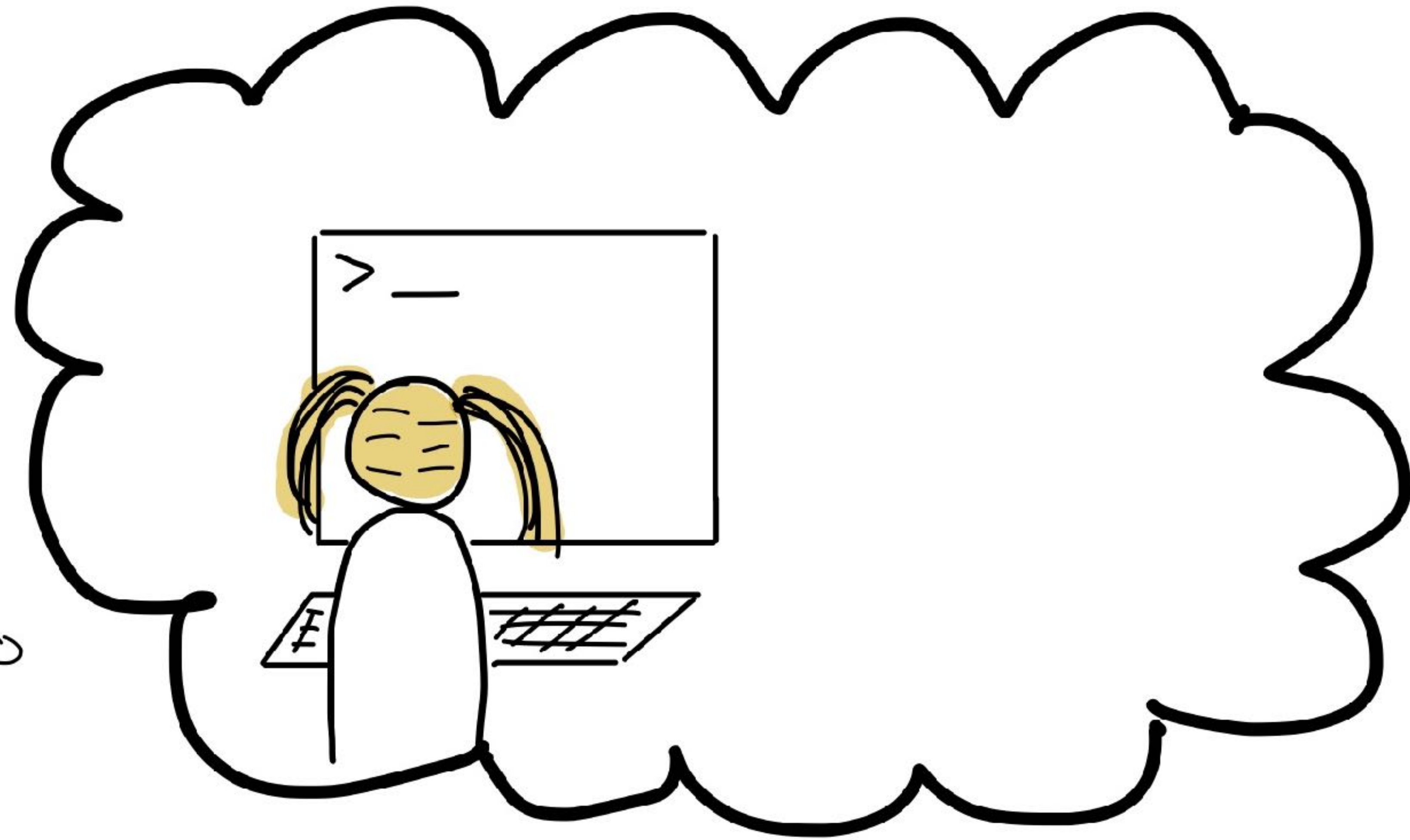




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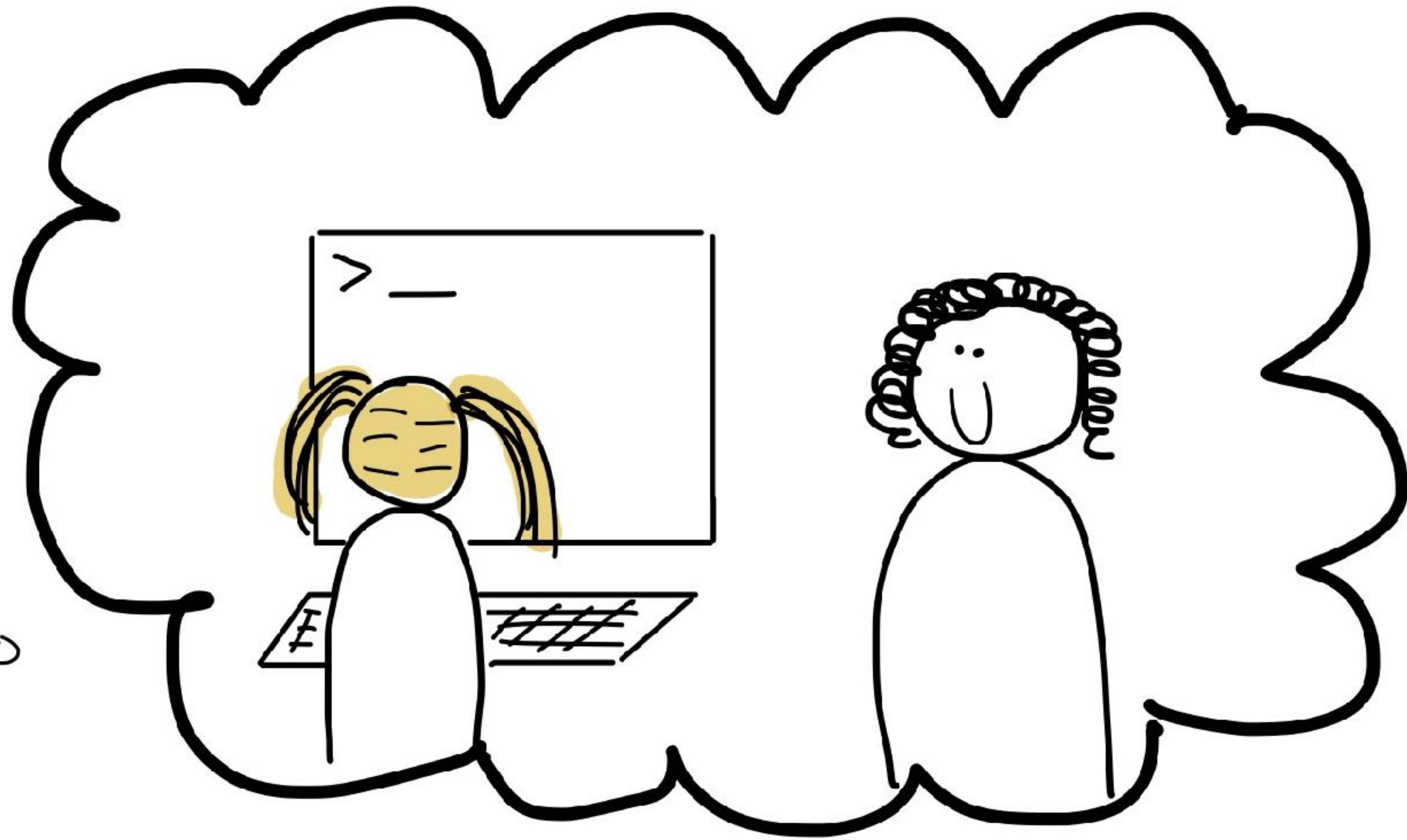




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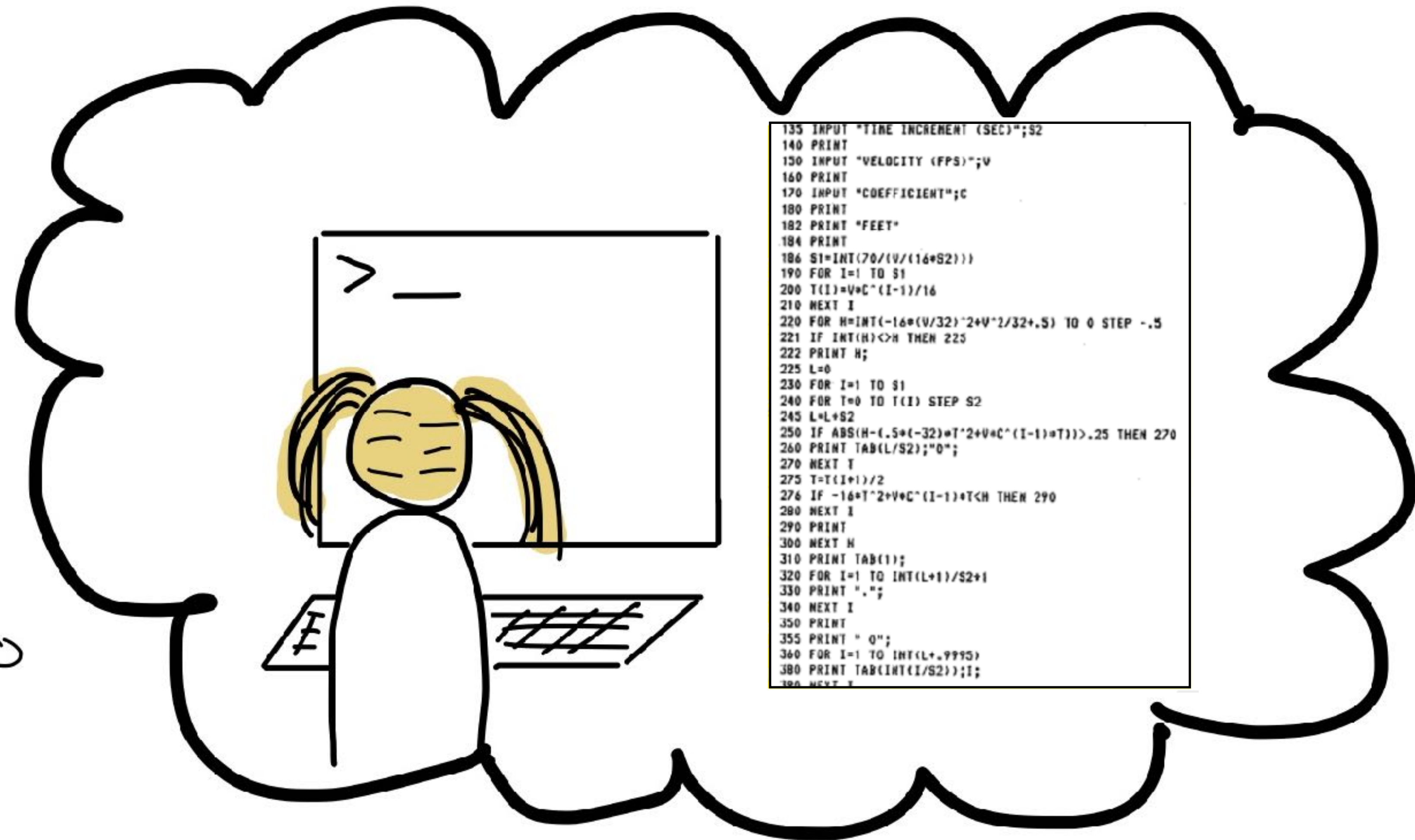






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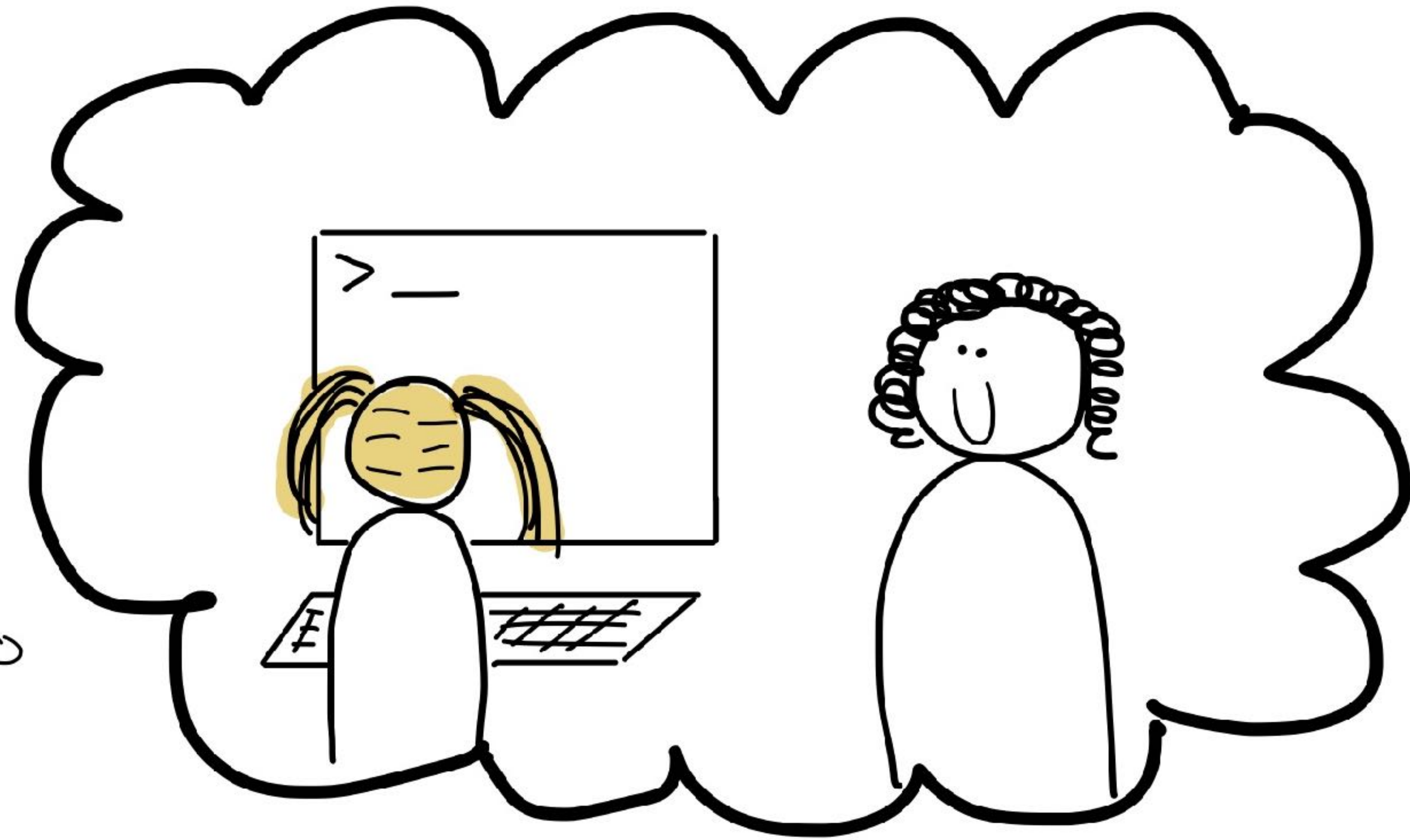
```
135 INPUT "TIME INCREMENT (SEC)";S2
140 PRINT
150 INPUT "VELOCITY (FPS)";V
160 PRINT
170 INPUT "COEFFICIENT";C
180 PRINT
182 PRINT "FEET"
184 PRINT
186 S1=INT(70/(V/(16*S2)))
190 FOR I=1 TO S1
200 T(I)=V*C*(I-1)/16
210 NEXT I
220 FOR H=INT(-16*(V/32)^2+V^2/32+.5) TO 0 STEP -.5
221 IF INT(H)<>H THEN 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;
390 NEXT I
```



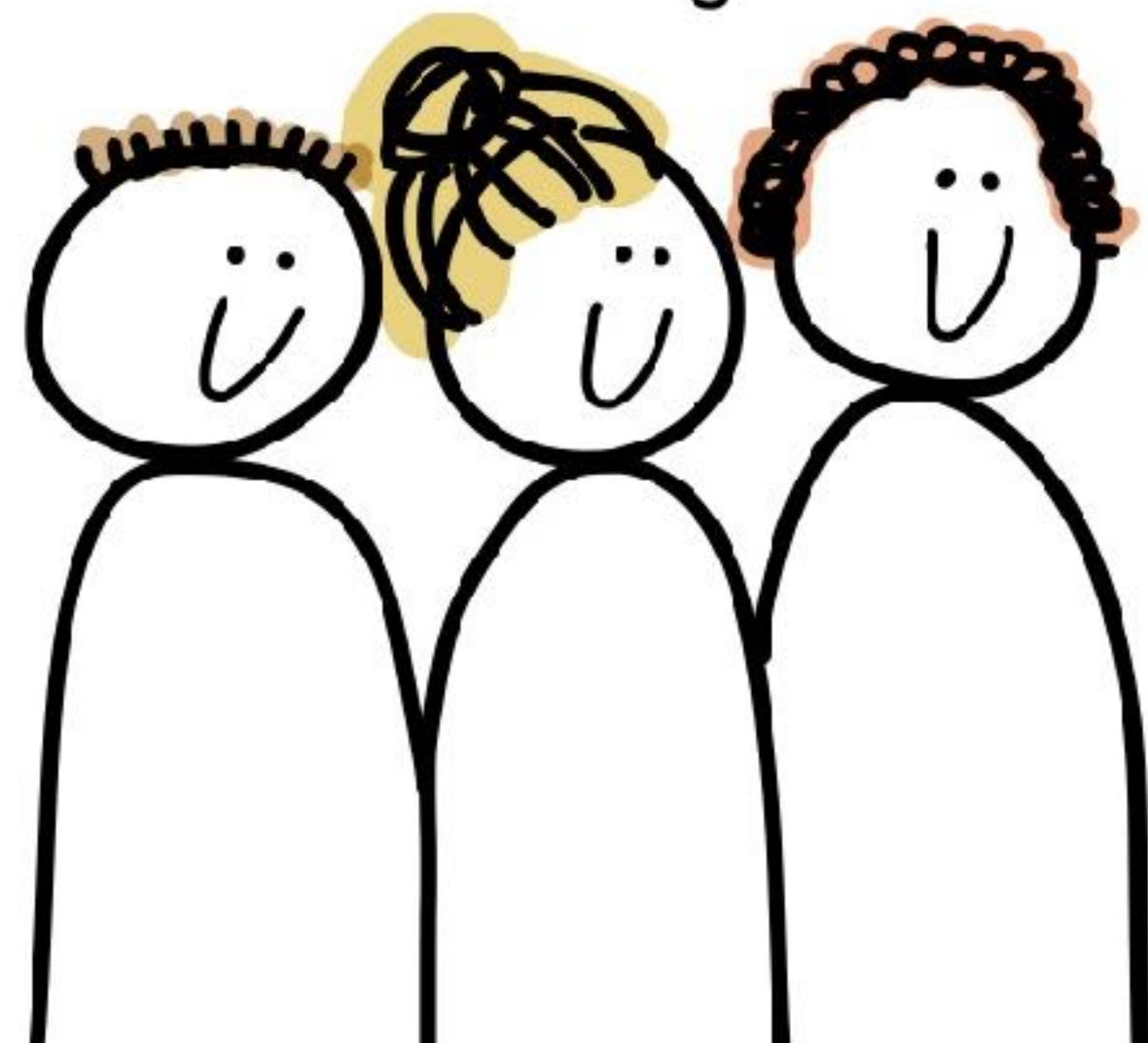

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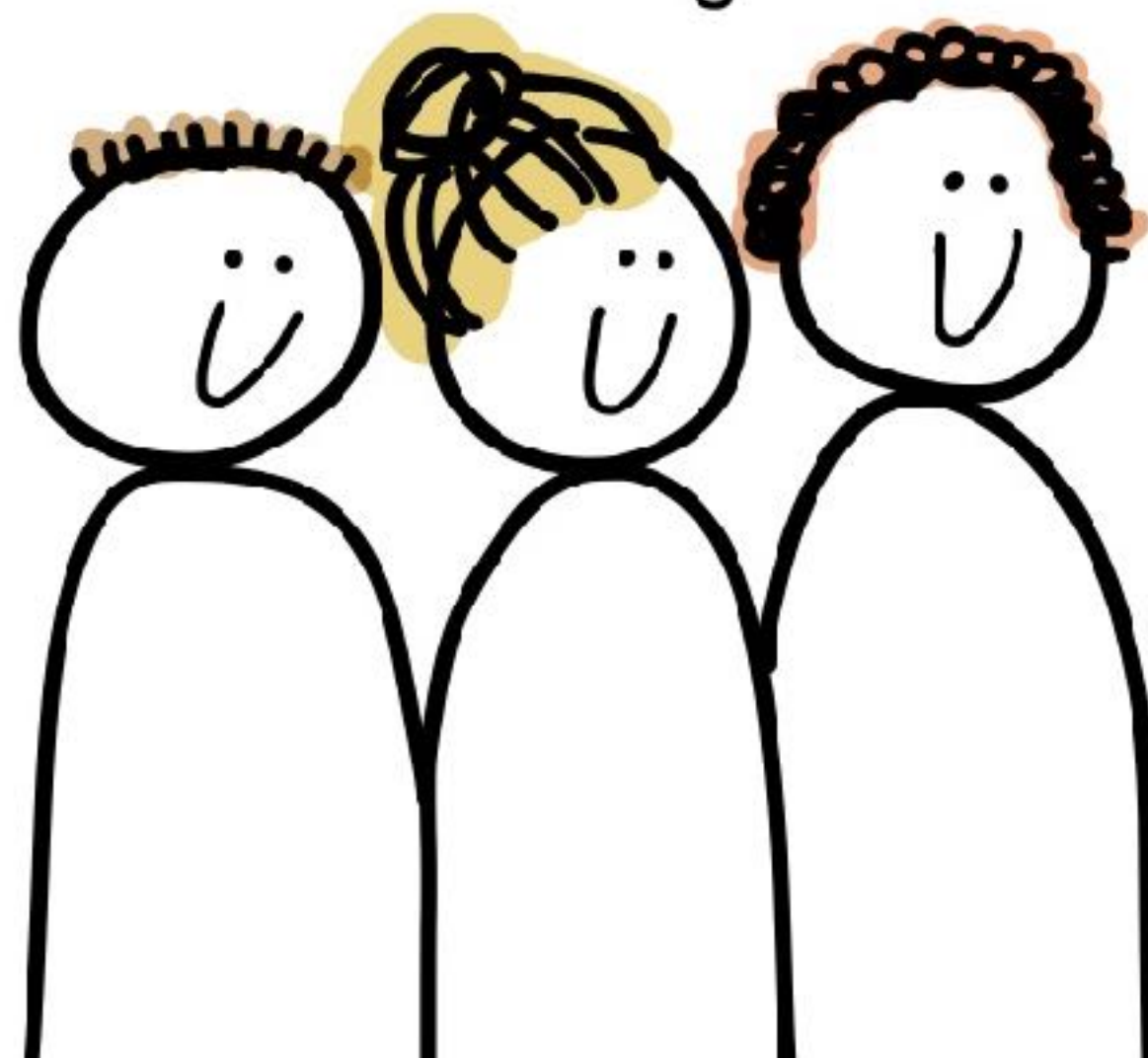
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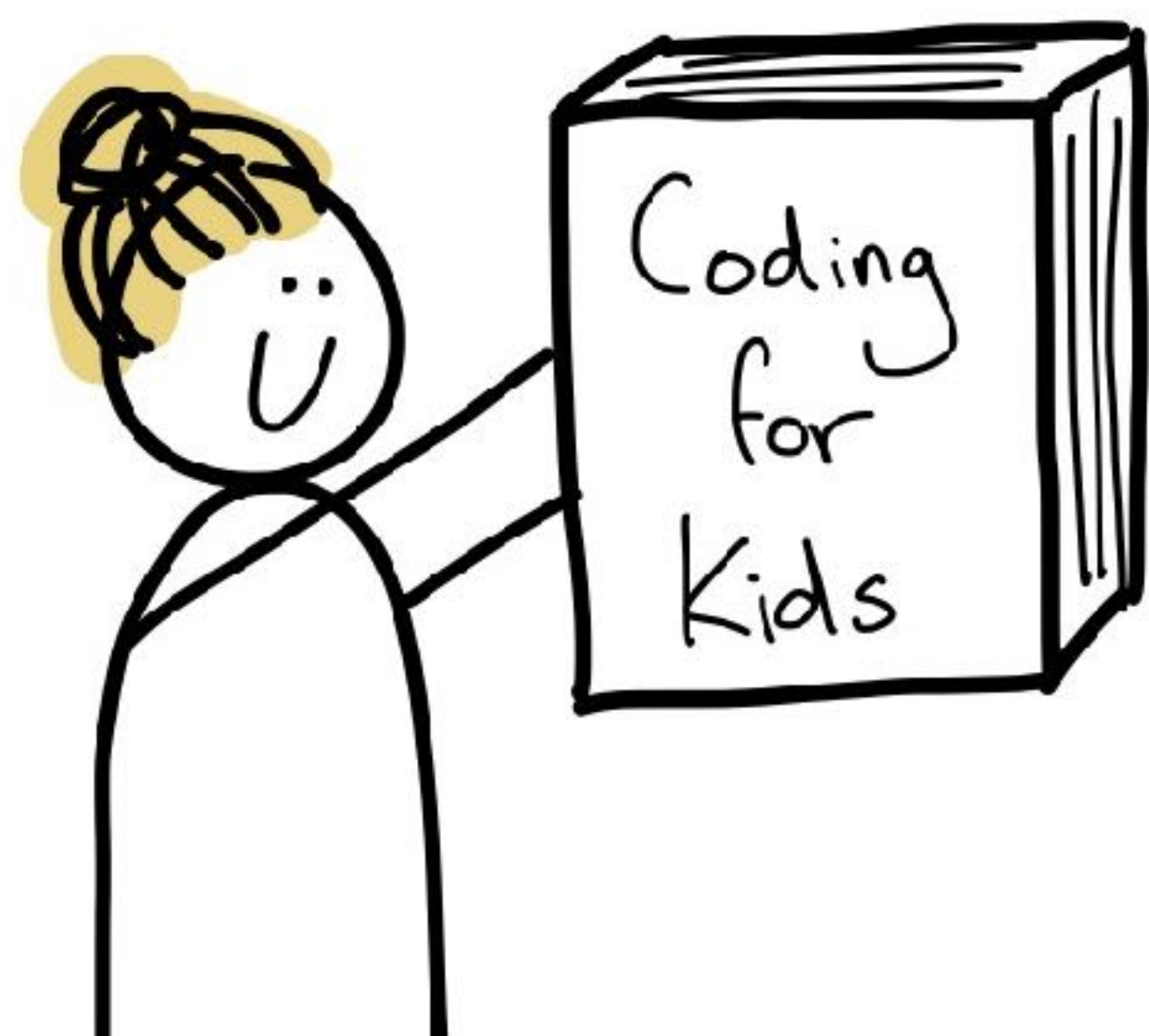




Just let
them explore!



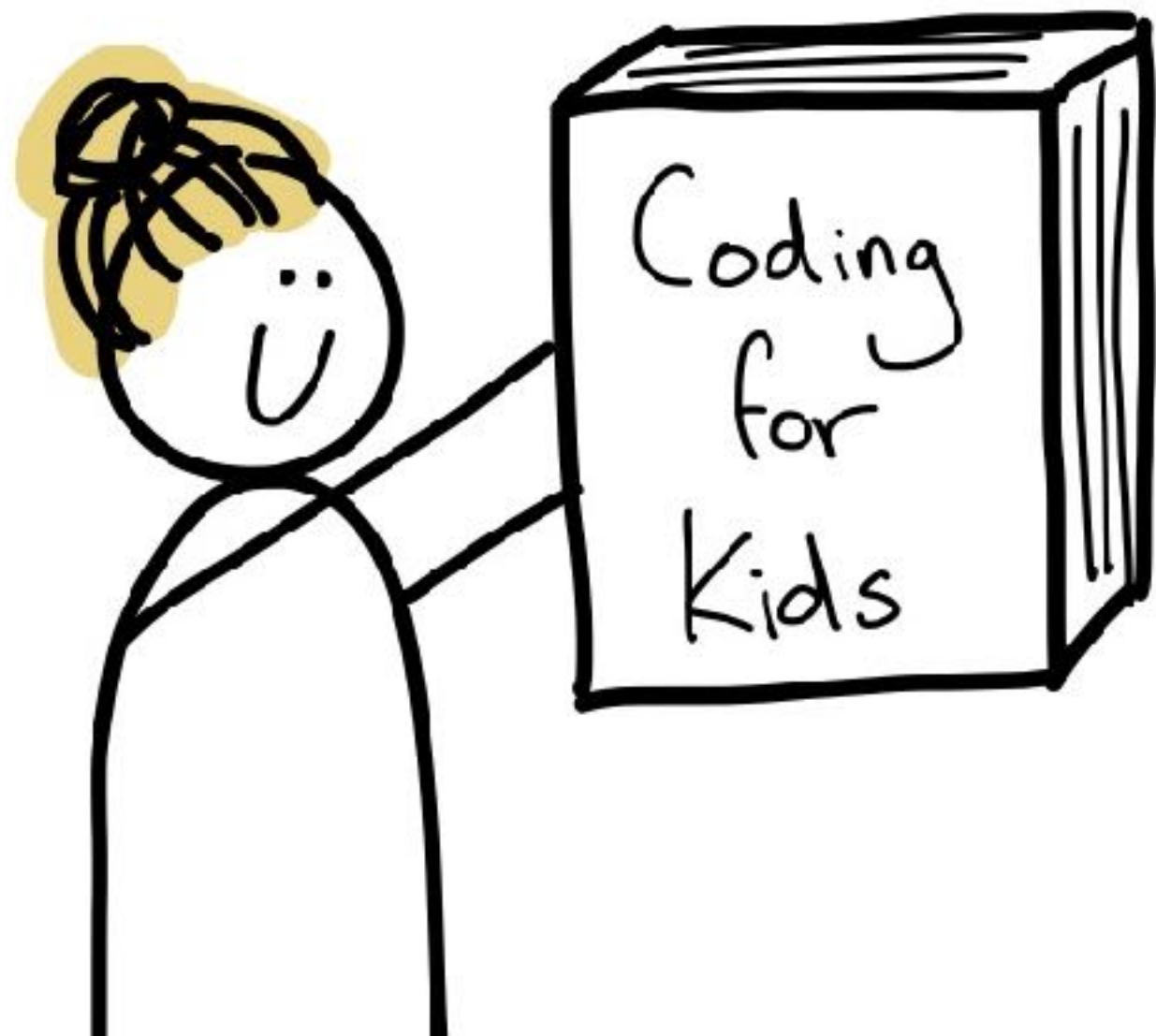




OH!
ER ZIT
EN BUG!

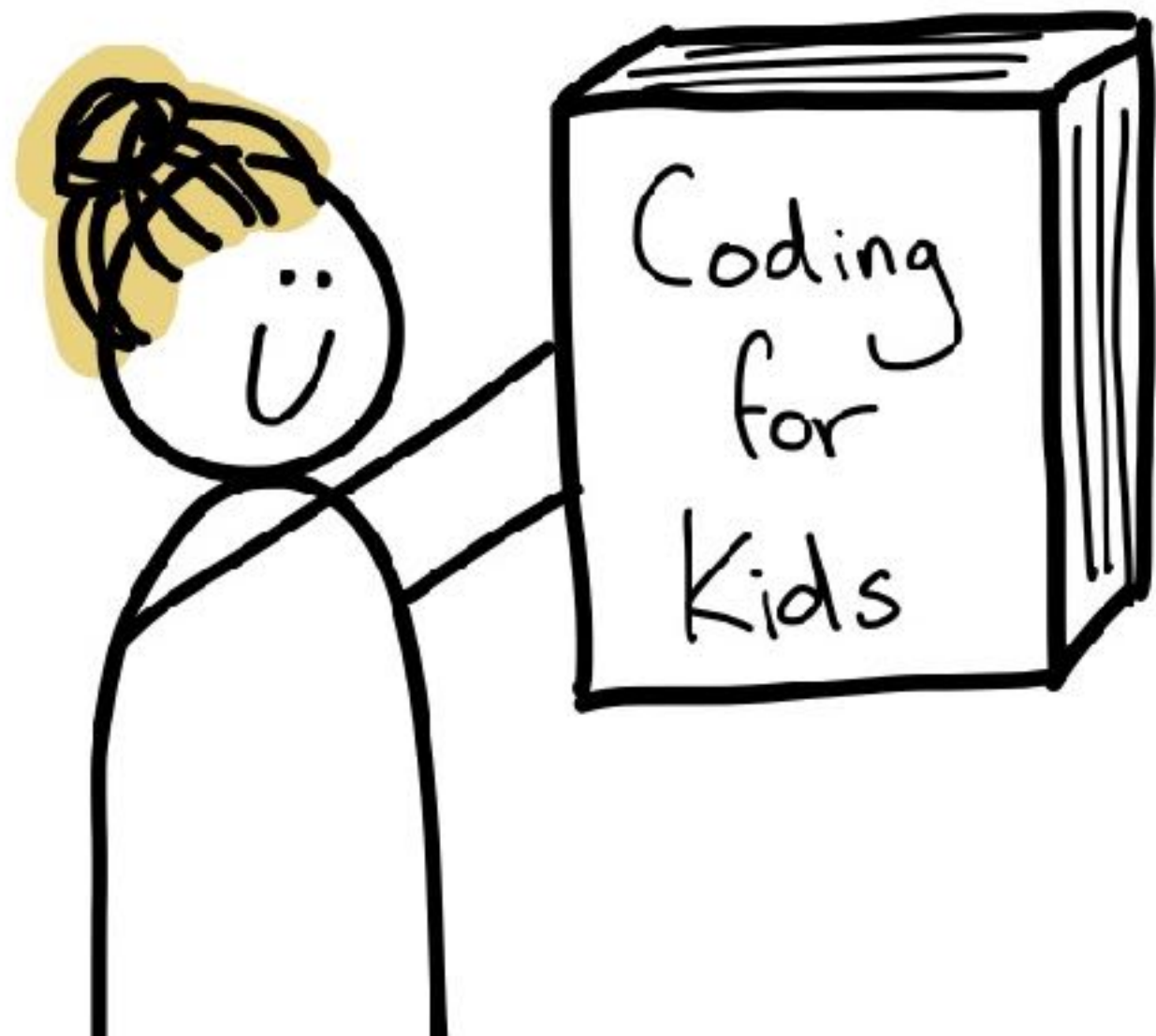
Af en toe kom je een probleem tegen als je je project start. Dit heet een bug. Dit is het leukste van programmeren: een fout ontdekken in iets dat je gemaakt hebt, en die dan oplossen.

"The best part of programming is finding mistakes"



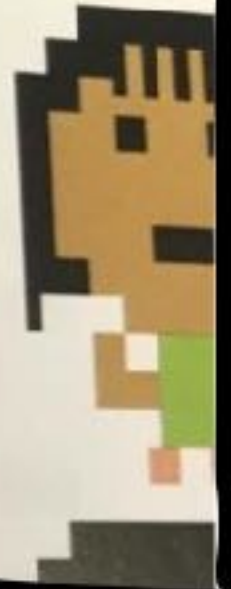
Reken erop dat je veel fouten zult maken en veel van dit soort foutmeldingen te zien krijgt. Denk erom, programmeurs leren alleen maar meer door het maken van fouten en door uit te zoeken waar de fout zit. Zelfs de beste programmeurs ter wereld maken fouten, zoals het vergeten van een " in hun code.

"Programmers only learn from making mistakes"

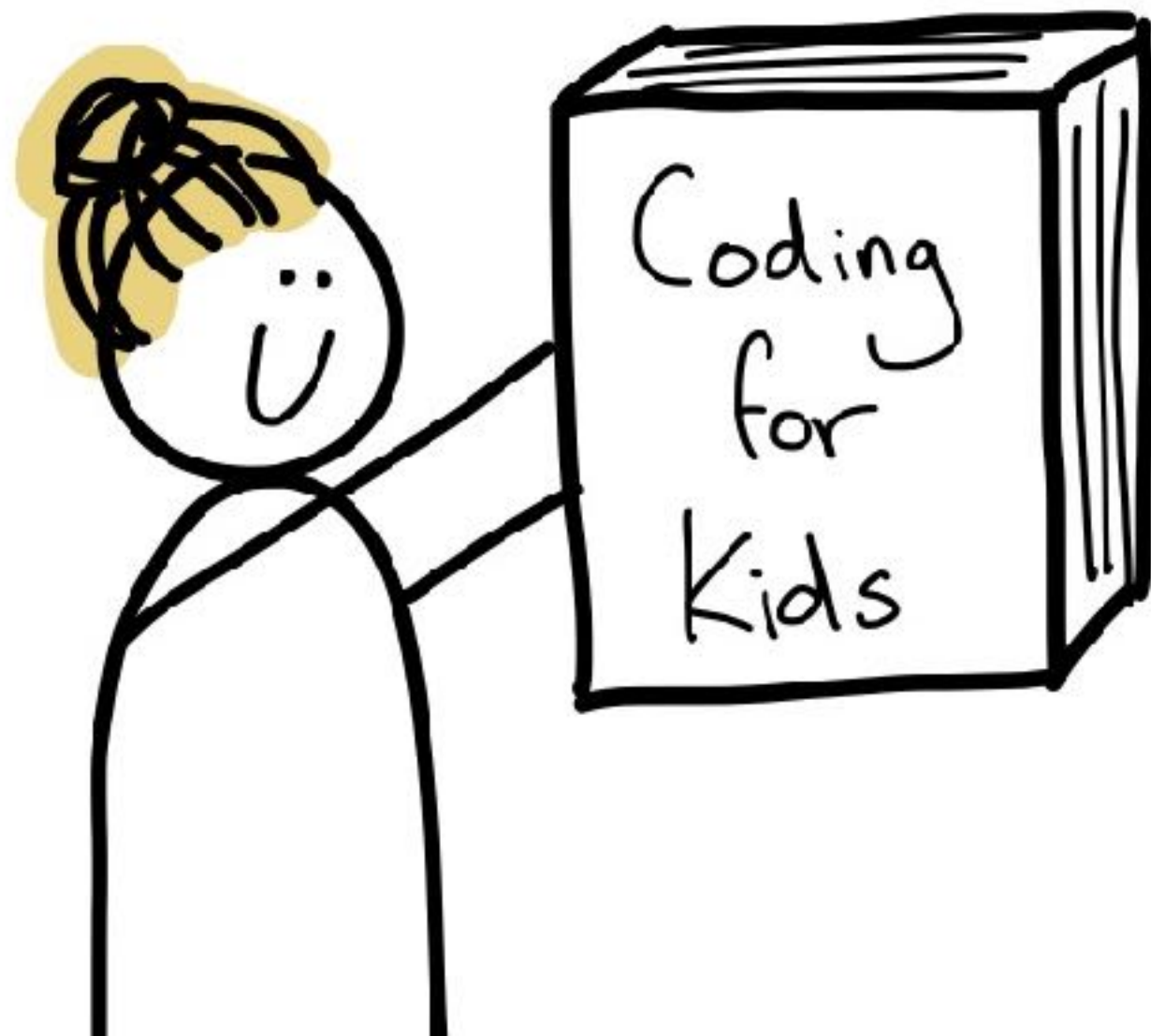


Heb plezier!

