Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professiona Learning of School Leaders and Teachers

Leaving Certificate Computer Science

National Workshop 5

Day 1

Workshop Overview

Session 1 10:00 - 11:30	Computers and Society 2
Tea/Coffee 11:30 – 12:00	
Session 2 12:00 - 13:30	Databases
Lunch 13:30 - 14:30	
Session 3 14:30 - 16:30	Inclusion and Curriculum Planning

Key Messages

All learning outcomes (LOs) are interwoven. This means that the specification can be used in many ways.

ALTs provide an opportunity to teach theoretical aspects of LCCS.

LCCS is suitable for all! This includes students with SEN and of all ability levels.

LCCS can be mediated through a constructivist pedagogical approach.

Group work is a key feature in the teaching, learning and assessment of LCCS.

Oide

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Supporting the Professiona Learning of School Leaders and Teachers

LCCS
NW5 Session 1

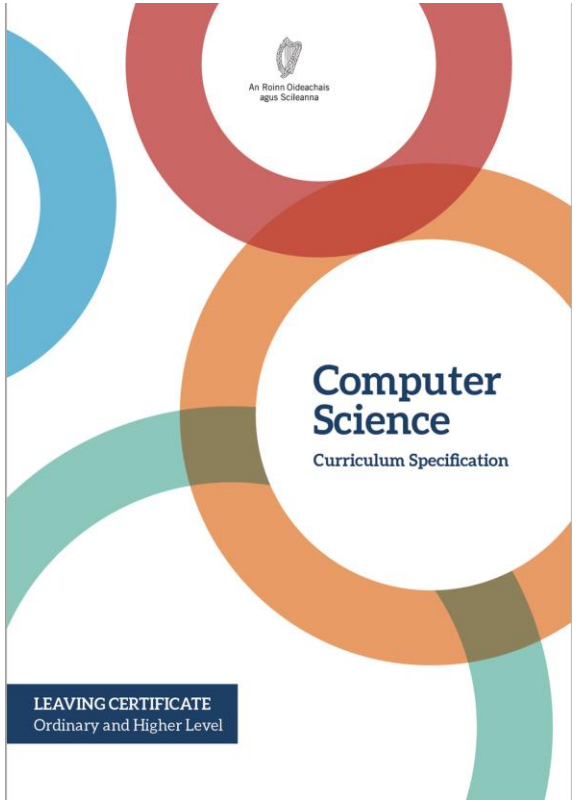
Computers and Society 2

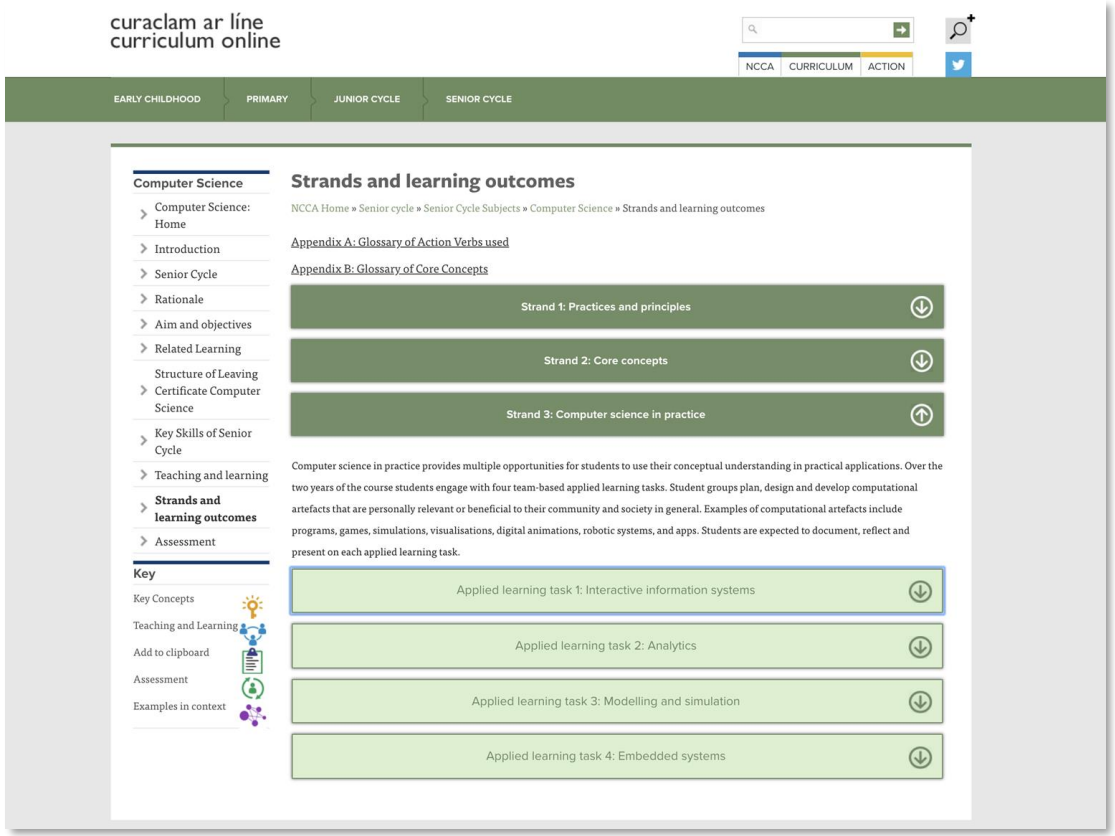
By the end of this session

Participants will be enabled to:

- reflect on what the specification says about Computers and Society
- listen to other teachers as they share their own classroom experiences
- further their pedagogic content knowledge of Computers and Society
- develop their knowledge of Artificial Intelligence and related concepts
- participate in an activity to select when and what machine learning and AI algorithms might be used in certain contexts

LCCS Curriculum Specification





https://www.curriculumonline.ie

What does the specification say?

