AI for Climate Action (SDG13) with the CARE-KNOW-DO Framework

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CARE-KNOW-DO in compliance with

SUSTAINABLE DEVELOPMENT GOALS

accept challenge
in school with professional

WE care

raise awareness
at home with family

learn concepts & skills
in school

WE know

prepare action
at home with the family

WE do

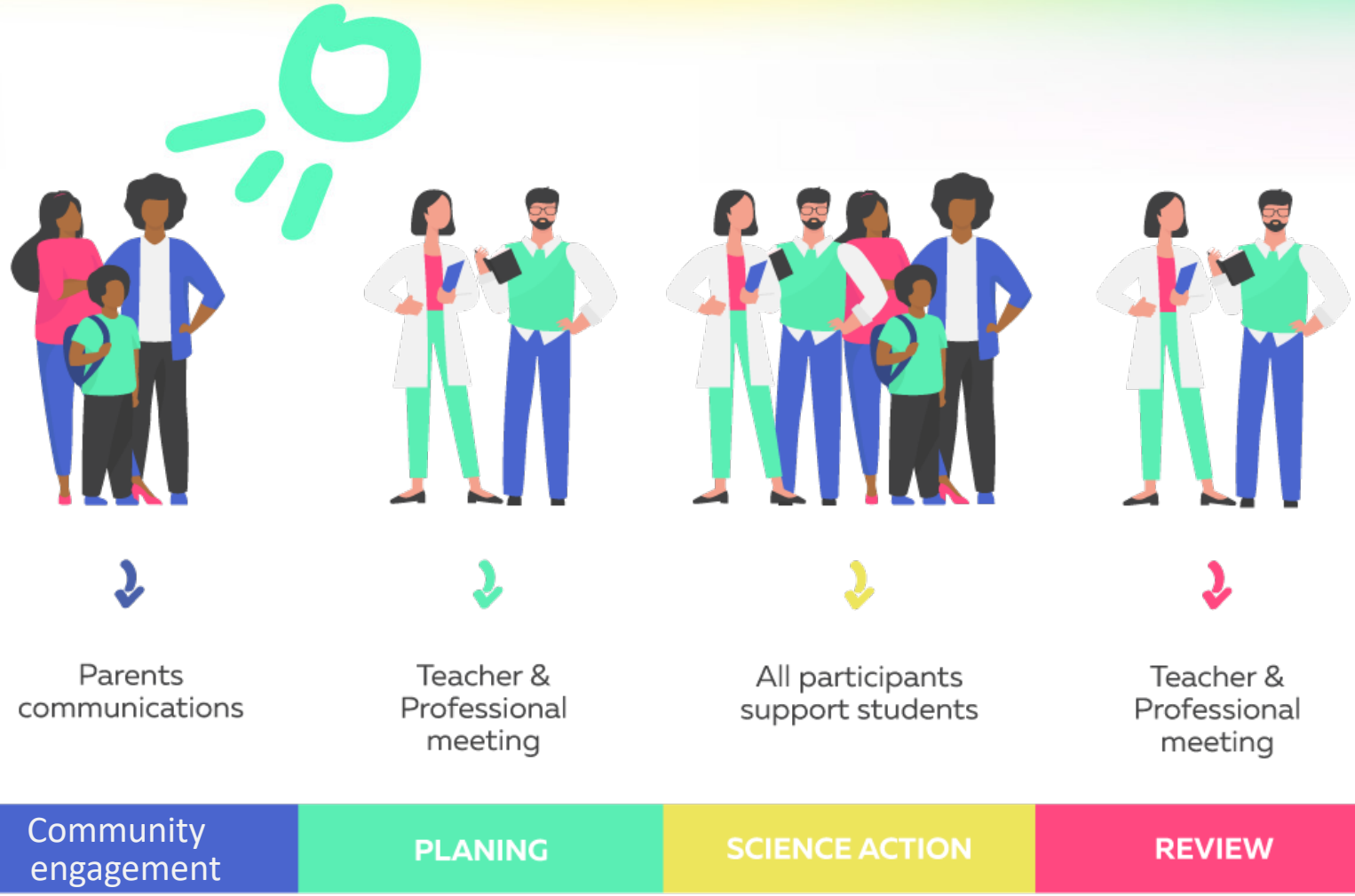
delivery action
in school with professional

Open schooling supported by CARE-KNOW-DO

1. Real-life issue that students **care** about for sustainable development goals
2. Curriculum **knowledge** in context supporting students' citizenship and future career
3. Fun participatory approaches for learning in **action**
4. Students interactions with **families, teachers**, and **professionals**

(Okada, 2023)

Students interactions with families, teachers, and AI experts



(Okada, 2023)

CARE-KNOW-DO model to support AI in Education

AI Principles

CARE

Value Human-centre AI for Real-world Challenge

Ethics Fairness

KNOW

Understad AI for Digital Lifelong Learning

Accountability Agency

DO

Apply AI for Inclusive Sustainable Future

Safety Responsability

AI in Education for SDG

(Okada, 2024)

AI Competency framework

for Teachers

Aspects	Progression		
	Acquire	Deepen	Create
Human-centred Mindset	Human agency	Human accountability	AI social responsibility
Ethics of AI	Ethical principles	Safe and responsible use	Co-creating AI ethical rules
AI Foundations & Applications	Basic AI techniques and applications	Application skills	Creating with AI
AI pedagogy	AI-assisted teaching	AI-pedagogy integration	AI-enhanced pedagogical transformation
AI for professional development	AI enabling lifelong professional learning	AI to enhance organizational learning	AI to support professional transformation

for Students

Competency Aspects	Progression Levels		
	Understand	Apply	Create
Human-centred mindset	Human Agency	Human Accountability	AI Society Citizenship
Ethics of AI	Embodied Ethics	Safe and Responsible Use	Ethics by Design
AI techniques and applications	AI Foundations	Application Skills	Creating AI Tools
AI system design	Problem Scoping	Architecture Design	Iteration and Feedback Loops

