Chapter 2: programming

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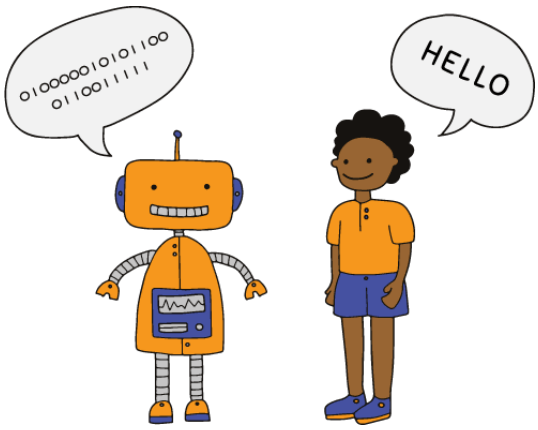
1. Warming

a. What are the words that you know in relation to coding?

b. What programming languages do you know?

c. Do you think English is important for coding? Why?

d. Do you think there are similarities between coding and English?

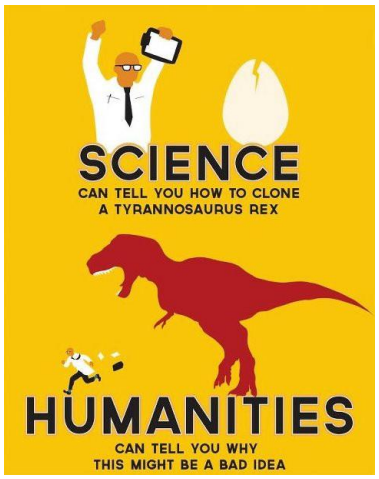


2. Reading activity

Read the text about similarities and differences between human languages and programming languages and answer the questions.

Human languages vs. Programming languages[1]

A brief comparison from a perspective of a linguist (soon to be) turned programmer



I still remember the day I first learned about computational linguistics. I had just graduated from science specialized high school, and faced the tough decision on what to study. For whatever reason I decided to go with languages, and it was on one of the first lectures that I learned about applied linguistics and its numerous subdivisions. Out of all those fields, computational linguistics caught my attention. I remember thinking it must be a perfect balance of two very different disciplines, ideal for the indecisive types like me who refuse to choose between humanities and science.

Nine years later I am learning again, but this time I'm on the other side of the coin — learning about programming. The memories of student days have returned, but this time I can do more than dream about this *perfectly balanced* field. I'm using this opportunity to learn more about linguistics, programming, and everything they have in common. So let's start from the very basics.

What is a language?

Defining a language might seem easy, but pages and pages could be (and have been) written about it. The reason behind this is the complex nature of a language as a phenomenon, as well as different ways to approach it and explain it. Language can be defined as a system of spoken, manual, or written symbols that human beings use to express themselves, their identity, imagination, and emotions. Over time languages evolved and developed, and we found a way to describe and systematize those changes. However, their main purpose — communication — didn't change. Programming languages revolve around the same principle of communication. They were created by humans as a system of symbols and rules used to communicate a set of instructions to a machine/computer. Although a lot simpler in their nature, programming languages have also developed their own classification and history.

So what are the similarities and differences between programming languages and human languages?

Similarities

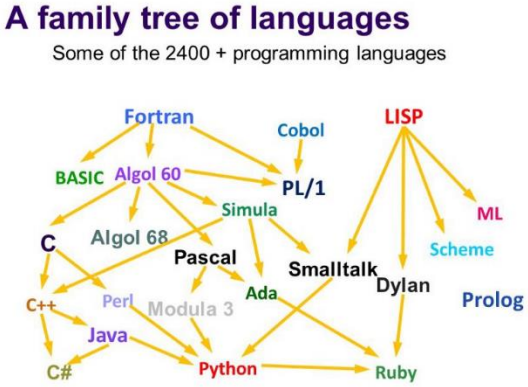
We already got this from the previous paragraph, but let's repeat it again: the main function of languages, be it Python or Chinese, is communication. This is the most important similarity between them, and one of the main reasons we refer to both of them as languages.