Coderen lijkt veel op puzzels oplossen. Het is een uitdaging, vaak lukt het niet, en soms is het frustrerend. Maar je beleeft ook een doorbraak als je een probleem weet op te lossen en het geeft een kick als je codering werkt. Werk op je eigen niveau: als een

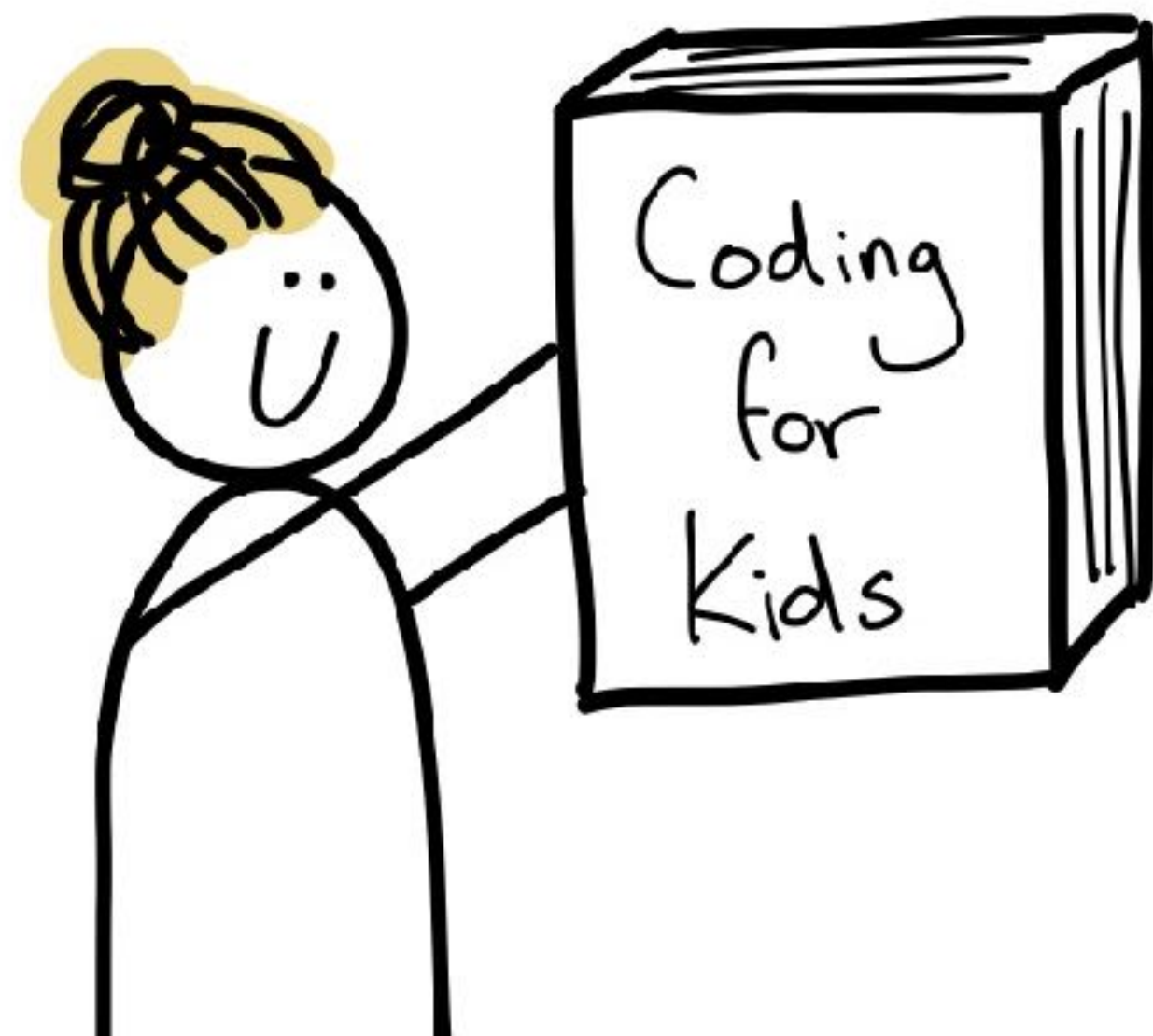


"You will fail often,
and it will be frustrating"



belangstelling. Wees nooit bang om te rotzooien, prutsen en experimenteren en houd je niet aan de regels, maar blijf nieuwsgierig. En het belangrijkste: het is leuk!

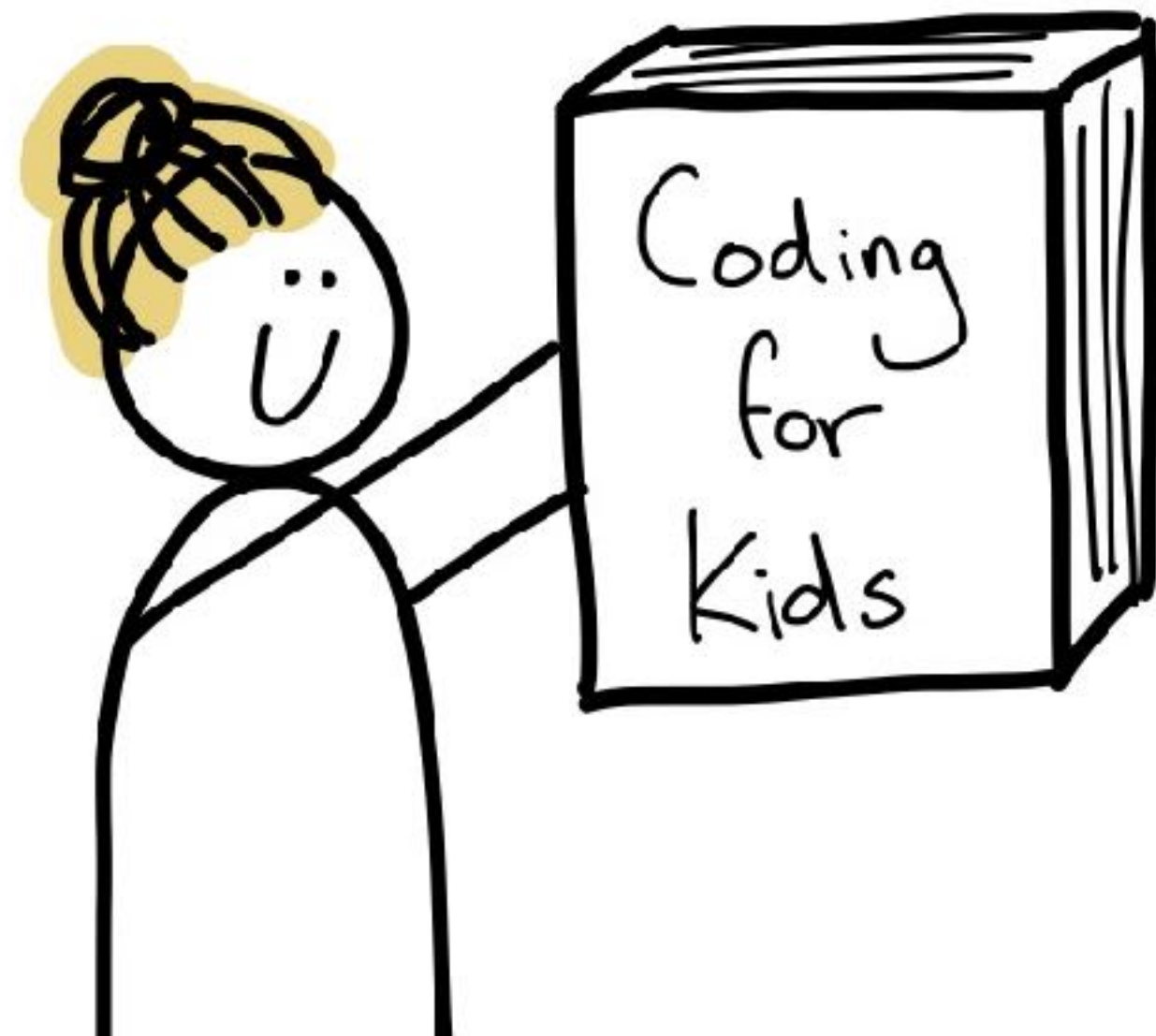
"Never be afraid to mess around and experiment"



Computer Coding for Kids

belangstelling. Wees nooit bang om te rotzooien, prutsen en experimenteren en houd je niet aan de regels, maar blijf nieuwsgierig. En het belangrijkste: het is leuk!

"Break the rules"



Computer Coding for Kids

The first character, "F", is in position 0

3 "Slicing"
Two indexes can be used to pull out a part of the string or "slice" it. The letter in the last position isn't included.

```
>>> a[1:7]
```

Colon defines the range of characters

A slice from index 1 to index 6 of variable "a"

4 From the start or the end
If you leave off the start or end index, Python will automatically use the first or the last character of the string.

```
>>> a[:3]
```

Starts at index 0

'FLA'

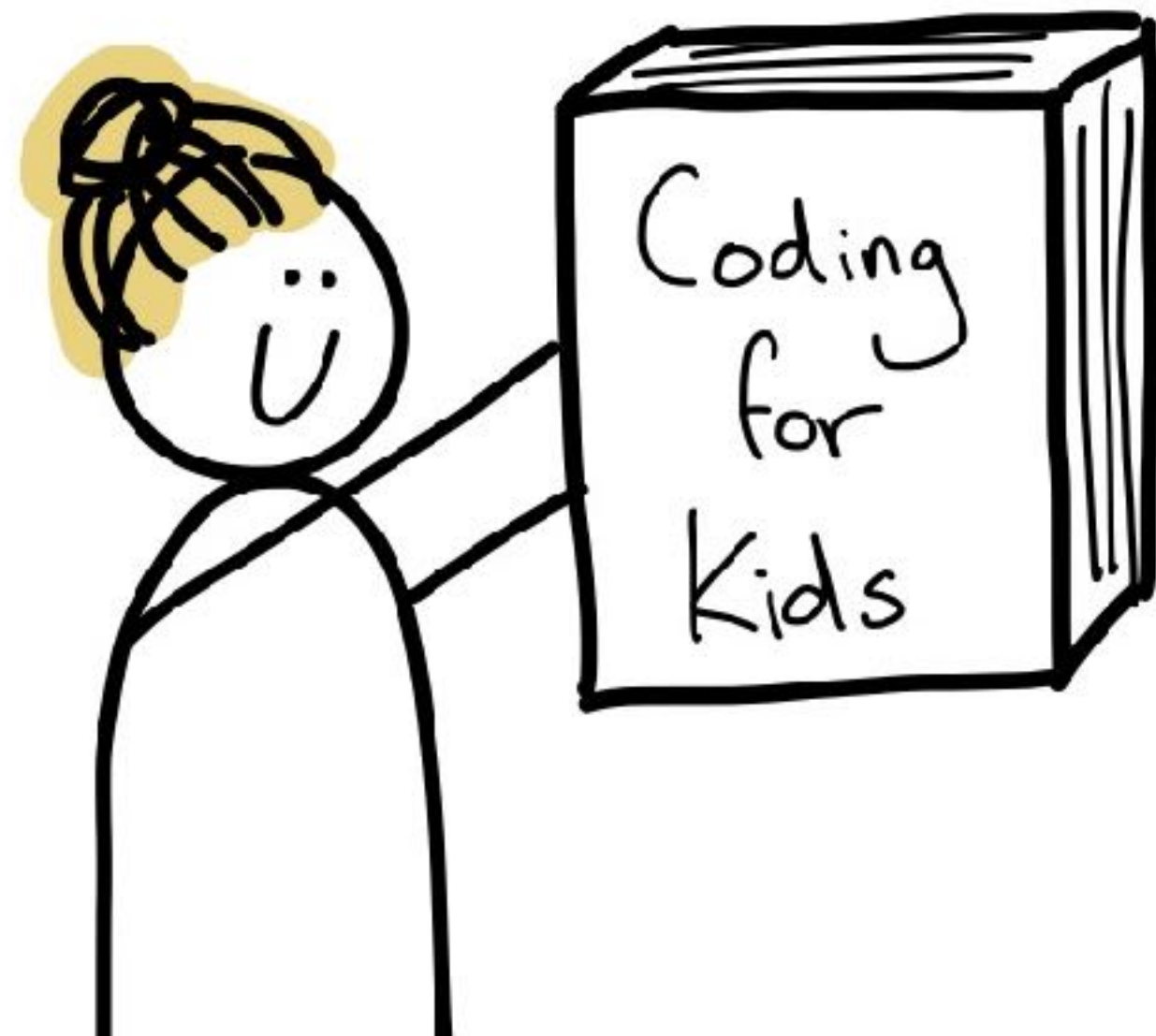
```
>>> a[3:]
```

Ends at index 7

'MINGO'

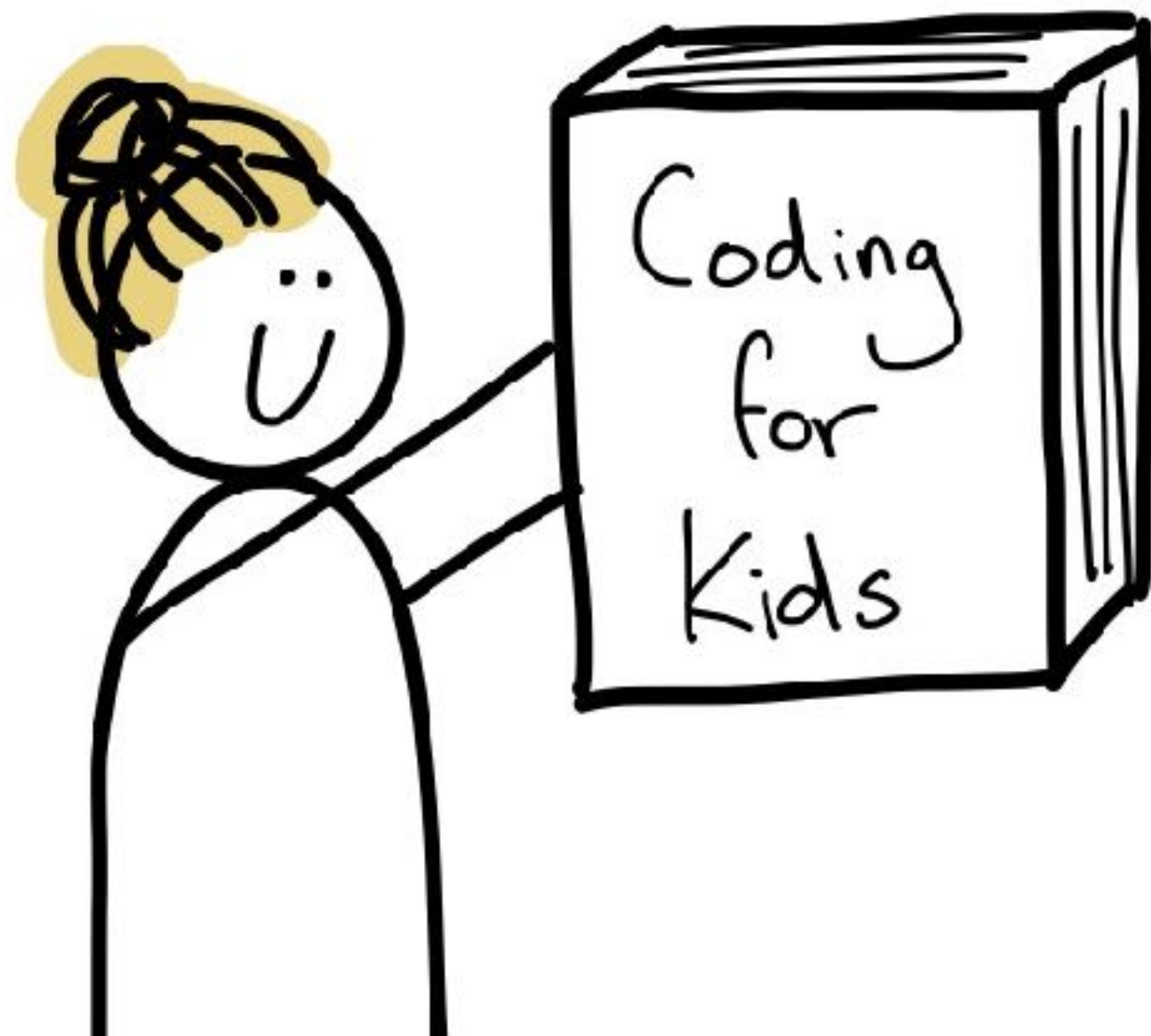


"Break the rules"

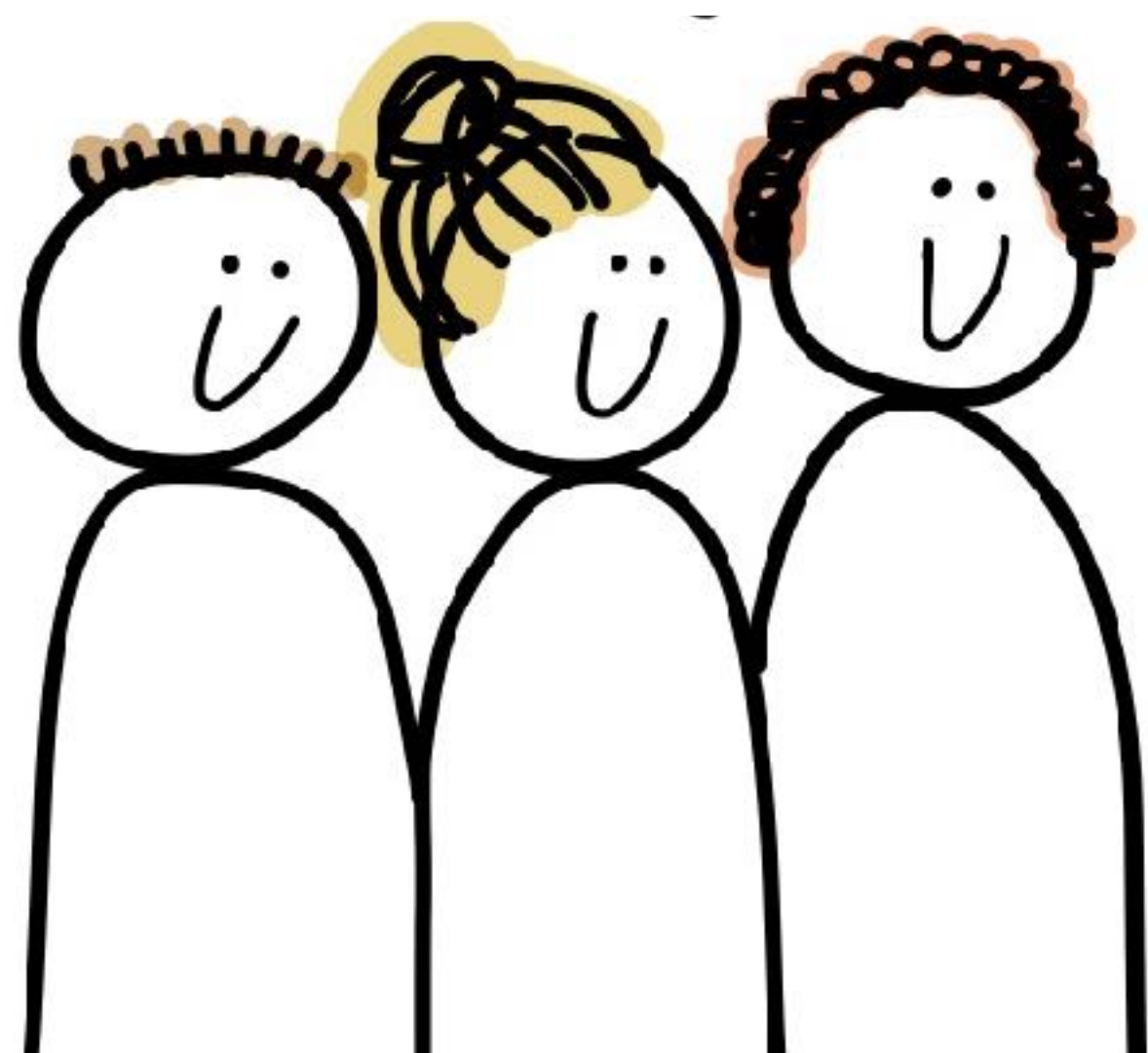


belangstelling. Wees nooit bang om te rotzooien, prutsen en experimenteren en houd je niet aan de regels, maar blijf nieuwsgierig. En het belangrijkste: het is leuk!

"And most importantly:
it's fun"



Computer Coding for Kids

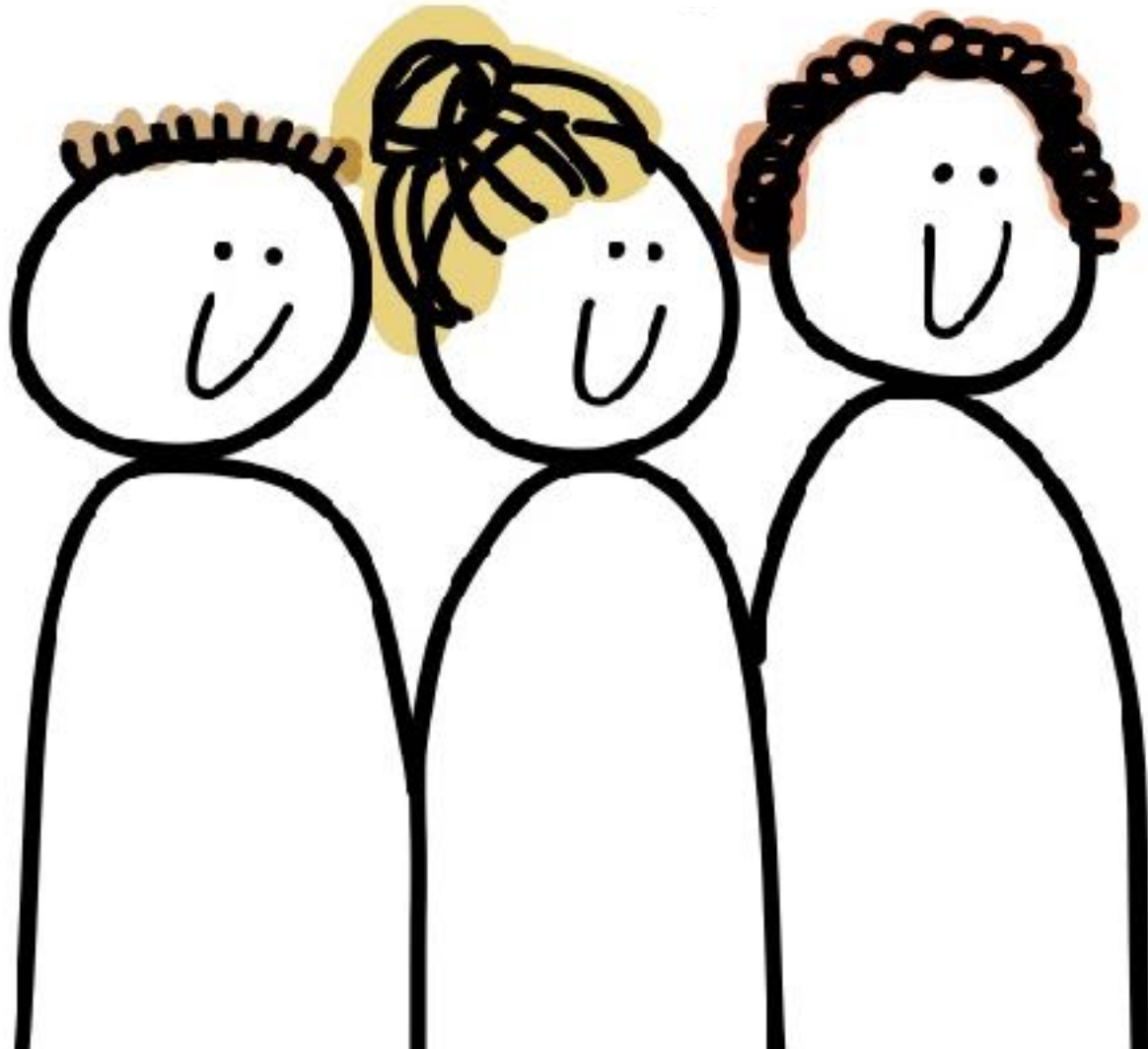
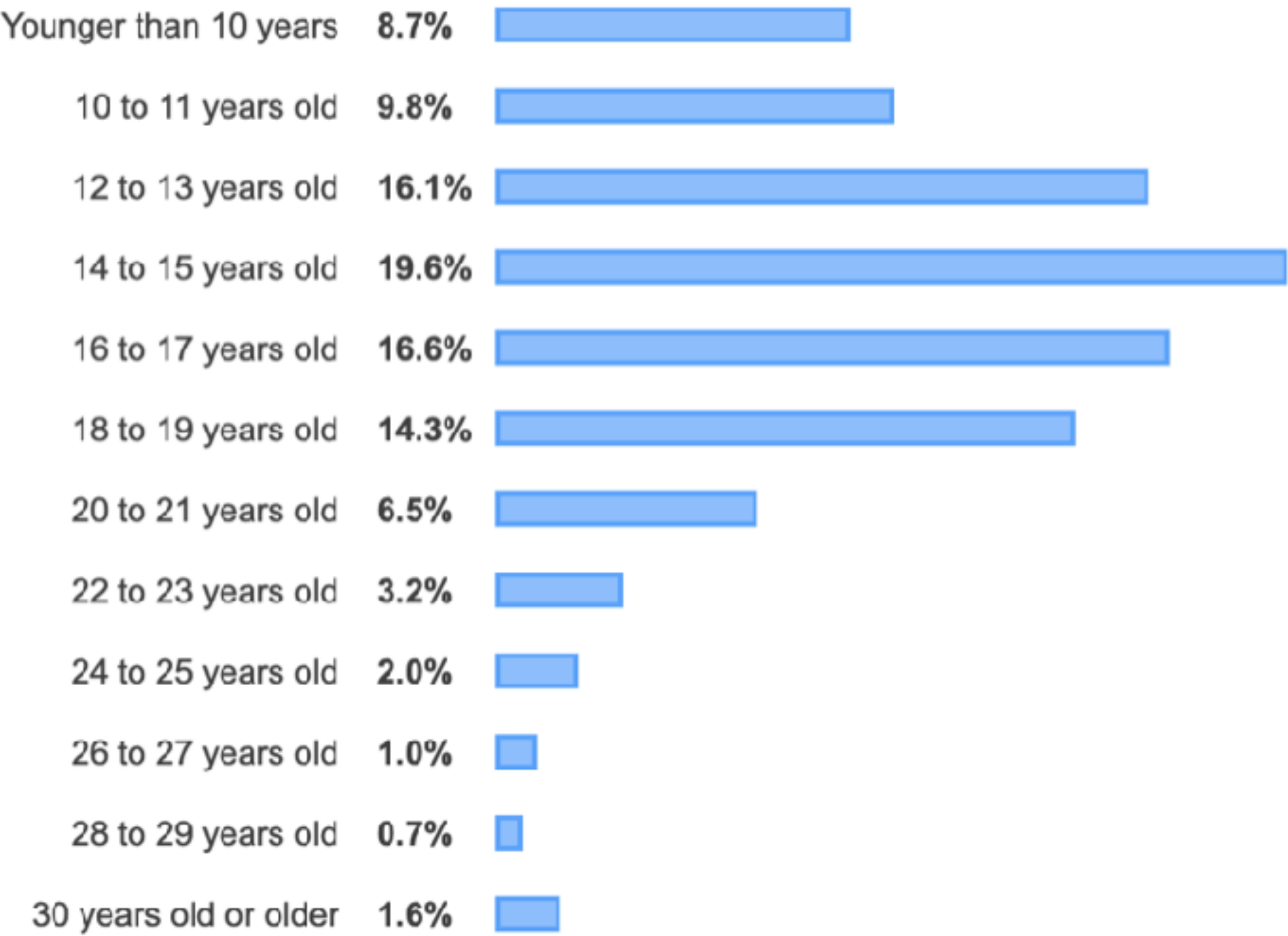


Writing That First Line of Code

Overall

★ By Country

By Gender



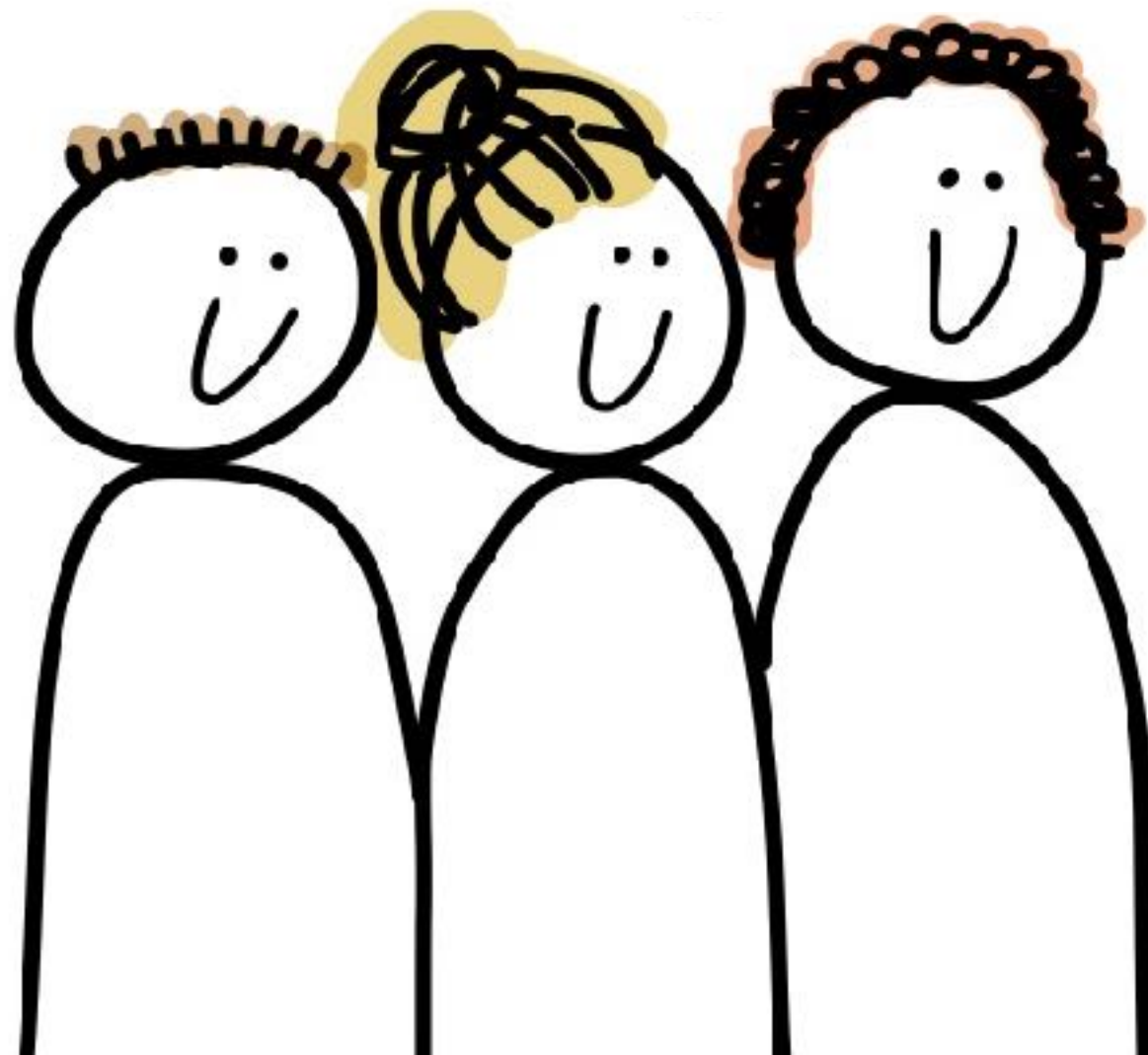
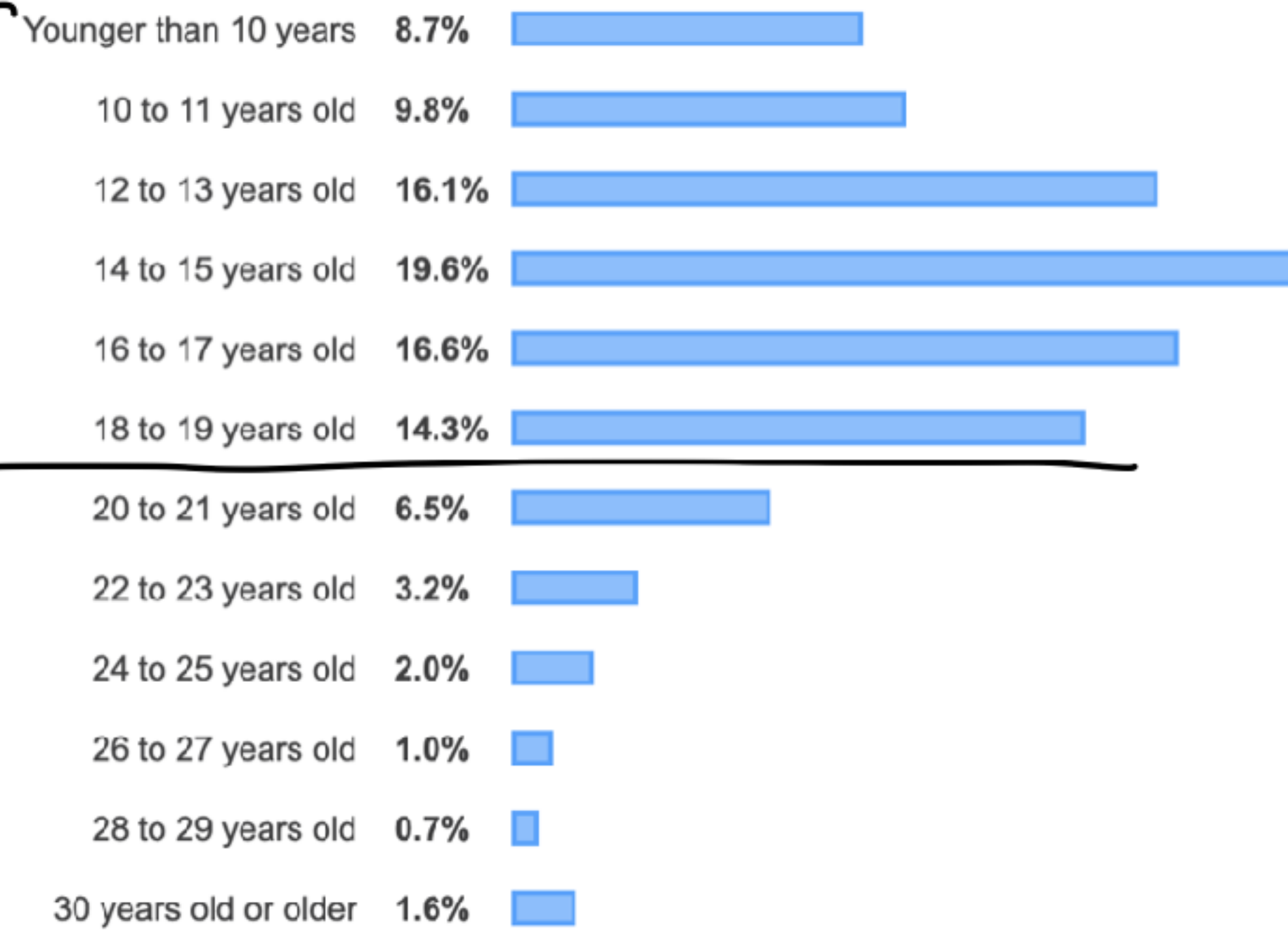
85%

Writing That First Line of Code

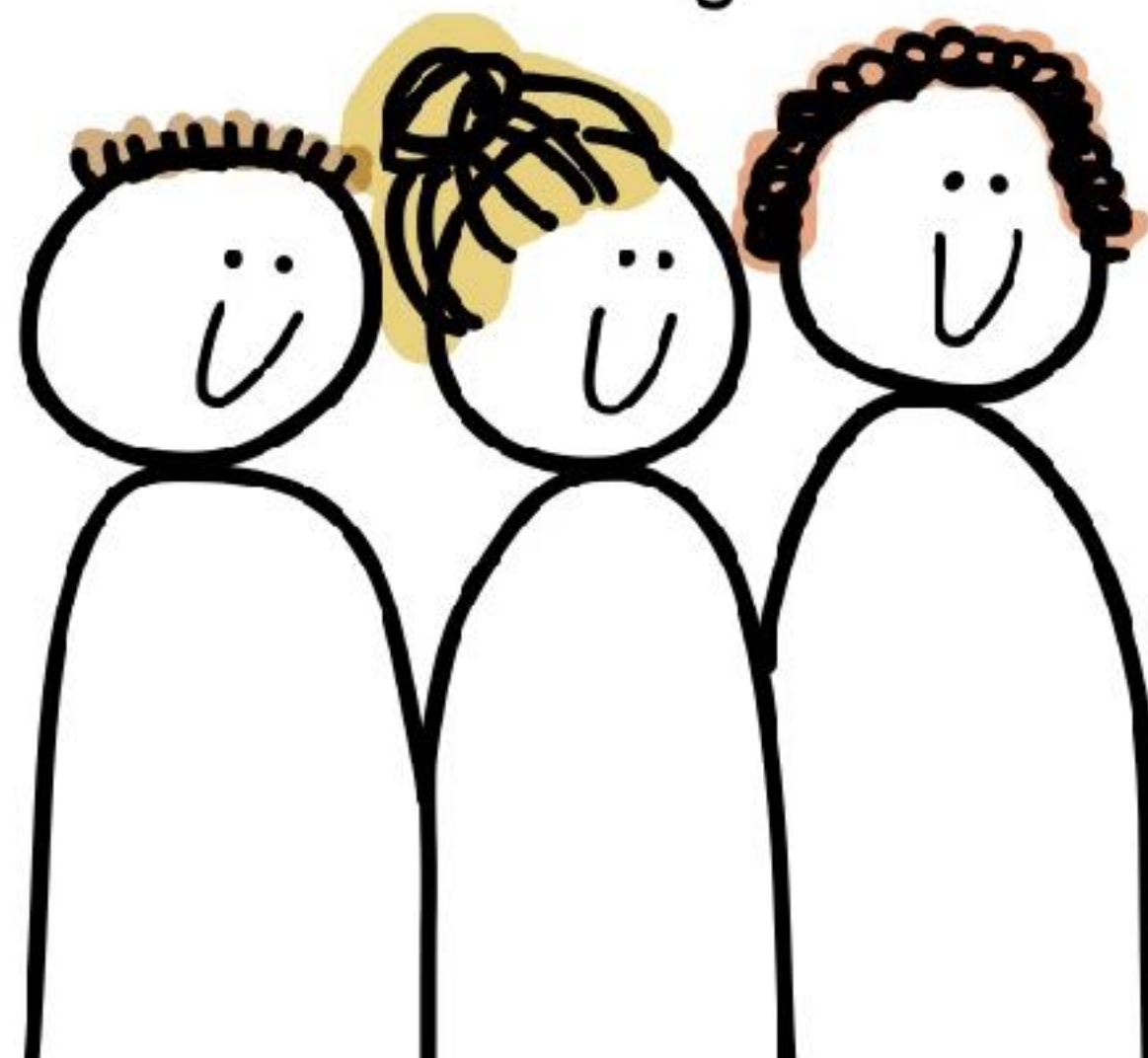
Overall

★ By Country

By Gender



Just let
them explore!