(Okada, 2024)

Real Issue in Greece: Climate Action

Climate Challenges in Greece

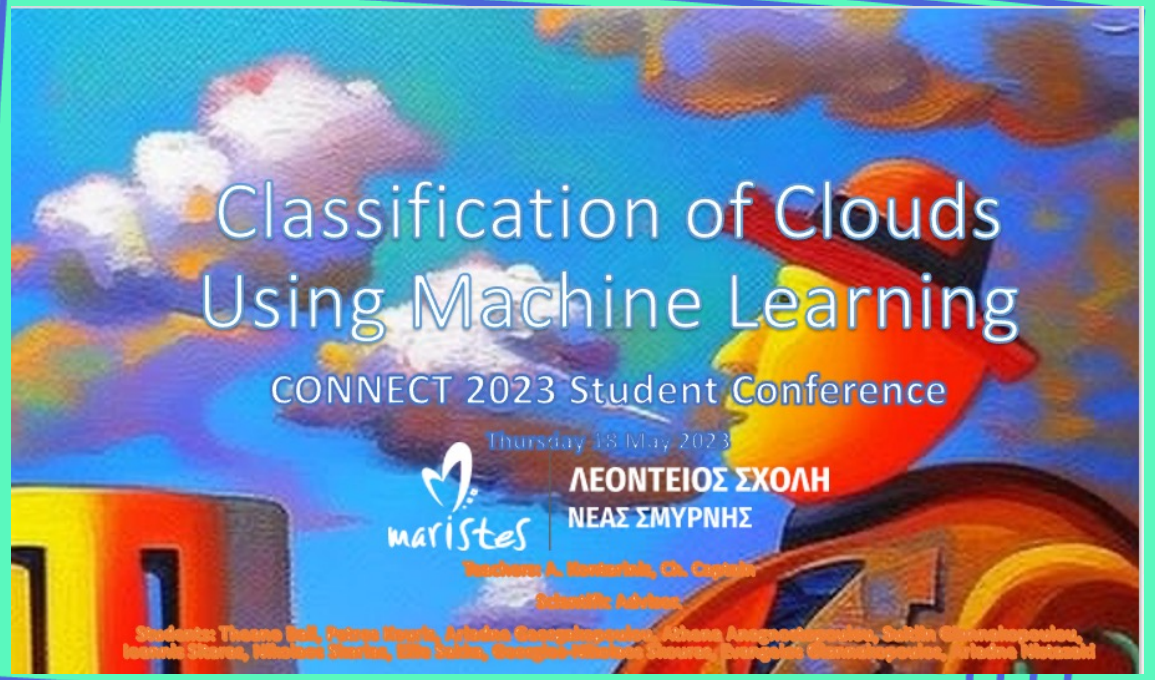
Greece is increasingly facing severe climate challenges. These include more frequent and intense heatwaves, droughts, and wildfires, which are exacerbated by climate change. The Mediterranean region, where Greece is located, is particularly vulnerable to these effects. The summer of 2021 saw catastrophic wildfires that ravaged large parts of the country, destroying forests, homes, and livelihoods.

Importance of Weather Forecasting

Accurate weather forecasting is crucial for several reasons:

1. **Disaster Preparedness**: Timely and accurate weather forecasts can help prepare for and mitigate the impact of extreme weather events like heatwaves, storms, and wildfires.
2. **Agriculture**: Farmers rely on weather forecasts to make informed decisions about planting, irrigation, and harvesting.
3. **Public Safety**: Forecasts help protect public health by warning of extreme temperatures and air quality issues.
4. **Tourism**: Greece's economy heavily depends on tourism, which can be significantly impacted by weather conditions. Reliable forecasts can enhance tourist safety and experience.

CONNECT

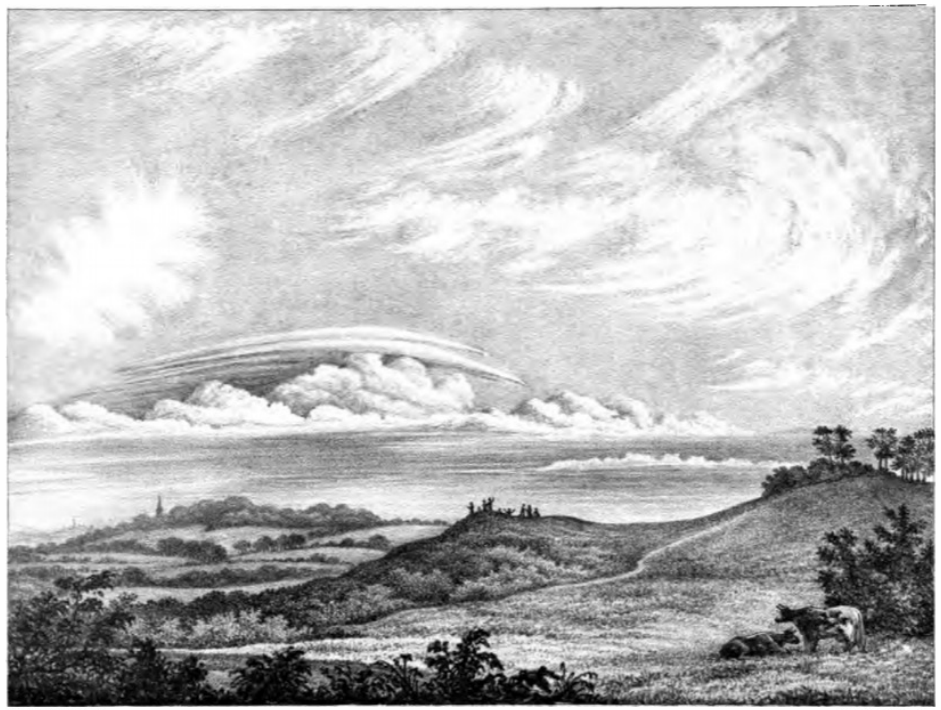


Students Conference Presentation

This project has received funding from the European Union's Horizon 2020 Research ad Innovation Programme under Grant Agreement No 872814