Another important feature that they have in common is structure. Two of the main concepts in linguistics are semantics and syntax. Semantics refers to the meaning of a certain word, or rather an information connected to a certain concept. For example, a word *eat* applies to a specific action living organisms can do. Syntax, on the other hand, is a set of rules that tell us how to arrange and combine words and phrases. The two are closely intwined and only together can create a fully functioning

[1] https://medium.com/@anaharris/human-languages-vs-programming-languages-c89410f13252

expression. Take a sentence *Bed eats* as an example: while it's correct from the point of view of a syntax, semantically it's wrong since a bed is not alive and therefore cannot eat. Similarly to natural languages, programming languages distinguish between syntax and semantics. Every programming language is written with a certain idea or intention in mind (semantics) while following the set of rules around the use of variables, functions, different kinds of parenthesis, colons, etc. (syntax).

It is also important to point out that both form language families, or groups of related languages that branch one from another. We all have heard of the Indo-European language family, that includes English, among many other languages. Programming languages have their own families of language with relatively similar syntax and/or semantics. In the picture below you can see some of the more familiar programming languages.



Differences

While speaking about the structure of languages, let's not forget to mention morphology. Morphology is the study of words, their formation, their relationship with other words in the same language, as well as the ways context can change a word's pronunciation and meaning. While morphology plays a very important role in the analysis of human languages, we can't really say that programming languages have anything similar to it.

First of all, programming languages are artificial creations. This means that all of their rules and definitions were designed beforehand, which allows for them to be fully described and studied in their entirety. Their grammar is self-defining, and it doesn't change depending on the context. Think about it this way: every line of code has either zero or one meaning (in other words, it either contains an error or it's a valid program you can run). There are no synonyms (although Ruby's .map and .collect could be seen as synonyms, for example), allegories, analogies, historical or cultural references. Because of this, programming languages don't really have morphology, at least not the same way human languages do.

Second, due to the fact that they follow very strict set of rules, programming languages can't evolve and develop the same way human languages do (although we could say that programming languages evolve through various libraries). There's no room for errors or improvisation. On the other hand, human languages are full of imperfections. Just think of dialects, slang, jargon, argot (secret language used by a certain group that's incomprehensible to outsiders), namesake, accents, mispronounced words, typos, irregular punctuation and many other aspects of human languages that don't disrupt the message we're trying to communicate.

And the message human languages communicate is both logical and emotional. If spoken, it involves body language, intonation, volume, and many other nonverbal clues. In fact, languages are much defined by the physical attributes of human bodies (eyes, tongue, hands), and are for that reason unique to humans. None of these applies to programming languages. Although highly skilled programmers can develop their own styles of writing code, the nature of that code remains the same: logical, precise, perfectly unambiguous. Which shouldn't come as a surprise, since the foundation of all programming languages are billions and billions of 1s and 0s.

Why is this important?

Understanding the difference between programming languages and human languages is of great value for many fields that work on creating tools for important practical tasks such as machine translation,

speech recognition, speech synthesis, information extraction from text, grammar checking, text mining and more. Think of Google Translate or Siri, and try to understand everything it takes to turn a simple sentence in English into a message that can be processed by a computer. Now think of the first conversation in Spanish you had outside of class. It made you feel dizzy, didn't it?

Questions

1. How can you describe/define what a language is?

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2. What are programming languages?

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3. What are the three main similarities between human language and programming language? Briefly explain each concept.

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4. Is the syntax the same for all programming languages?

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5. What is morphology?

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6. Does programming language use morphology or something similar? Why?

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7. Why can't programming languages evolve by themselves?

Strict set of rules beforehand

8. Give two reasons why the human language is unique to humans and can't apply to programming languages?

3. Listening activity

Coding is Not Difficult - Bill Gates[2]

Watch the video and answer the questions.

1. What is Bill Gates' comparison between coding and everyday life?

if (raining) i have to take my jacket (Plants VS Zombies ?)

2. What is the fundamental concept in computer programming?

the if statement

[2] https://www.youtube.com/watch?v=hb7Q33ysCwI

3. According to Carly, why is it important to learn programming?

She thinks that it's a weapon, it's important because it's the language of the future

4. How did Zuckerberg teach a kid to program? How did he feel after this experience?

Developper kit for iPhone, giving tips step by step, gratifying to teach to the new generation

5. What does David think is easier about programming nowadays?

A lot of ways to learn how to code, a lot of better ressources, we can find all the answers we want

6. What would his advice be for learning to code on your own?

Starts by copying the html site of other people and edit it until you had what you want

The more you do it, the more you learn

Vocabulary[3]: fill the sentences below using the words in the box.

key concept – path – to grow up (grow, grew, grown) – spare – nerd – to end up – footsteps – tic-tac-toe – to target – surroundings – from scratch – to be fascinated by – gratifying

1. With my sister, we often play ..tic-tac-toe.....
2. Their children have all ....grown up..... and left home now.
3. Film-makers are increasingly ..targetting..... international markets.
4. She works in television, following in her father's footsteps.....
5. The "if statement" is a ..key concept..... in coding.
6. The buildings have been designed to blend in with their ..surroundings.....
7. He's studying music in his ....spare..... time.