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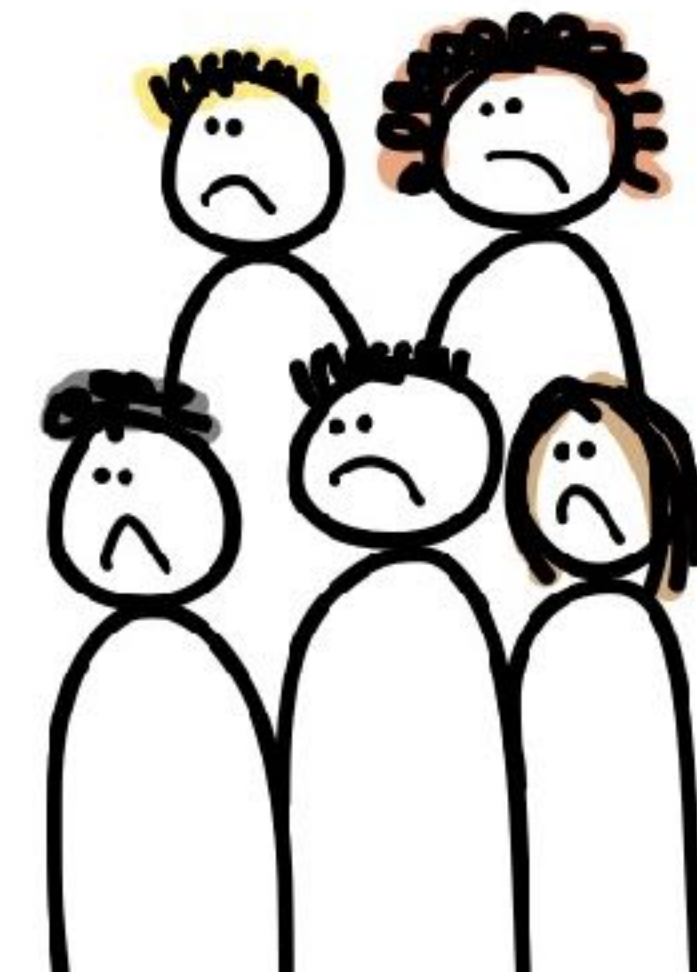
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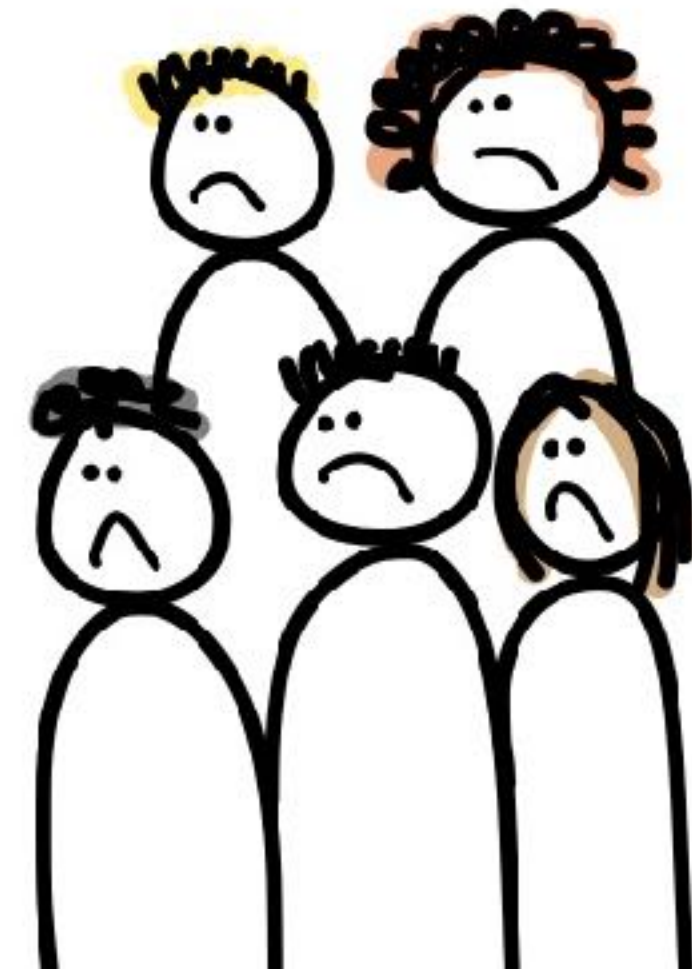


Just let
them explore!

This is hard!

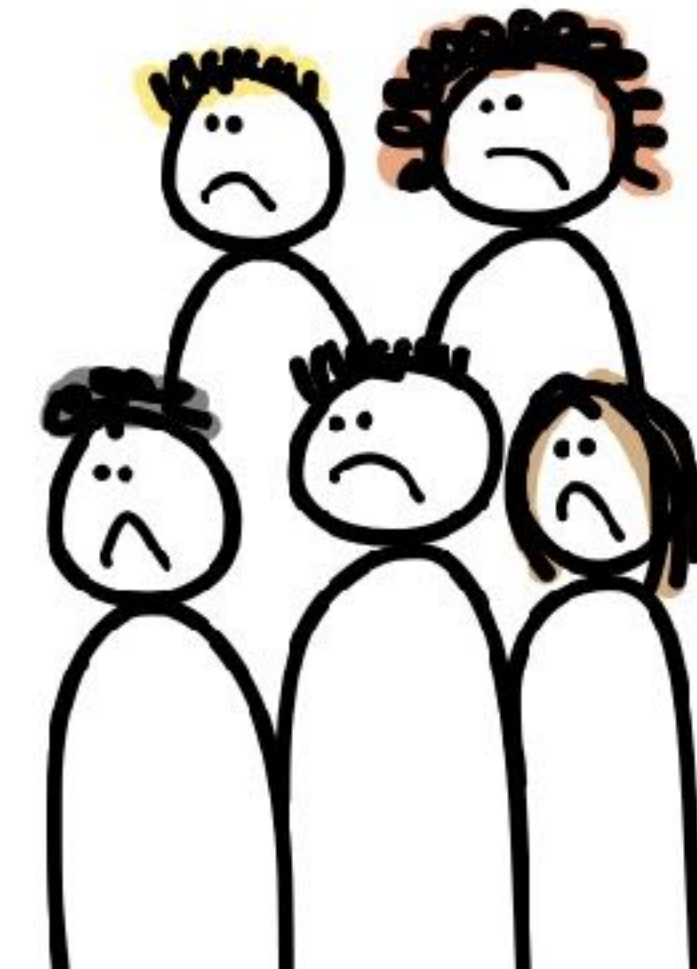


This is hard!



Skill progression
demonstrated by
users in Scratch
Scaffidi & Chambers

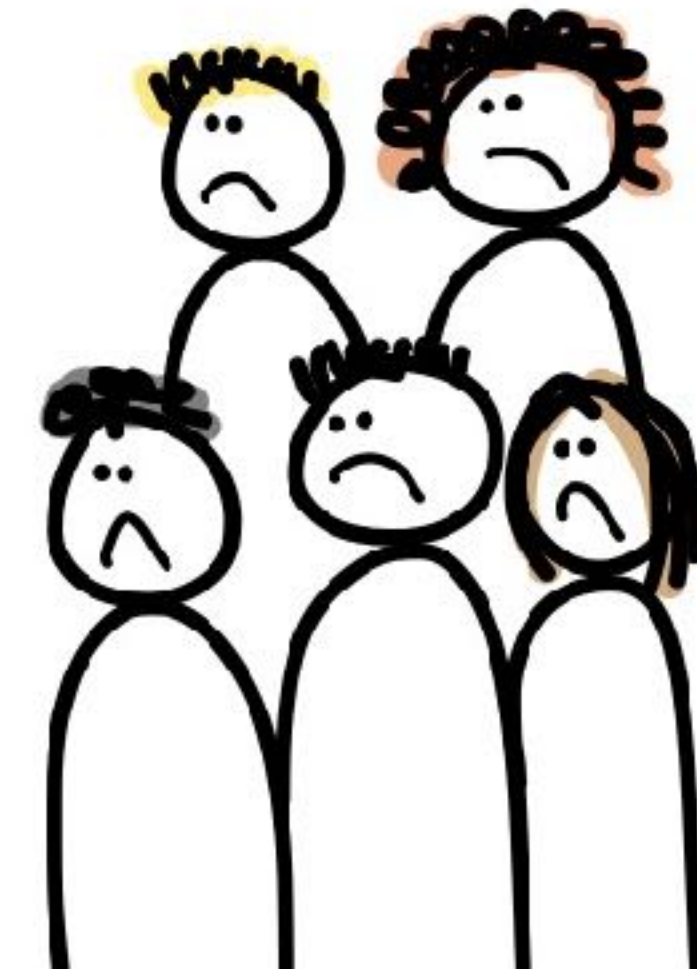
J HCI 2012



— High dropout

Skill progression
demonstrated by
users in Scratch
Scaffidi & Chambers

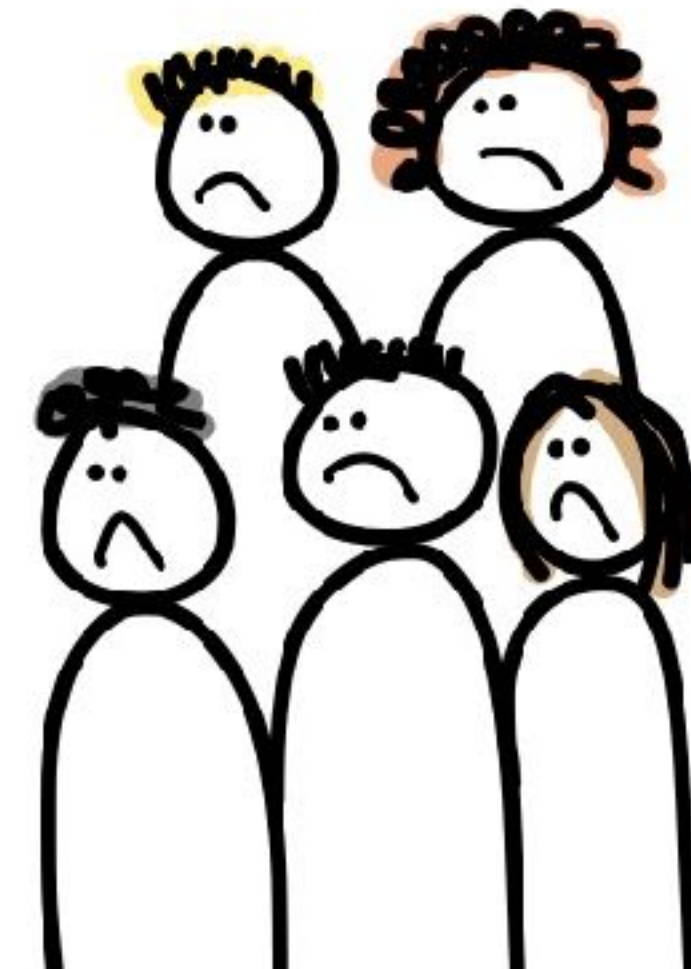
J HCI 2012



- High dropout
- Flat skill level

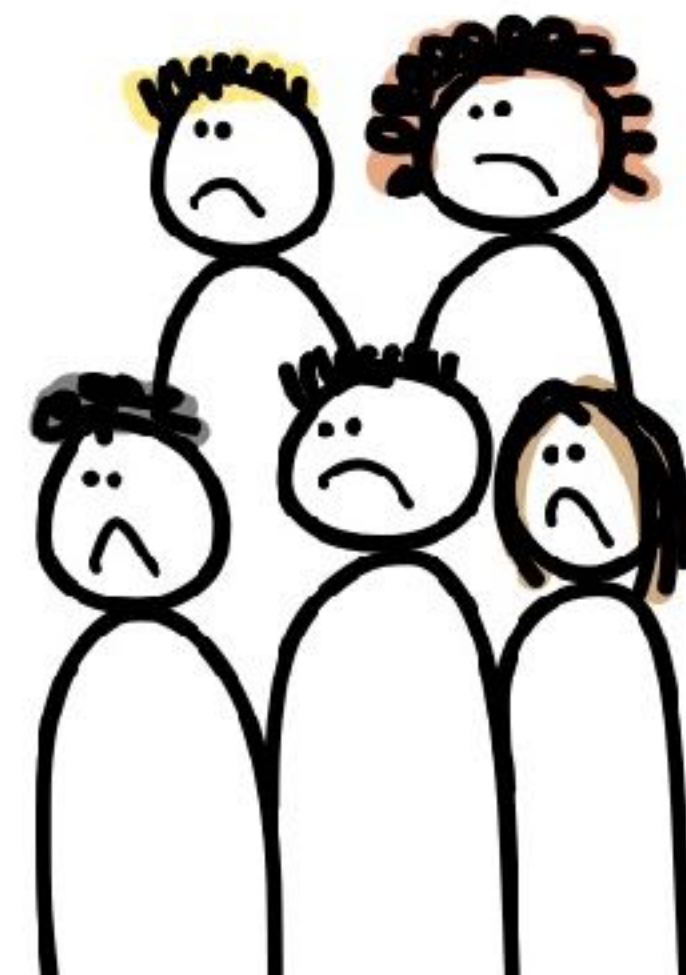
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demonstrated by
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2020

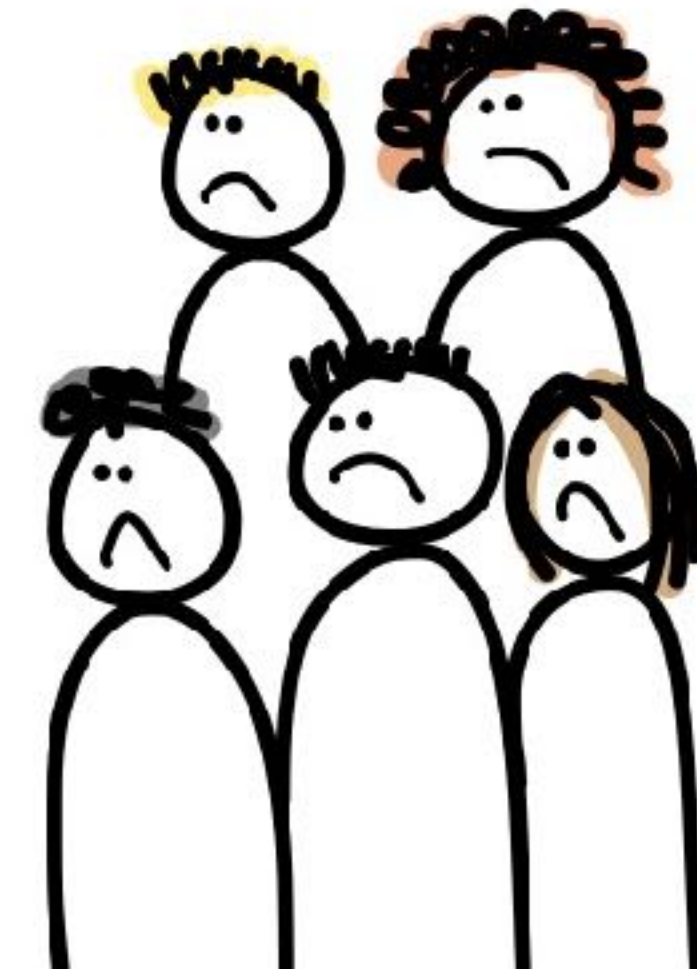


If they build it,
will they understand it?
Salac & Franklin

iticse 2020



2020





2013

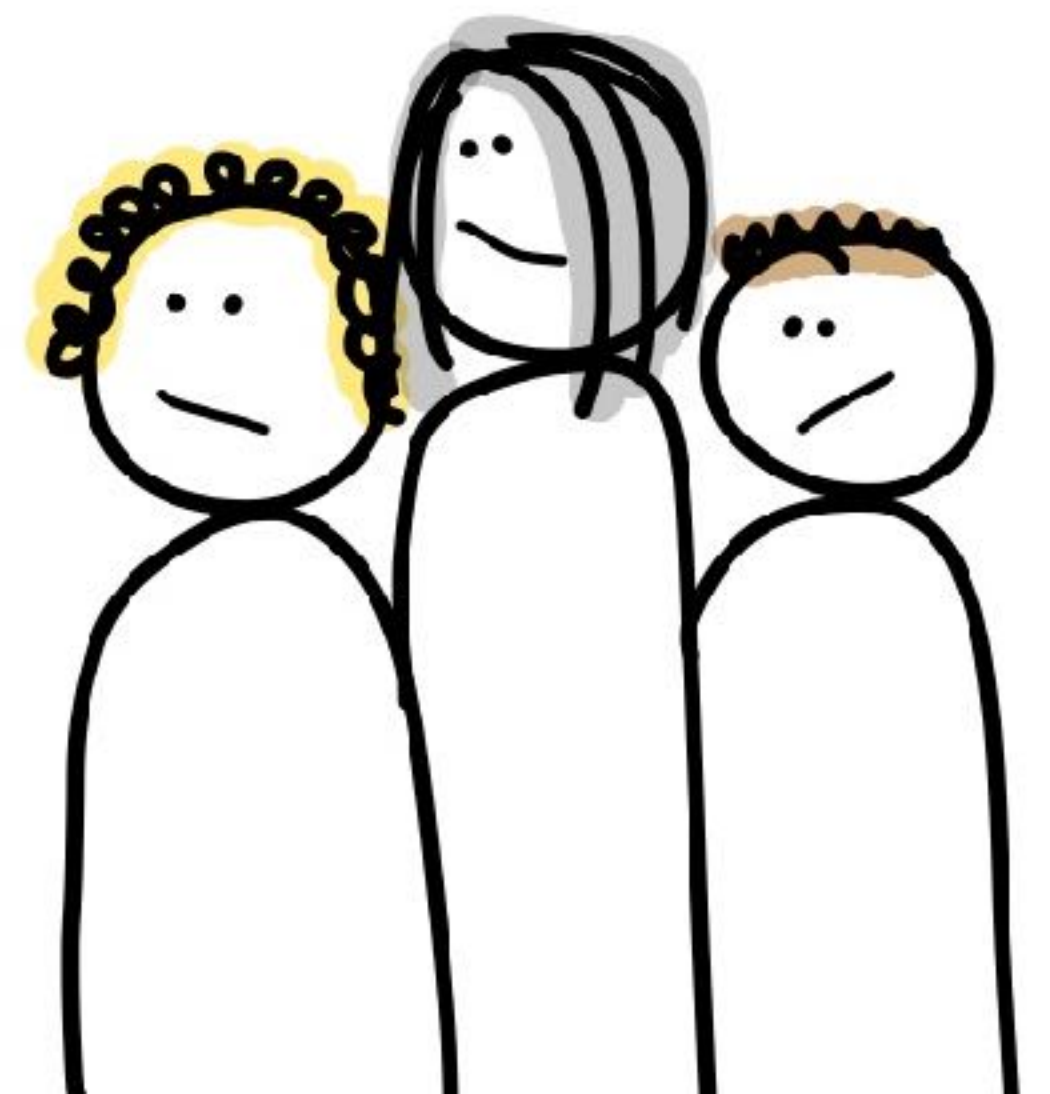
Doesn't know anything
about teaching



Doesn't know anything
about teaching



Aren't you
a professor?



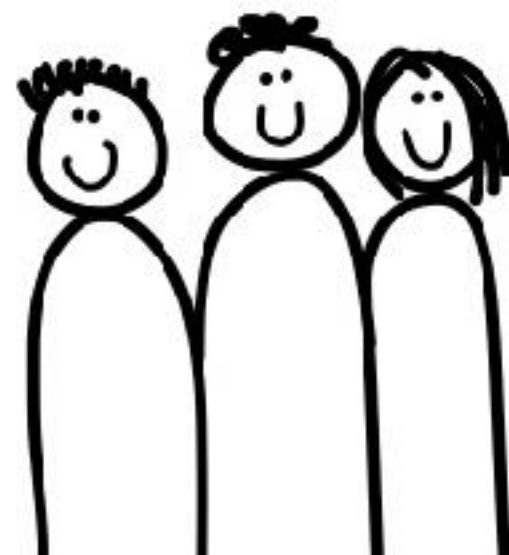
4 years in
School



4 years in
School



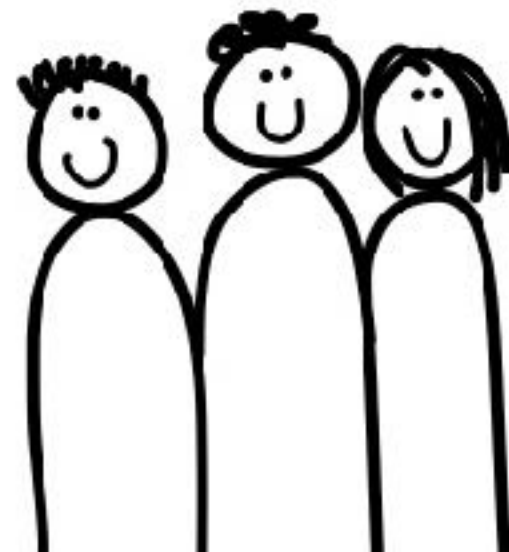
5 years in
School



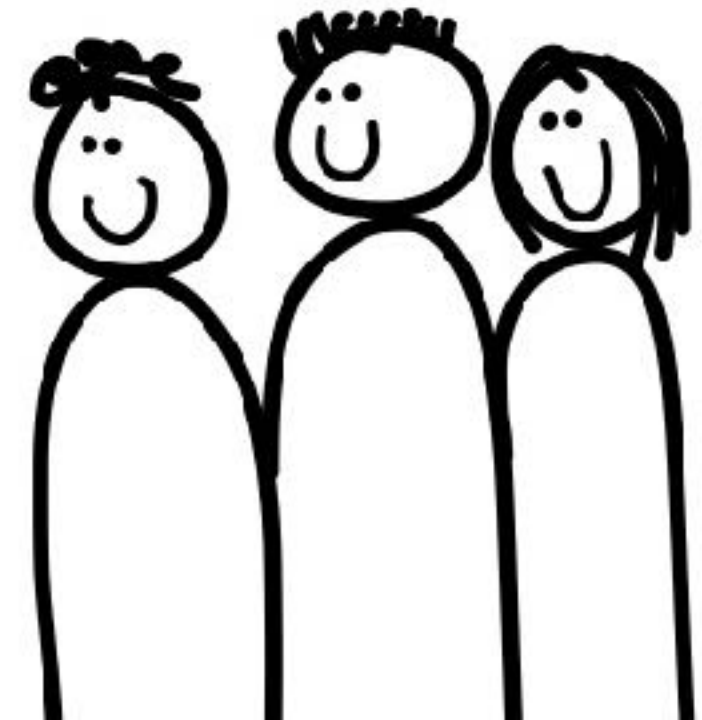
4 years in
School



5 years in
School



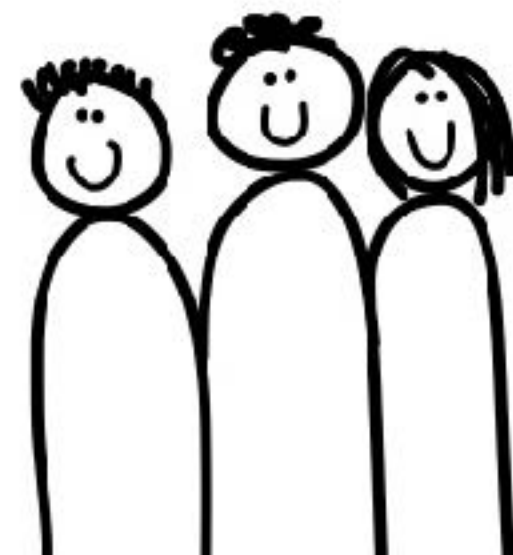
PhD



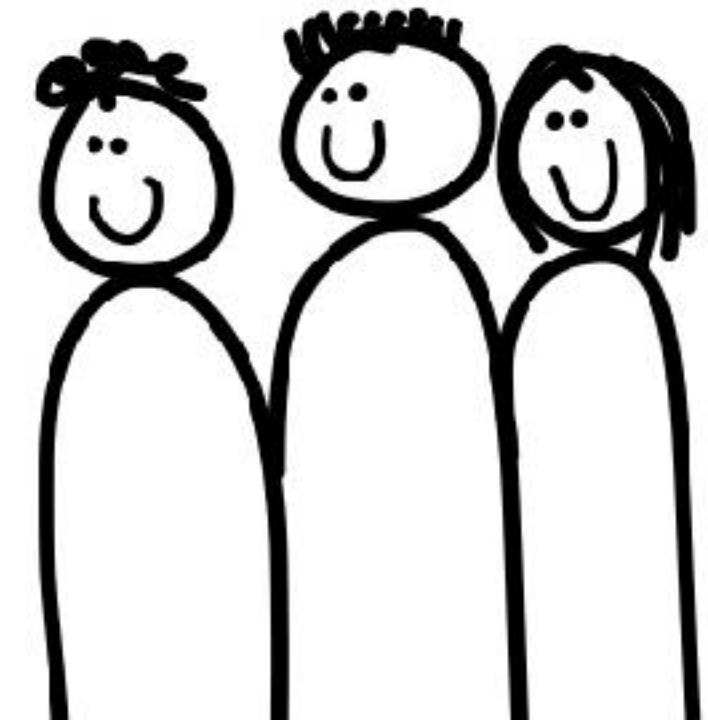
4 years in
School



5 years in
School



PhD +
12 afternoons



Doesn't know anything
about teaching

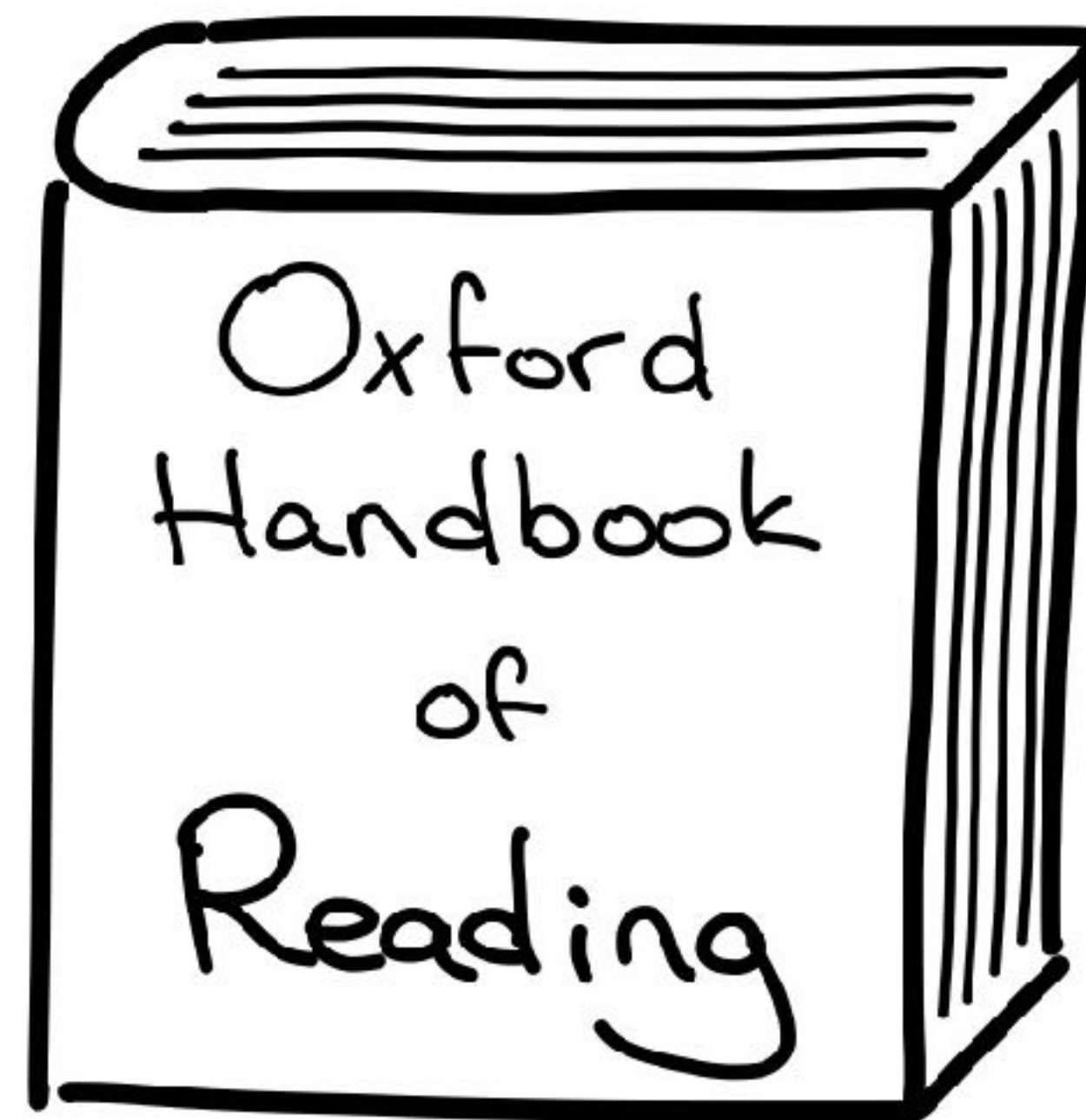


Doesn't know anything
about teaching

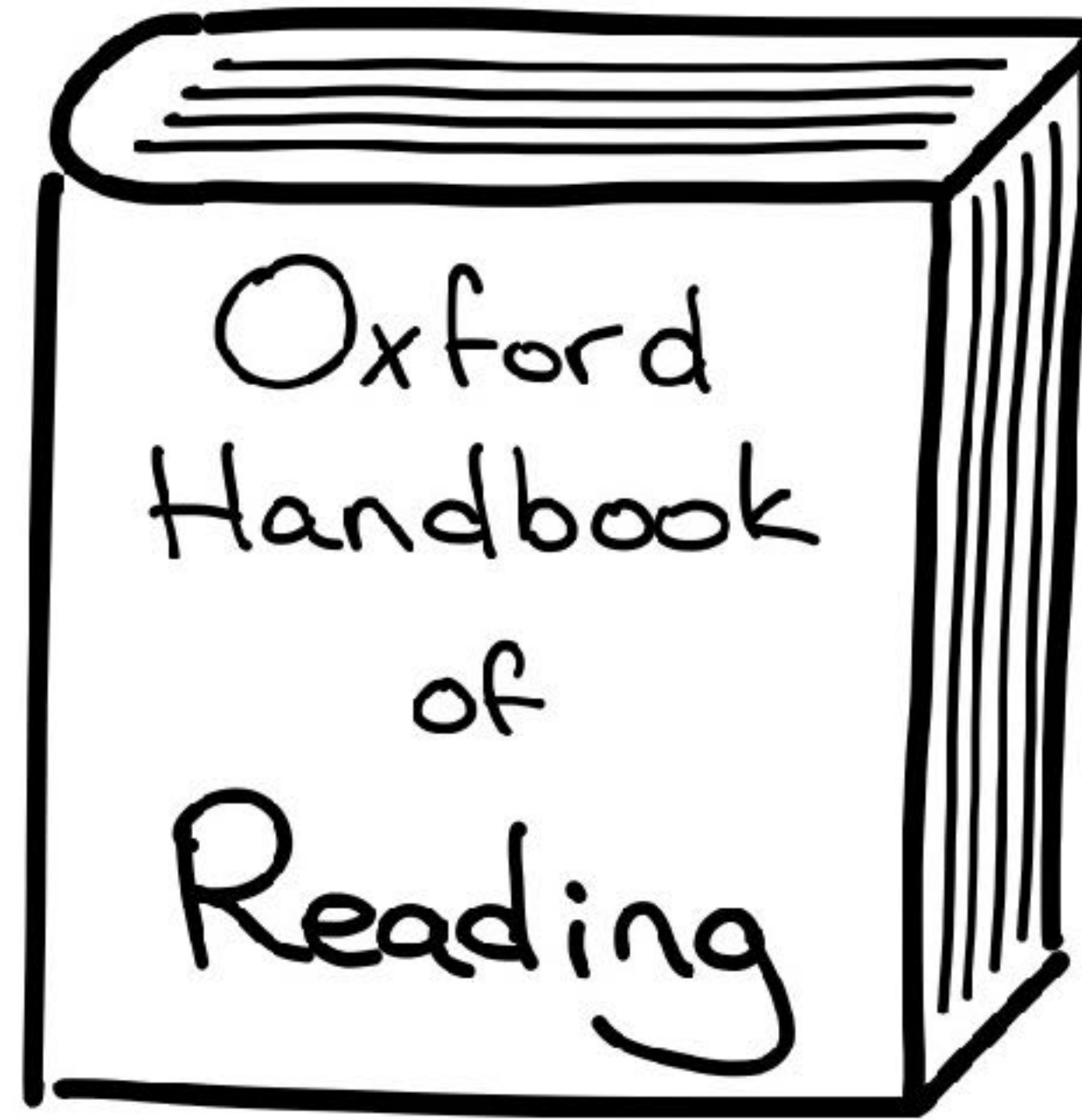


How do people learn?





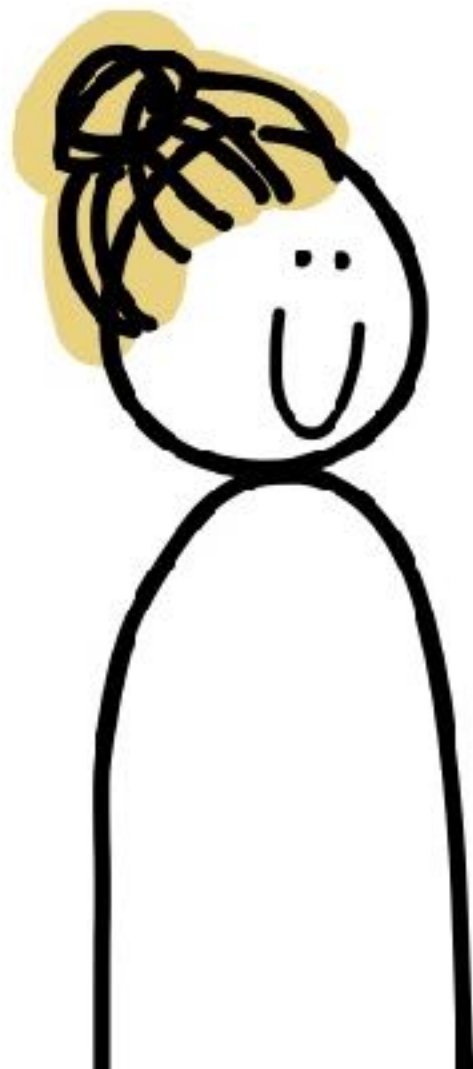
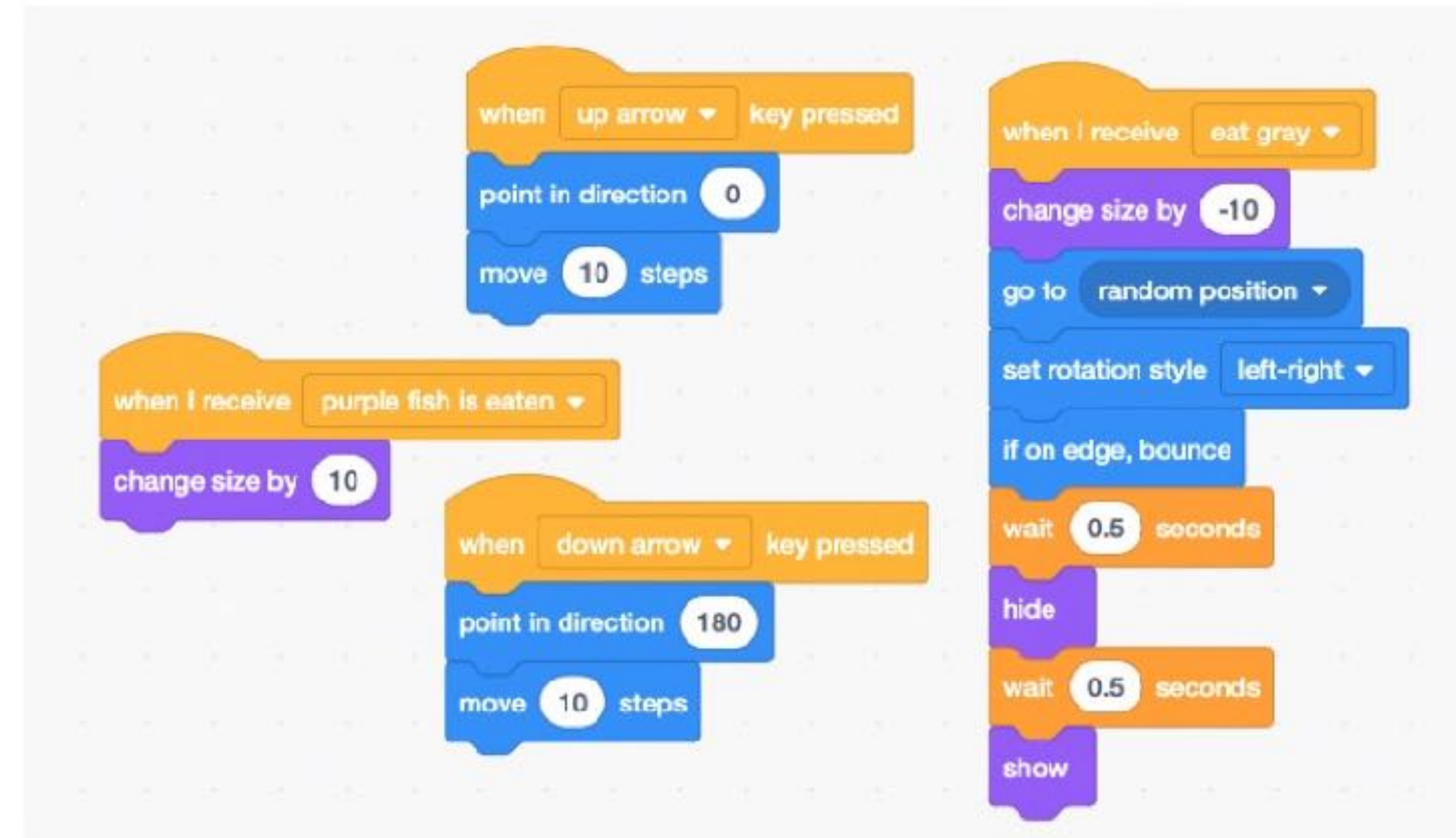
1) We don't teach reading code



1) We don't teach reading code

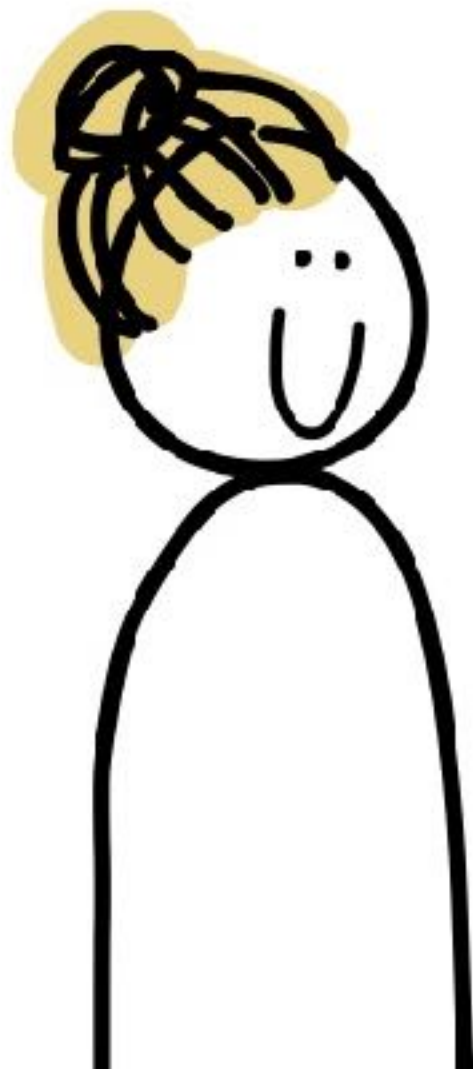
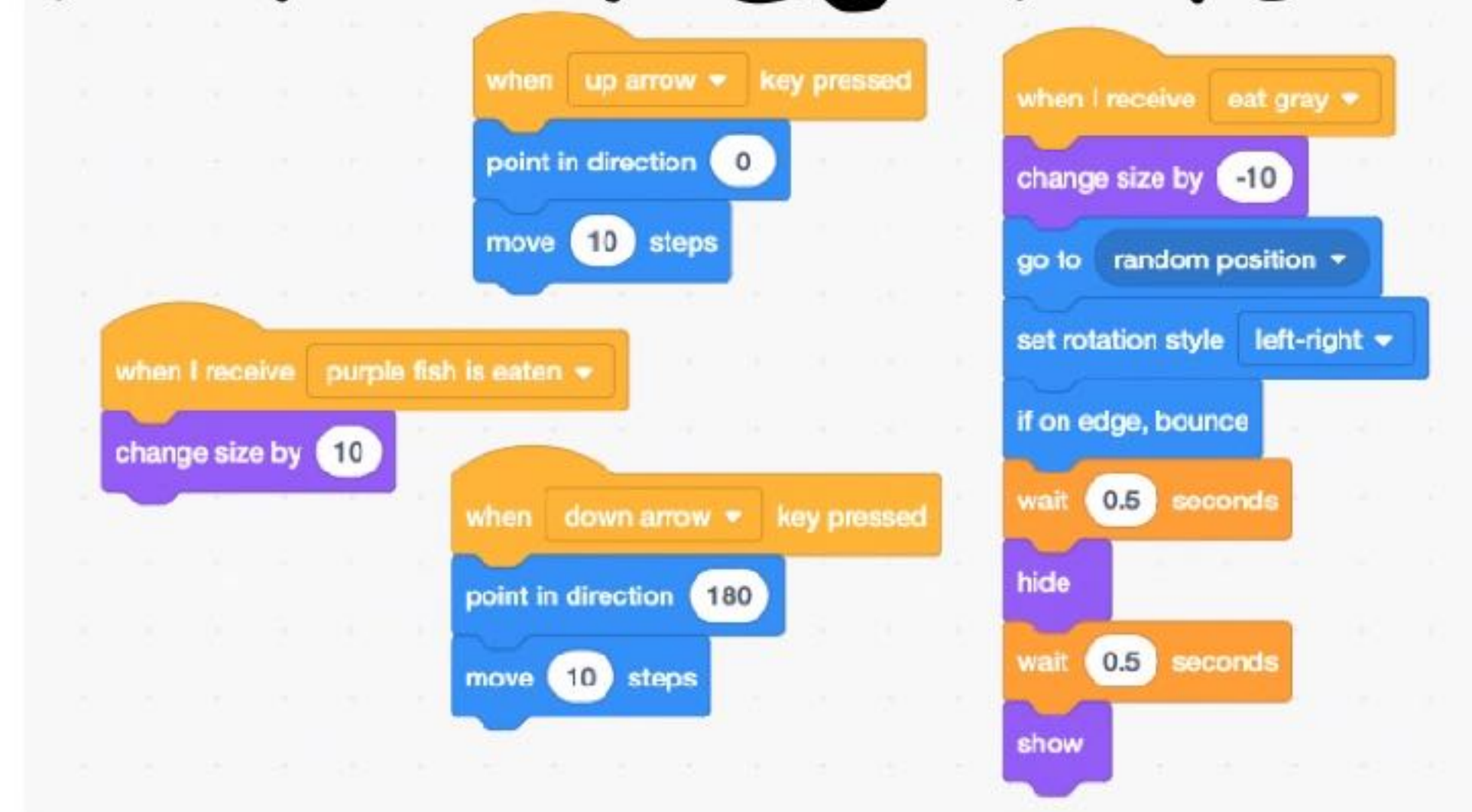


1) We don't teach reading code



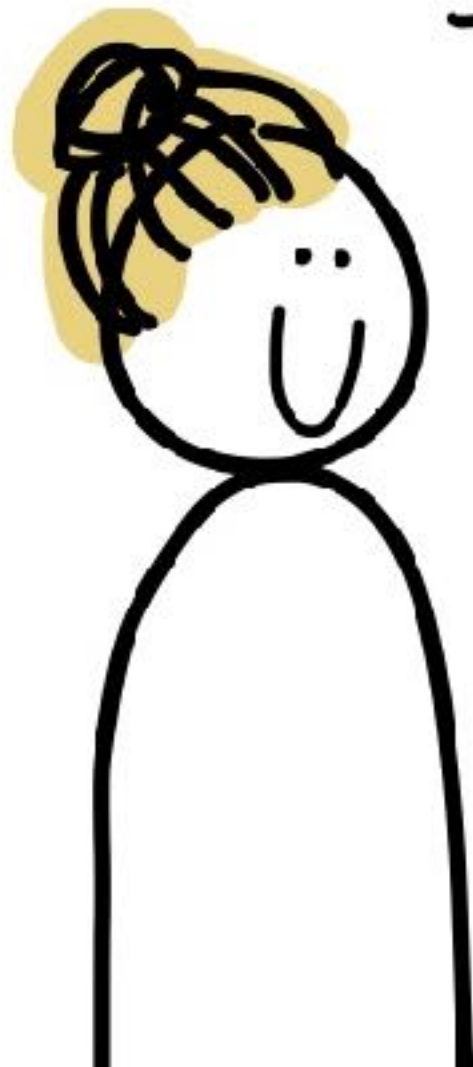
1) We don't teach reading code

What does this do?