Computer science is the study of computers and algorithmic processes. Leaving Certificate Computer Science includes how programming and computational thinking can be applied to the solution of problems, and ***how computing technology impacts the world around us.***

[LCCS Curriculum Specification, page 2]

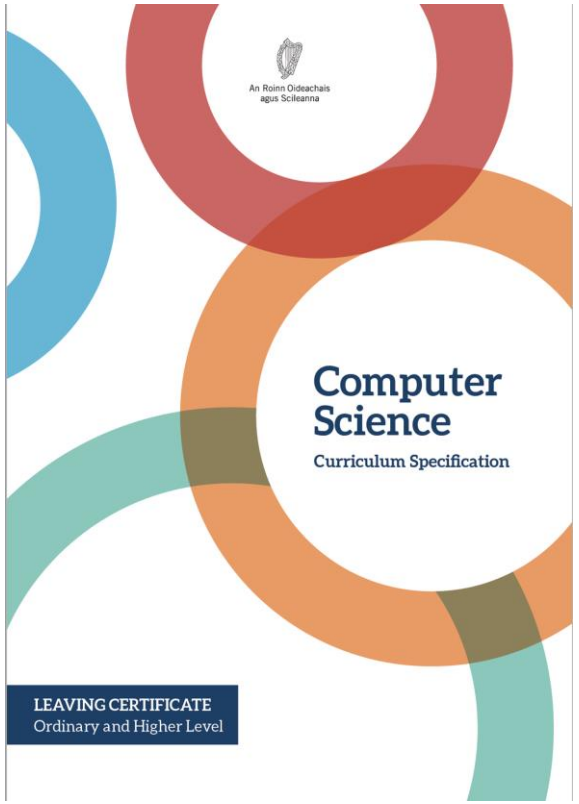
Strand 1: Practices and principles	Strand 2: Core concepts	Strand 3: Computer science in practice
▸ Computers and society ▸ Computational thinking ▸ Design and development	▸ Abstraction ▸ Algorithms ▸ Computer systems ▸ Data ▸ Evaluation/Testing	▸ Applied learning task 1 - Interactive information systems ▸ Applied learning task 2 - Analytics ▸ Applied learning task 3 - Modelling and simulation ▸ Applied learning task 4 - Embedded systems

What does the specification say?

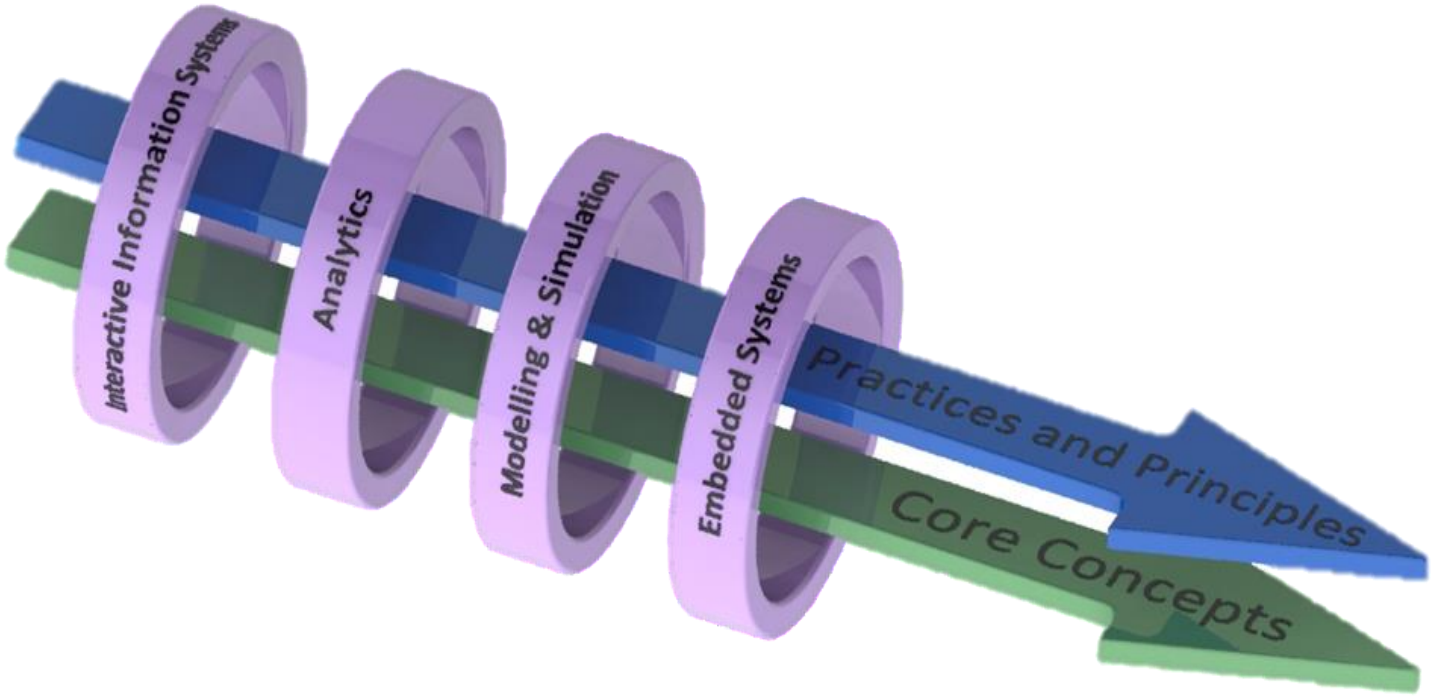
Objectives

- appreciate the ethical and social implications relating to the use of computing technology and information and identify the impact of technology on personal life and society

- understand how information technology has changed over time and the effects these changes may have on education, the workforce and society

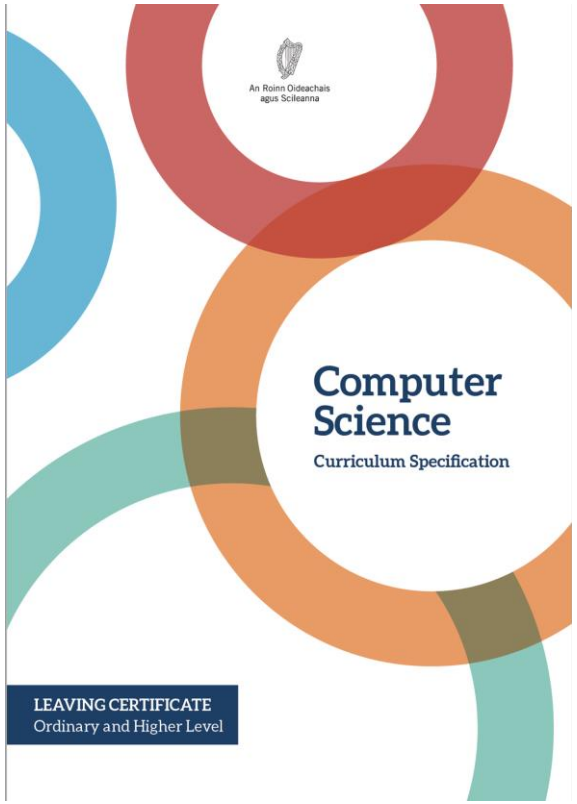


What does the specification say?