[3] https://www.oxfordlearnersdictionaries.com/

8. I learned German …from scratch…… in six months. (du début)
9. I …ended up…… doing all the work myself.
10. I …'m fascinated by…… computer sciences; I am a computer …nerd……
11. Follow the …path…… through the woods.
12. It is …gratifying…… to see such good results.

4. Grammar: revision

Present simple and present continuous

Present simple – use: facts, habits, permanent situations:

- The sun **rises** in the east.
- I often **go** to the market on Saturdays.
- I **work** in a bank.
- **Does** he **live** in France?
- They **don't like** children.

Present continuous – use: things we are doing now, temporary situations, future activities that are decided:

- I**'m having** lunch at the moment.
- She**'s living** with her parents while she's looking for a job.
- I**'m seeing** my mother tomorrow.
- **Is** she **playing** tennis tomorrow?
- He **isn't doing** anything at the moment

Exercise[4]

Complete the sentences with the correct tense (present simple or present continuous).

1. It's seven o'clock and they …… to school now. (go)
2. Mrs. Cooper …… in the restaurant every Sunday. (eat)
3. Our cat never …… on the kitchen table. (jump)
4. Look! The men …… blue uniforms. (wear)
5. Curt always …… his guitar in the afternoon. (play)
6. The taxi …… for them at the moment. (wait)
7. He always …… his grandmother in the coat. (help)
8. They never …… very much. (eat)

[4] https://www.english-4u.de/en/tenses-exercises/present-simple-progressive2.htm

9. Listen! Bill …… his electric guitar. (play)
10. He …… his car every Sunday. (wash)
11. The alarm …… at seven o'clock every morning. (ring)
12. She …… at the moment. (not/studying)
13. They always …… their aunt a tree for Christmas. (bring)
14. She …… a red pullover and black jeans today. (wear)
15. The boys …… snowballs at the girls now. (throw)
16. Mr. Black …… into the classroom at the moment. (walk)
17. In Johannesburg most people …… at least five languages. (speak)
18. Languages …… very fast. Half of world's languages will disappear by 2100. (disappear)
19. Please keep quiet, I …… to the radio. You know I …… to the news in the morning. (listen)
20. What …… tonight? Would you like to come and watch the game? (do)
21. You look worried. What …… about? (think)
22. You …… chocolate. (not/like)

Past simple and past continuous

Past simple – use: completed actions in the past, past facts:

- Yesterday I **went** to the bank.
- I **lived** in England for 30 years.
- There **wasn't** much pollution in my grandparents' days.
- **Did** you **watch** television last evening?
- They **didn't like** the meal.

Past continuous – use: interrupted actions in the past, atmosphere, descriptions, actions we were doing in the past:

- I **was having** a bath when the phone rang.
- While he **was living** in France, he visited Paris.
- When I woke up this morning the sun **was shining**.
- She **was wearing** a beautiful blue dress when I saw her yesterday.
- **Were** you **listening** when I **was talking** to you?
- They **weren't eating** when we arrived.

Exercise[5]

Complete the sentences. Use the past simple or the past continuous of the verbs in parenthesis.

1. I …… (start) my new job yesterday.
2. I am sitting in the class right now. I …… (sit) in the class at this exact same time yesterday.
3. What …… (to do) at around 8 a.m. this morning?
4. I …… (call) Roger at nine last night, but he …… (be, not) at home. He …… (study) at the library.
5. While I was washing the dishes, I suddenly …… (to have) a brilliant idea.
6. He didn't hear the phone ring. He …… (to listen) to really loud music.
7. I didn't buy anything. They …… (to close) the shop when I got there.
8. The teacher told us to stop what we …… (to do).
9. …… (to find) what you were looking for in the library yesterday?
10. When I heard the phone ring, I …… (to answer) it straight away.