1) We don't teach reading code

What do
you think?



What does this do?

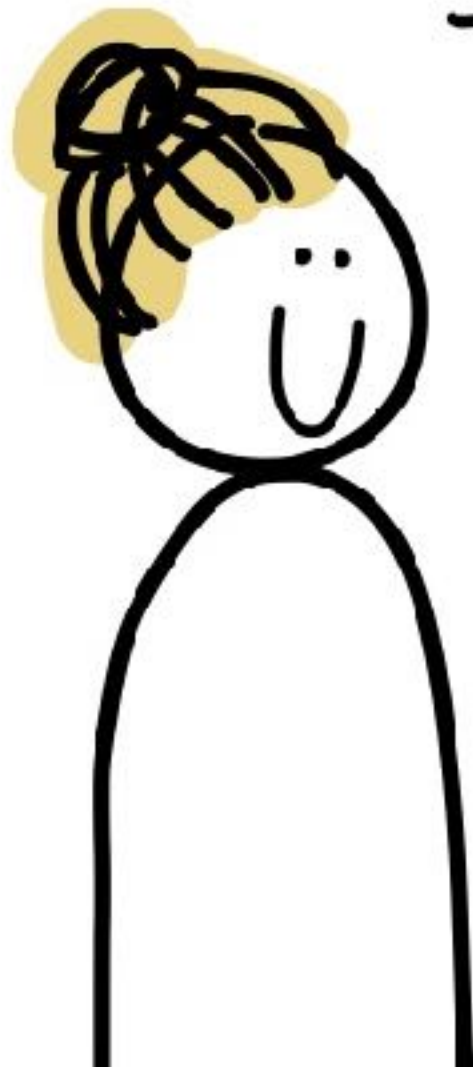
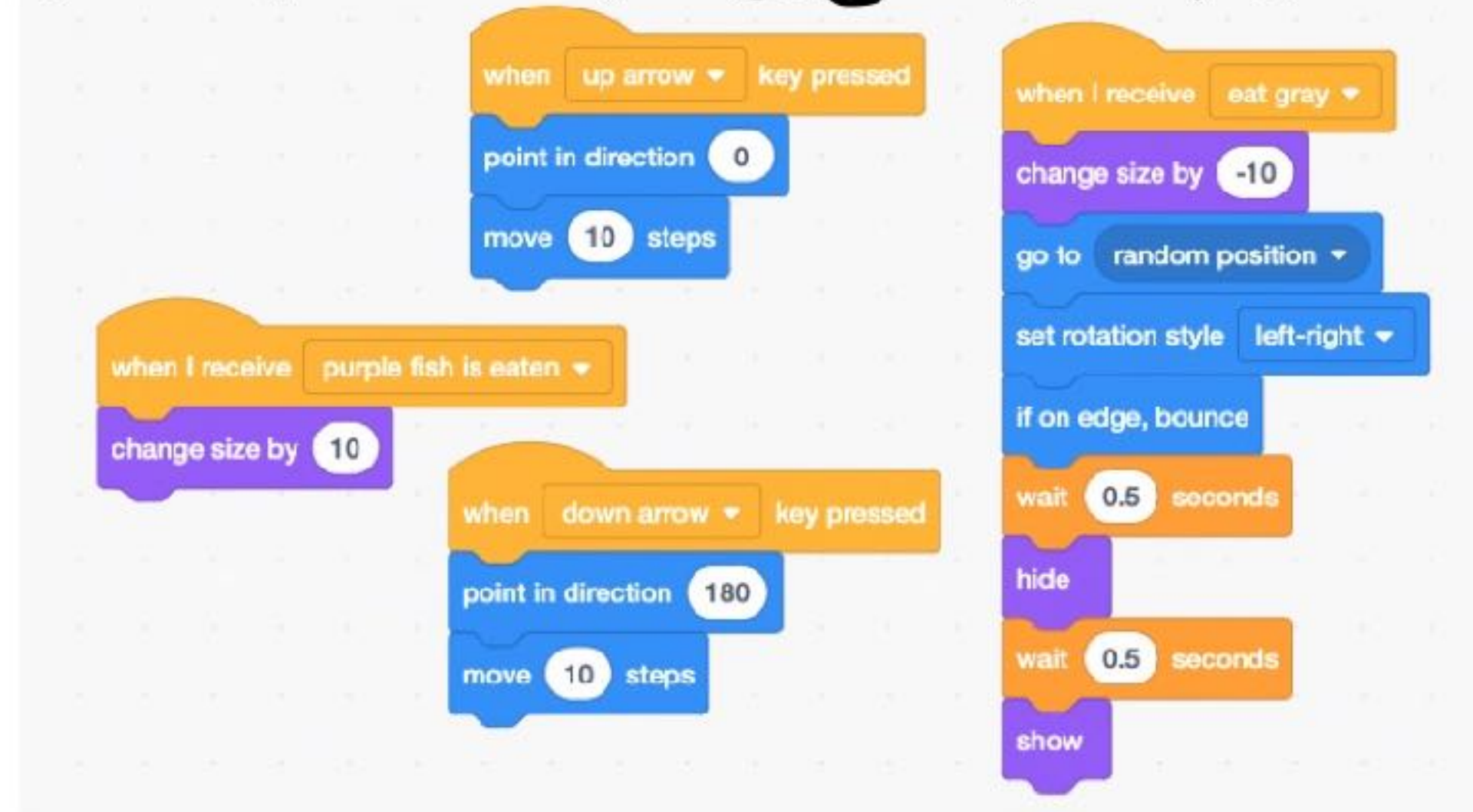


1) We don't teach reading code

"Never be afraid to mess around and experiment"

What do you think?

What does this do?



1) We don't teach reading code



What do
you think?



I dont know!



1) We don't teach reading code

Apple



1) We don't teach reading code

What does that say?

Apple



1) We don't teach reading code

Do you know the
first letter?

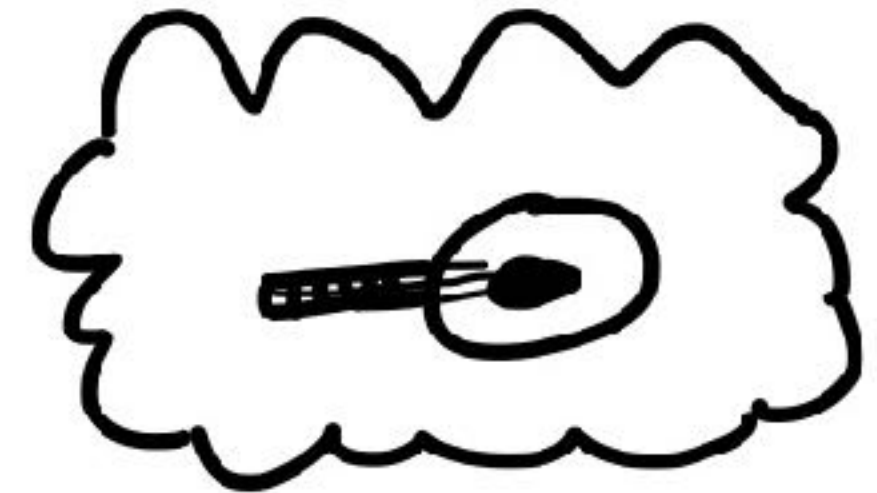


What does that say?

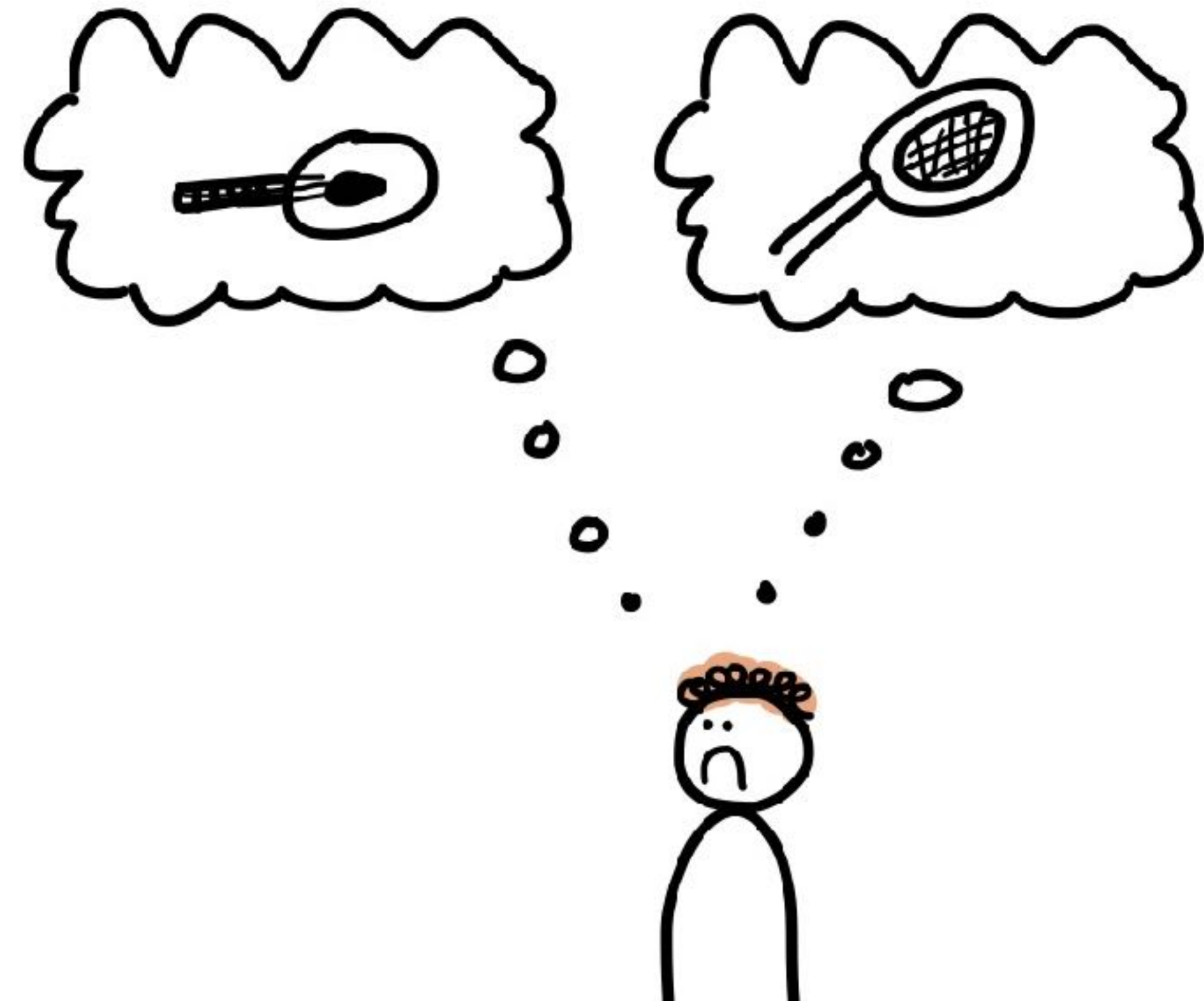
Apple



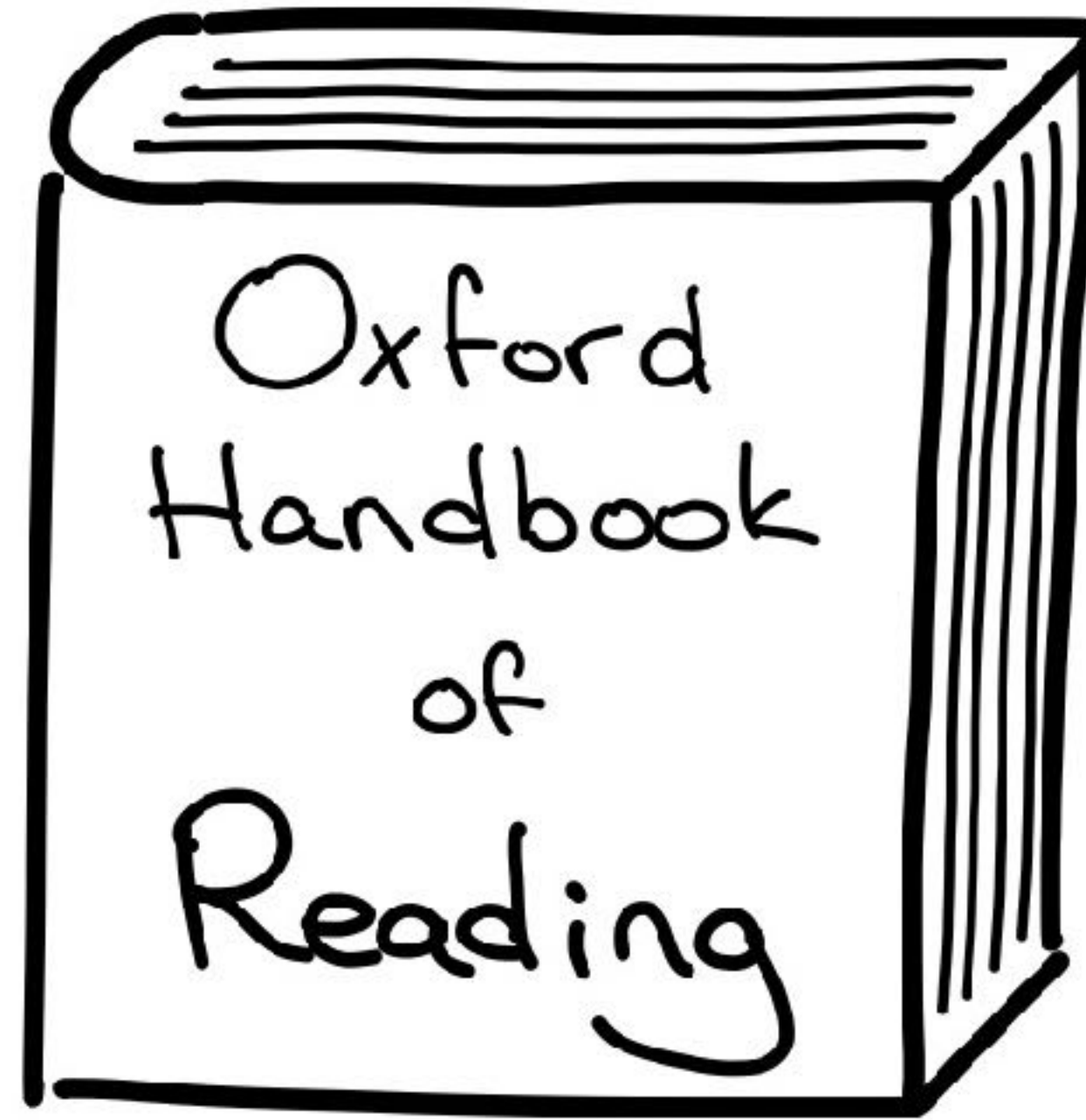
1) We don't teach reading code



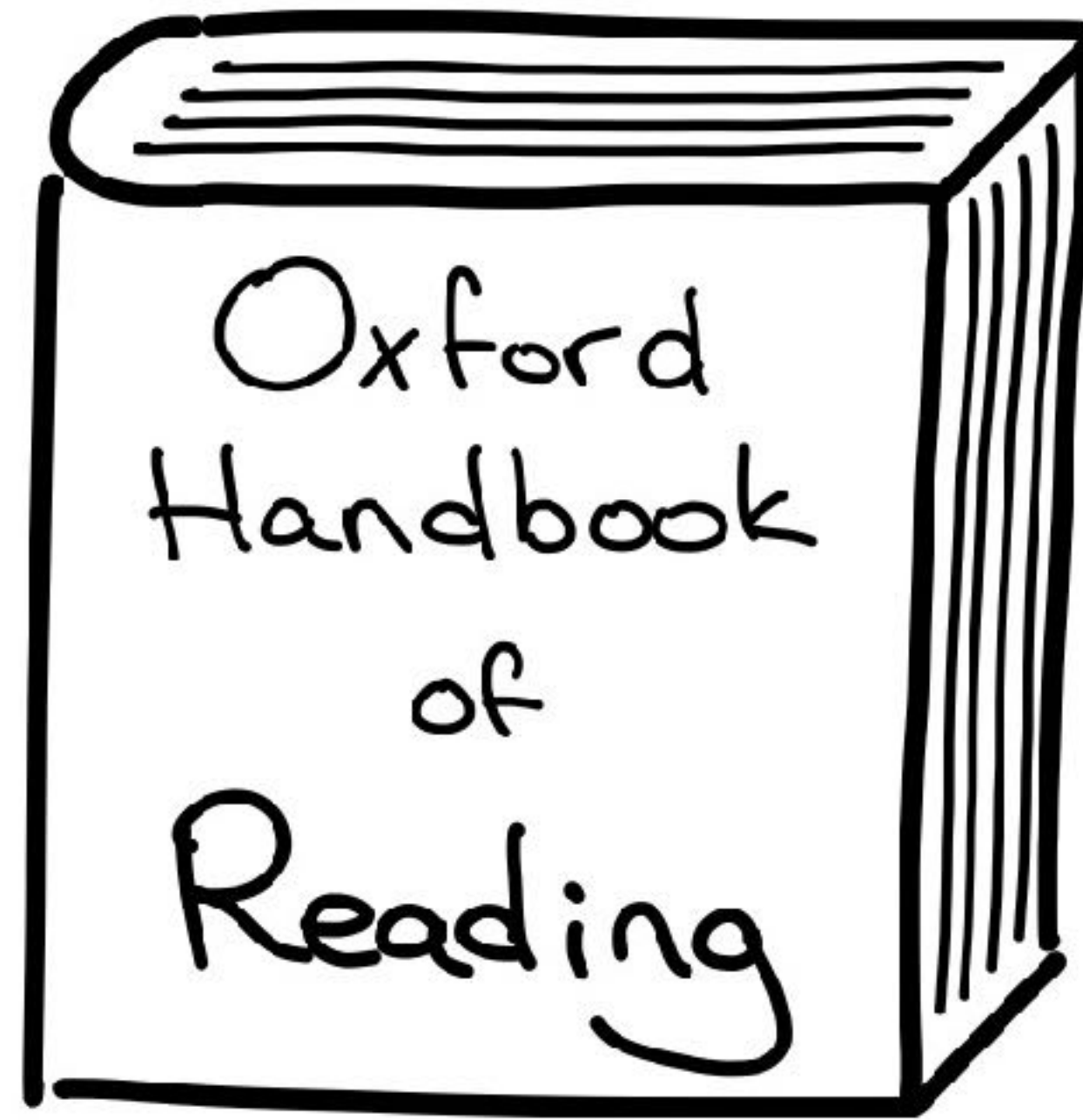
1) We don't teach reading code



1) We don't teach reading code



2) We don't practice reading



We don't practice reading



Measuring program
comprehension
Xia et al.

_____	_____
_____	_____
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_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

TSE 2017

We don't practice reading

We spent 58 %
of time reading

Measuring program
comprehension
Xia et al.

TSE 2017





Measuring program
comprehension
Xia et al.

TSE 2017

We don't practice reading

"Never be afraid to mess around and experiment"

We spent 58 %
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— But advancing =
writing

Measuring program
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TSE 2017

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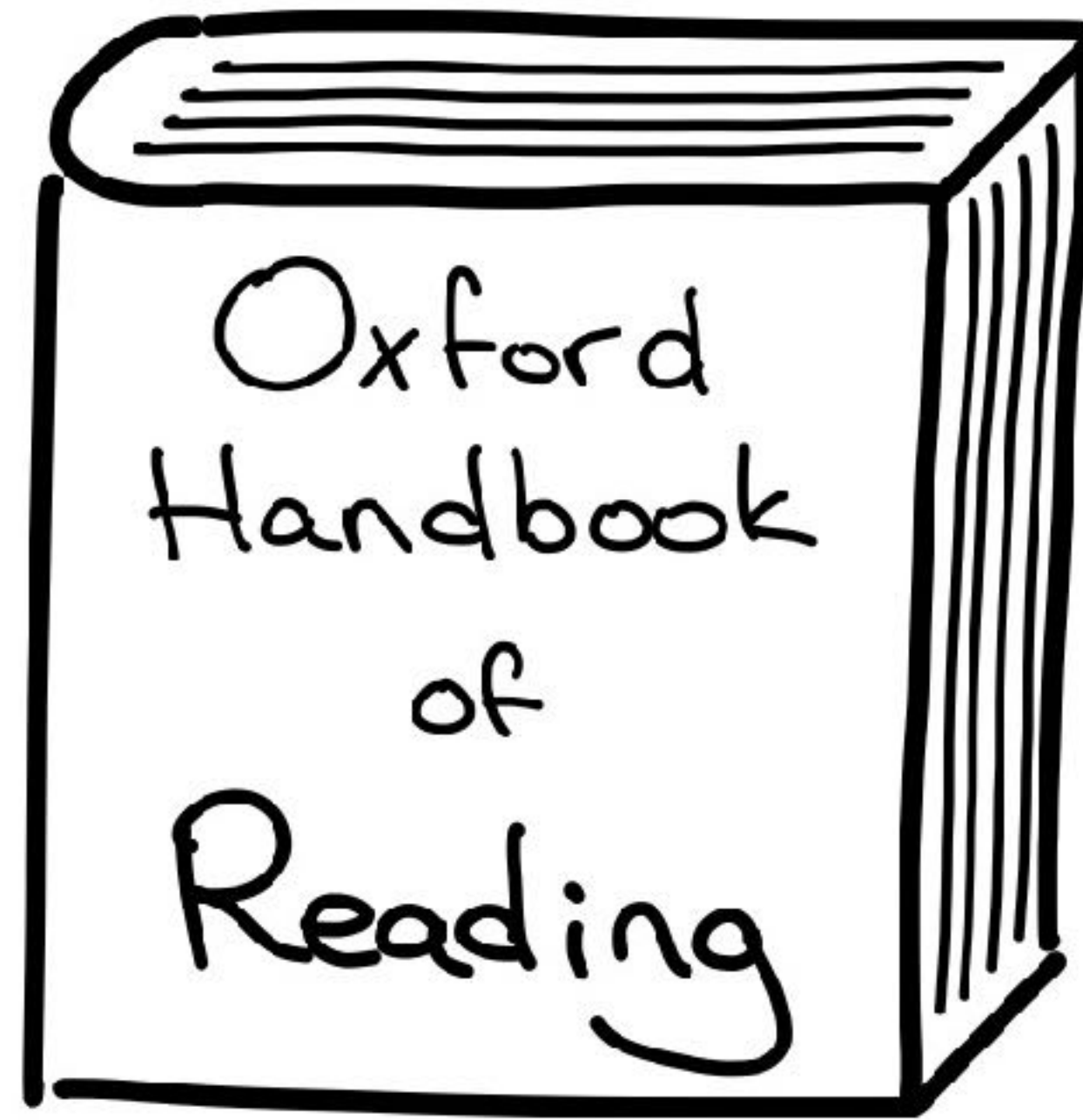
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Measuring program
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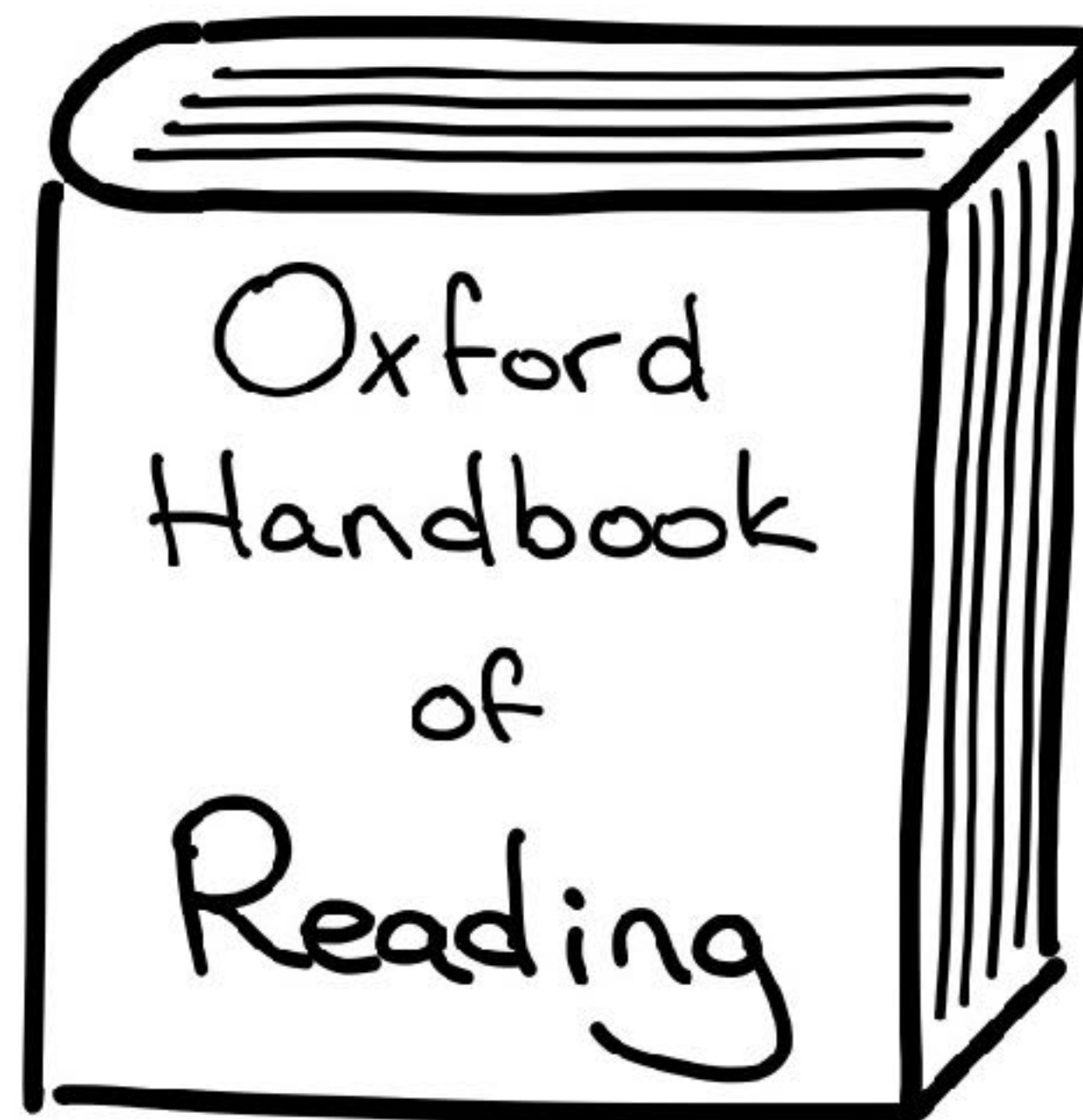
_____	_____
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_____	TSE 2017



2) We don't practice reading



3) We don't have theories for
reading code

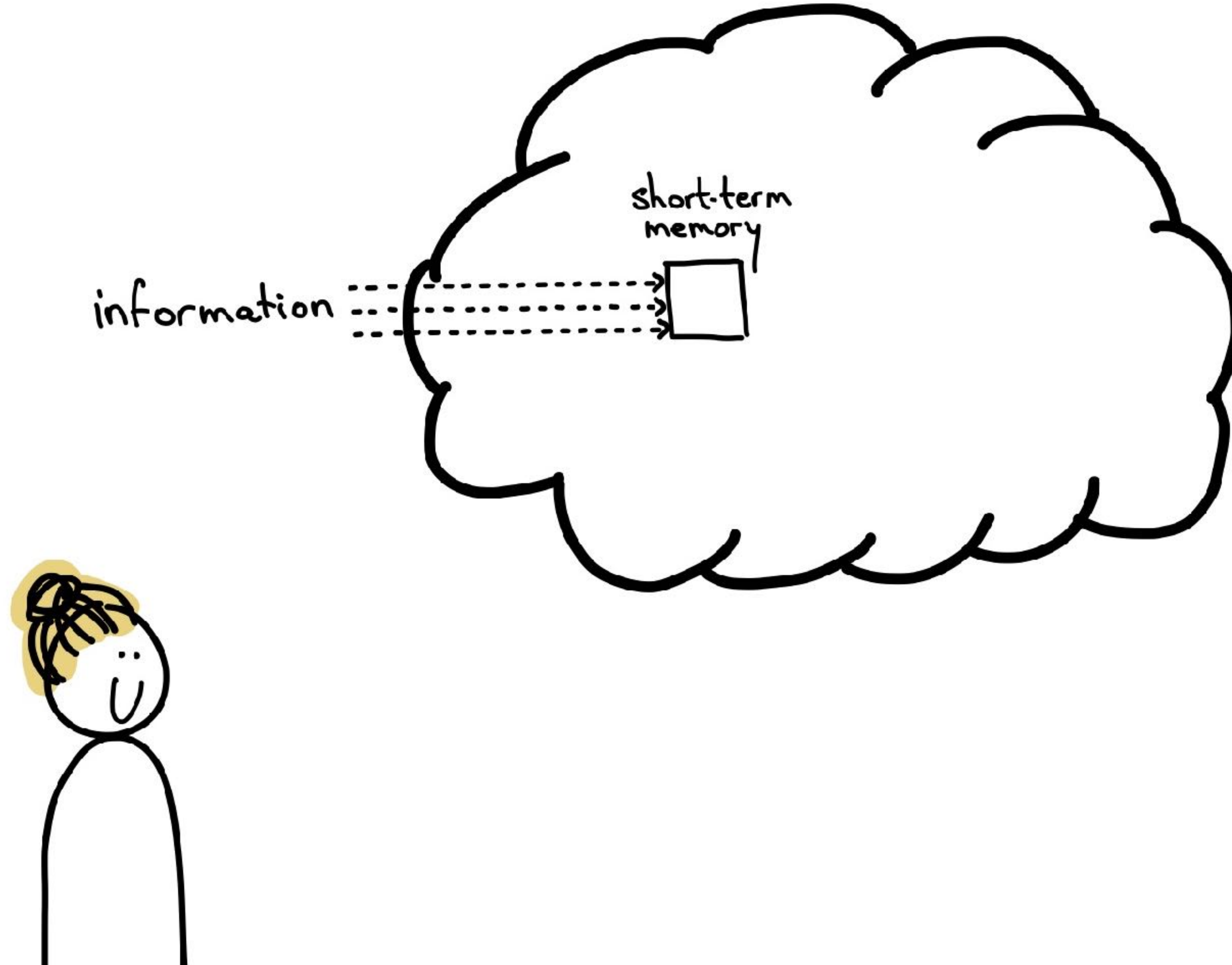


What happens in your
brain when you read code?

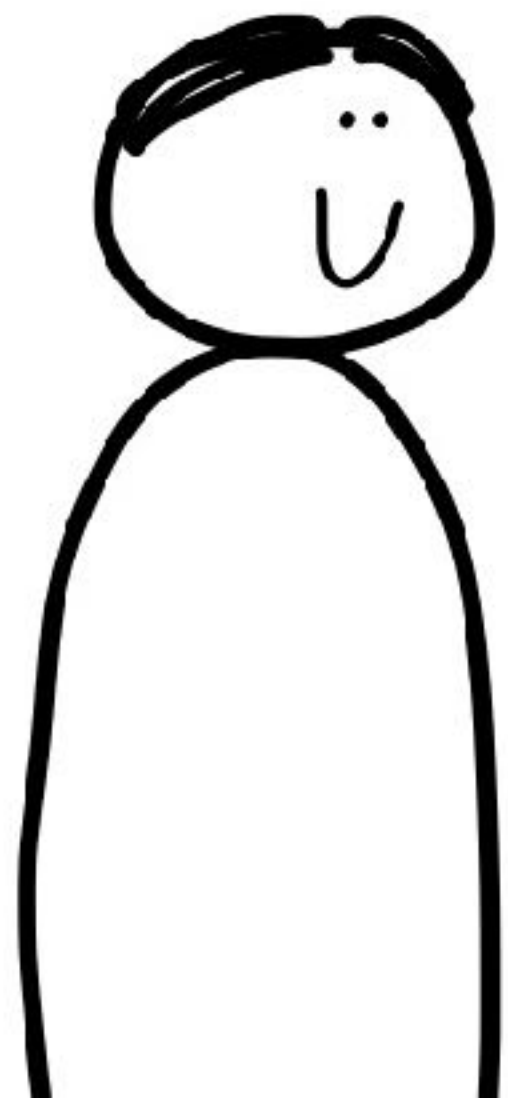


What happens in your
brain when you read?

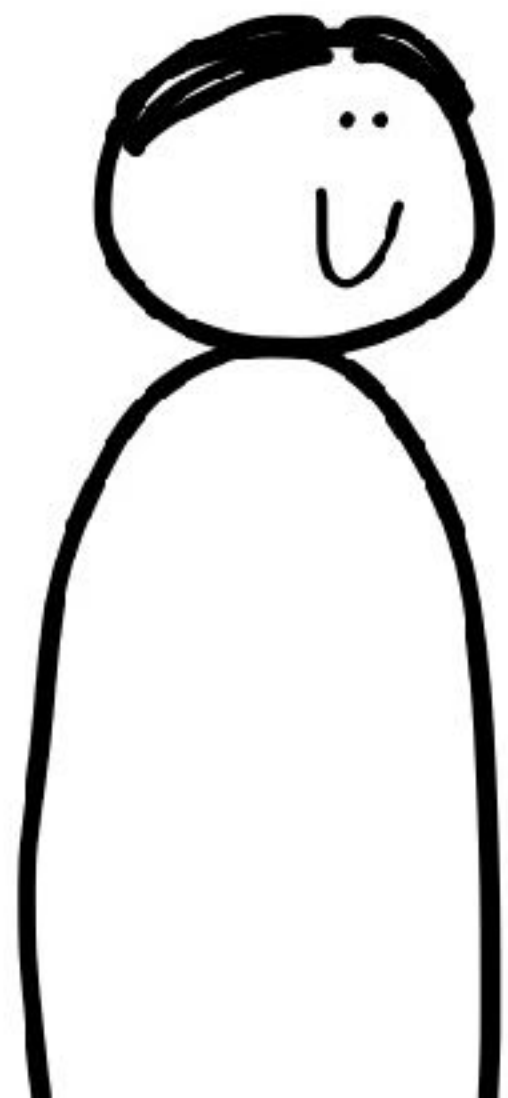




I am George Miller

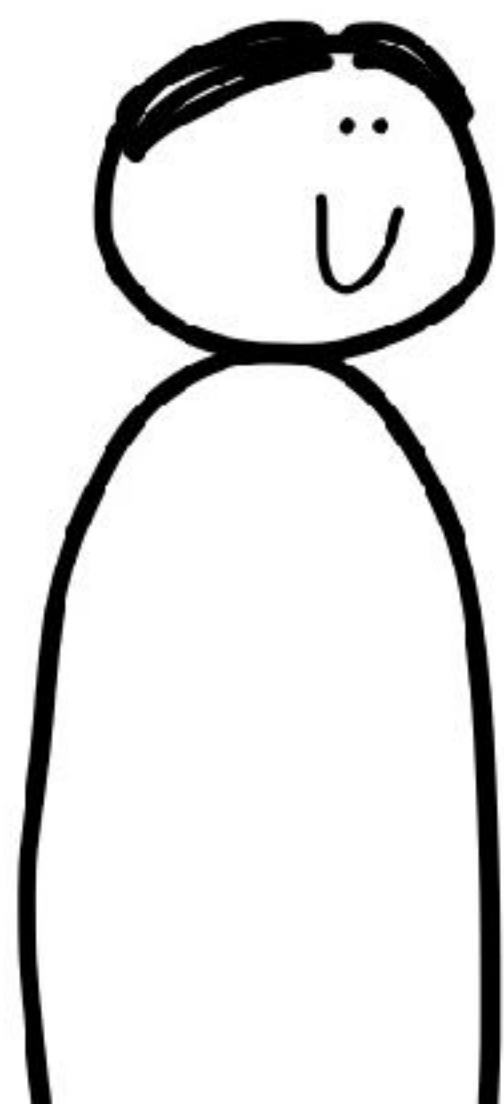


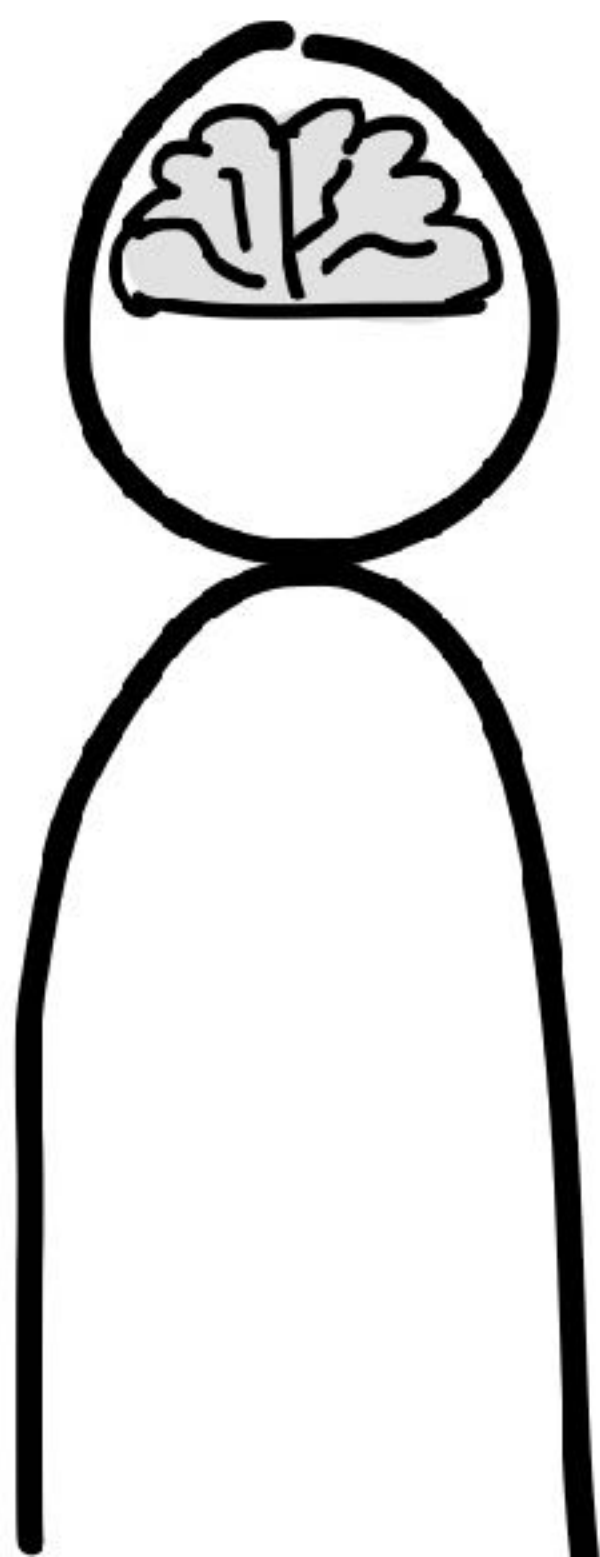
Short-term memory
is very small!