Importance of Cloud Classification

- In 1803 the "father of meteorology" Luke Howard introduced the three basic categories of clouds: **cumulus (cumulus)**, **stratus (layers)**, **cirrus (cirrus)**.



CUMULOSTRATUS FORMING, FINE WEATHER CIRRI ABOVE

- In 1918 meteorologists realised that the **cause of the development of wet and stormy weather systems** was not a change in air pressure but the contact of extensive areas of warm and cold air.

Dominant Cloud Classification System

10 subcategories of clouds:

1) Low clouds (h < 2km):

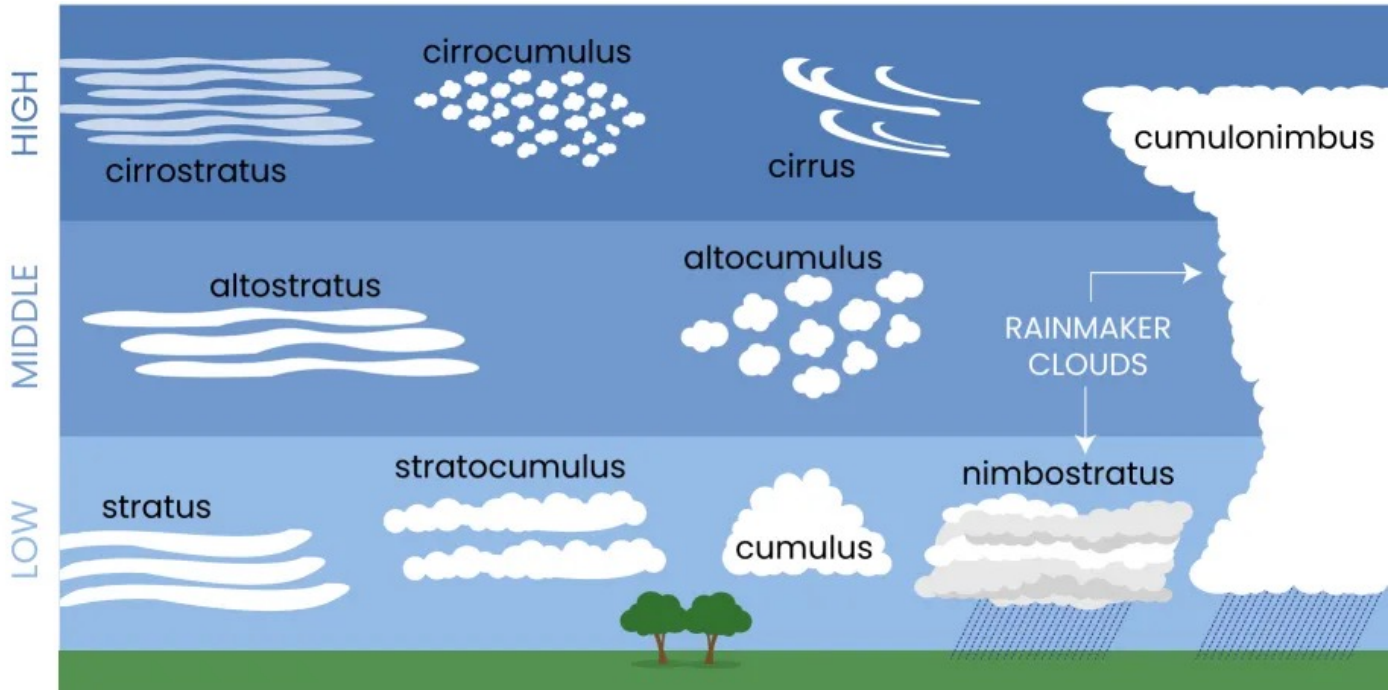
- Cumulus (Sorites)
- Cumulonimbus (Cumulonimbus)
- Stratus (Mattresses)
- Stratocumulus (Stratocumulus)
- Nimbostratus (Melanostratus)

2) Medium Clouds (2km < h < 6km):

- Altocumulus (Highlanders)
- Altostratus (Altostratus)

3) High Clouds (h > 6km):

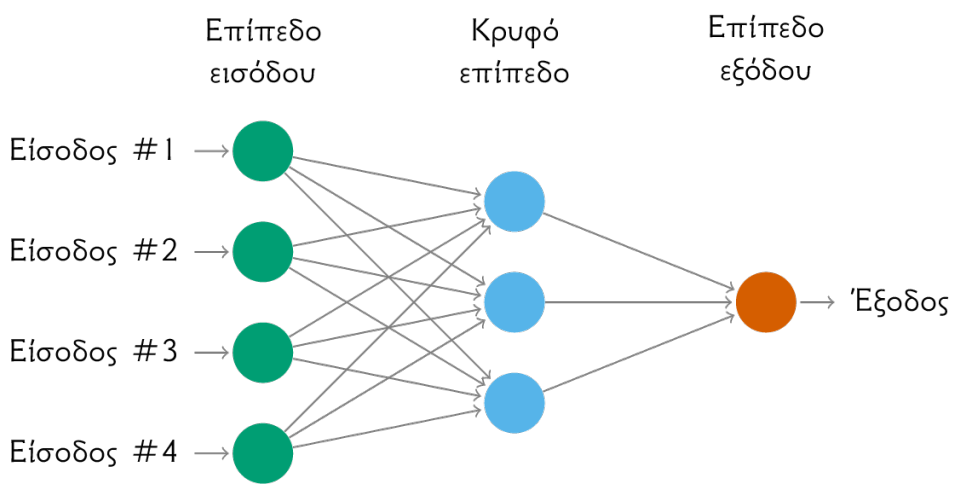
- Cirrus (Thysans)
- Cirrocumulus (Thysanosorites)
- Cirrostratus (Thysenostratus)