Computers and Society Learning Outcomes

Students learn about:[2]	Students should be able to:
S1: Computers and society	
Social and ethical considerations of computing technologies	1.11 discuss the complex relationship between computing technologies and society including issues of ethics
	1.12 compare the positive and negative impacts of computing on culture and society
Turing machines	1.13 identify important computing developments that have taken place in the last 100 years and consider emerging trends that could shape future computing technologies
The Internet	
Machine learning	1.14 explain when and what machine learning and AI algorithms might be used in certain contexts
Artificial intelligence	
	1.15 consider the quality of the user experience when interacting with computers and list the principles of universal design, including the role of a user interface and the factors that contribute to its usability
User-centred design	**1.16 compare two different user interfaces and identify different design decisions that shape the user experience**
	1.17 describe the role that adaptive technology can play in the lives of people with special needs
	1.18 recognise the diverse roles and careers that use computing technologies



Group Discussion

Instructions:

In your groups, discuss the following question. You may use the prompts on page 4 of the Professional Learning Booklet to help.

P5

Focusing on Computers and Society, how might you approach this section of the course with your students?

Group Discussion: Feedback

Instructions:

In your groups, discuss the following question. You may use the prompts on page 4 of the Professional Learning Booklet to help.

P5

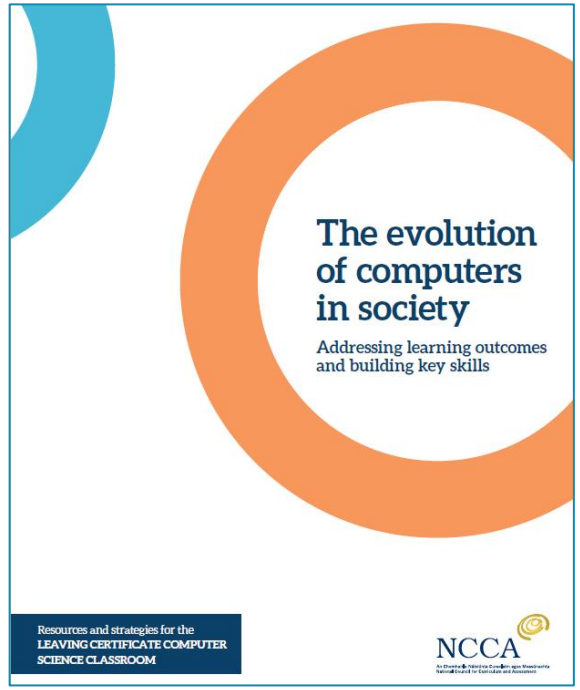
Focusing on Computers and Society, how might you approach this section of the course with your students?

NCCA - The Evolution of Computers in Society

Stimulate a Debate Strategy

P6

1. Engage with Stimulus material (e.g., video/text)
2. Provide prompt questions to provoke discussion and elicit opinion
3. Divide into research groups and explore topic from key standpoints
4. Choose a teaching/facilitation methodology



https://curriculumonline.ie/getmedia/a5e0d88d-e0f1-43bc-ab68-349b5660fbce/NCCA-The-Evolution-of-Computers-in-Society-LC-SC.pdf

Stimulate a Debate

China's social credit system

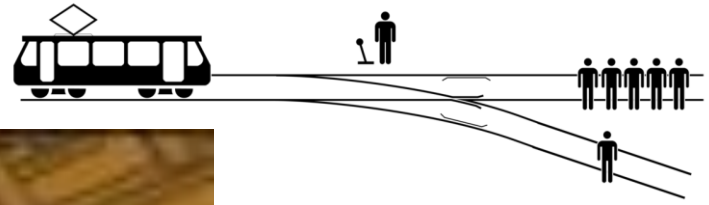
Agree/Disagree Line…What if?

P7

Could you be friends with a robot?

100% AGREE — **100% DISAGREE**

Agree/Disagree Line: The Trolley Problem



P8

The Trolley Problem

Agree/Disagree Line: Activity

MORAL MACHINE

The ethical dilemma of self-driving cars - Patrick Lin

Oide

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Supporting the Professiona Learning of School Leaders and Teachers

LCCS NW5

Introduction to AI

Introduction to AI

"Do You Love Me?"

Group Discussion

Instructions:

In your groups, discuss and agree on the following ..

1. Examples of Artificial Intelligence
2. A definition of Artificial Intelligence
3. Terminology/Concepts you associate with AI

P9

Group Discussion - Feedback

Instructions:

In your groups, discuss and agree on the following ..

1. Examples of Artificial Intelligence
2. A definition of Artificial Intelligence
3. Terminology/Concepts you associate with AI

P9

Terminology and Definition

P10

Artificial General Intelligence

Narrow Artificial Intelligence

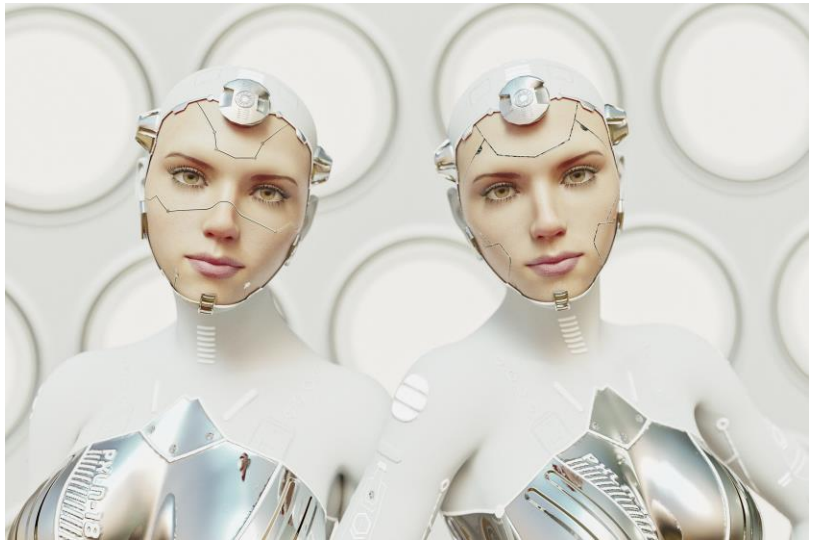
"Artificial intelligence can be defined as a branch of knowledge that strives to recreate human intelligence within machines"

Source: How to talk to Robots (Tabitha Goldstaub)

AI and Philosophy

The study of artificial intelligence raises a lot of philosophical questions:

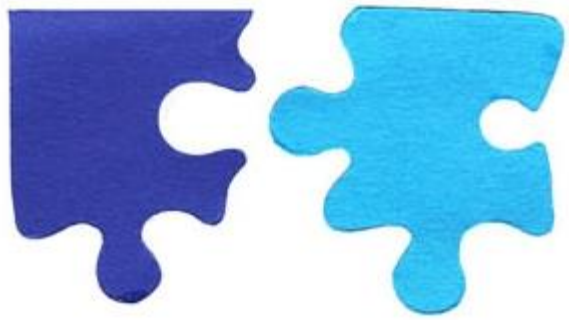
- What is intelligence?
- Is consciousness a requirement of intelligence?
- Is intelligent behaviour equivalent to intelligence?
- Sentience vs. Sapience