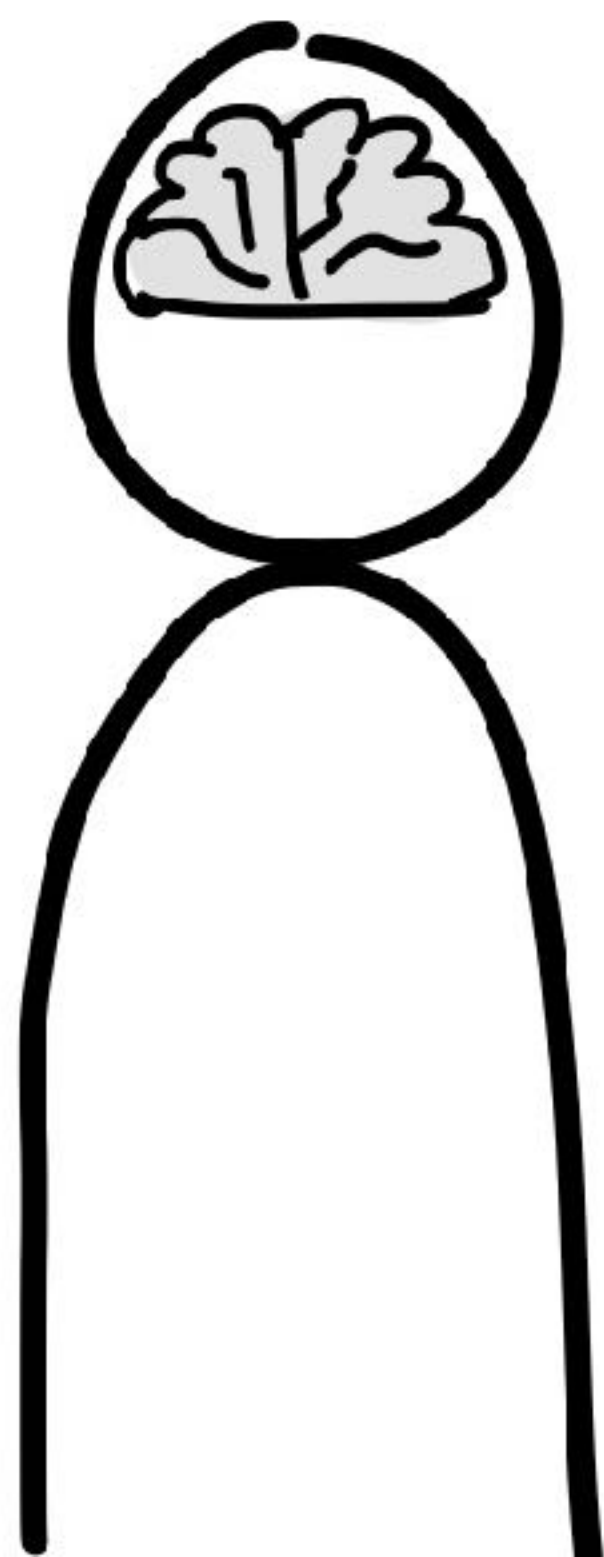


Short-term memory
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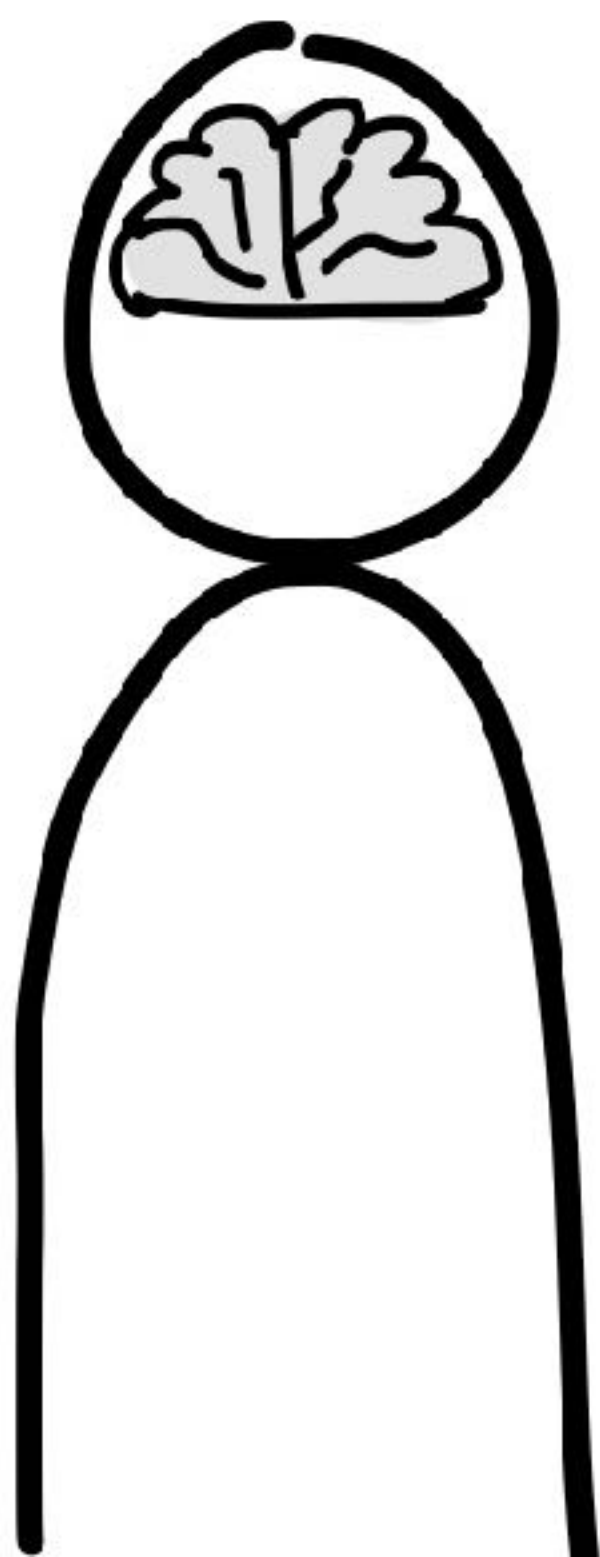
It can hold between
5 and 9 elements.

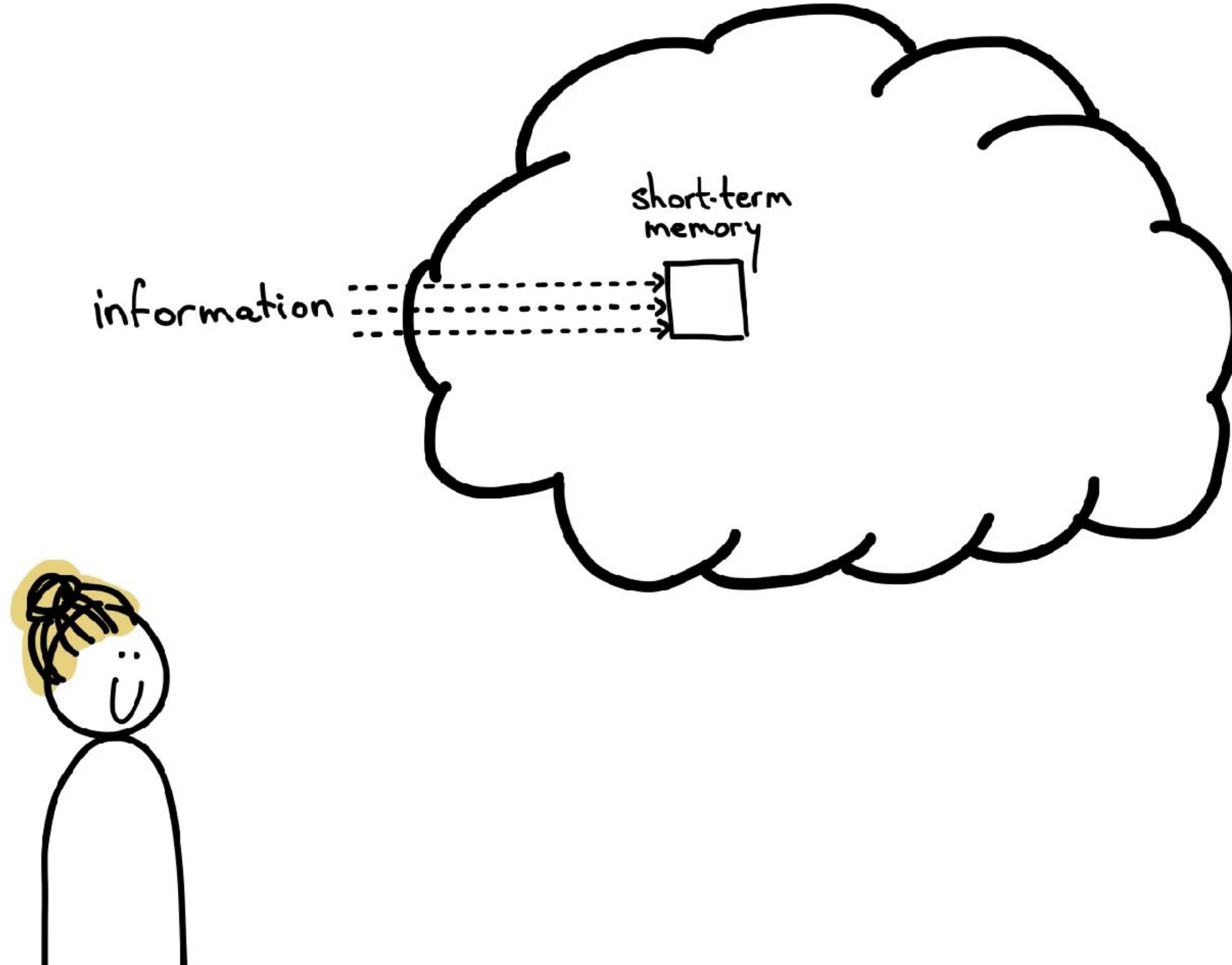


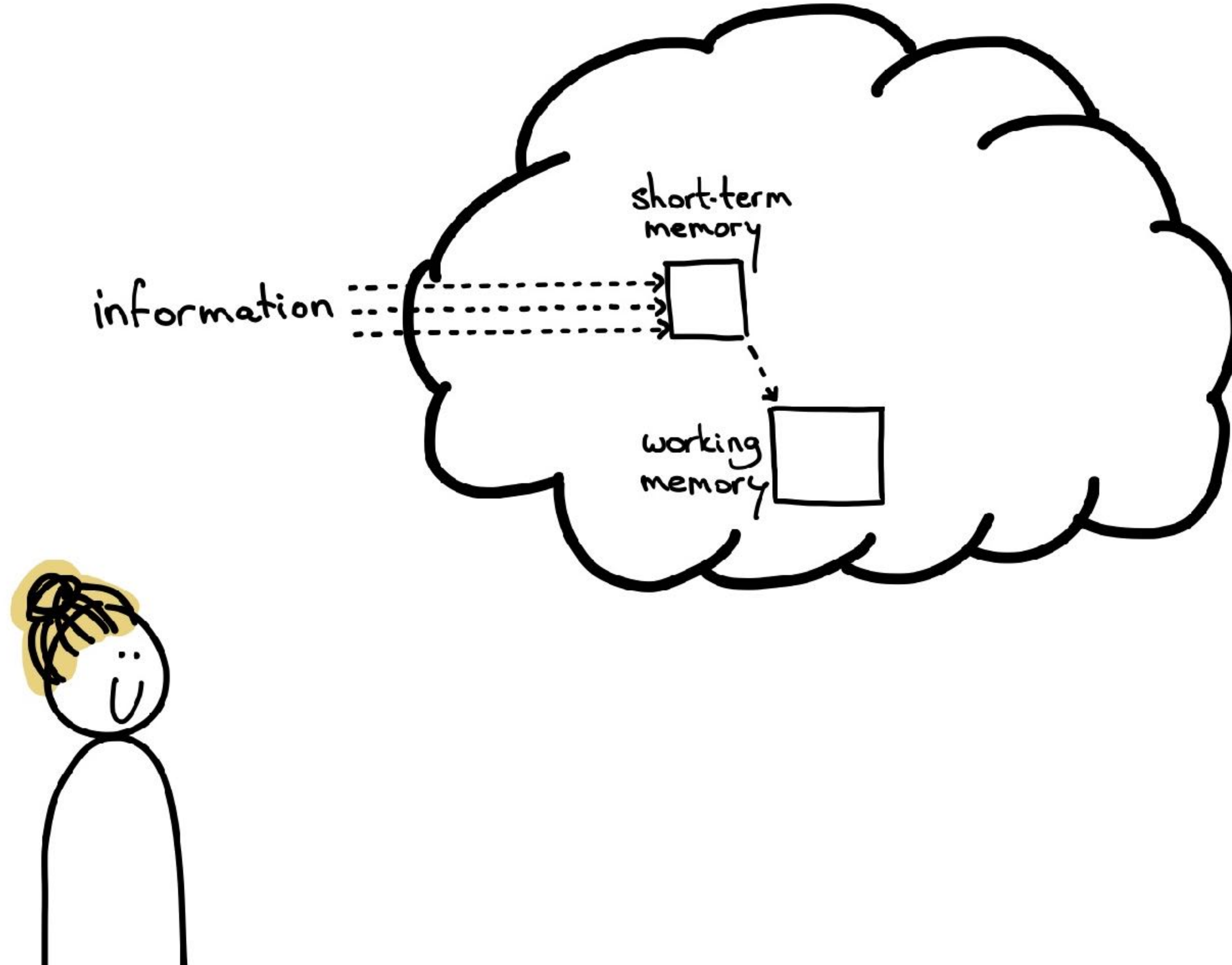


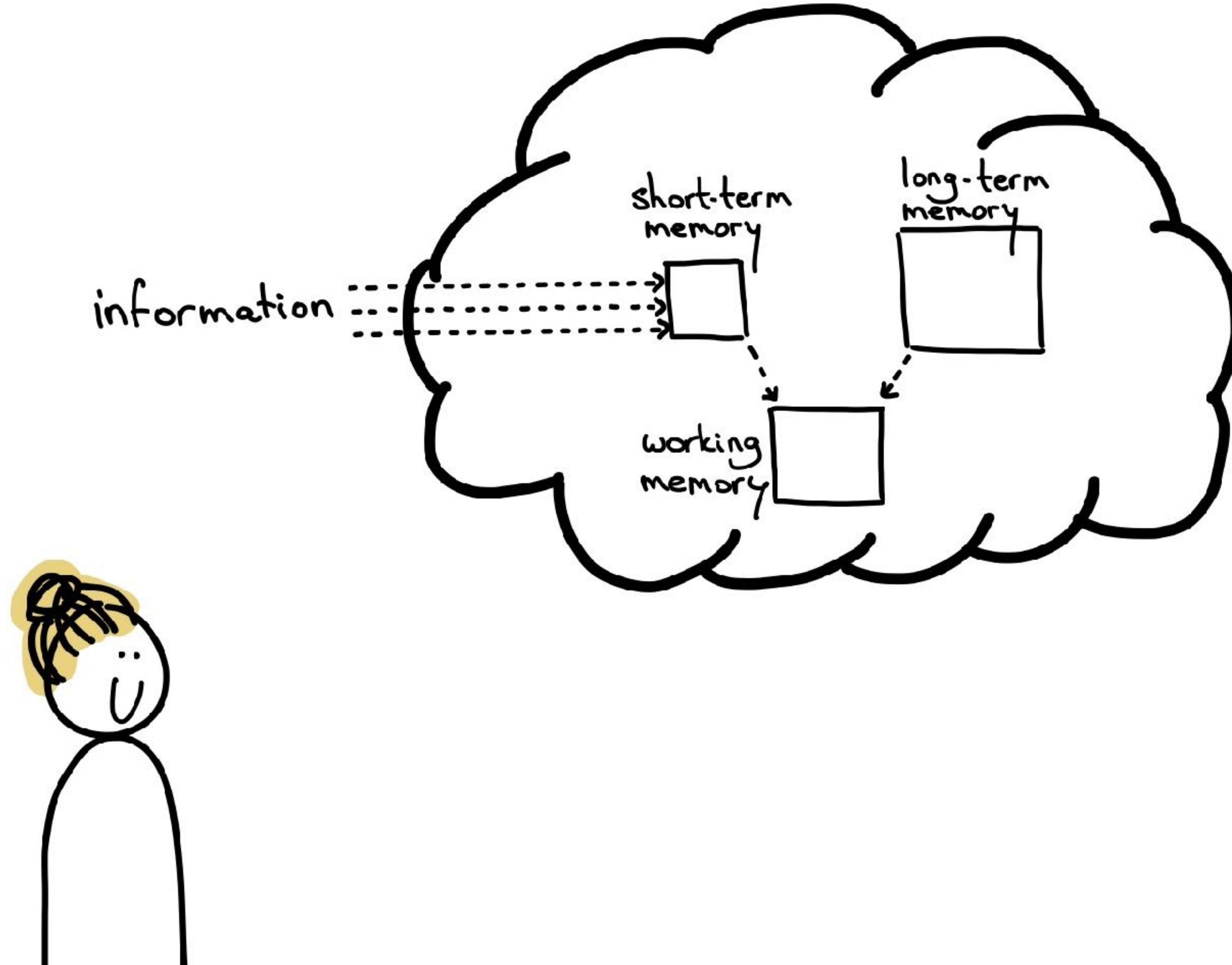


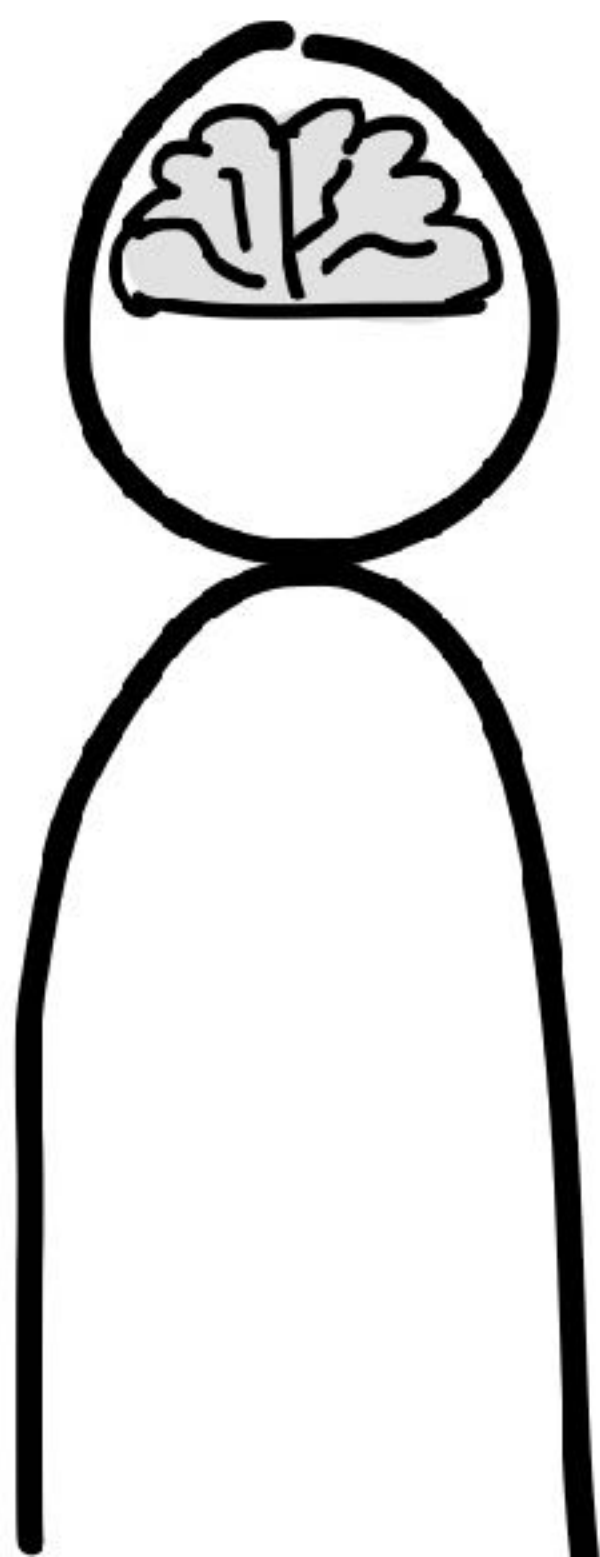
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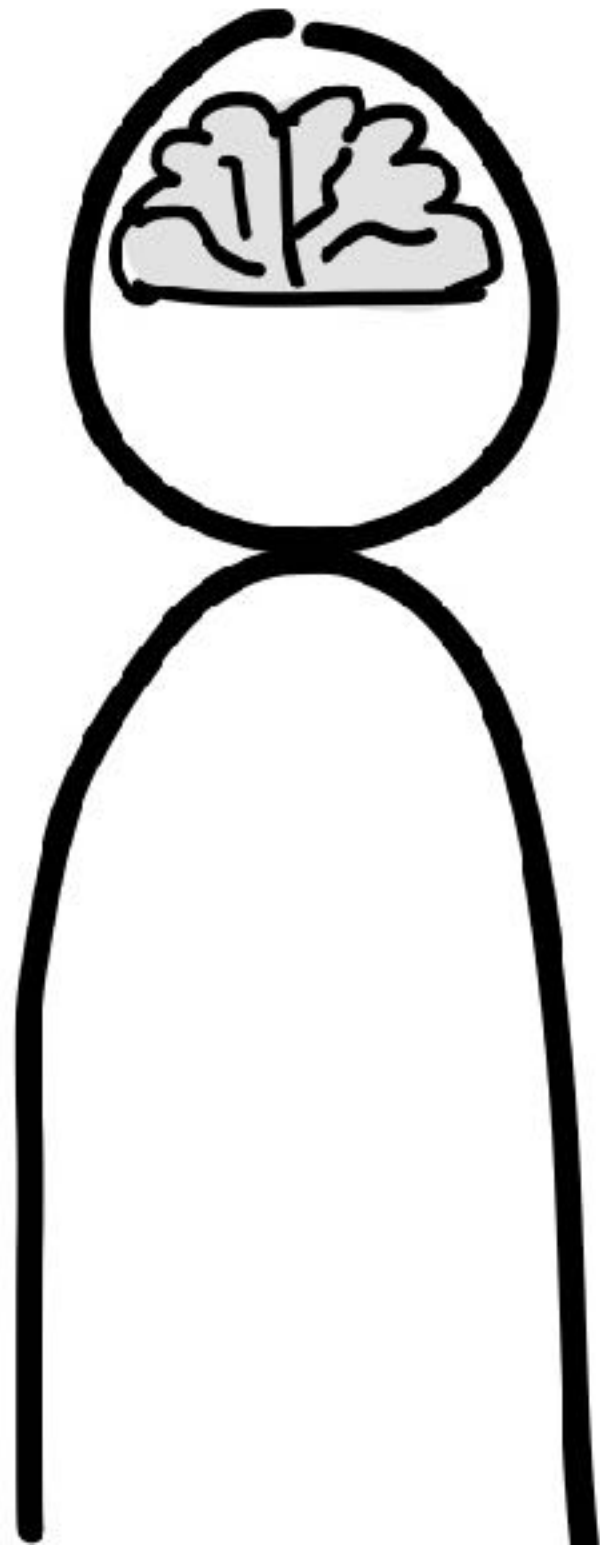




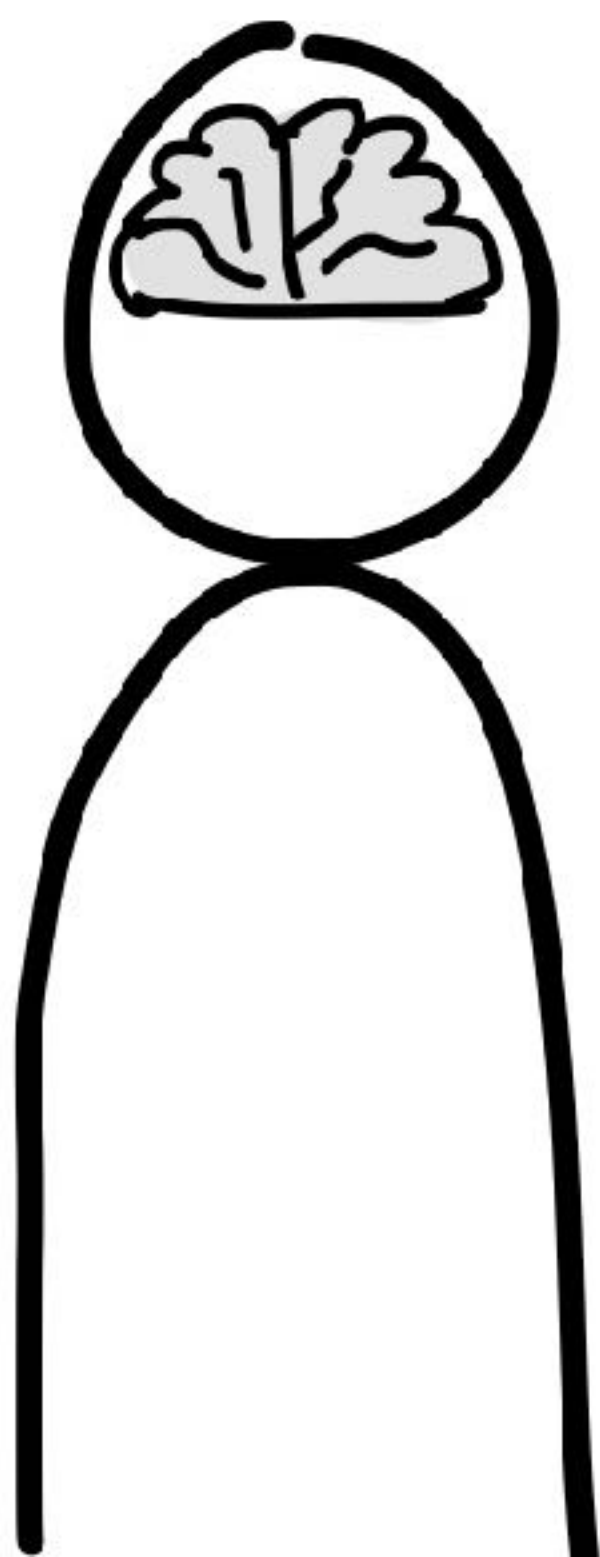


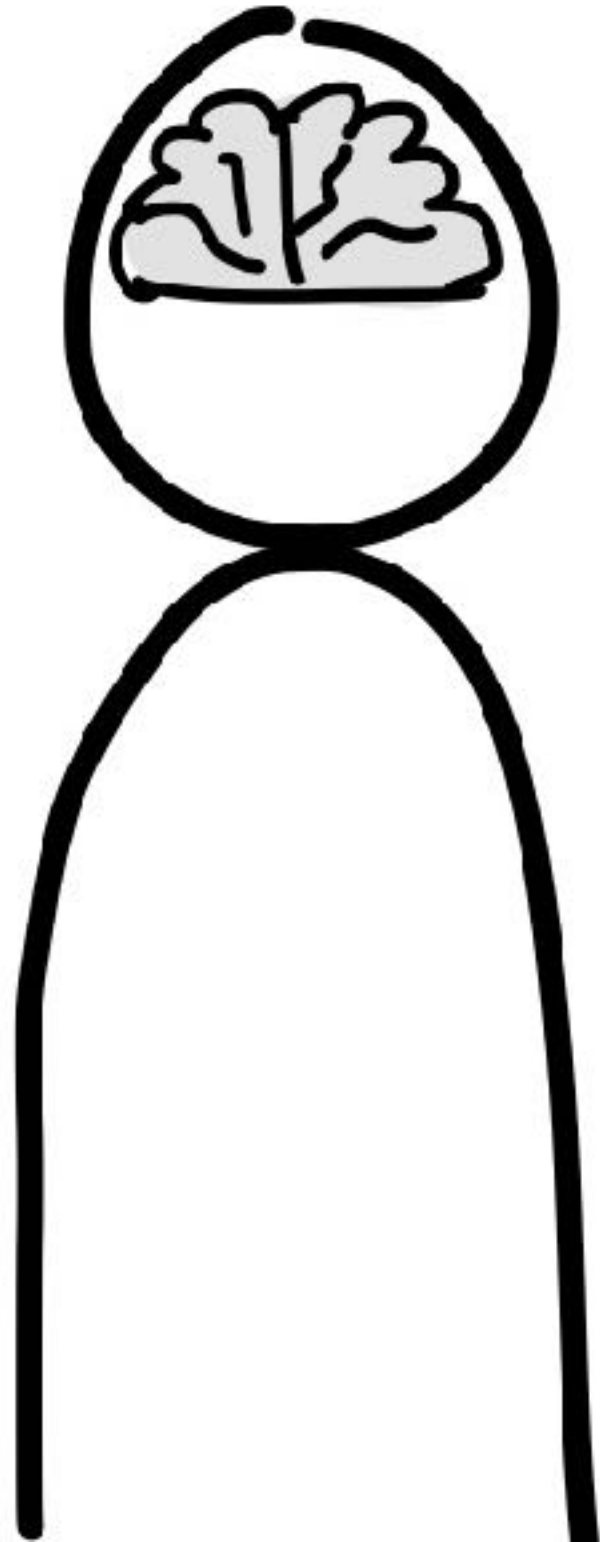




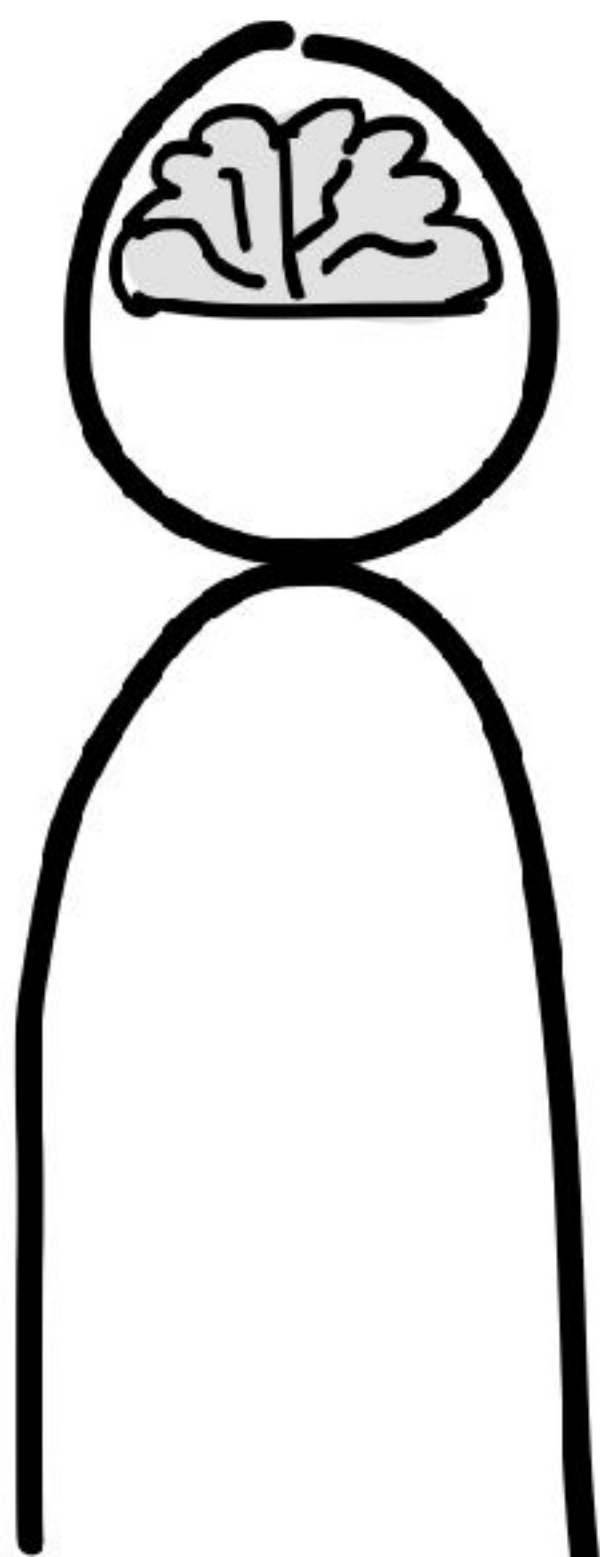


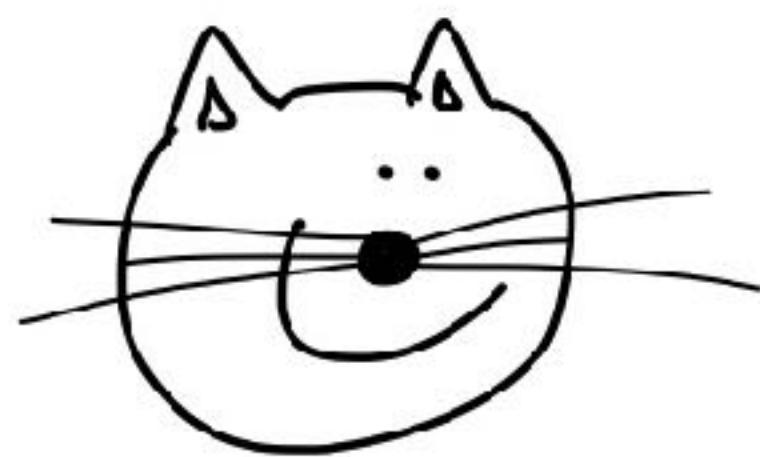
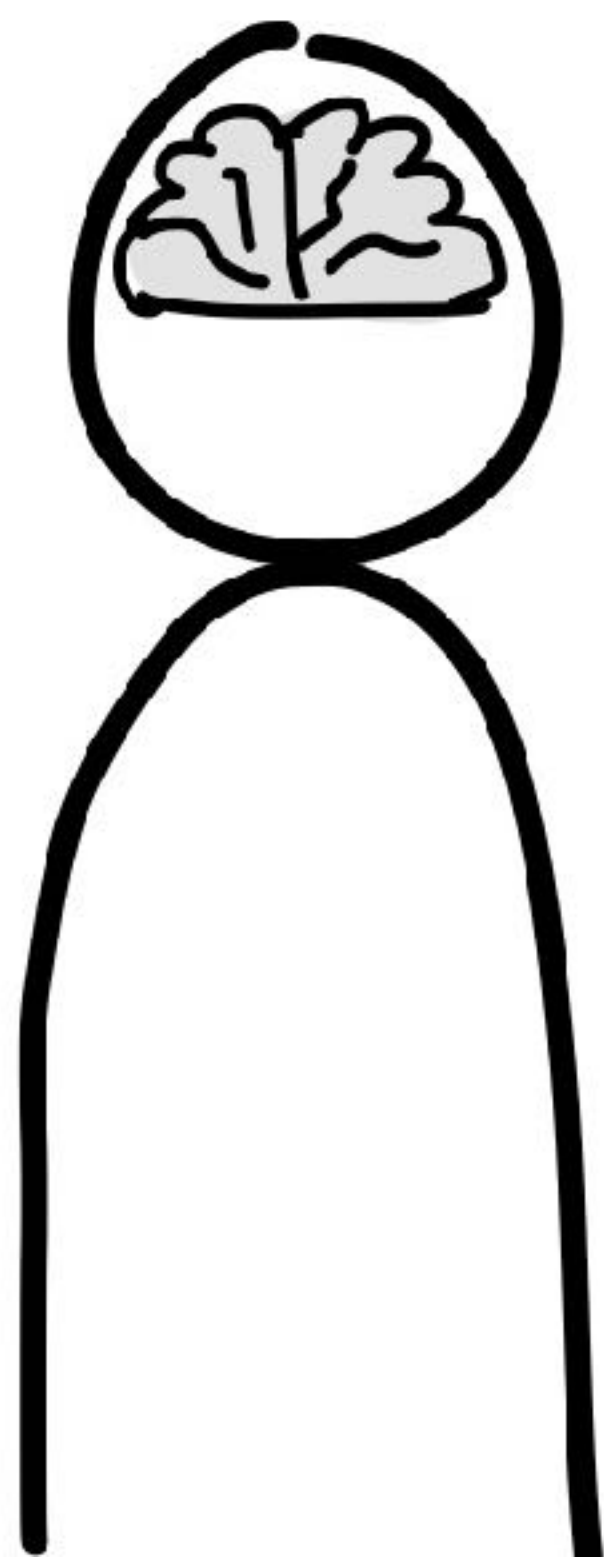
abk mrtpi gbar





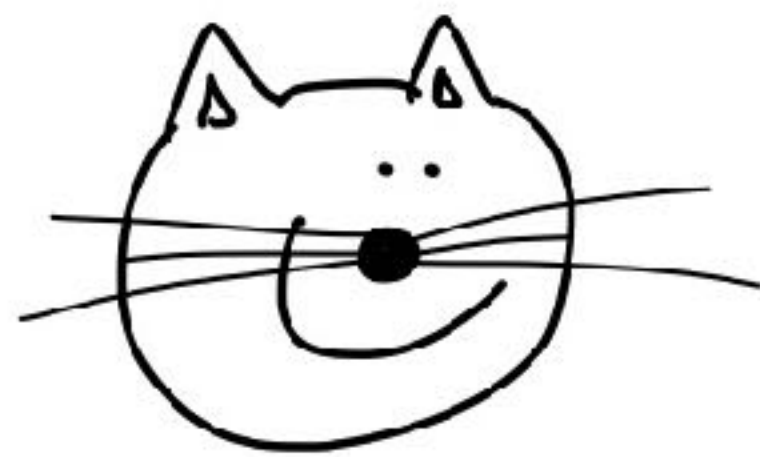
cat loves cake



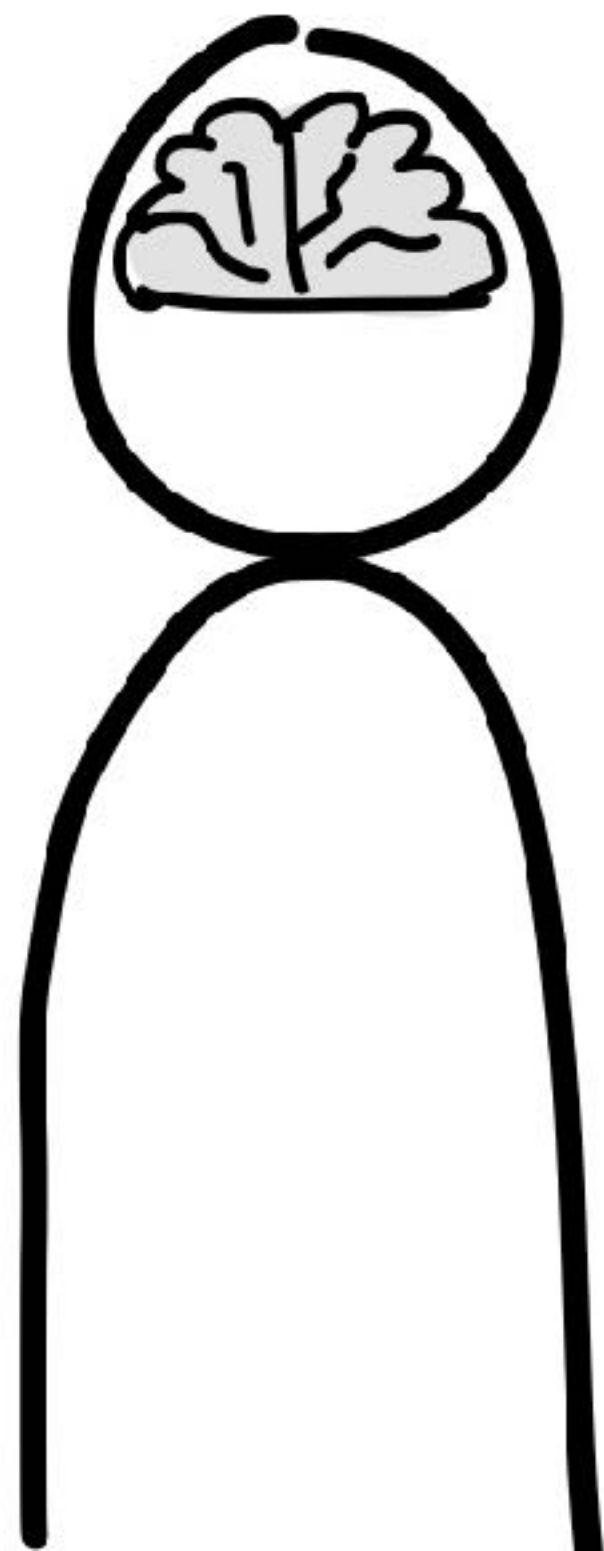


cat loves cake

Retrieved from
long-term memory



cat loves cake



What happens in your
brain when you read code?