- It is not always easy to distinguish the type of cloud. For example, middle altostratus clouds look like lower stratus clouds as well as higher cirrostratus clouds
- The correct **identification of a cloud** is important because it is linked to the change of meteorological parameters (e.g. wind, visibility, precipitation, temperature)!

Automation of the Cloud Classification

- The question "what type of cloud is a cloud?" is a **classification problem**.
- It can be solved using questionnaires, but computers can also help.
- For example, **AI** can help with decision trees which are hierarchical decision support structures.



Jet Propulsion Laboratory
California Institute of Technology

Dichotomous Key: Cloud Types

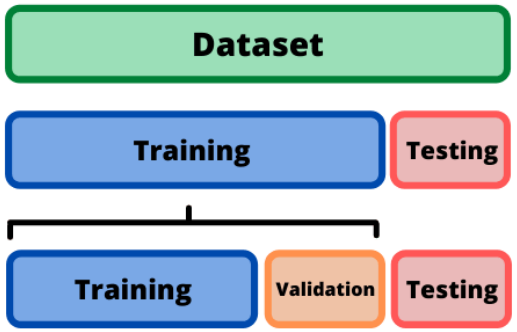
Dichotomous Key: Cloud Types

1. Does the sky contain clouds?
   a. Yes – go to #2
   b. No – It is a clear day
2. Are the clouds low and do they look like puffy cotton balls? They mean fair weather.
   a. Yes – Cumulous clouds
   b. No – go to #3
3. Are the clouds low, light or gray, and cover the sky like a blanket? They may bring poor weather. It can also be called fog when it's low to the ground.
   a. Yes – Stratus clouds
   b. No – go to #4
4. Are the clouds low, irregular masses, rolling and/or puffy?

Great progress in Object Recognition and Computer Vision has been made thanks to the help of Machine Learning and specifically **Artificial Neural Networks**!

Training of the Classifier of Clouds

- First, we collect photos of clouds of each known category from reliable sources on the Internet (e.g. https://www.weather.gov/, https://cloudatlas.wmo.int/)



Ideally we use too many photos of each category for training!

- Then we divide the photos into 2 sets: training and testing.

- The neural network then runs its training algorithm on the photos in the training set.

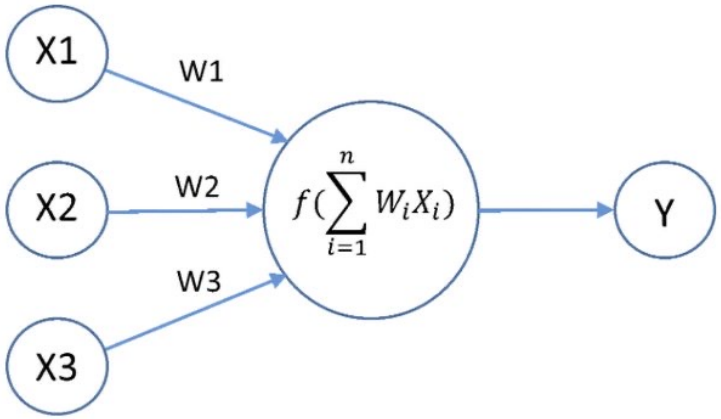
Machine Learning For Kids

The ML for kids platform we used has a limit of 100 photos per project.

So we only used 10 photos per category!

Testing the Cloud Classifier

- The now trained neural network has the right weights w in its connection tested on new photos it has never seen before.



- This is what the photos of the test set are for:



Cirrus Cirrostratus Cirocumulus

???

https://wset.com/resources/media2/16x9/full/1015/center/80/47d55fc1-6736-4687-9c2c-112a3fc9931e-large16x9_cindywhorley2.png

Recognised as **H1**
with 66% confidence

The neural network correctly predicted that this cloud belongs to the Cirrus category!

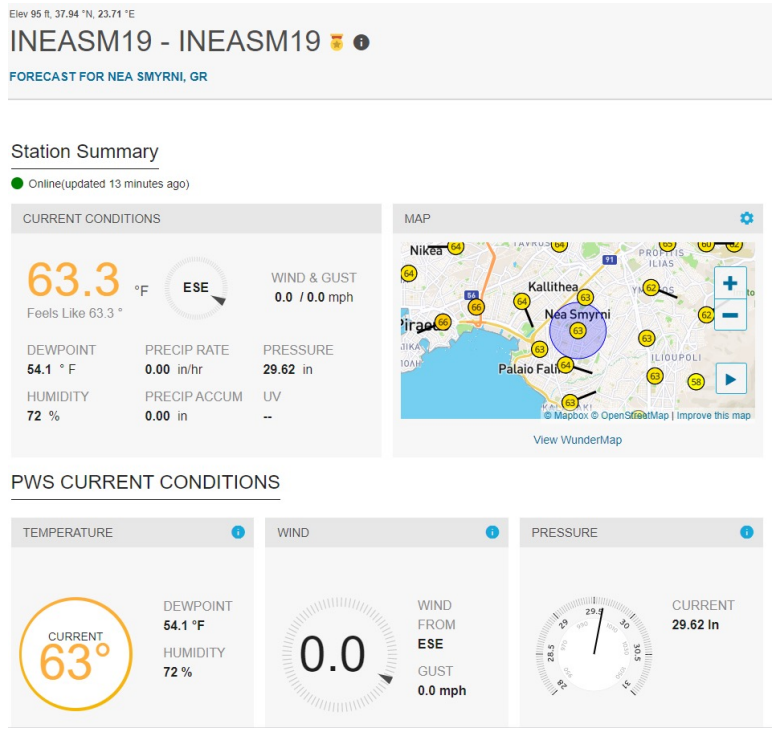
- How is the performance of the classifier evaluated?