AI and Philosophy

The Chinese Room - 60-Second Adventures in Thought

Terminology Matching Exercise



Terminology Matching Exercise

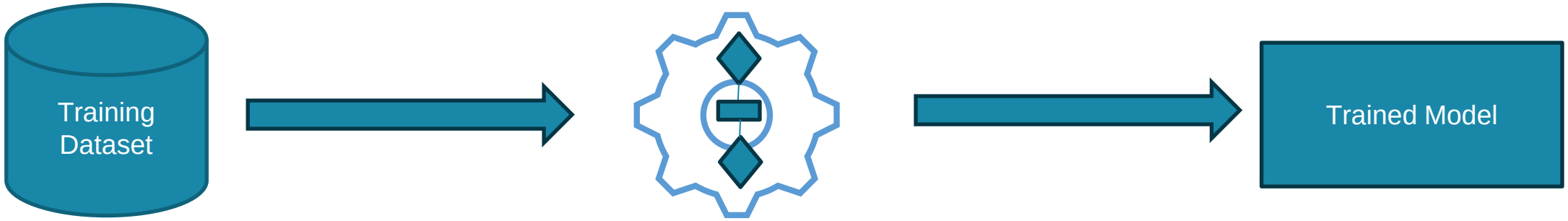
Intelligence	The ability to learn and perform suitable techniques to solve problems and achieve goals, appropriate to the context in an uncertain, ever-varying world.
Narrow AI	Intelligent systems for one particular thing, e.g., speech or facial recognition.
AGI	A theoretical ideal that aims to create machines with a level of intelligence comparable to human intelligence.
Human Centred Artificial Intelligence	A type of AI that seeks to augment the abilities of, address the societal needs of, and draw inspiration from human beings. It researches and builds effective partners and tools for people, such as a robot helper and companion for the elderly.

Terminology Matching Exercise

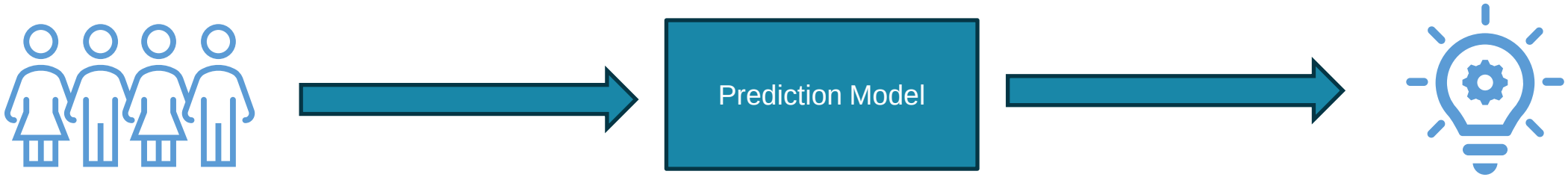
Machine Learning	A branch of AI studying how computer agents can improve their perception, knowledge, thinking, or actions based on experience or data.
Supervised Learning	A technique whereby computers can be trained predict human-given labels, such as dog breed based on labelled dog pictures.
Unsupervised Learning	A type of learning that does not require labels, sometimes making its own prediction tasks such as trying to predict each successive word in a sentence.
Deep Learning	The use of large multi-layer (artificial) neural networks that compute with continuous (real number) representations, a little like the hierarchically organised neurons in human brains.