Different forms of confusion

Let's look at
three programs



Different forms of confusion

1) APL

2 2 2 2 2 T n

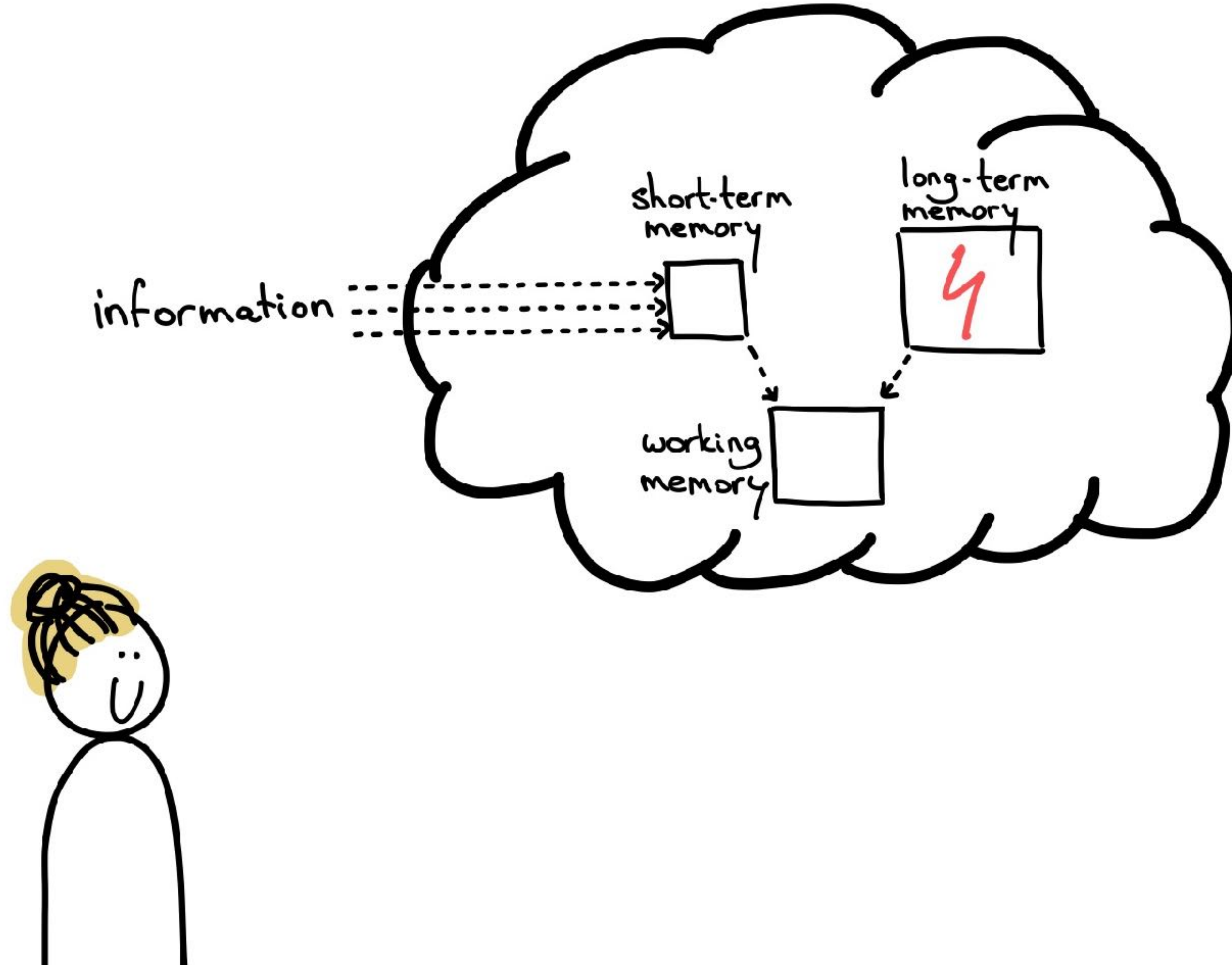


Different forms of confusion

1) APL

2 2 2 2 2 T n





Different forms of confusion

2) Java

```
public class BinaryCalculator {  
    public static void main(Int n) {  
        System.out.println(Integer.toBinaryString(n));  
    }  
}
```

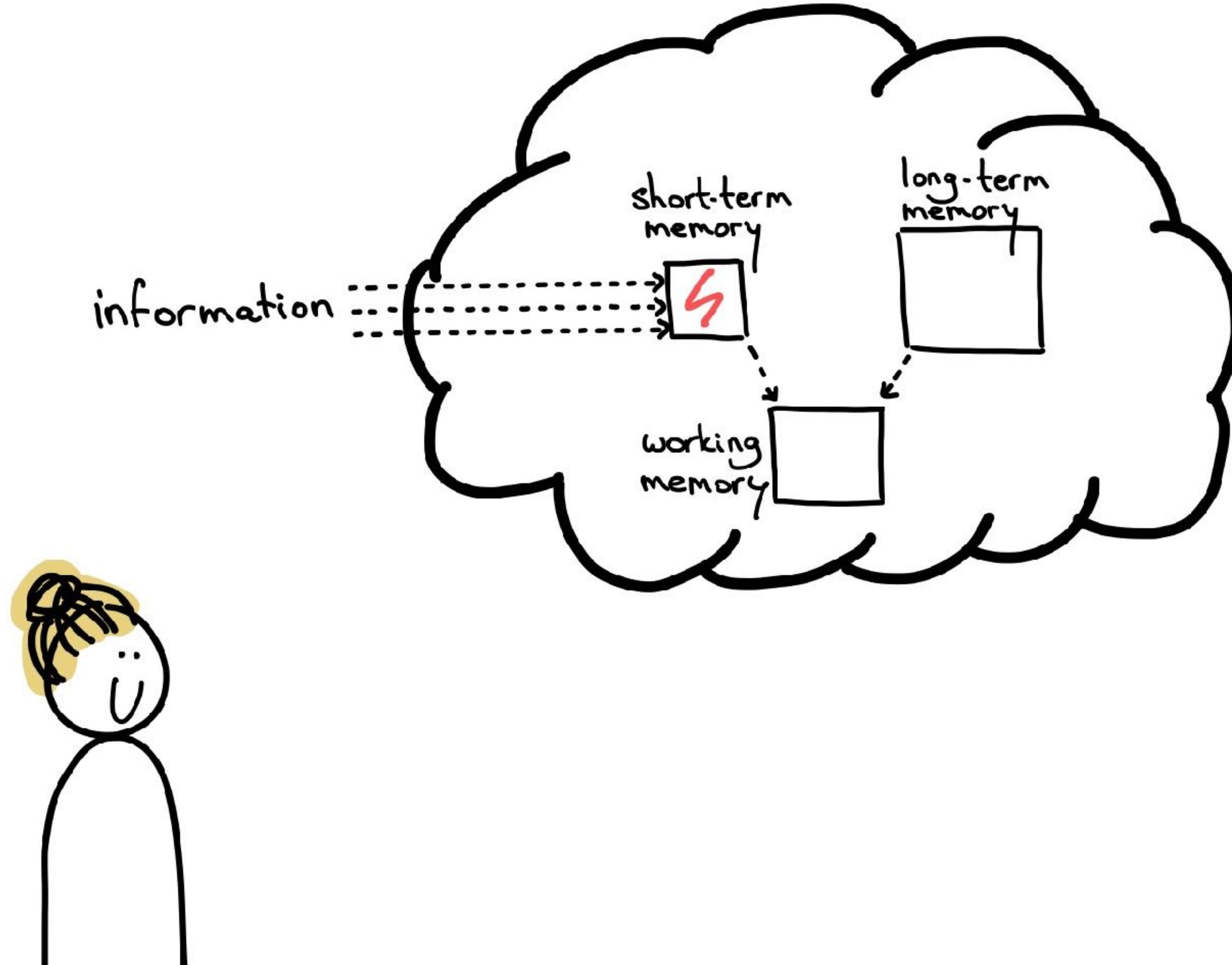


Different forms of confusion

2) Java

```
public class BinaryCalculator {  
    public static void main(Int n) {  
        System.out.println(Integer.toString(n));  
    }  
}
```





Different forms of confusion

3) BASIC

```
1 LET N2 = ABS (INT (N))
2 LET B$ = ""
3 FOR N1 = N2 TO 0 STEP 0
4     LET N2 = INT (N1 / 2)
5     LET B$ = STR$ (N1 - N2 * 2) + B$
6     LET N1 = N2
7 NEXT N1
8 PRINT B$
9 RETURN
```



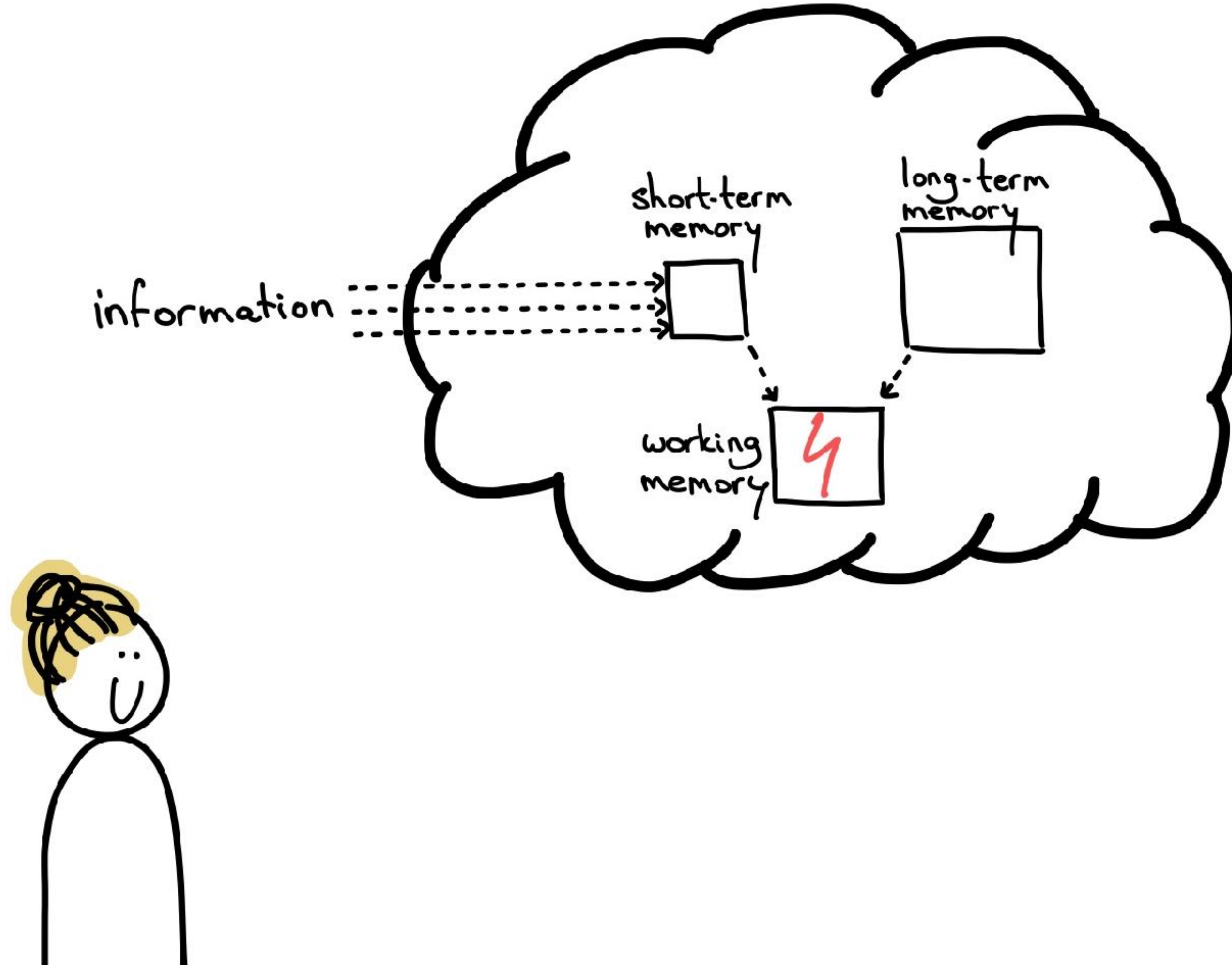
Different forms of confusion

3) BASIC

```
1 LET N2 = ABS (INT (N))
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7 NEXT N1
8 PRINT B$
9 RETURN
```

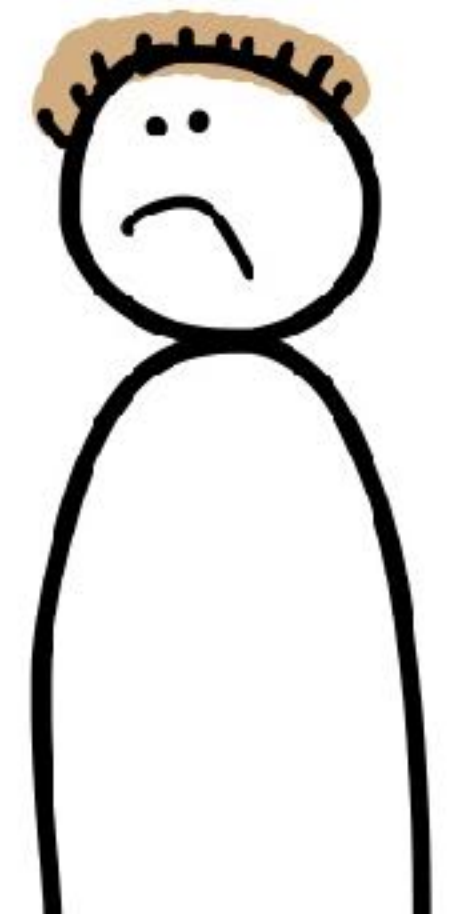
Handwritten annotations: An arrow points from the word "ABS" in line 1 to the number 7. Another arrow points from the expression "N1 / 2" in line 4 to the number 3. A third arrow points from the expression "N1 - N2 * 2" in line 5 to the string "0".





Different forms of confusion

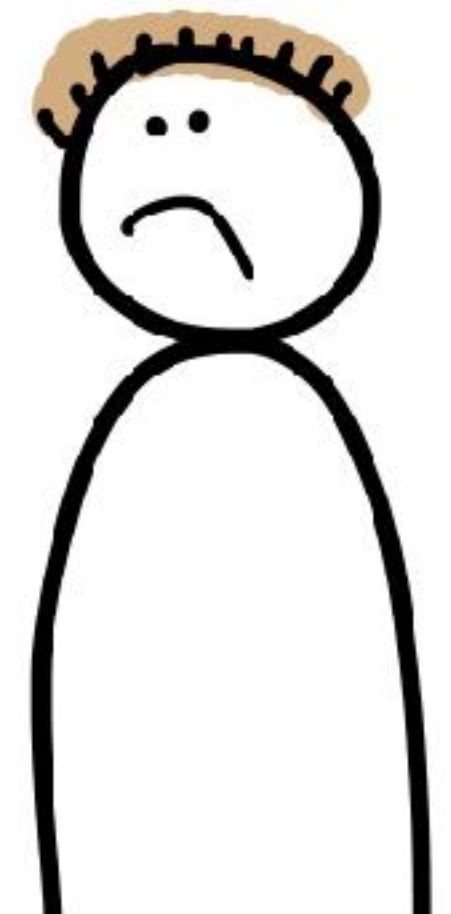
Reading code is
hard



Different forms of confusion

Reading code is
hard

Rewriting is
easier



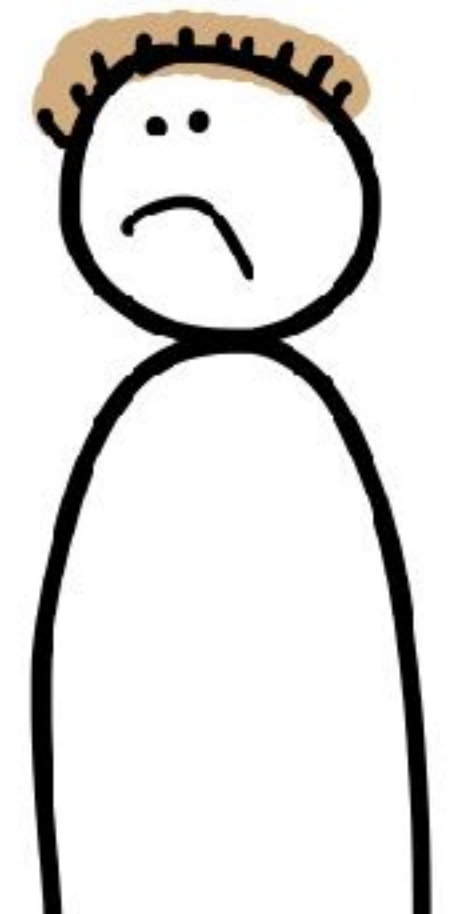
Different forms of confusion

You can get
better at reading



Reading code is
hard

Rewriting is
easier

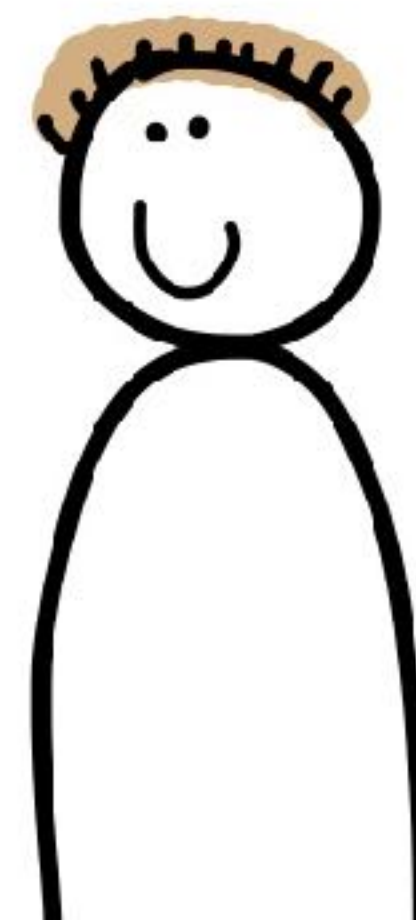


Different forms of confusion

You can get
better at reading



How?



Different forms of confusion

Different solutions for each



Different forms of confusion

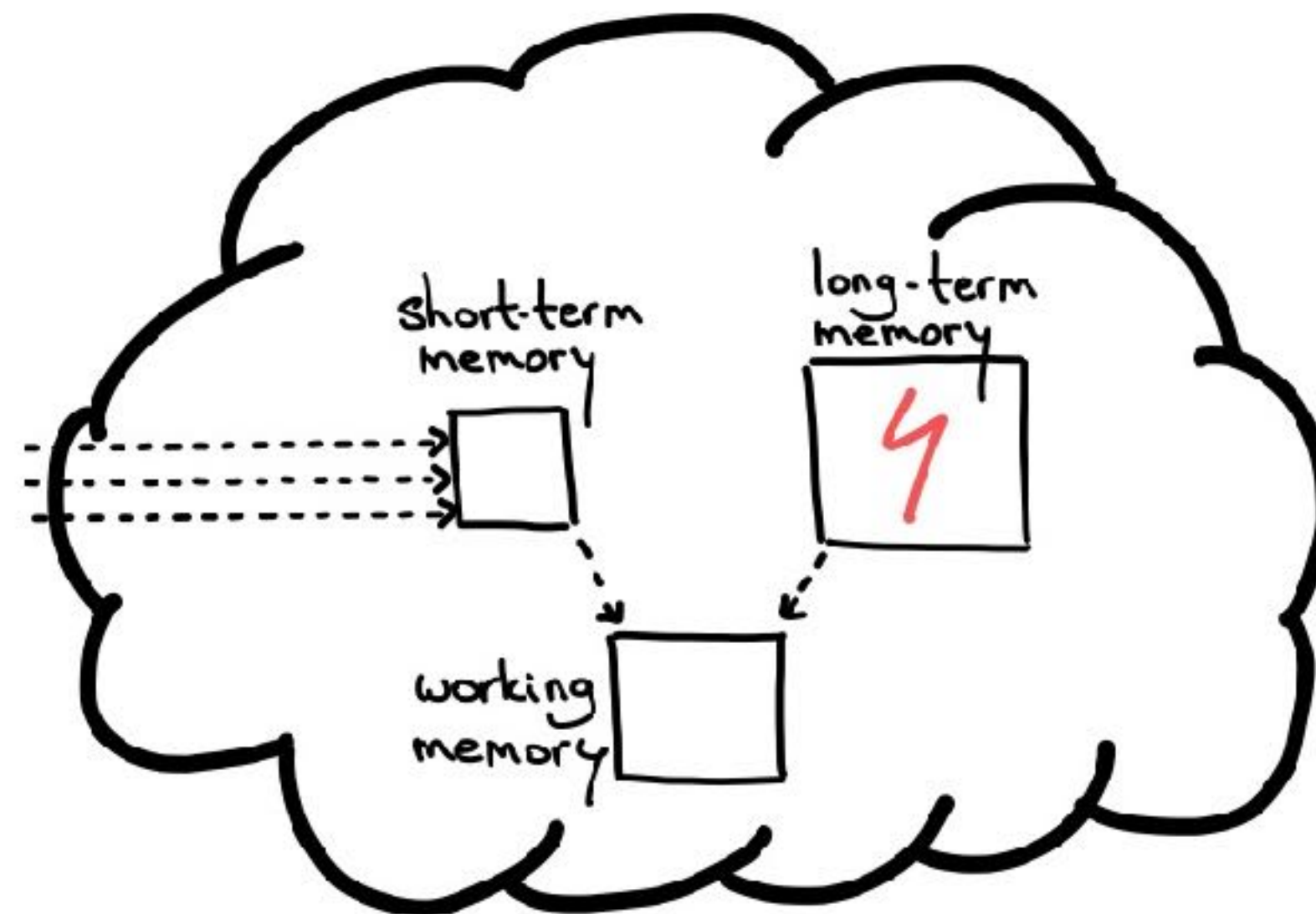
Different solutions for each



2 2 2 2 2 T n

Different forms of confusion

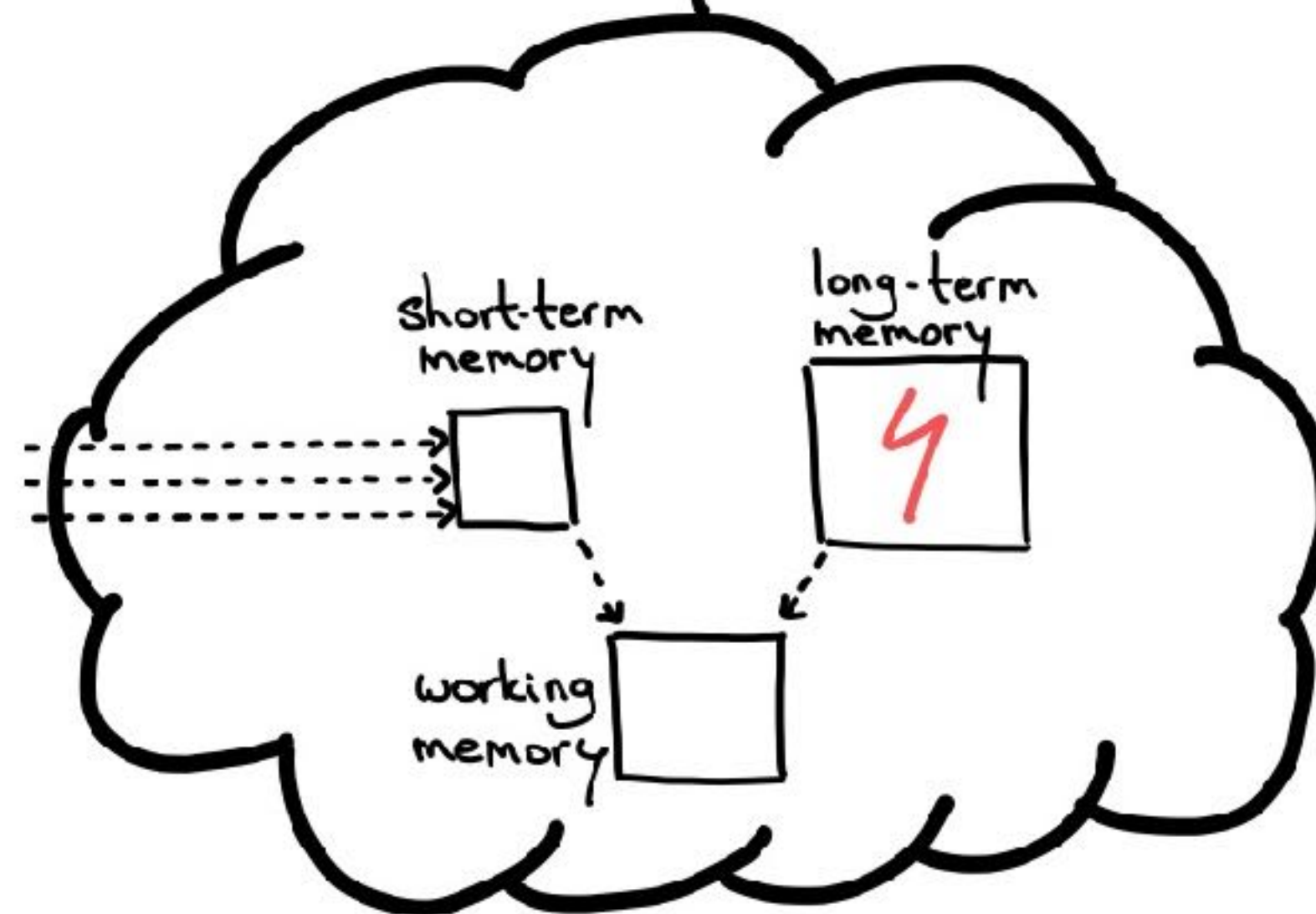
Different solutions for each



Different forms of confusion

Different solutions for each

Practice syntax



Different forms of confusion

Different solutions for each

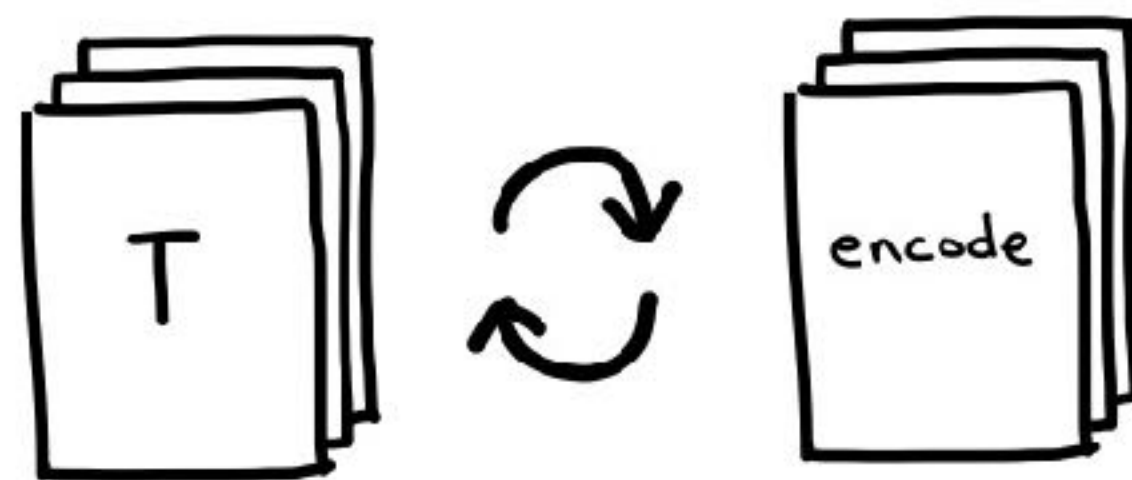
Practice syntax



Different forms of confusion

Different solutions for each

Practice syntax



Different forms of confusion

Different solutions for each



Different forms of confusion

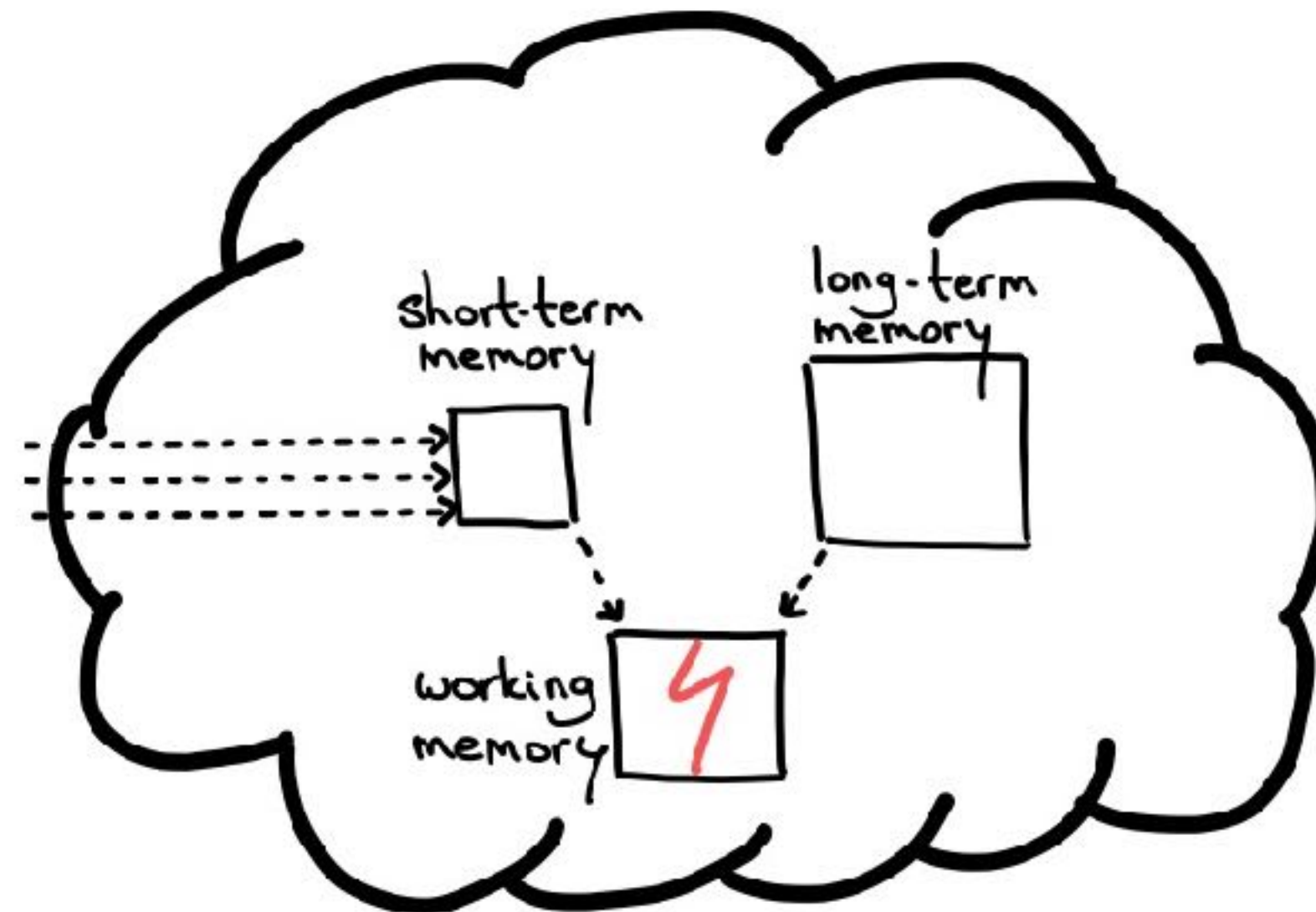
Different solutions for each



```
1 LET N2 = ABS (INT (N))
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6     LET N1 = N2
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8 PRINT B$
9 RETURN
```

Different forms of confusion

Different solutions for each



Different forms of confusion

Different solutions for each

Support working memory



```
1 LET N2 = ABS (INT (N))
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6     LET N1 = N2
7 NEXT N1
8 PRINT B$
9 RETURN
```

	N	N2	B\$	N1
init				
loop1				
loop2				

Different forms of confusion

Different solutions for each

Support working memory



```
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Different forms of confusion

Different solutions for each

Support working memory



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8 PRINT B$
9 RETURN
```

	N	N2	B\$	N1
init	7	7	-	7
loop1				
loop2				

Different forms of confusion

Different solutions for each

Support working memory



```
1 LET N2 = ABS (INT (N))
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9 RETURN
```

	N	N2	B\$	N1
init	7	7	-	7
loop1		3	0	3
loop2				

More techniques from reading

You can get
better at reading

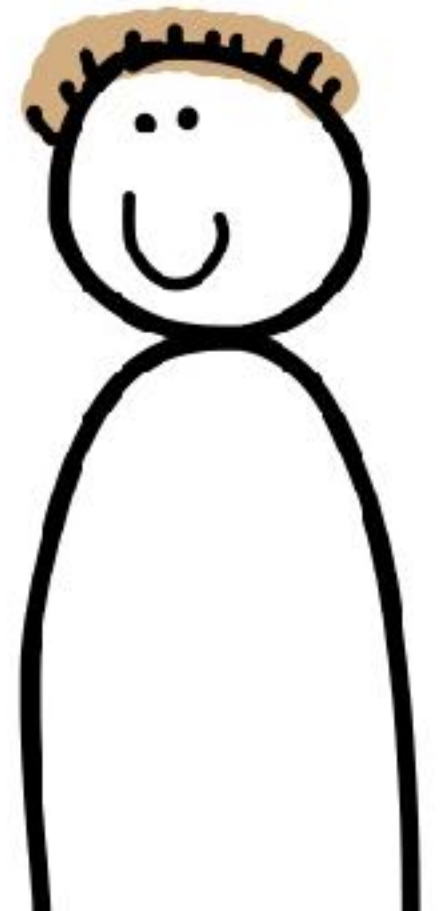


More techniques from reading

You can get
better at reading



How?