  accuracy vs precision

Conclusion and Future Extension

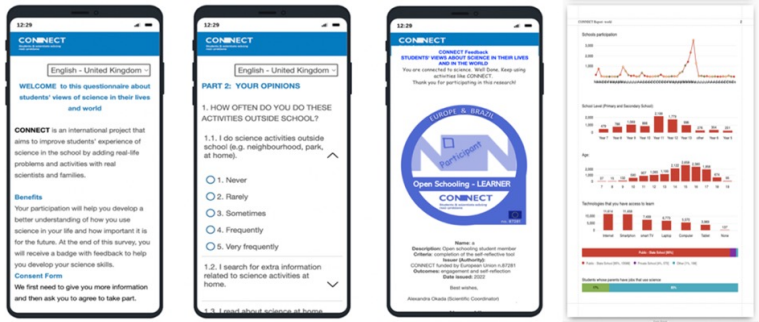
- The ML for kids platform allows the classifier to be applied to photos **uploaded to the Internet** or taken from a **computer camera**. But it also allows the integration of the neural network into scratch, **appinventor**, or python applications.
- We are already developing an app so that the cloud classifier can be used on-the-go by the user!

- In order to predict the weather locally, we look at the correlation of the classifier with the data recorded by the School's personal weather station!



CONNECT

CONNECT-science instrument



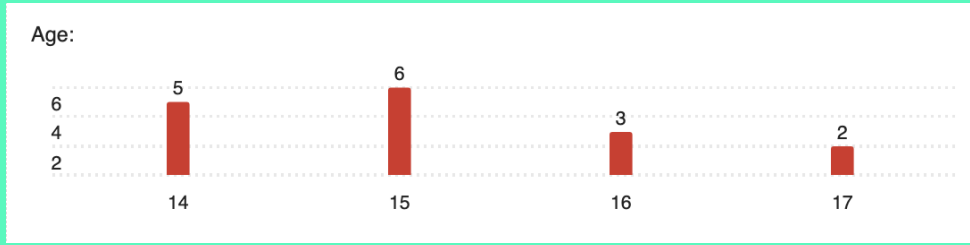
Research Analysis about students ‘ learning with AI

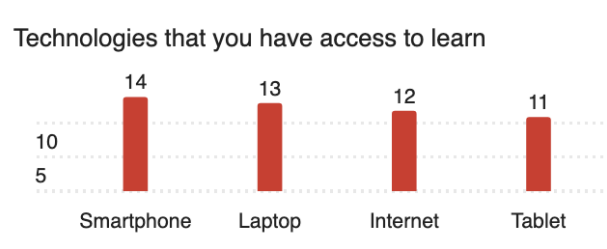
with CONNECT-science self-reported instrument
Okada (2023)

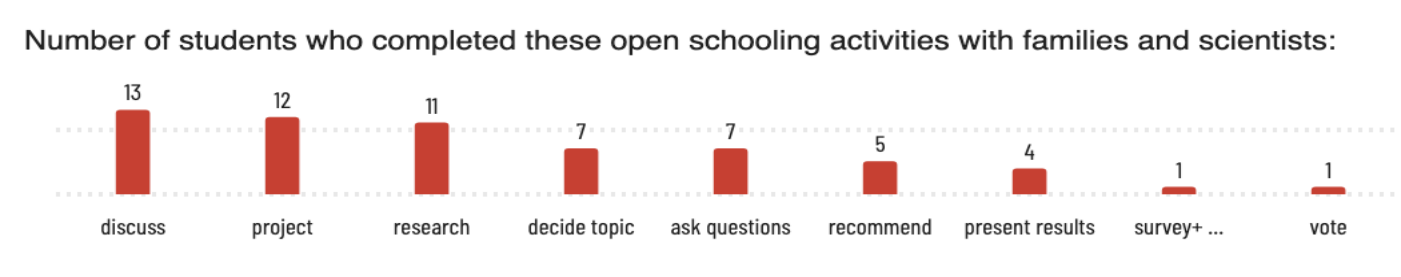
This project has received funding from the European Union's Horizon 2020 Research ad Innovation Programme under Grant Agreement No 872814

STUDENTS PARTICIPANTS

Pilot study: 17 students







Students' views about their learning with AI

Μάθαμε για το scratch συζητήσαμε για θέματα που έχουν σχέση με την τεχνητή νοημοσύνη και το μέλλον .

Συζητήσαμε για την αναγνώριση προσώπου και την μηχανική μάθηση

We learned about scratch and discussed topics related to artificial intelligence and the future.

We discussed facial recognition and machine learning.

Greek Students

Students' views about their learning with AI

Έμαθα πόσο έχουμε άναγκη την τεχνιτή νοημοσύνη ότι η επιστήμη βοηθάει στη προστασία του περιβάλλοντος .