Machine Learning Process

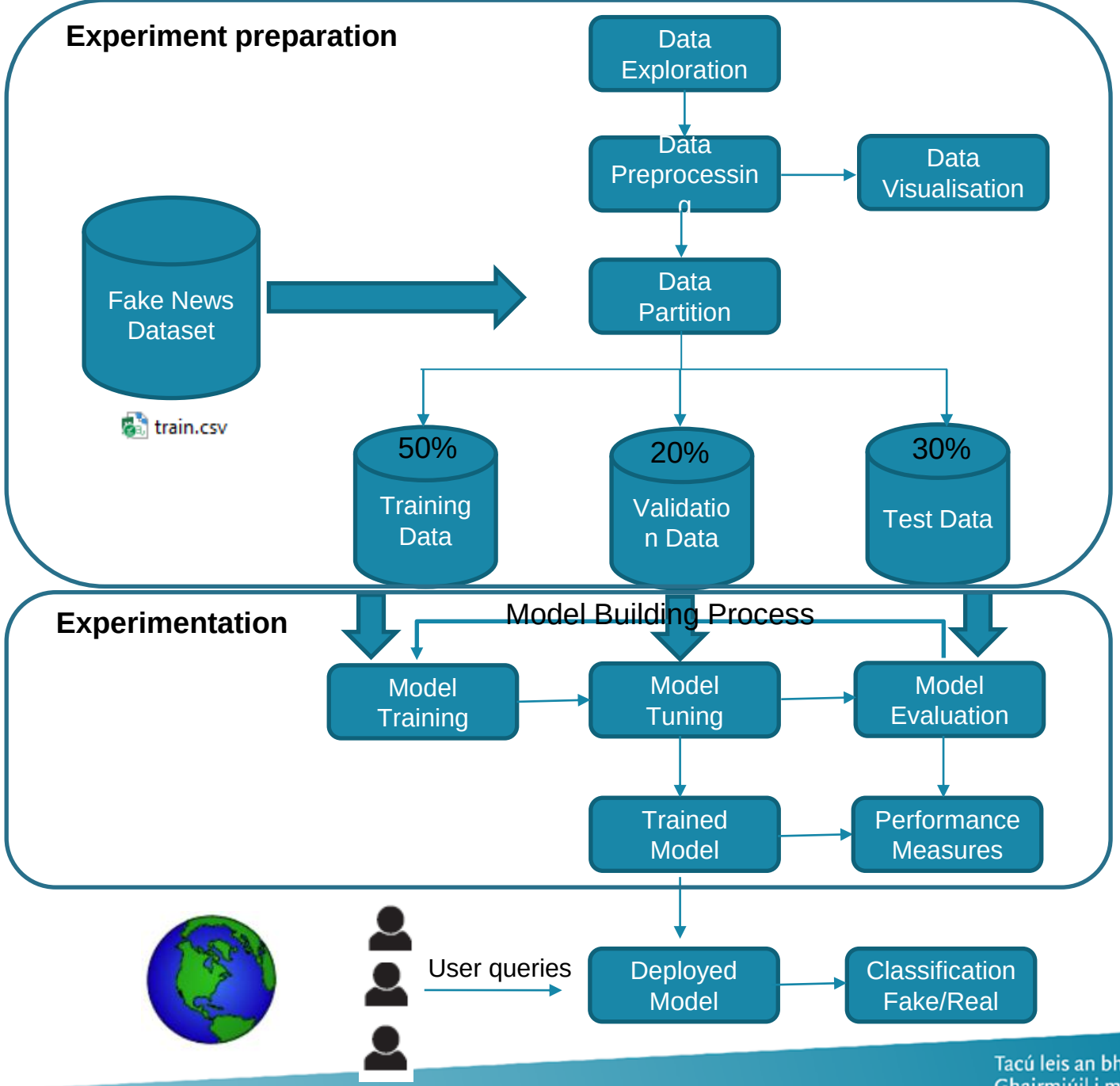
STEP 1 – Train the Model



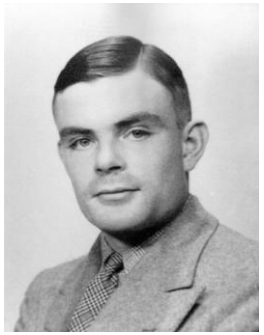
STEP 2 – Use the Model



Example

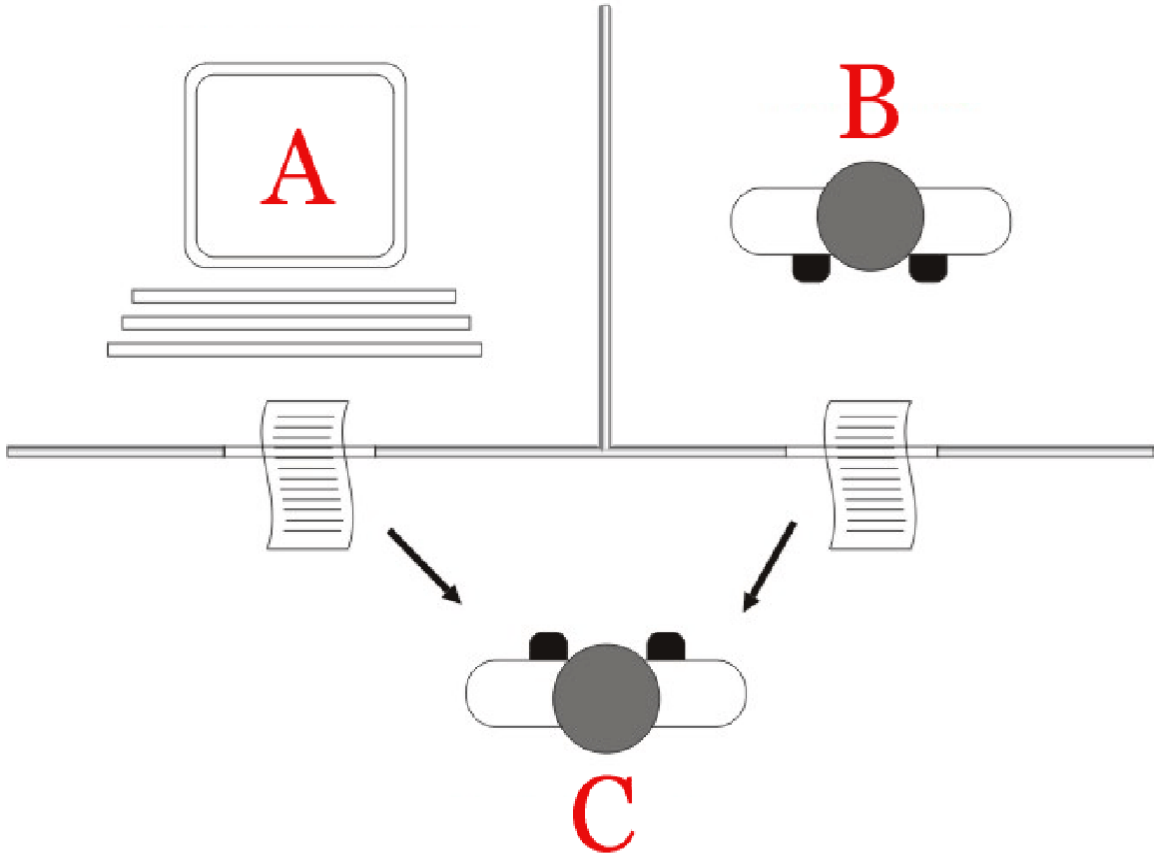

Experiment preparation
Data Exploration
Data Preprocessing
Data Visualisation
Fake News Dataset
train.csv
Data Partition
50%
Training Data
20%
Validation Data
30%
Test Data
Experimentation
Model Building Process
Model Training
Model Tuning
Model Evaluation
Trained Model
Performance Measures
User queries
Deployed Model
Classification Fake/Real

AI History



"Computing Machinery & Intelligence", **Alan Turing**, 1950

Fundamental paper in artificial intelligence that described what came to be known as the **Turing Test**



A.I. HISTORICAL TIMELINE

— ImageNet at the origin of major advances in image recognition —

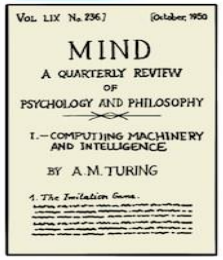
IMAGE NET

First design of a computer program by Ada Lovelace

1837

Invention of the algorithm concept (Turing machine)

1939



Test for machines' "intelligence" (Turing test)

1950

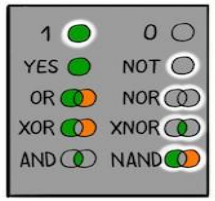
Margaret Masterman

Creation of the Cambridge Language Research Unit

1953

First psychotherapist chatbot (ELIZA)

1965



First artificial intelligence program (Logic Theorist)

1956

First general-purpose mobile robot (Shakey the robot)

1966

Expert system used for the diagnosis and therapy of infectious diseases (MYCIN)

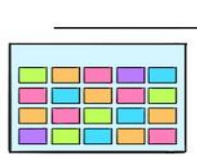
1972

1st AI winter

1974–1980

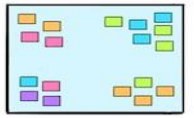
Chess-playing expert system (Deep Blue)

1997



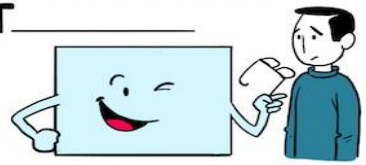
Large-scale hierarchical Image Database (ImageNET)

2009



DeepLearning in Image recognition (AlexNet)

2012

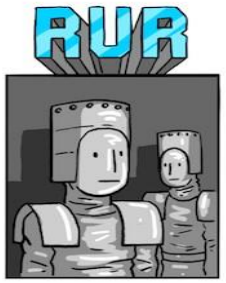


Computer vision exceeds human vision

2015

1921

Creation of the word "ROBOT"