Present perfect simple

Present Perfect simple – use: unspecified past, life experience, uncompleted actions, change over time:

- I**'ve seen** that film before. (*but I don't know when*)
- Tom **has worked** in two companies. (*but I don't know which companies or when*)
- I**'ve been** a teacher for 32 years. (*and I'm still a teacher*)
- His English **has improved** since we last met.
- **Has** he **arrived** yet?
- I **haven't been** there. (*in my whole life*)

Exercise[6]

Write a sentence and use the present perfect simple.

1. (you / eat Thai food before)?

   ……

2. (we / not / hear that song already)

   ……

[5] https://gamedata.britishcouncil.org/
[6] https://www.perfect-english-grammar.com/present-perfect-exercise-4.html

3. (she / steal all the chocolate)

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4. (he / study Latin)

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5. (where / you / study Arabic)?

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6. (what countries / they / visit in Europe)?

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7. (he / hurt his leg)

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8. (she / leave her phone in a taxi)

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9. (we / not / lose our tickets)

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10. (she / call her mother)?

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11. (he / take a taxi)?

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12. (we / not / go to Paris)

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13. (she / not / see The Lord of the Rings)

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14. (he / not / meet my mother)

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15. (why / I / miss the plane)?

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5. Grammar: exercise

Complete the sentences using the present simple or continuous, the past simple or continuous, or the present perfect simple.

1. We ..invite..... (invite) them to the party but they didn't come.
2. It ..'s raining..... (rain) when we ...went..... (go) out.
3. It's a nice day today. The sun ..'s shinning..... (shine).

4. I got up early and ..i had..... (have) a shower.
5. I ..have eaten..... (eat) alligator once.
6. The phone rang..... (ring) while Mary ..was cooking..... (cook) dinner.
7. Tom isn't at home at the moment. He 's travelling..... (travel) abroad.
8. I saw Bob and Sam at the party, but I ..didnt speak..... (not/speak) to them.
9. Robert had a book in his hand but he ....wasn't reading..... (not/read) it.
10. The floor is clean now. I ...'ve just washed..... (just/wash) it.
11. How often ....do you go..... (you/go) on holiday?
12. Janet and Daniel....have been..... (be) married for nine years.
13. Who ..invented..... (invent) the telephone?
14. Jo got married when she .....was..... (be) 23.
15. I .....have known..... (know) Ann and Lesley since we were at school.
16. ..i don't watch..... (I/not/watch) TV very much.
17. The children are in the living room. They ..'re watching..... (watch) TV.
18. We ...weren't..... (not/be) hungry, so we didn't stay for lunch.
19. Betty ...has had..... (have) the same job for 15 years.
20. I .....'ve never riden..... (never/ride) a horse in my life.
21. We ....went..... (go) to the cinema yesterday.

6. Writing skill

Programming is everywhere nowadays.

In the box below, you will find different fields that have evolved thanks to programming. Write a short text about what was not possible to do in the past and is now possible thanks to the evolution of technologies. Use the different tenses appropriately.

- Transportation
- Medicine
- Energy and carbon emissions
- Weather
- Public safety
- Art and entertainment
- …