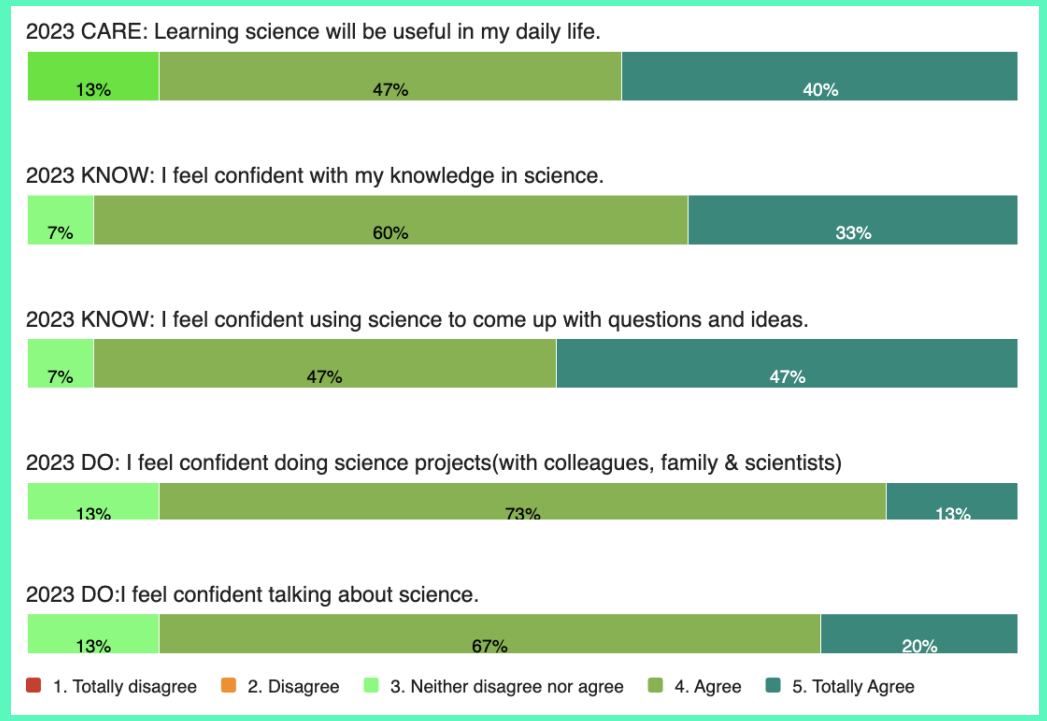
ενημέρωσα την οικογένεια για την τεχνητή νοημοσυνη διάφορα ερωτήματα είχαμε κάνει μια εργάσεια όλη μαζι .

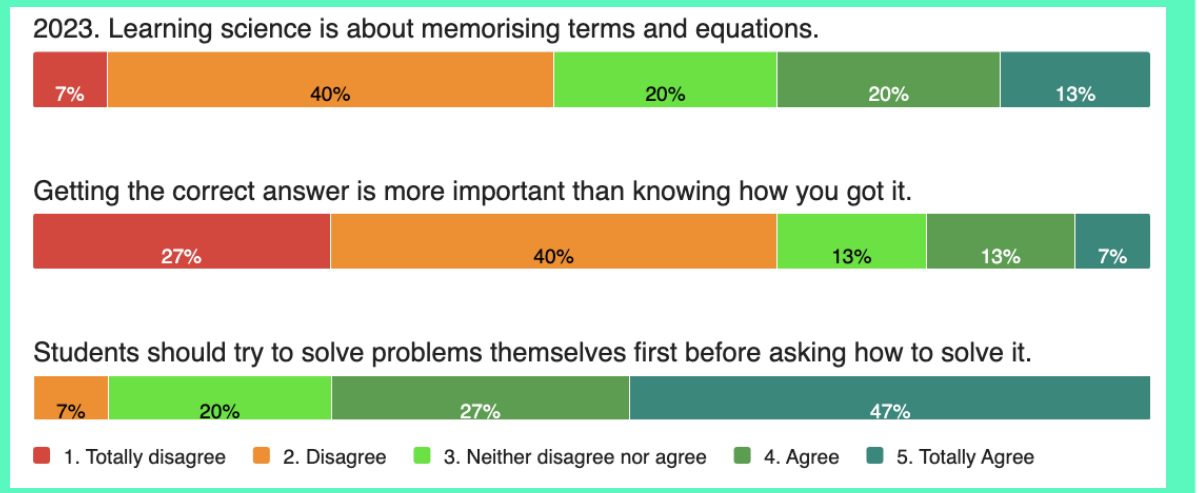
I learned how much we need artificial intelligence that science helps protect the environment

I informed the family about the artificial intelligence various questions we had done a work together