1945

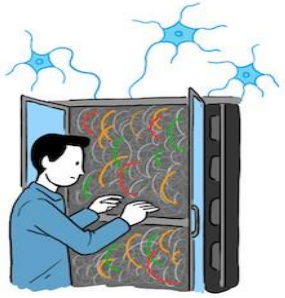
Electronic Numerical Integrator Analyser and Computer (ENIAC)

1956

Birth of the term "Artificial Intelligence"

1957

First single layer neural network (Perceptron)



1954

A demonstration of machine translation: Georgetown–IBM Experiment

General Problem Solver

1986

The computer is given a voice (NETtalk)

First computer controlled vehicles (Navlab)

AI boom

Rise of expert systems

1980-1987

2nd winter of AI

1988–1993

2013

Natural language processing technique (Word2Vec)

2018

Turing Award for recent advances in deep learning

2015

Announcement of fully autonomous cars

AI4T
AI FOR TEACHERS

Co-funded by the Erasmus+ Programme of the European Union

Key Drivers of AI

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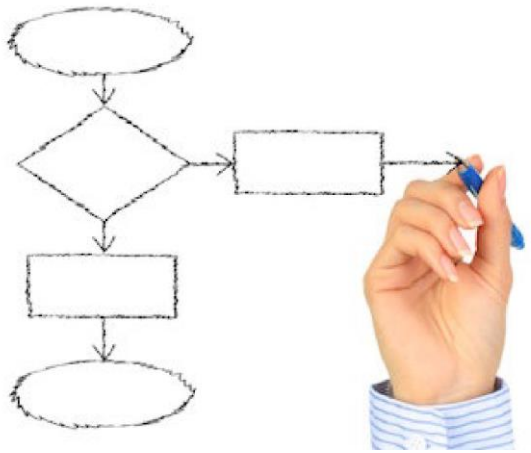
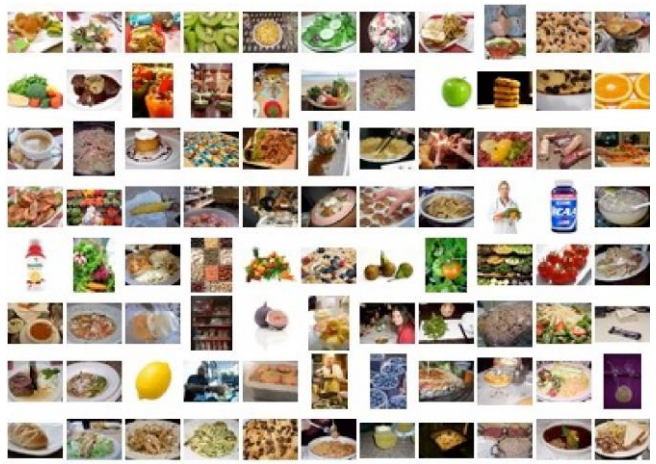
Algorithms