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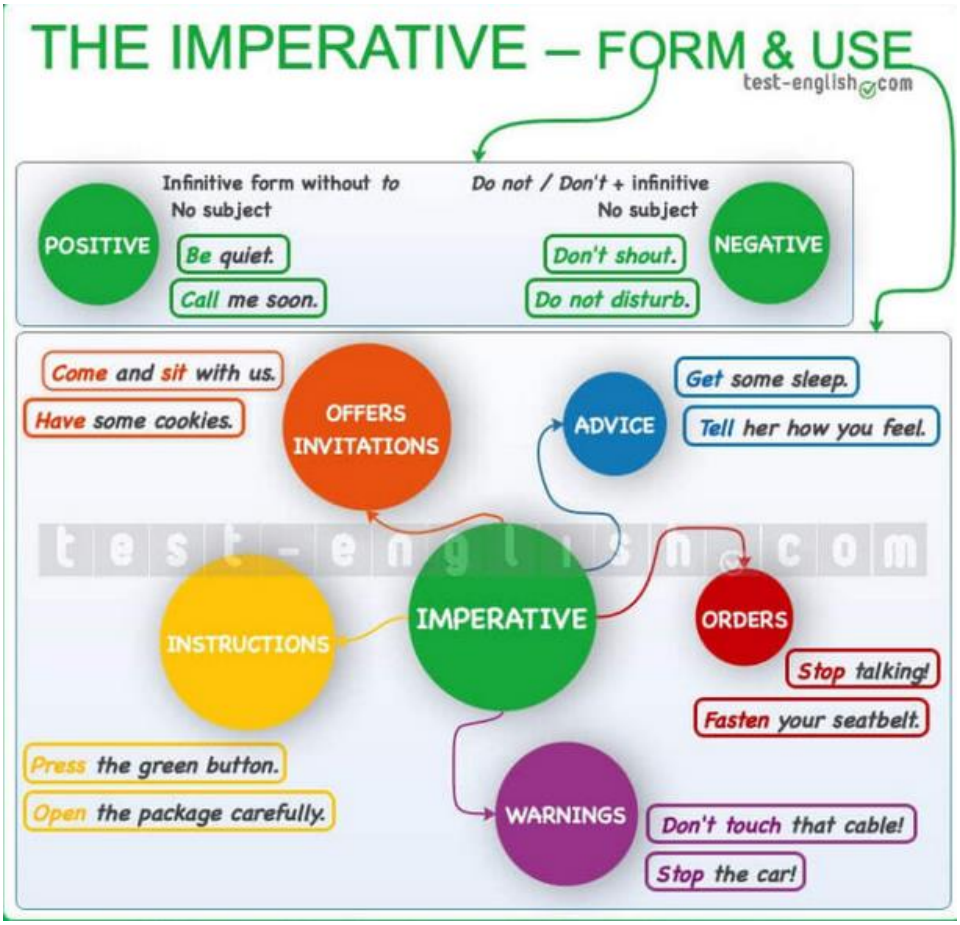
7. Oral activity

Grammar: the imperative



Oral game

One of the students will assume the role of a robot that can't do anything that isn't explicitly stated. Other students will provide him with simple instructions such as "move one step forward", "bend the knees", "open your hand" and so on in order to complete a simple task defined beforehand by the teacher (pick a pencil from the floor, go to the board, turn a page, etc.) Each student can only give one simple instruction. Change the student who was the robot once the task is done.

8. Additional activity: listening exercise

Computer science is changing everything[7]

Watch the video and then answer the questions.

1. What was the 19th century about? Explain.

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2. What was the 20th century about? Explain.

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3. What is the 21st century about?

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4. According to Jess Lee, why do you need programming?

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5. Fill-in: […] It's really exciting right now. The technology that we …… right now is going to be used by your doctor in, you know, in …… When you come into the …… and you're sick, and the doctor is going to be like all right, you know, …… in the cup and I will put it into this …… which is the sequencer and, in an hour, I can tell you what you

[7] https://www.youtube.com/watch?v=QvyTEx1wyOY

have or ……. So if we're looking for a new ……., for example, we'll …… of all the viruses that are known and we'll ……., you know, our sequence of interest against a whole database of all viruses. […]

6. Why is it important to have a computer for the weather forecast?

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7. Explain what Trina says about "Finding Nemo".

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8. Explain two positive/amazing things mentioned at the end of the video about programming.

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Vocabulary[8]

1. Listen to the video once again and match the words on the left to their definitions.

1	To forecast	a	The total amount of crops, profits, etc. that are produced
2	To disrupt something	b	The most important or difficult part of a problem or an issue = the nub
3	Yield	c	To say what you think will happen in the future based on information that you have now
4	The crux	d	An area of land in the country used for growing crops or keeping animals in, usually surrounded by a fence, etc.
5	A field	e	To cause significant change in an industry or market by means of innovation
6	To leverage something	f	To get much advantage or profit as possible from something that you have

1 - …	2 - …	3 - …	4 - …	5 - …	6 - …

[8] https://www.oxfordlearnersdictionaries.com/

2. Fill the sentences below using the words in the box. Use the correct form of the verbs.

sustainable – to tweak something – digital – to search for – a dorm room – a decade

a. There's not much space in my college …….
b. I think you'll have …… these figures a little before you show them to the boss.
c. This type of farming is simply not …… anymore.
d. New business models have emerged in the …… age.
e. Police …… clues in the area.
f. The nineties were a …… of rapid advances.