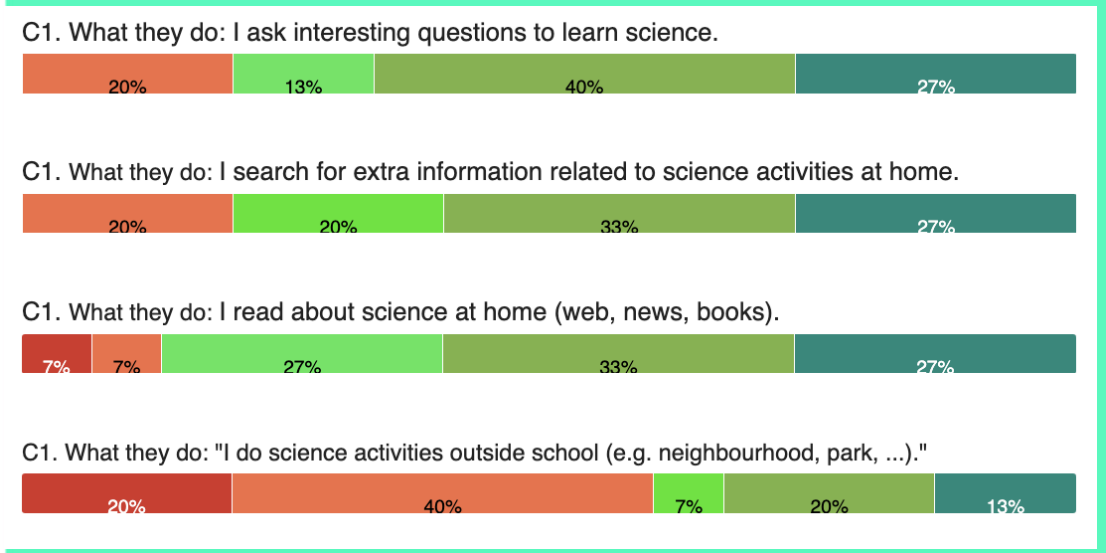
Greek Students

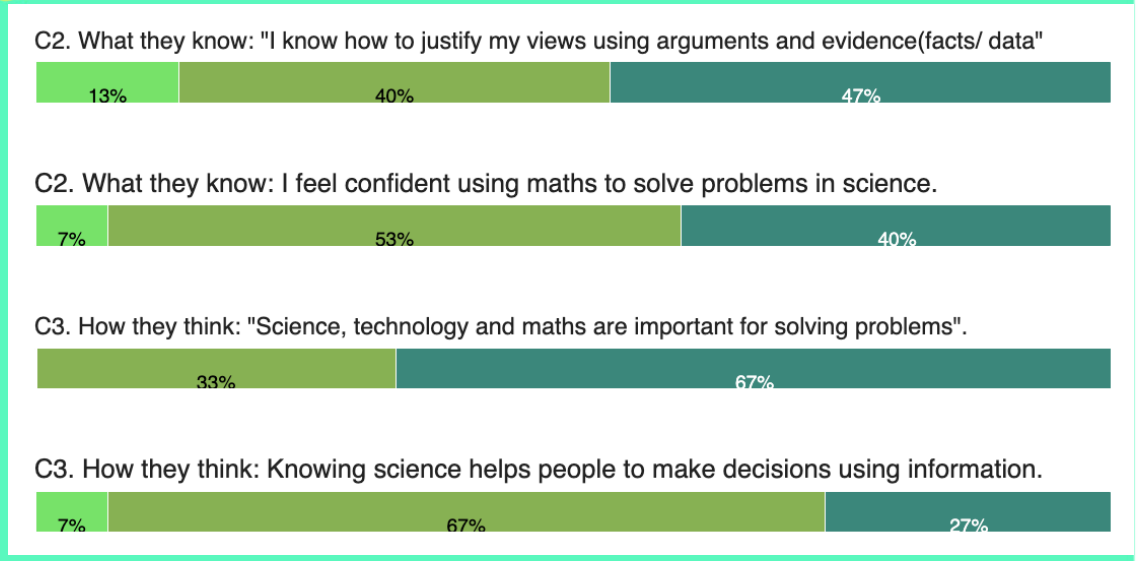
Students' views about their learning with AI