Data



4 Key drivers

Hardware

Applications

Google

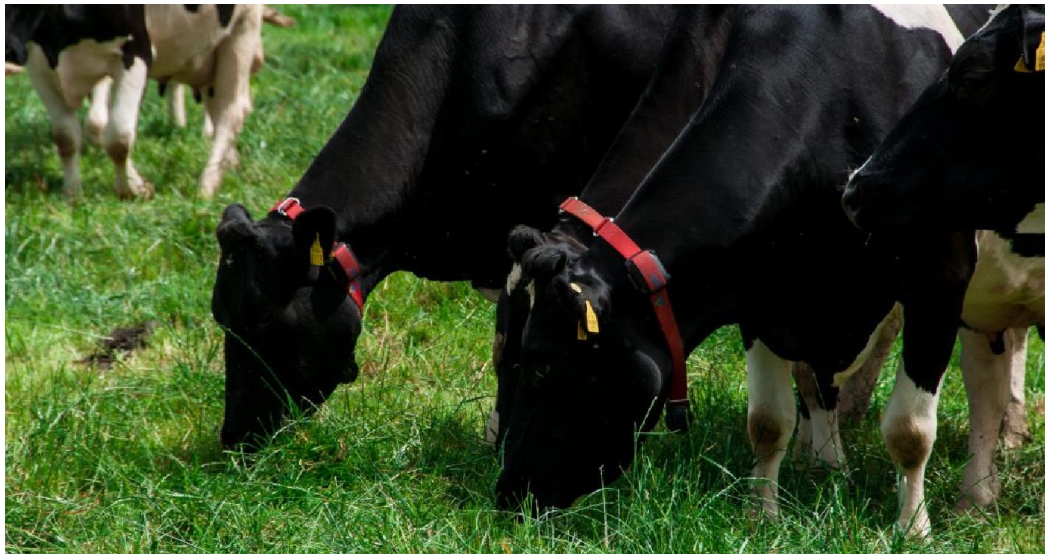
NETFLIX

facebook

Baidu 百度

Applications of AI

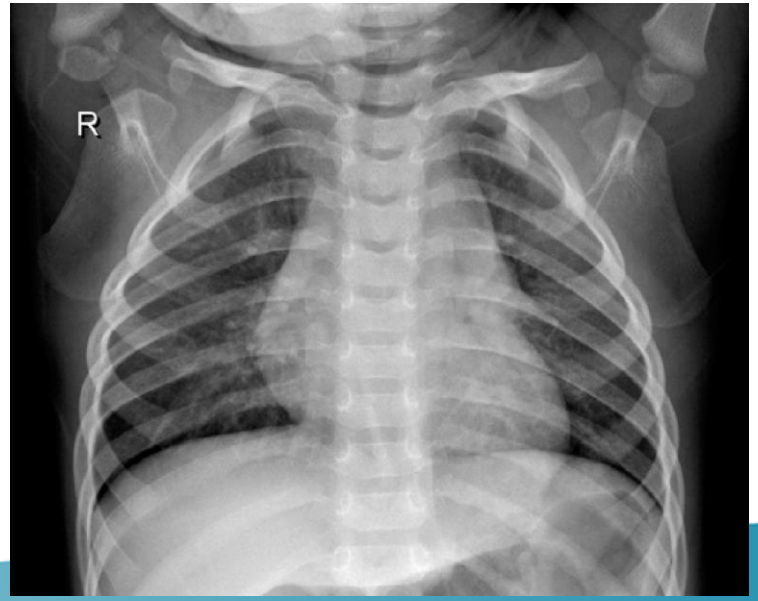
Oide



NETFLIX

amazon

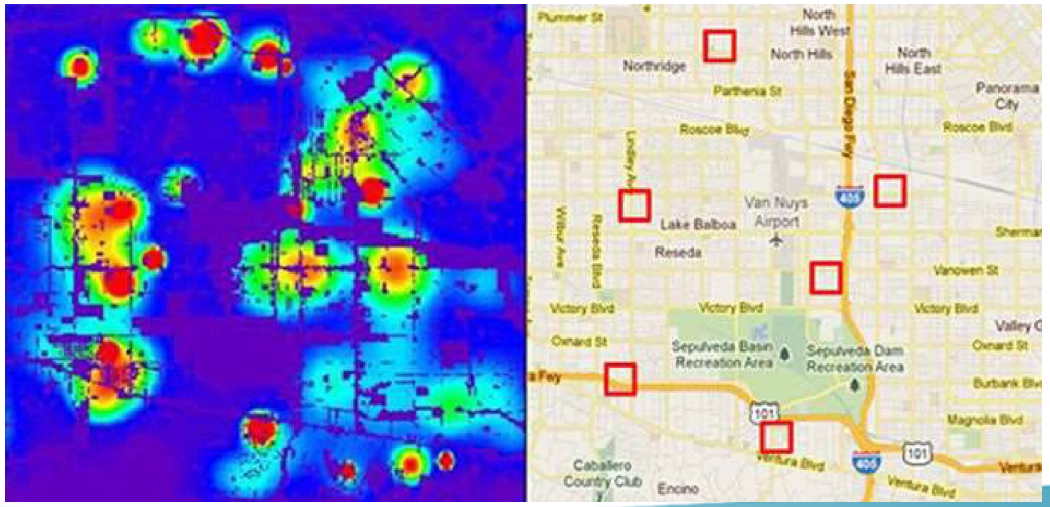
Google



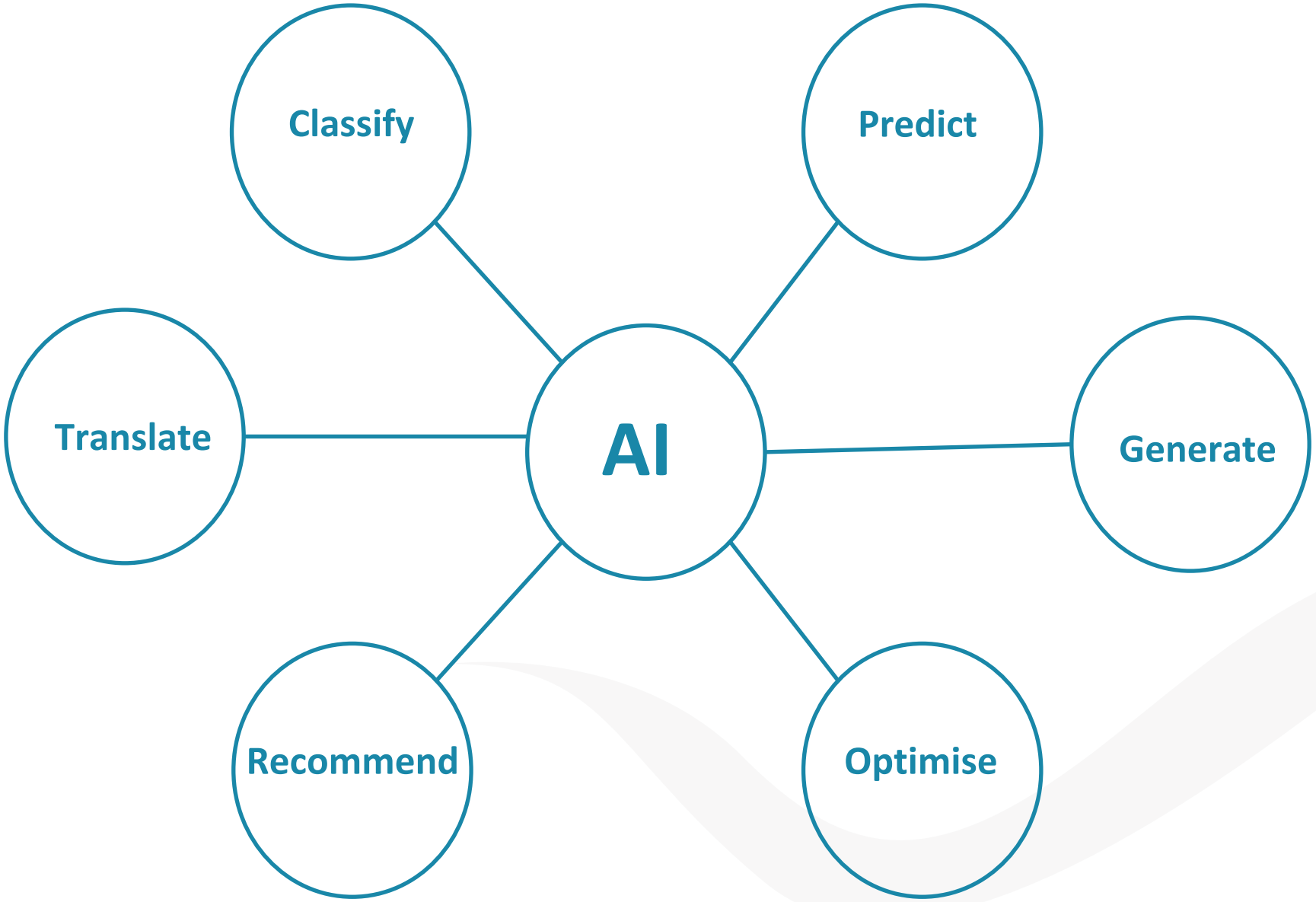
ChatGPT

Microsoft

More applications of AI



Categorising Applications of AI



Group Discussion

Discuss whether the applications should or should not be considered applications of AI.

P11

Group Discussion - Feedback

Discuss whether the applications should or should not be considered applications of AI.