More techniques from reading

Remember code



More techniques from reading

Remember code

```
public class InsertionSort {  
    public static void main (String [] args) {  
        int [] array = {45,12,...};  
        int temp;  
        for (int i = 1; i < array.length; i++) {  
            for (int j = i; j > 0; j--) {  
                if (array[j] < array [j - 1]) {  
                    // swap j with j - 1  
                    temp = array[j];  
                    array[j] = array[j - 1];  
                    array[j - 1] = temp;  
                }  
            }  
        }  
        //print array  
        for (int i = 0; i < array.length; i++) {  
            System.out.println(array[i]);  
        }  
    }  
}
```



More techniques from reading

Remember code



More techniques from reading

Remember code

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public class InsertionSort {  
    public static void main (String [] args) {  
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        for (int i = 1; i < array.length; i++) {  
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                    // swap j with j - 1  
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                    array[j] = array[j - 1];  
                    array[j - 1] = temp;  
                }  
            }  
        }  
        //print array  
        for (int i = 0; i < array.length; i++) {  
            System.out.println(array[i]);  
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    }  
}
```



More techniques from reading

Remember code

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    public static void main (String [] args) {  
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                    array[j - 1] = temp;  
                }  
            }  
        }  
        //print array  
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    }  
}
```



More techniques from reading

Remember code

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            System.out.println(array[i]);  
        }  
    }  
}
```



More techniques from reading

Remember code

Help explore this!



More techniques from reading

Remember code

Help explore this!

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More techniques from reading

Summarize code



More techniques from reading

Summarize code

- Goal
- Most important lines
- Decisions made
- Relevant concepts



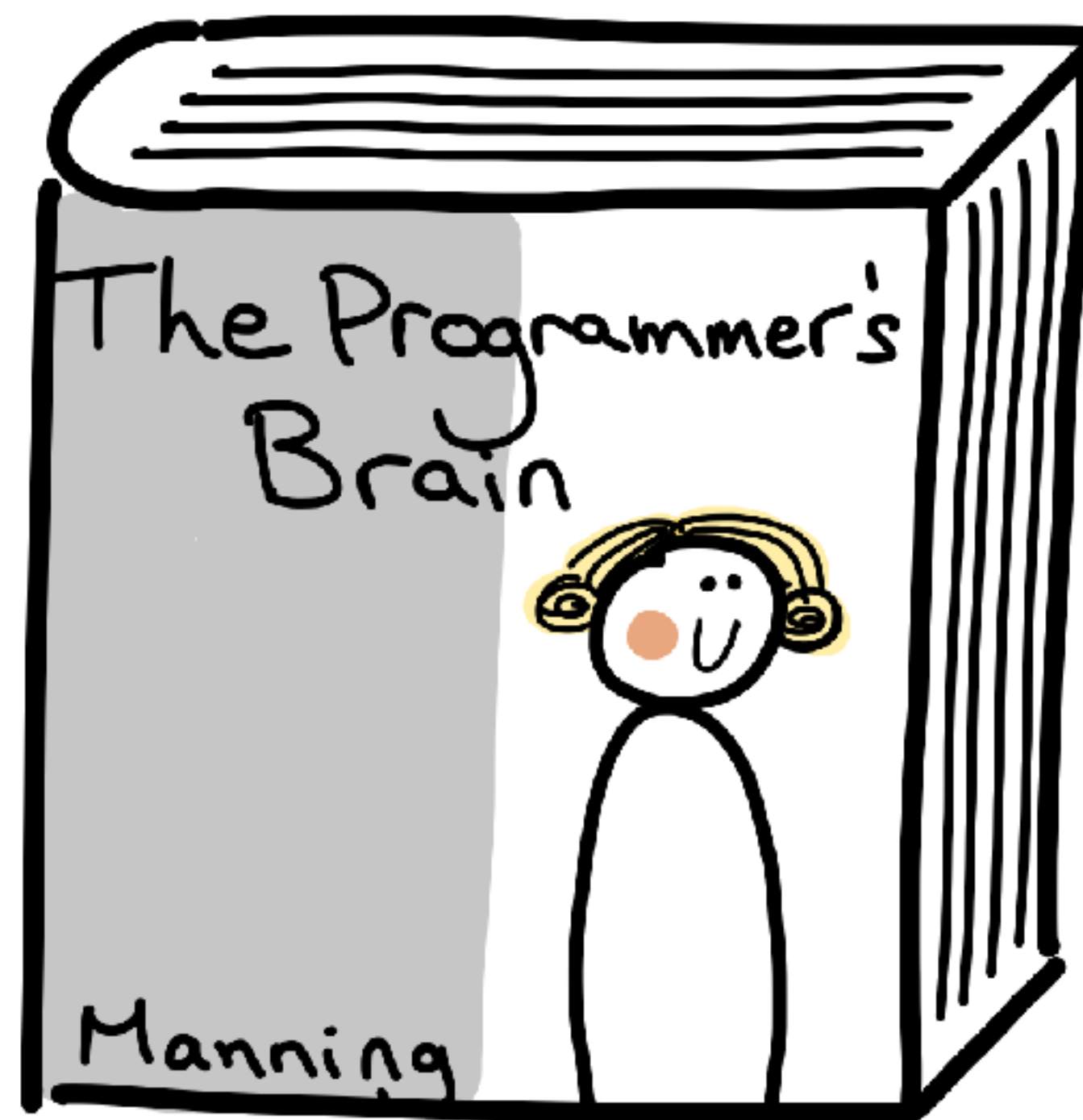
Want to know more?

Read my book



Want to know more?

Read my book



Want to know more?

Read my book

Start a code reading
club at work



THE END