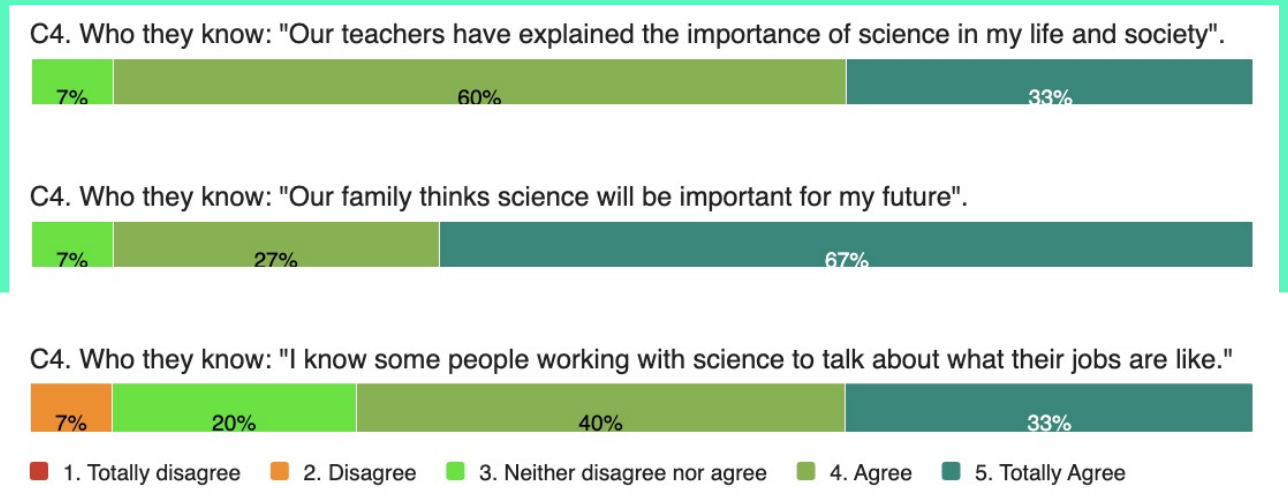




Students' views about their learning with AI

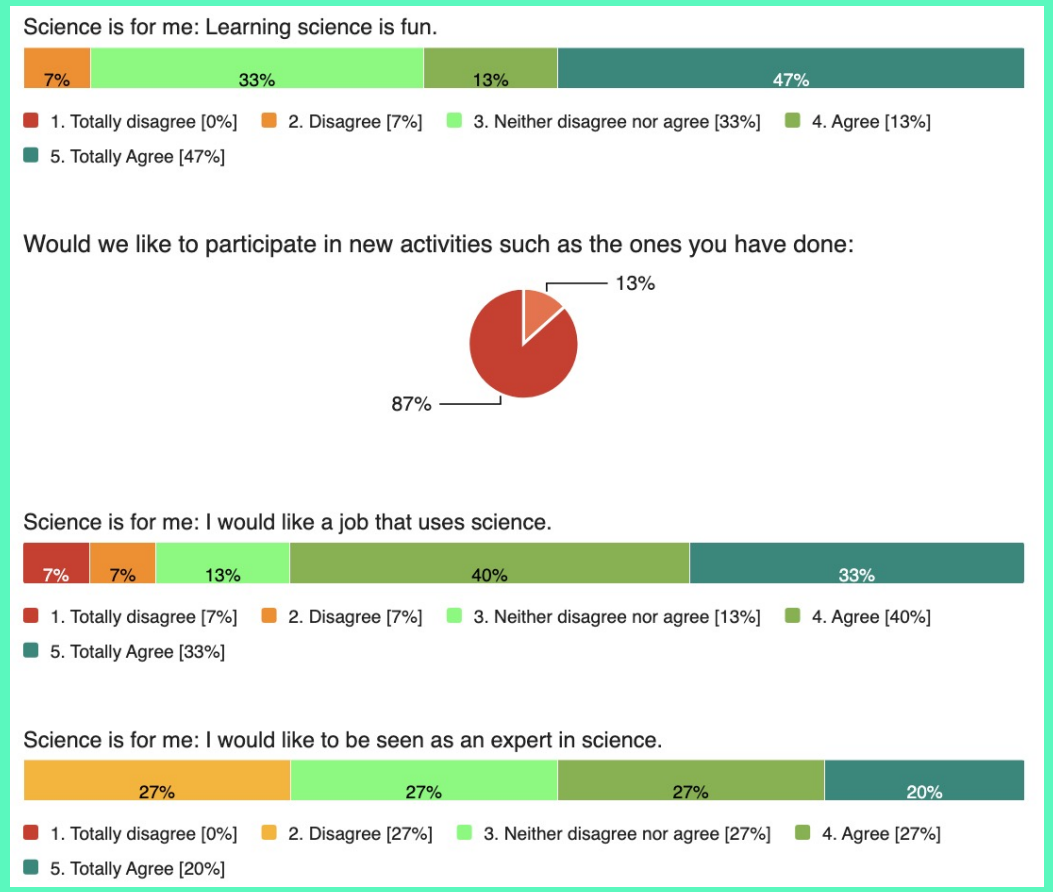






Students' views about their learning with AI

Full Report [URL]



Enjoyment and Engagement: 60% of students find learning science fun, which correlates strongly with the 87% who want to participate in new science activities. This suggests that enjoyment of science translates into a desire for more hands-on engagement, which is crucial for sustained interest and learning.

Enjoyment to Career Interest: The high percentage (73%) of students who would like a job that uses science is notably higher than those who find learning science fun (60%). This implies that even some students who don't necessarily enjoy learning science still recognize its value in future careers, showing a pragmatic appreciation for the subject.

Fun vs. Expertise: While 60% find learning science fun, only 47% want to be seen as experts. This gap might indicate that while students enjoy science, there's some hesitation about committing to it as a primary identity or career focus. It could also reflect awareness of the challenges in becoming a science expert.

Engaging science experiences are even more appealing than the prospect of a science career. This highlights the importance of experiential learning in science education.

The high percentages for both wanting a job using science (73%) and participating in new activities (87%) indicate that students see significant value in science for their future, whether for career prospects or personal growth.

CONNECT

APPENDIX

ML - Machine Learning for Kids is an educational platform that helps children understand machine learning concepts through hands-on projects

•**Functionality**: The platform allows students to train a classifier that can be applied to photos uploaded from the internet or taken with a computer camera. This trained model can then be integrated into various applications.

•**Use Cases**: Students can build projects where their machine learning models classify images, recognize objects, or even analyze sentiment in text. The platform provides various project templates and ideas to get students started.

Scratch is a visual programming language aimed primarily at children. It allows users to create games, stories, and animations through a block-based interface.

•**Integration**: Machine Learning for Kids can integrate with Scratch by allowing the trained machine learning models to be used within Scratch projects. This means that students can use machine learning models to make their Scratch projects more interactive and intelligent.

•**Examples**: For instance, a Scratch project could use an image classifier to change the story or gameplay based on objects detected in the webcam feed.

App Inventor is a visual programming environment that allows users to create applications for Android devices using a blocks-based approach similar to Scratch.

•**Integration**: Machine Learning for Kids can also integrate with App Inventor. This allows students to incorporate machine learning models into their mobile applications.

•**Examples**: A mobile app could use a machine learning model to recognize handwritten digits, classify photos taken with the phone's camera, or even analyze text for sentiment.

Python is a powerful programming language widely used in many fields, including web development, data analysis, artificial intelligence, and scientific computing.

•**Integration**: Machine Learning for Kids provides ways to export trained models that can be used in Python applications. This is more advanced compared to Scratch and App Inventor and suitable for older students or those with some programming experience.

•**Examples**: Python applications could use machine learning models for various purposes, such as real-time image classification, sentiment analysis, natural language processing, or creating intelligent agents.

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CONNECT

EXUS
Greece
www.exus.co.uk

OU
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www.open.ac.uk

DBT
Denmark
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IRSICAIXA
Spain
www.irsicaixa.es/en/livinglabhealth

MSc
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