How to read code?



@Felicie

How to read code?

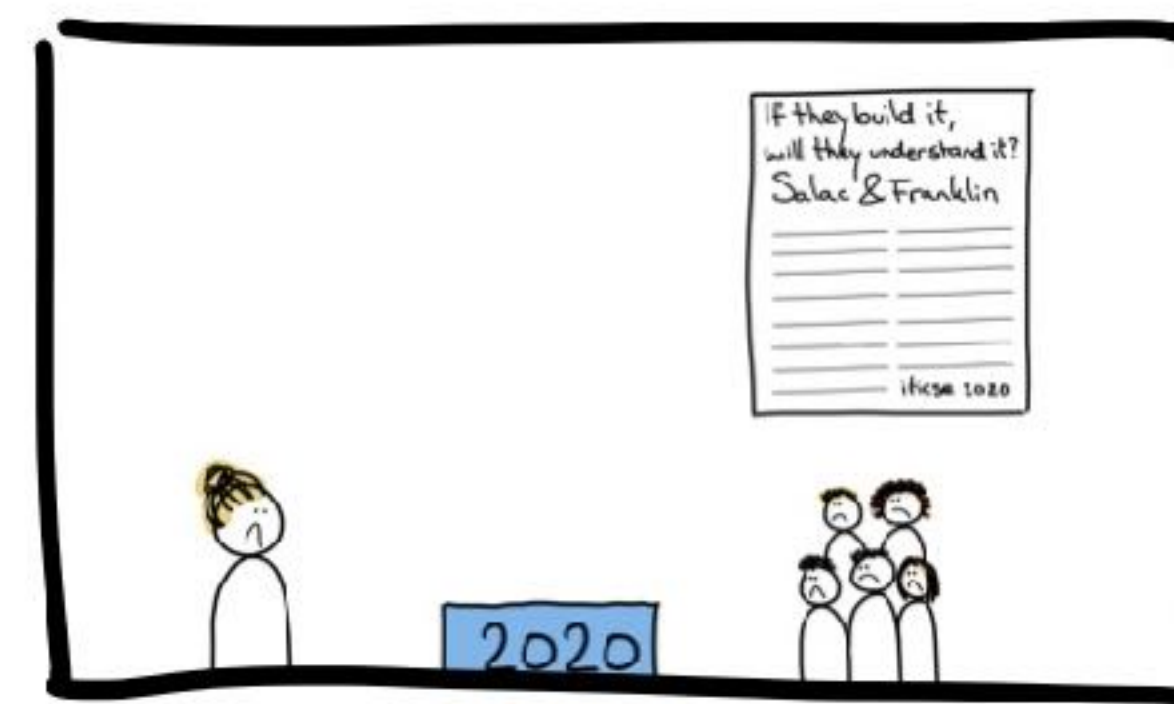
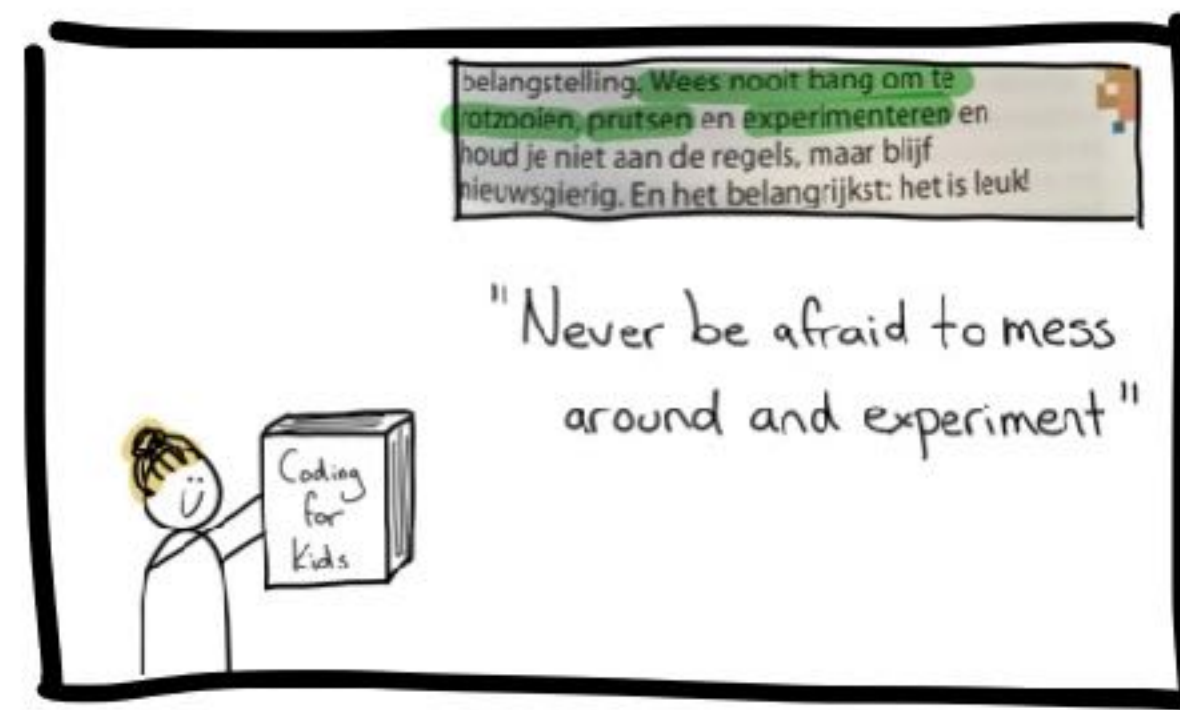
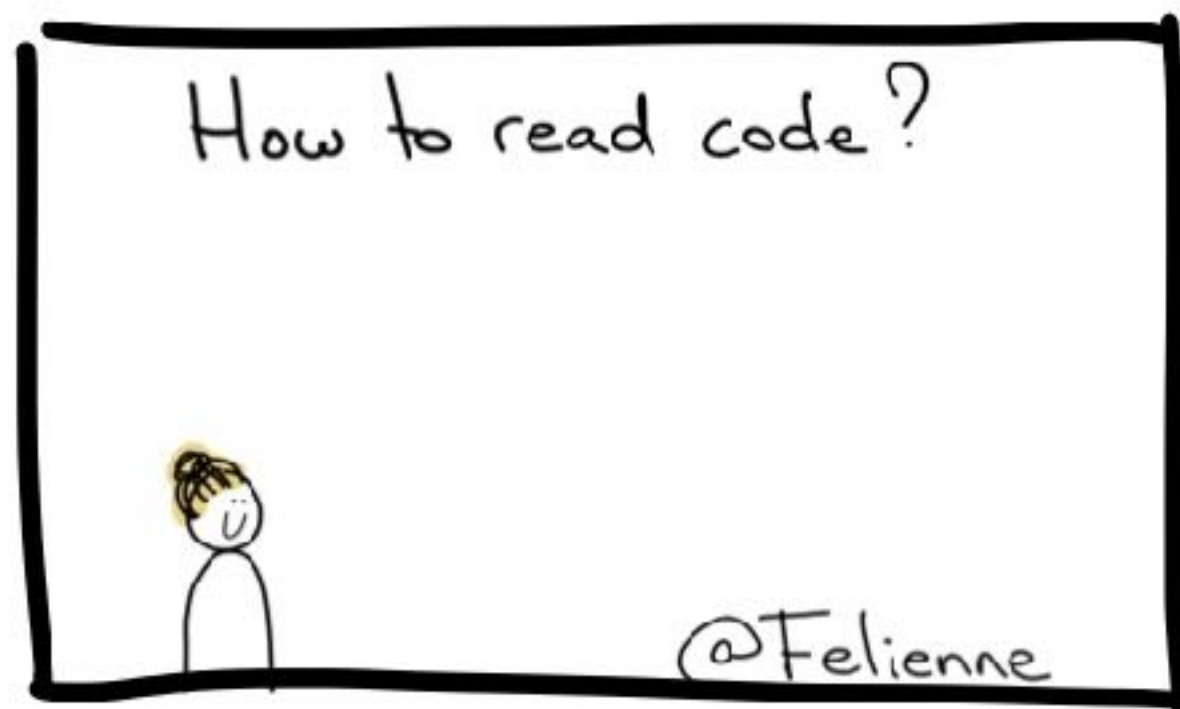


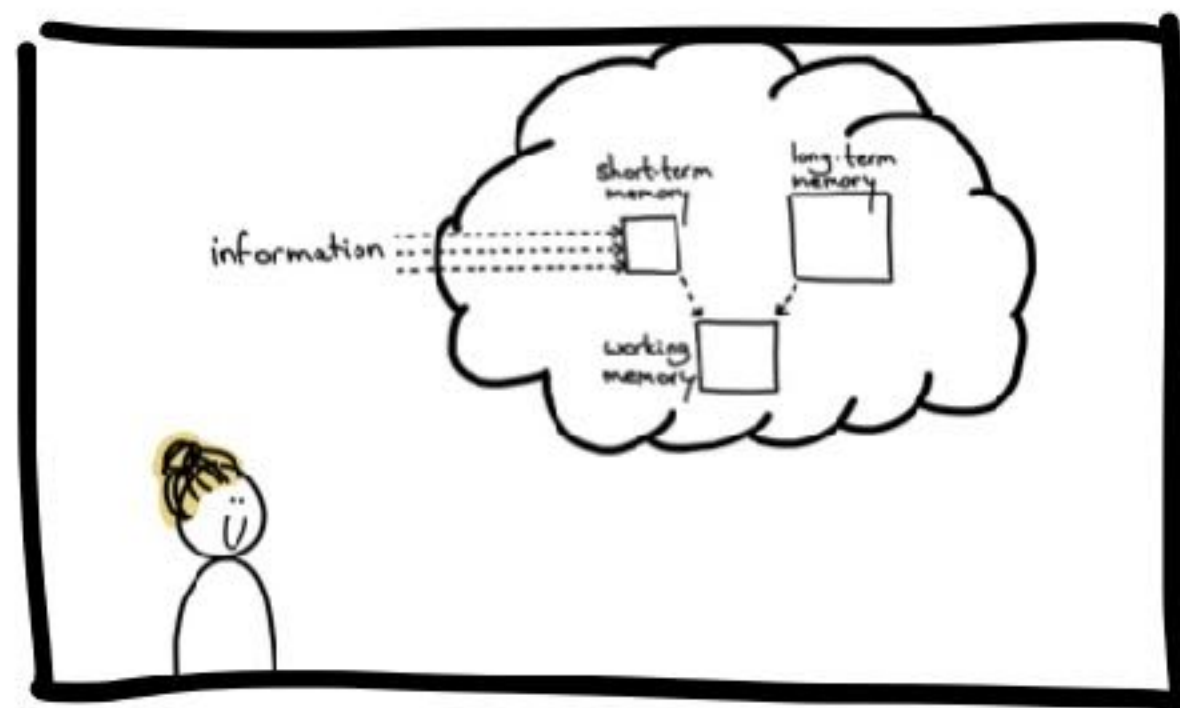
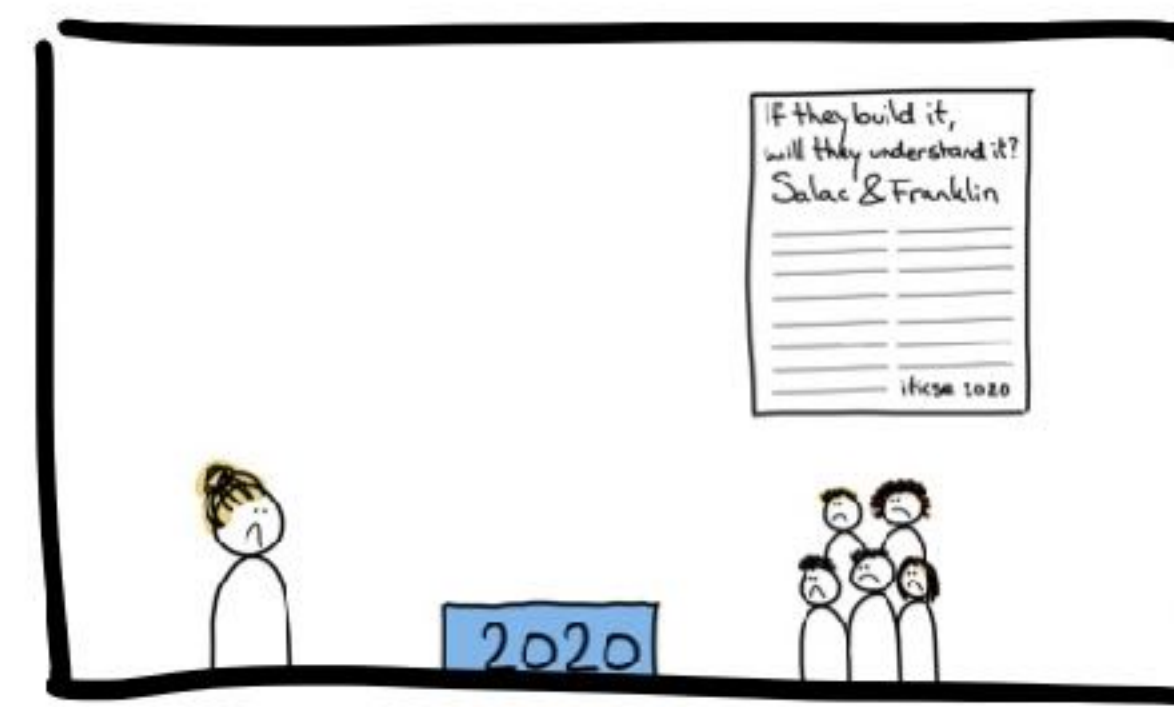
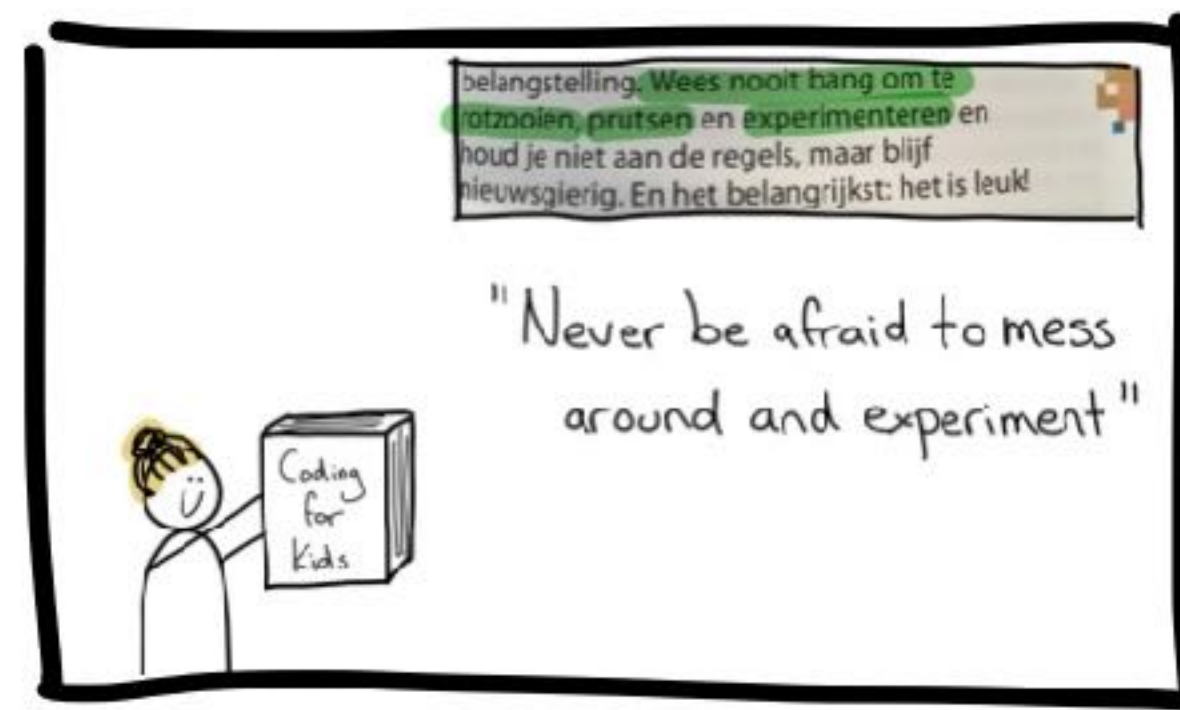
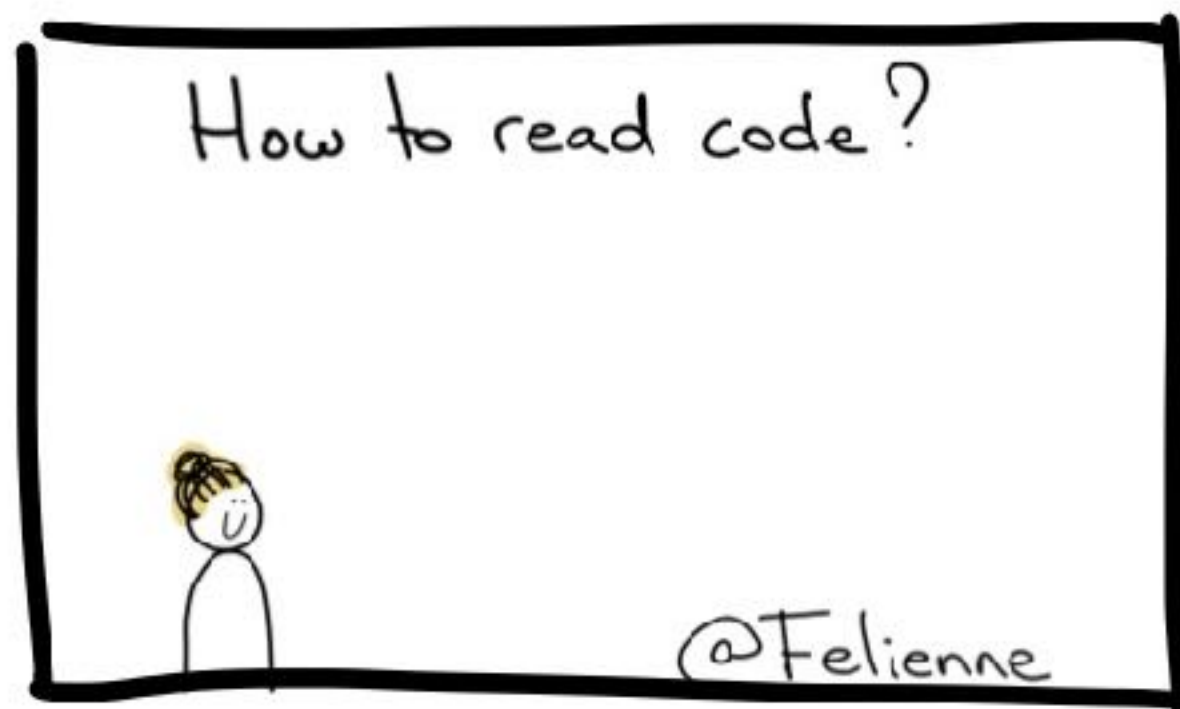
@Felicie

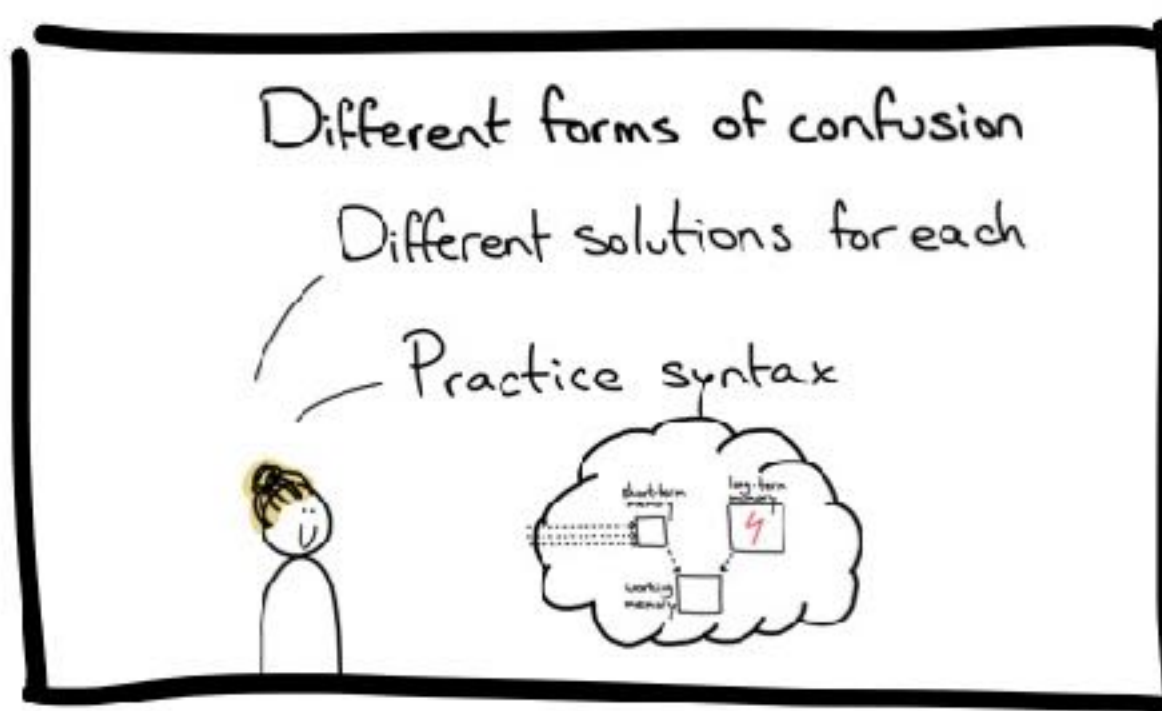
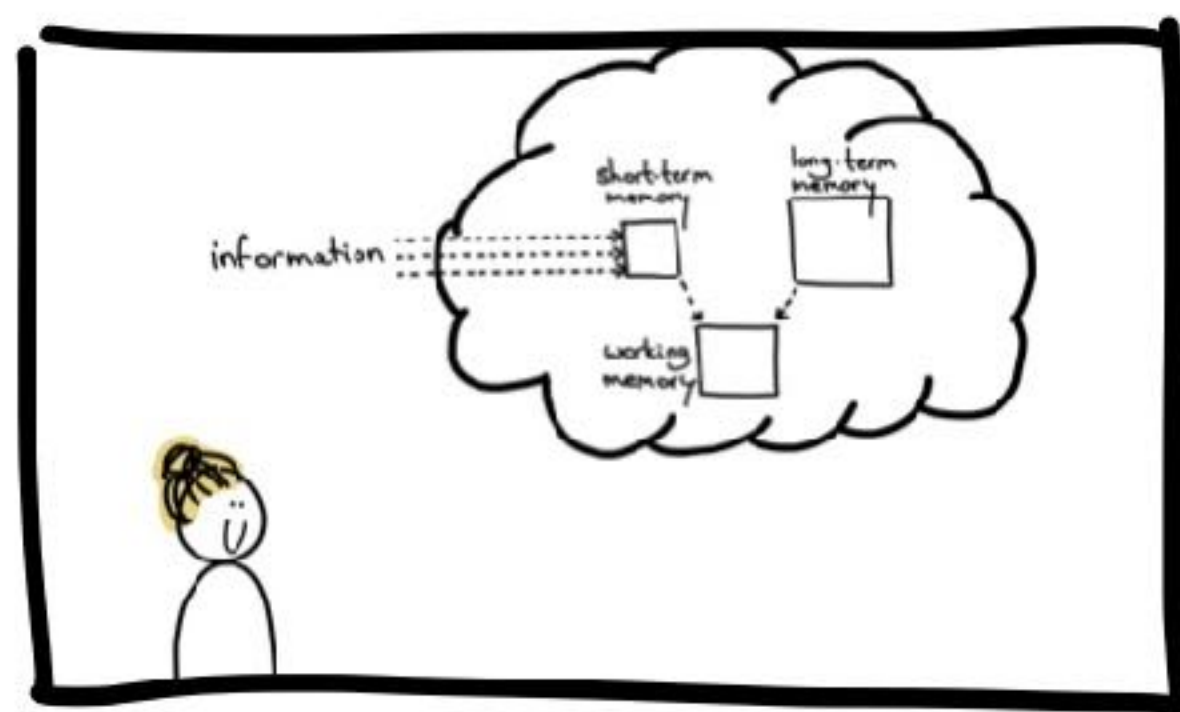
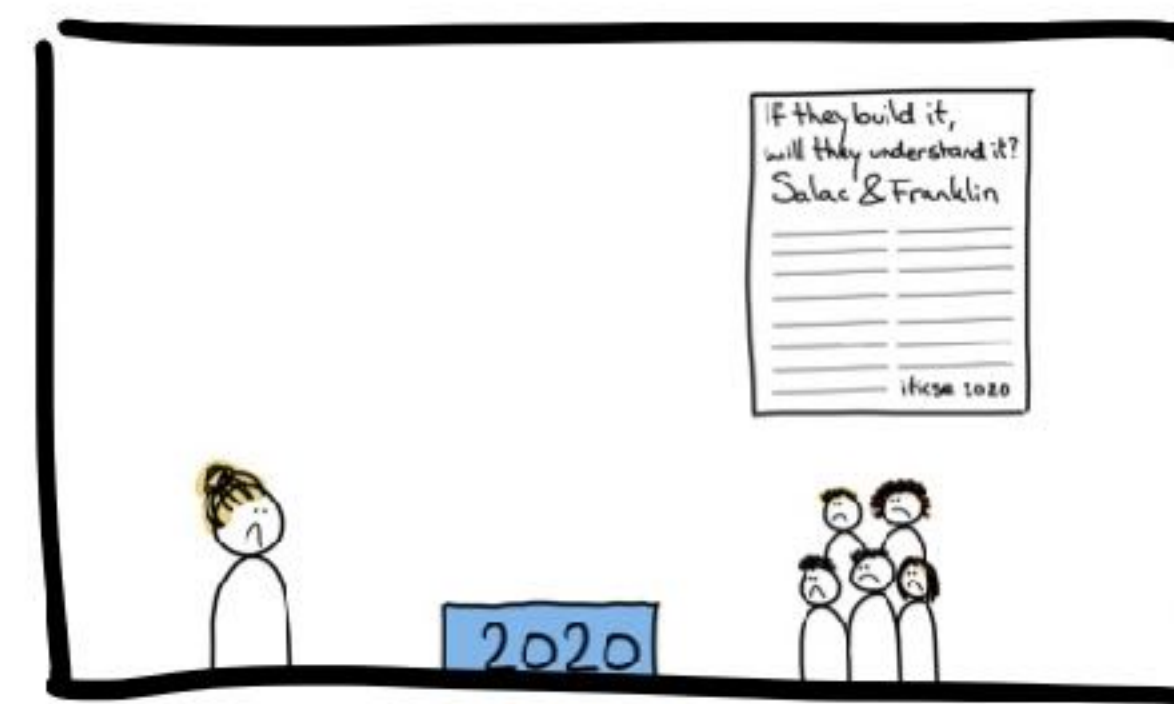
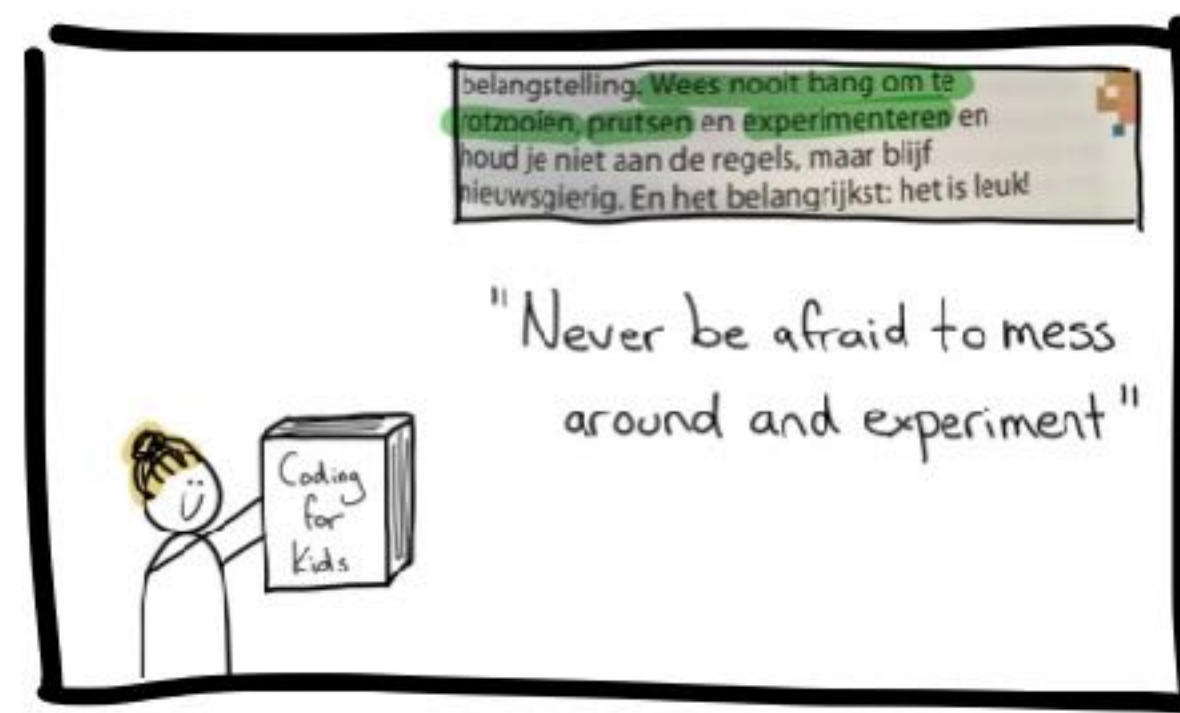
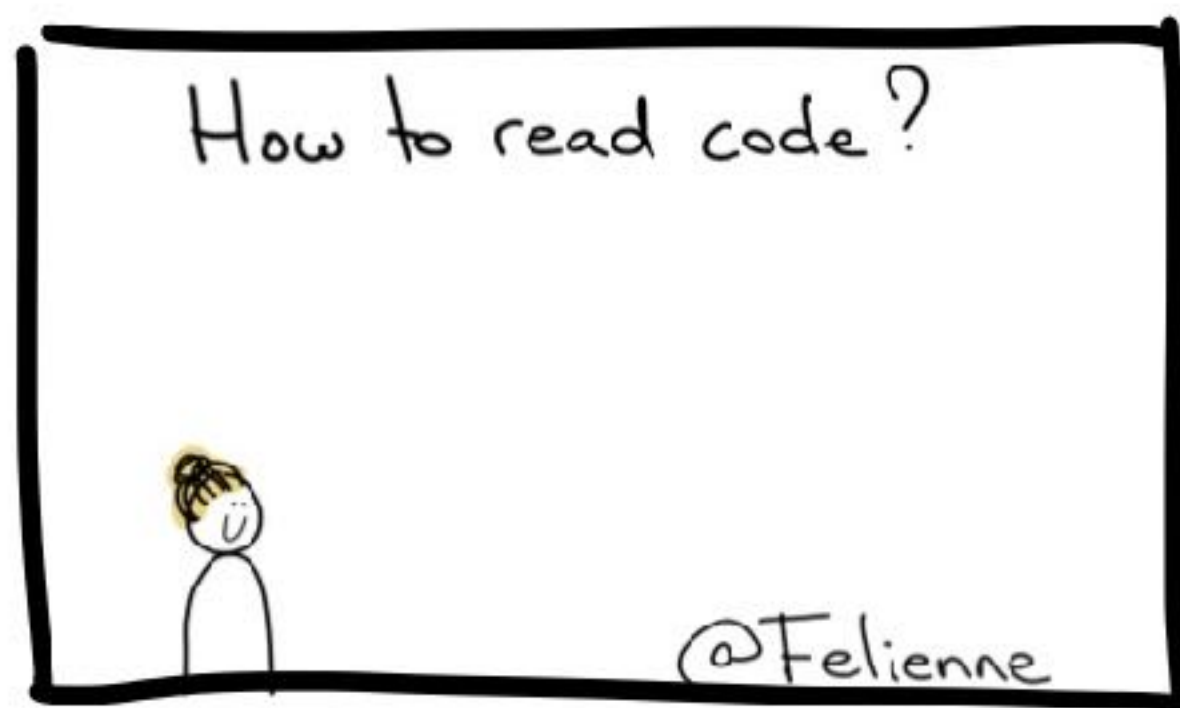
belangstelling. Wees nooit bang om te
otzooien, prutsen en experimenteren en
houd je niet aan de regels, maar blijf
nieuwsgierig. En het belangrijkste: het is leuk!

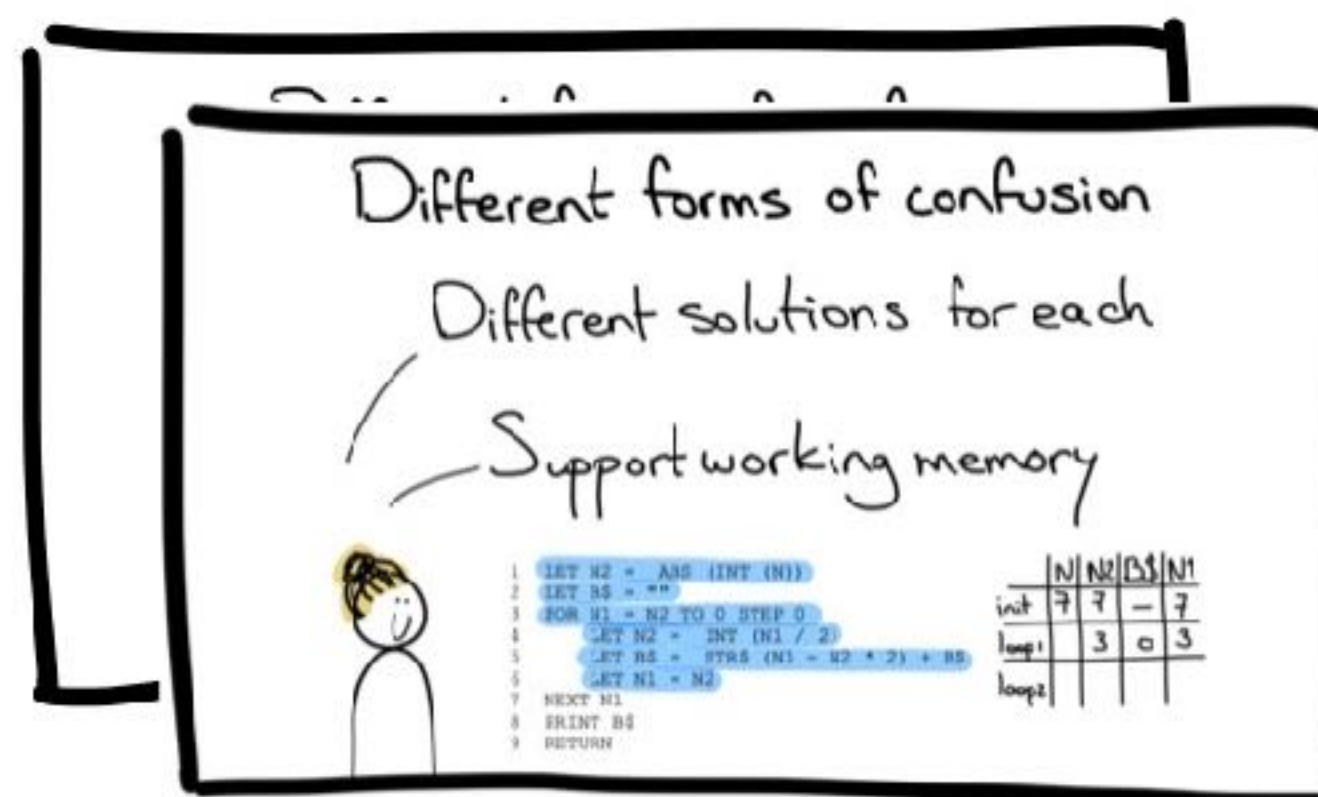
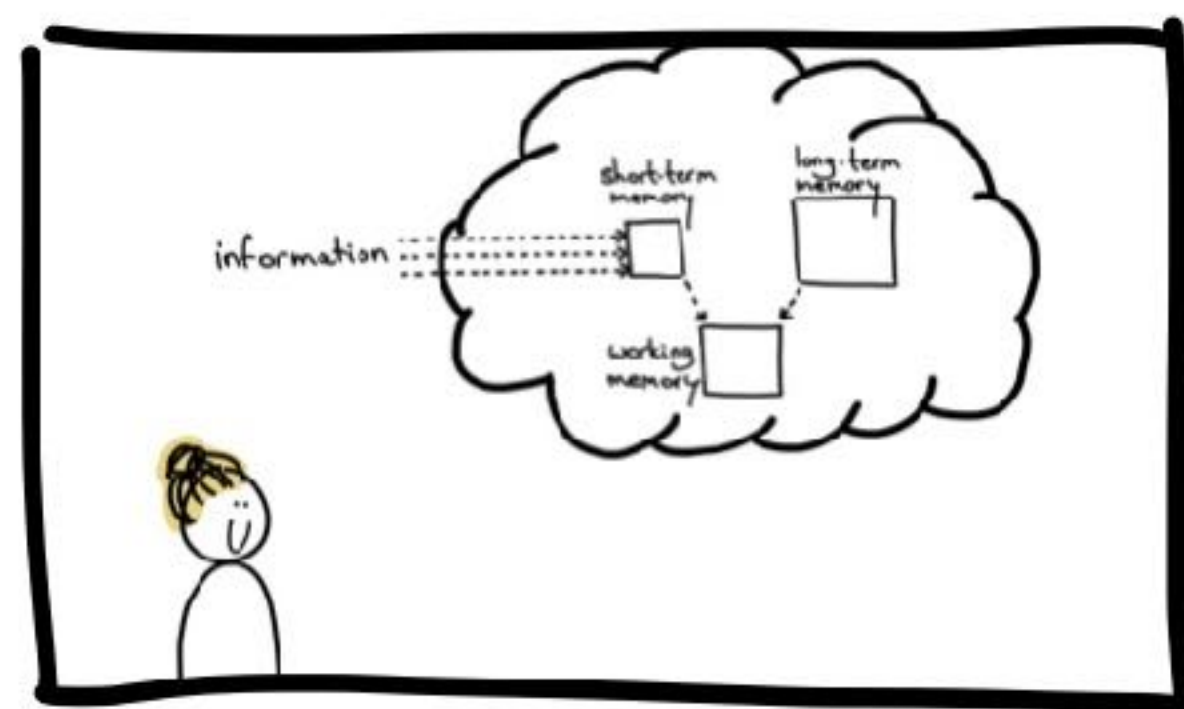
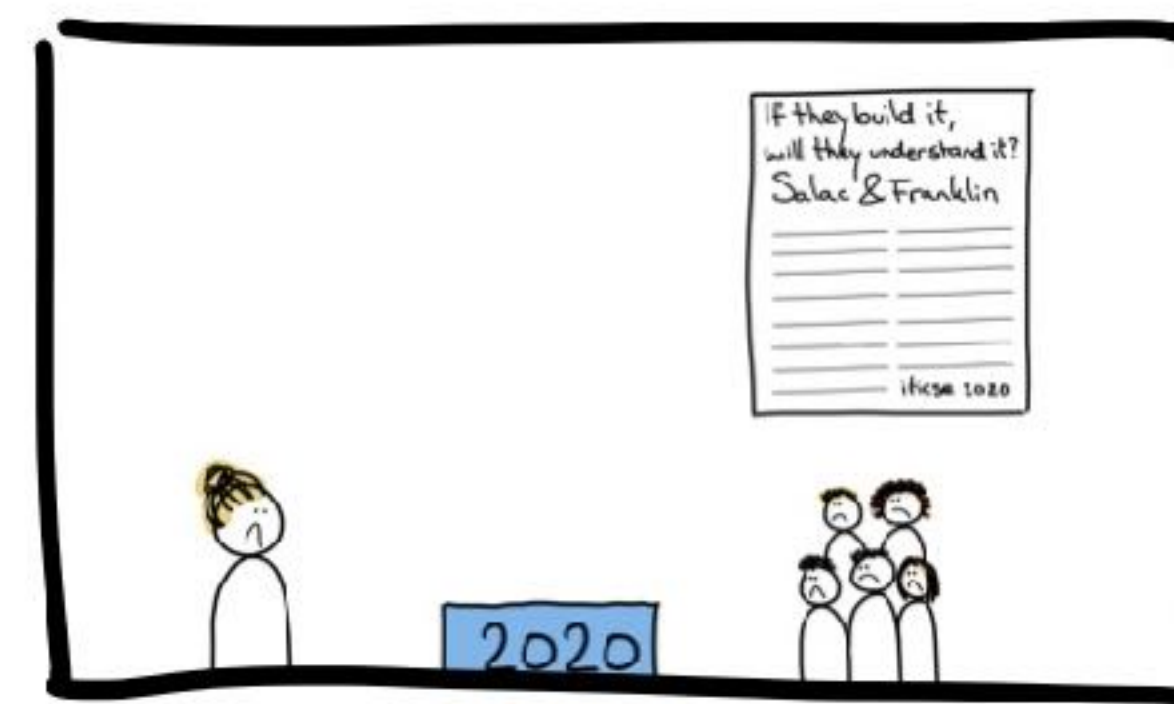
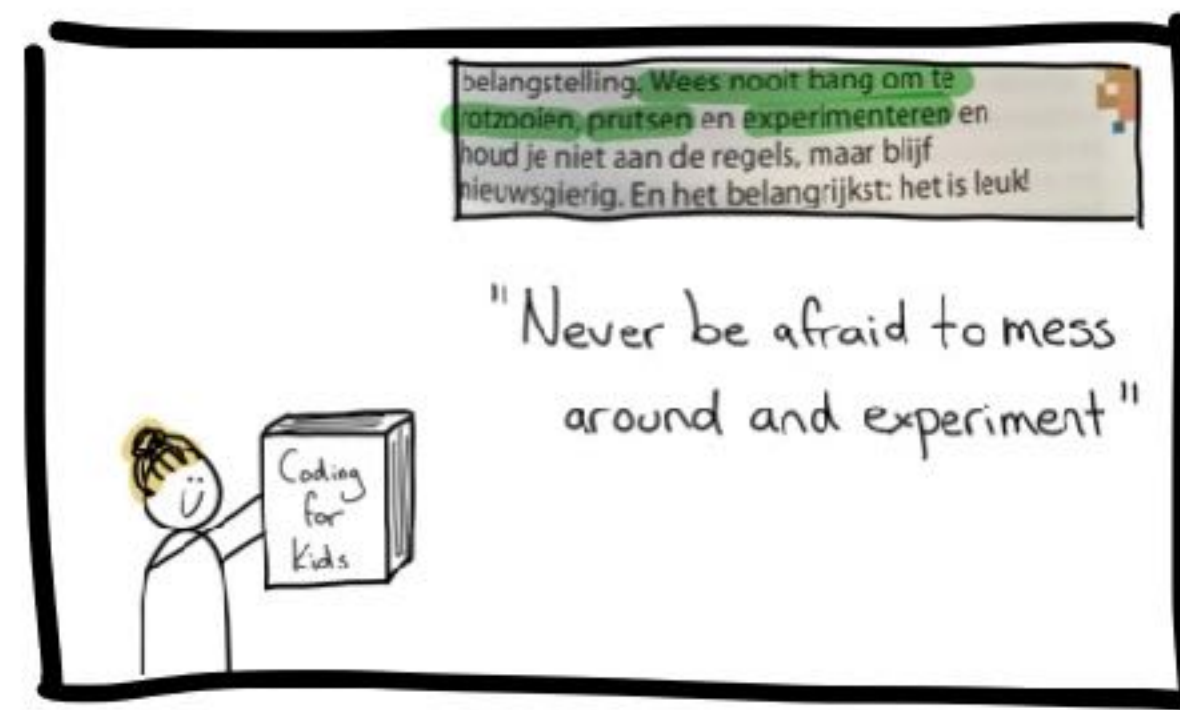
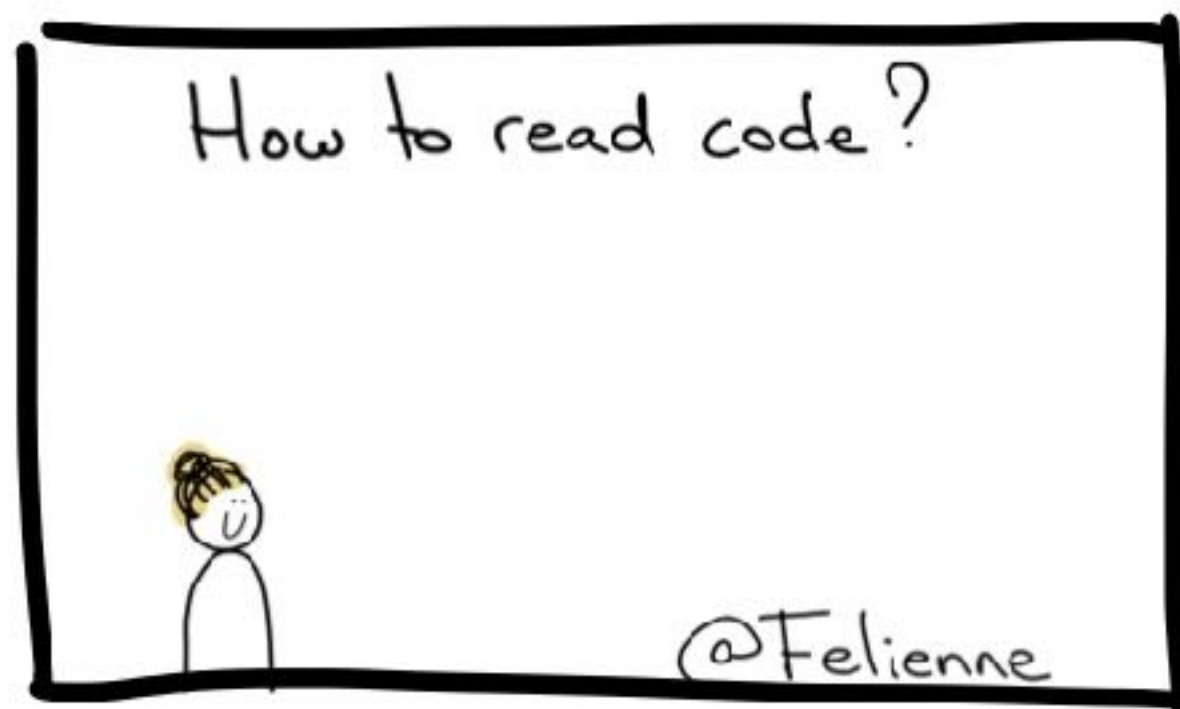
"Never be afraid to mess
around and experiment"

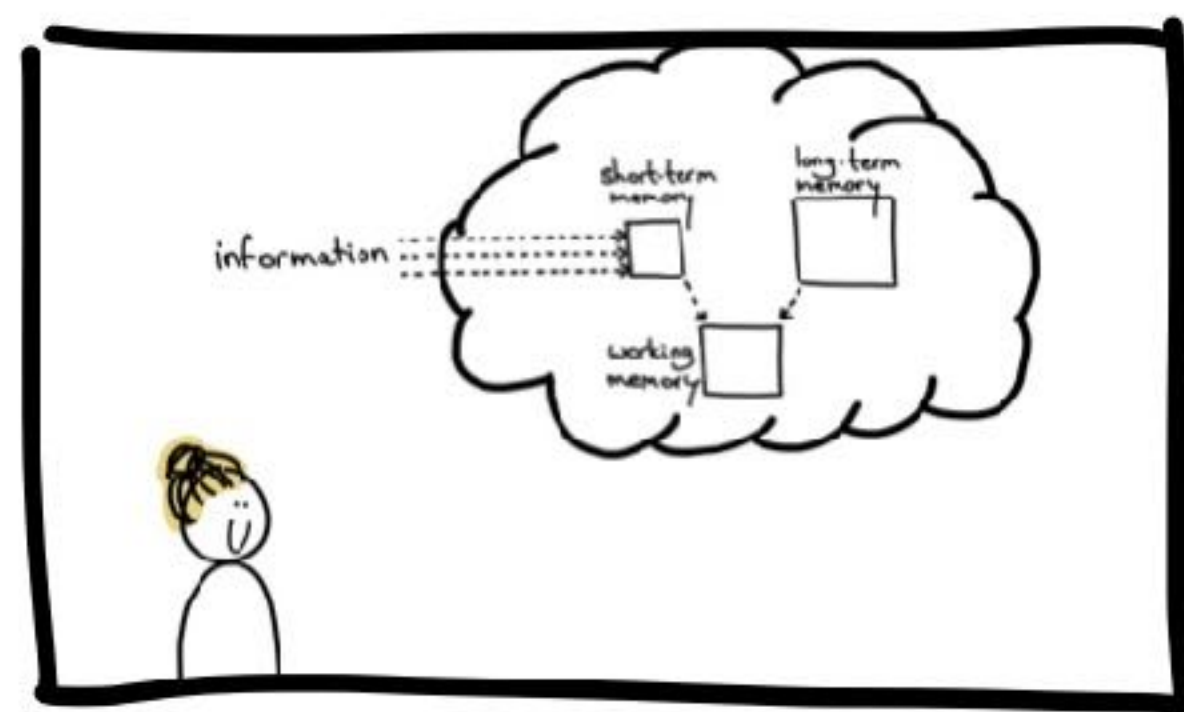
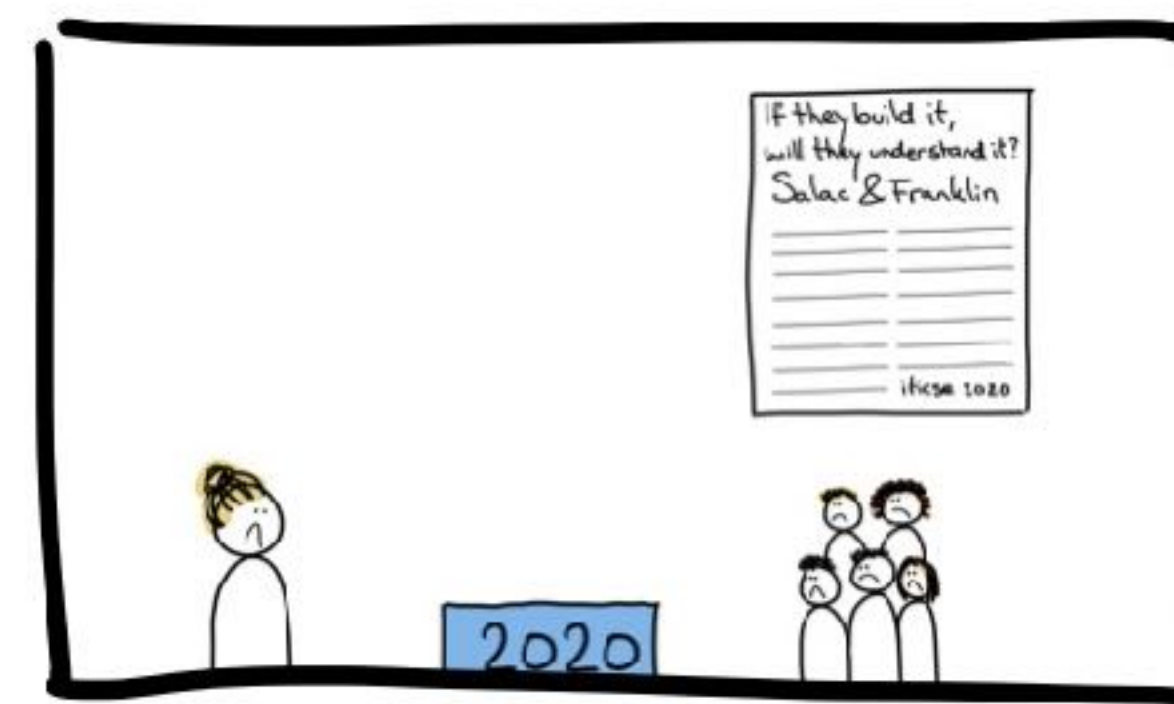
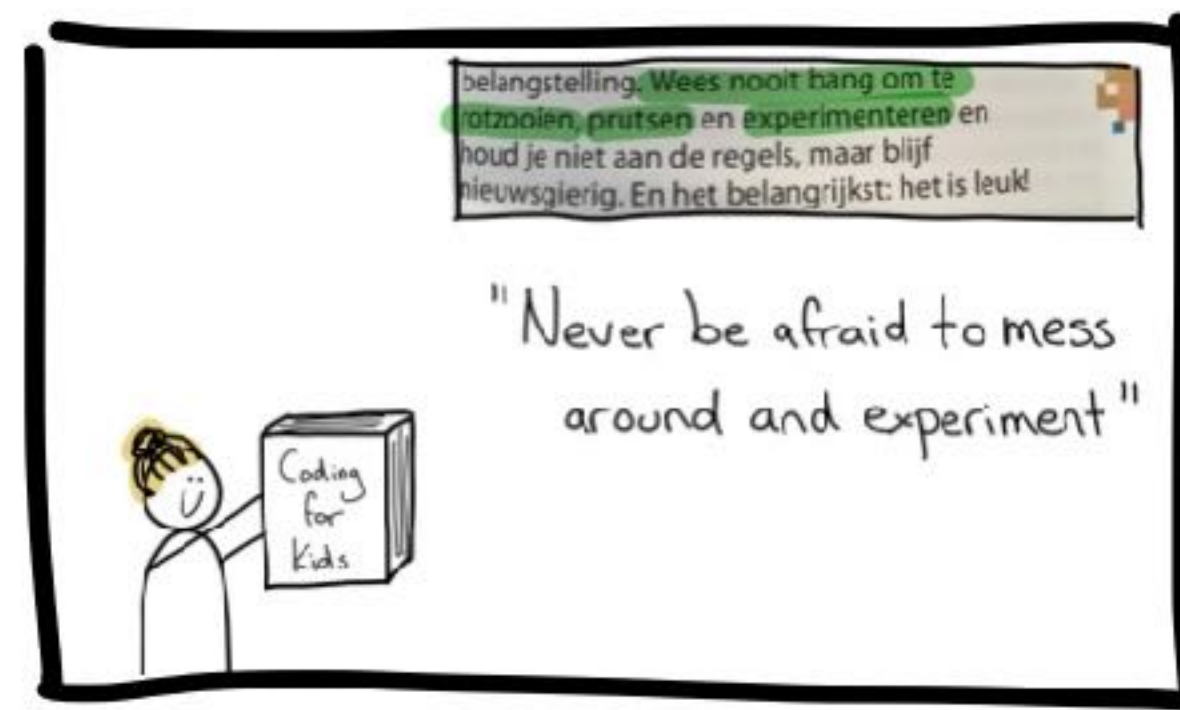
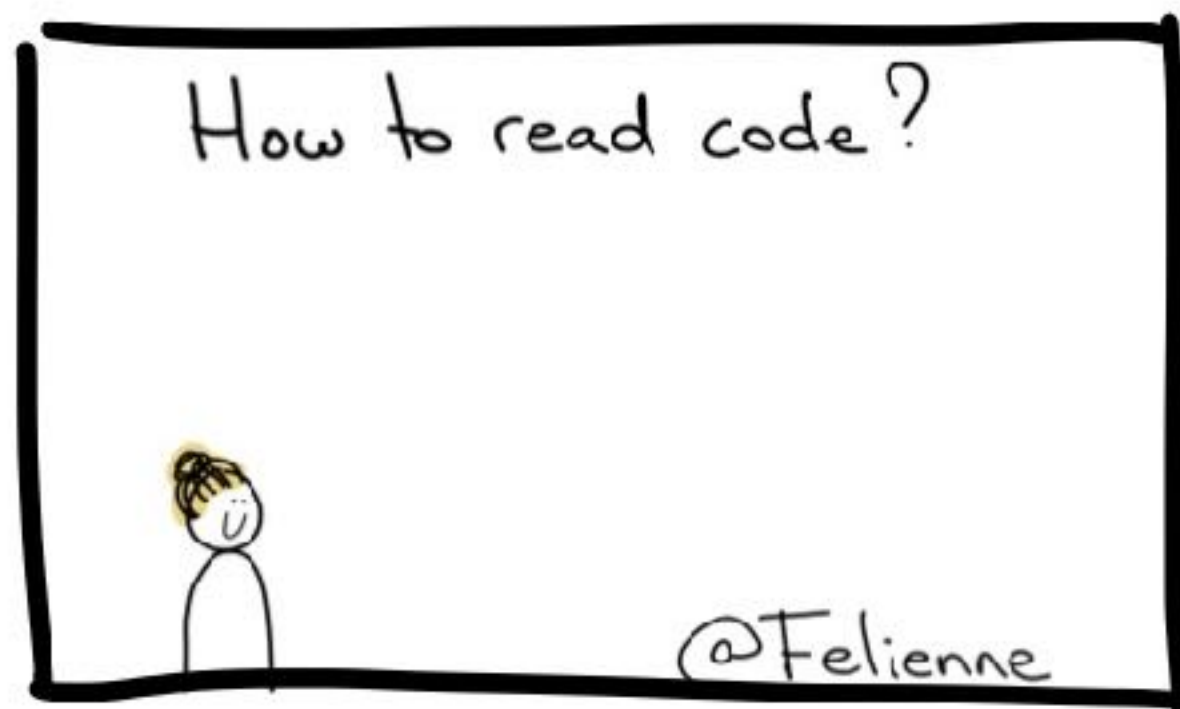












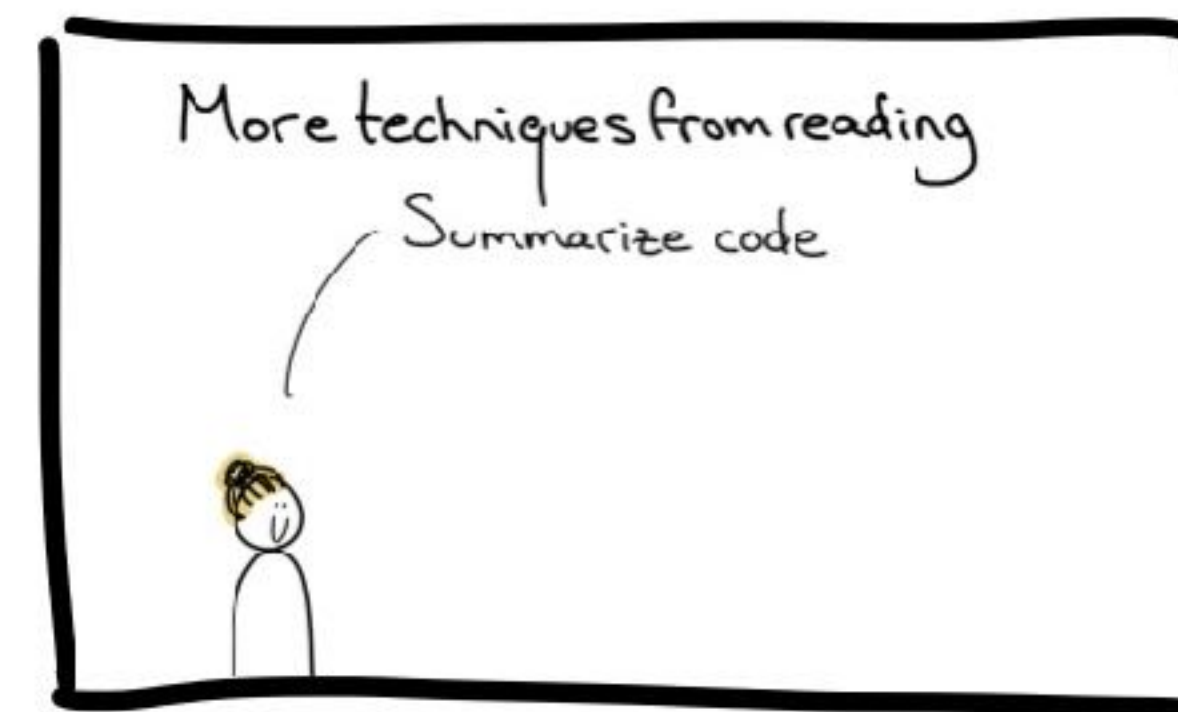
Different forms of confusion

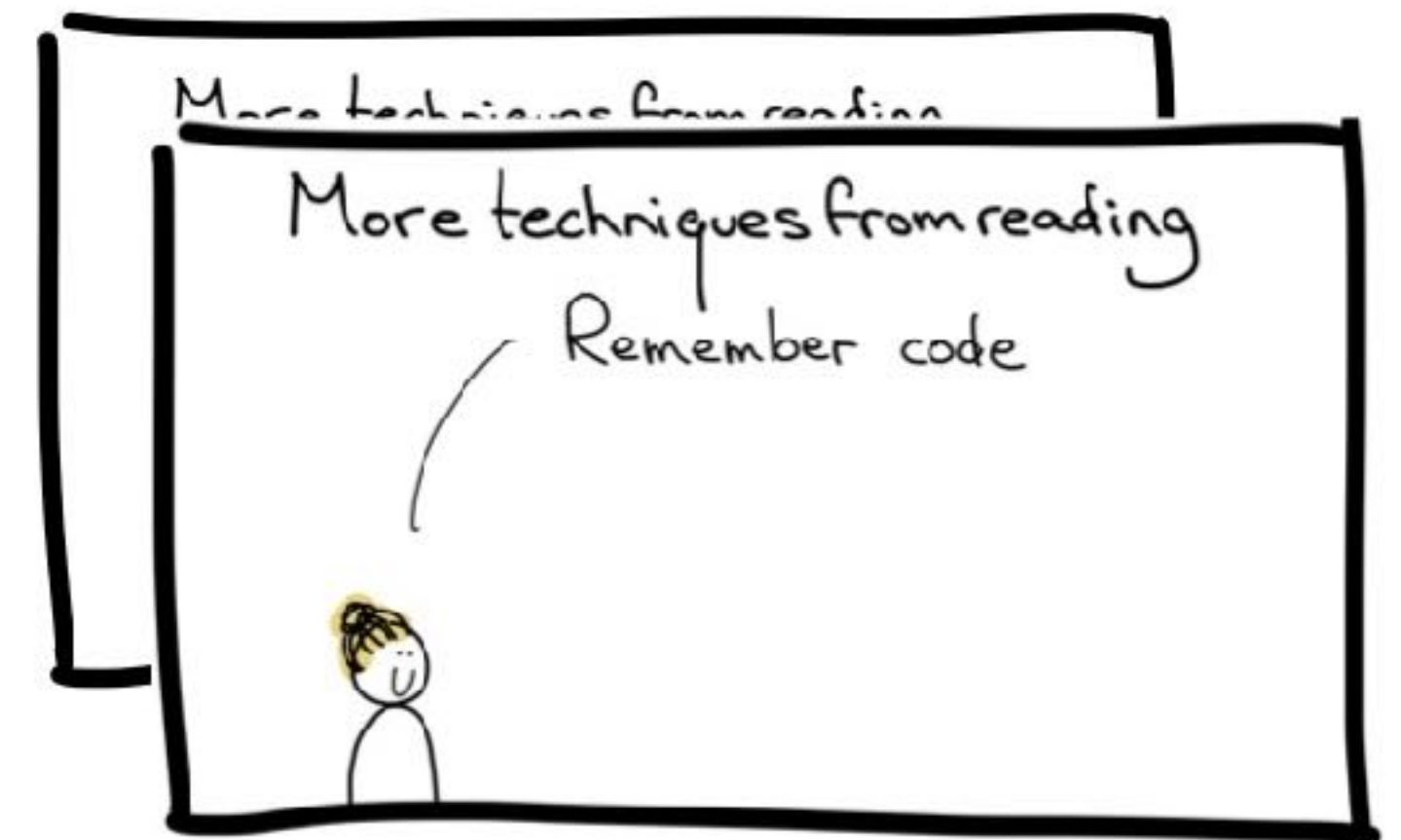
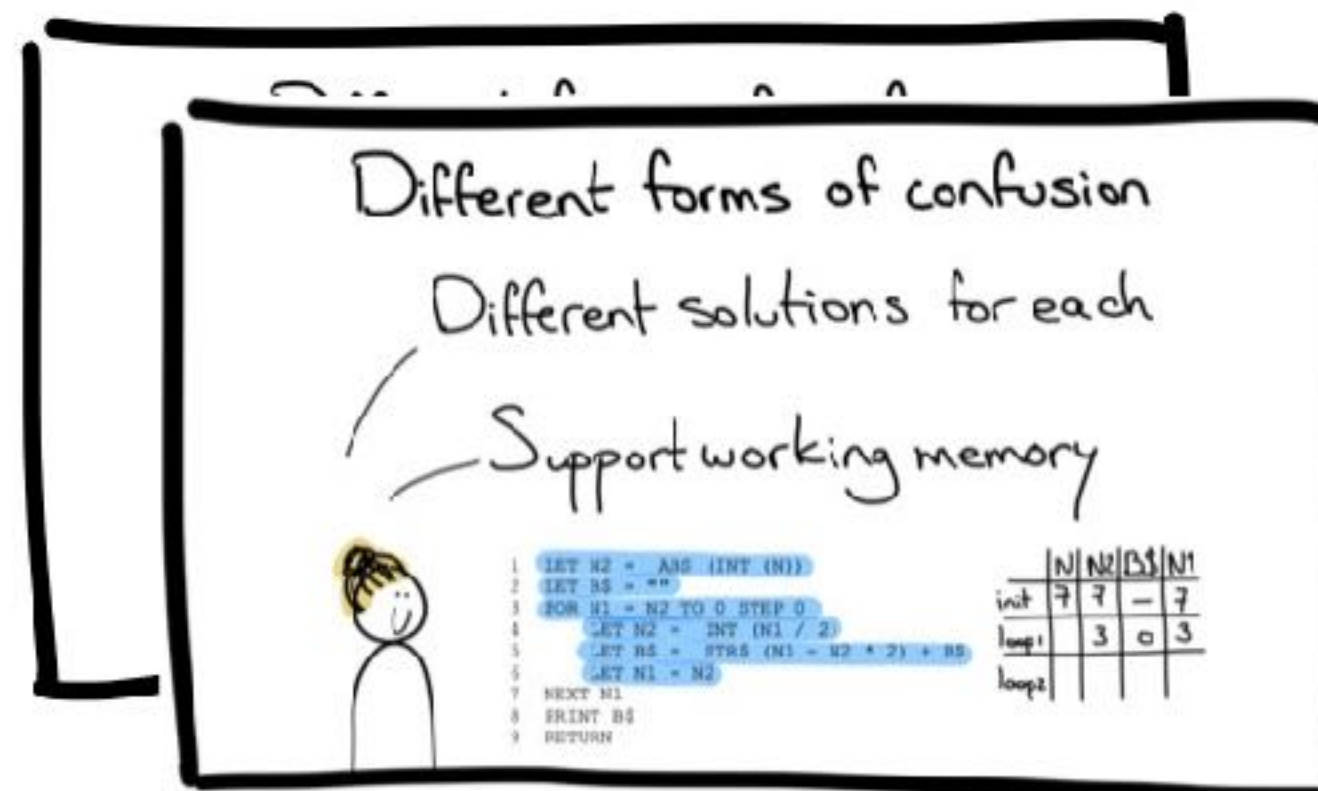
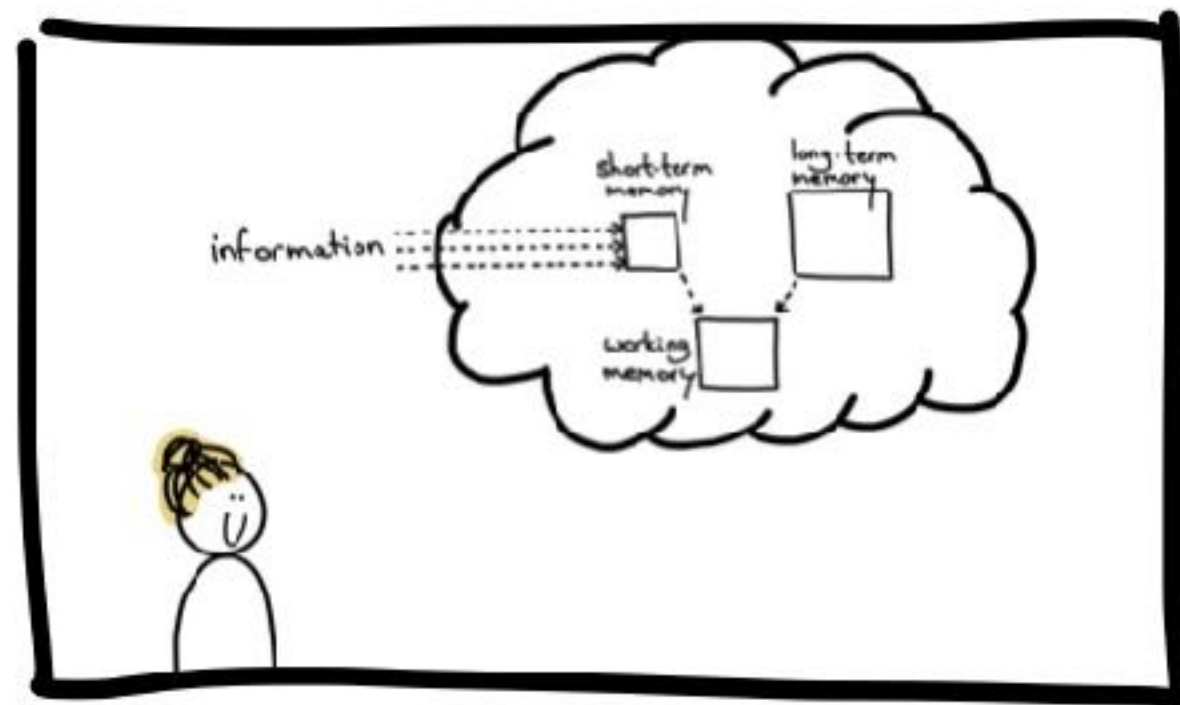
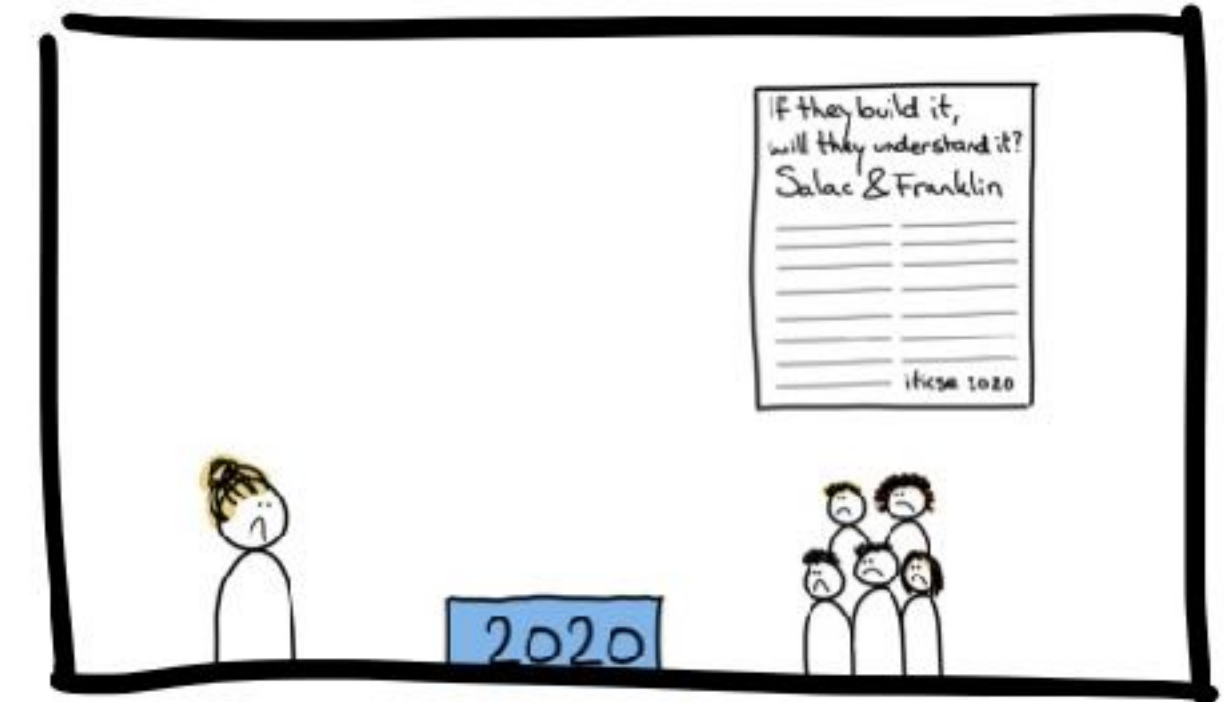
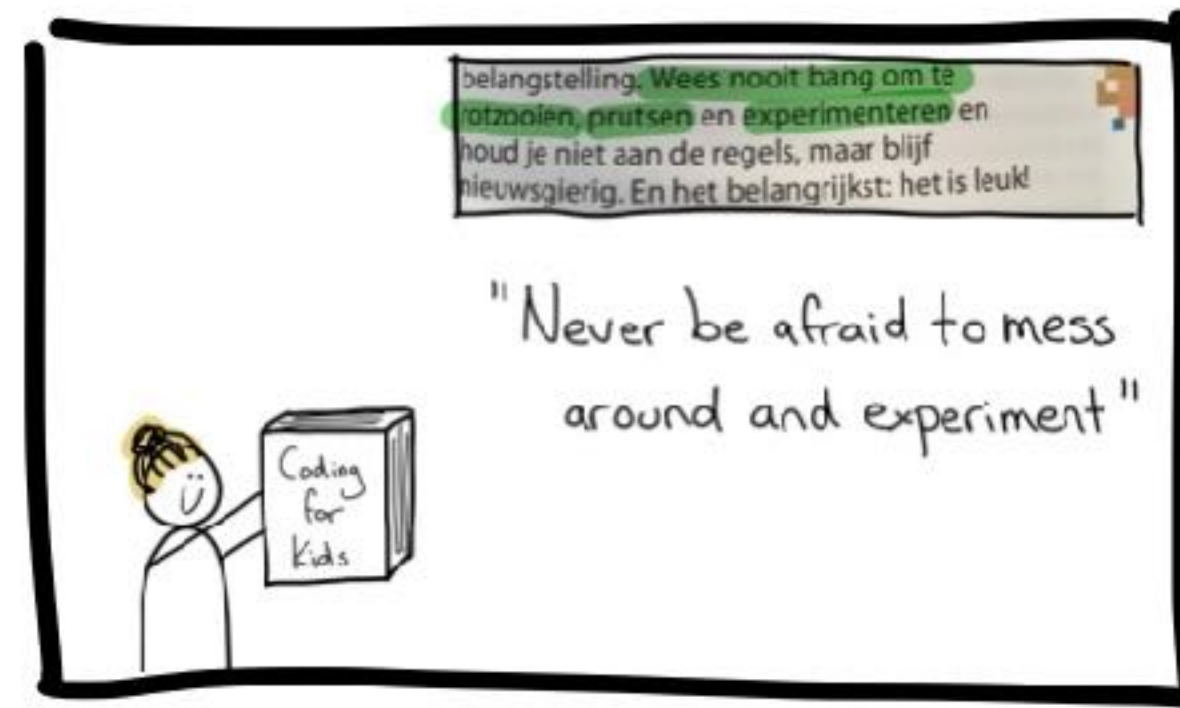
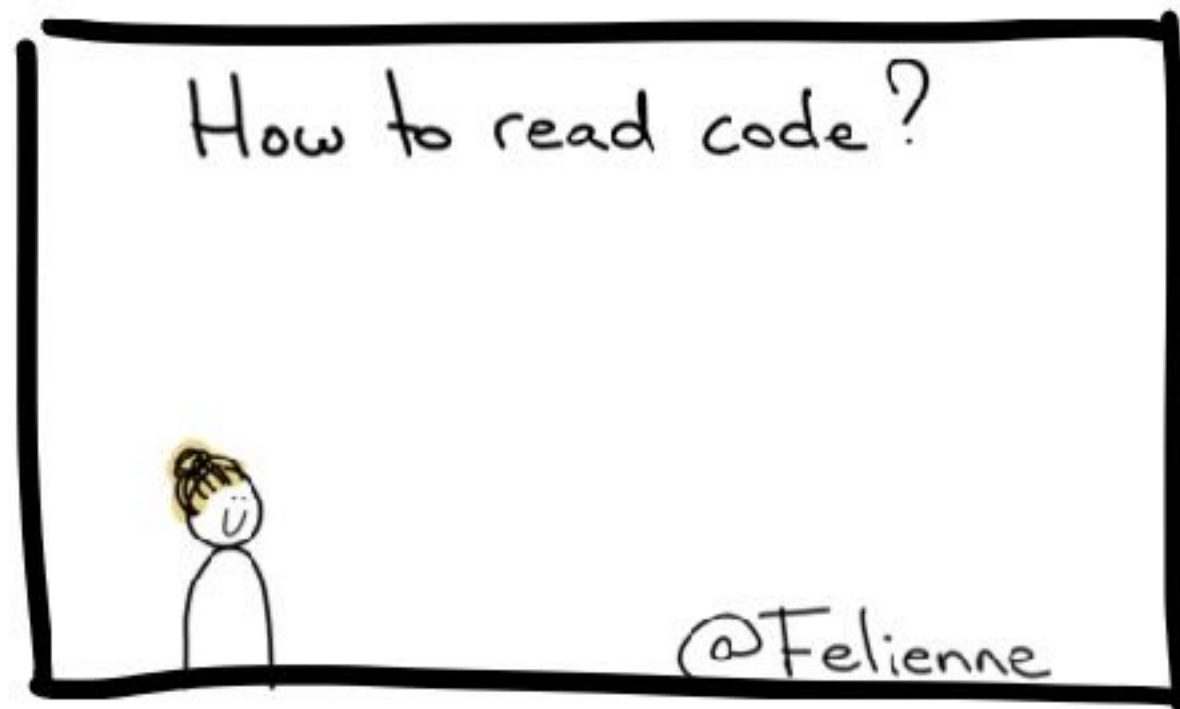
Different solutions for each

Support working memory

```
1 LET N2 = ABS (INT (N1))
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4   LET N2 = INT (N1 / 2)
5   LET B5 = STR$ (N1 - N2 * 2) + B5
6   LET N1 = N2
7 NEXT N1
8 PRINT B5
9 RETURN
```

	N	N/2	B5	N!
init	7	7	-	7
loop1	3	0	3	
loop2				





THE END

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/Test



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SE radio

Remember code

```
public class InsertionSort {  
    public static void main (String [] args) {  
        int [] array = {45,12,...};  
        int temp;  
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            for (int j = i; j > 0; j--) {  
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                    // swap j with j - 1  
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                    array[j] = array[j - 1];  
                    array[j - 1] = temp;  
                }  
            }  
        }  
        //print array  
        for (int i = 0; i < array.length; i++) {  
            System.out.println(array[i]);  
        }  
    }  
}
```

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