P11

3-2-1 Reflection

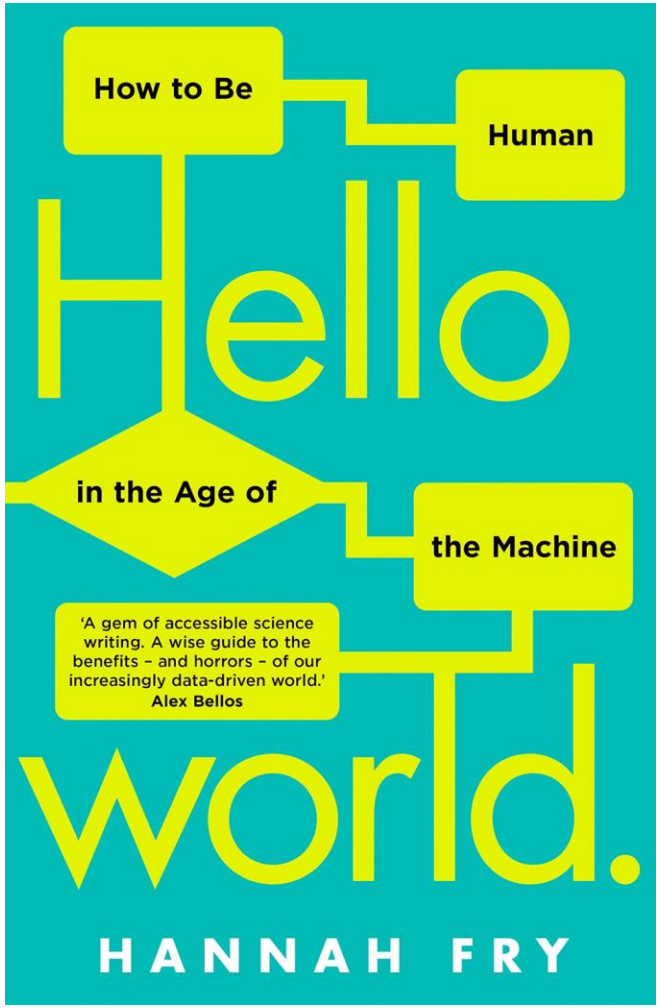
3 - List three things you learned

2 - List two areas you would like to learn more about

1 - One question you still have

P12

Additional Resources



Power

Data

Justice

Medicine

Cars

Crime

Art

Conclusion

https://helloworld.raspberrypi.org/

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Supporting the Professiona Learning of School Leaders and Teachers

LCCS
NW5 Session 2

Databases

By the end of this session participants will have …

- developed an understanding of Flat-file systems and databases
- explored the meaning of relational databases
- used the micro:bit datalogging feature to record and store temperature data from a micro:bit (generate a csv file)
- used a web application to populate and access a ThingSpeak database
- enhanced their web development skills through creating a dynamic website displaying real-time data
- acquired additional skills, knowledge and ideas in order to facilitate ALT1 in their own classrooms

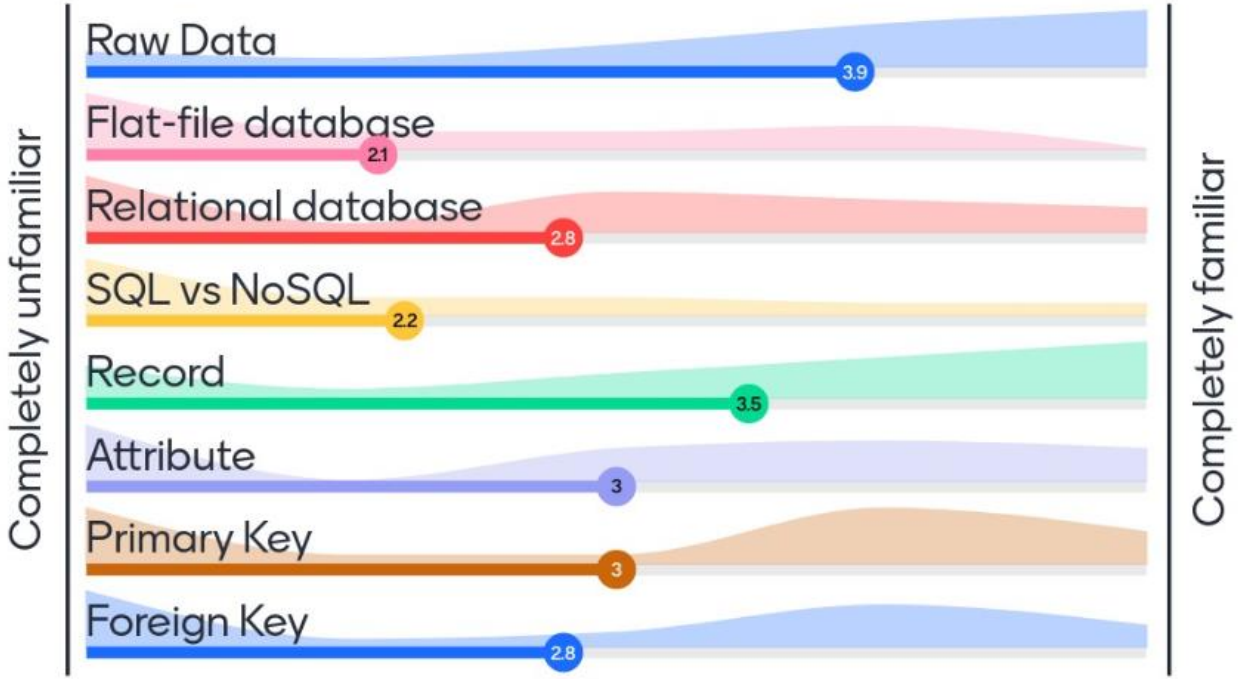
Keywords

P13

	I don't know the term at all	I've seen or heard the term but I don't know the meaning	I think I know the meaning	I know a meaning
Data (raw data)				
Database				
DBMS				
Non-relational database				
Relational database				
SQL				
NoSQL				
Record				
Field				
Primary Key				
Foreign Key				
System Architecture				
Client-server Model				
Front-end system				
Back-end system				

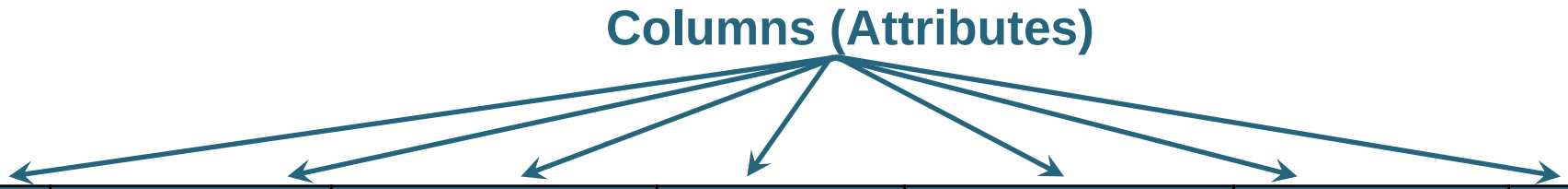
*Adapted from "An Integrated Approach to Learning, Teaching and Assessment", p28
https://pdst.ie/sites/default/files/Integrated%20Approach.pdf

Please rate your own knowledge/undestanding with respect to the following terms/topics

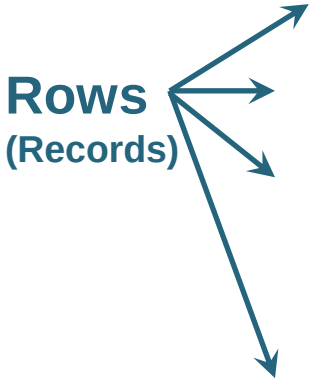


Database Concepts

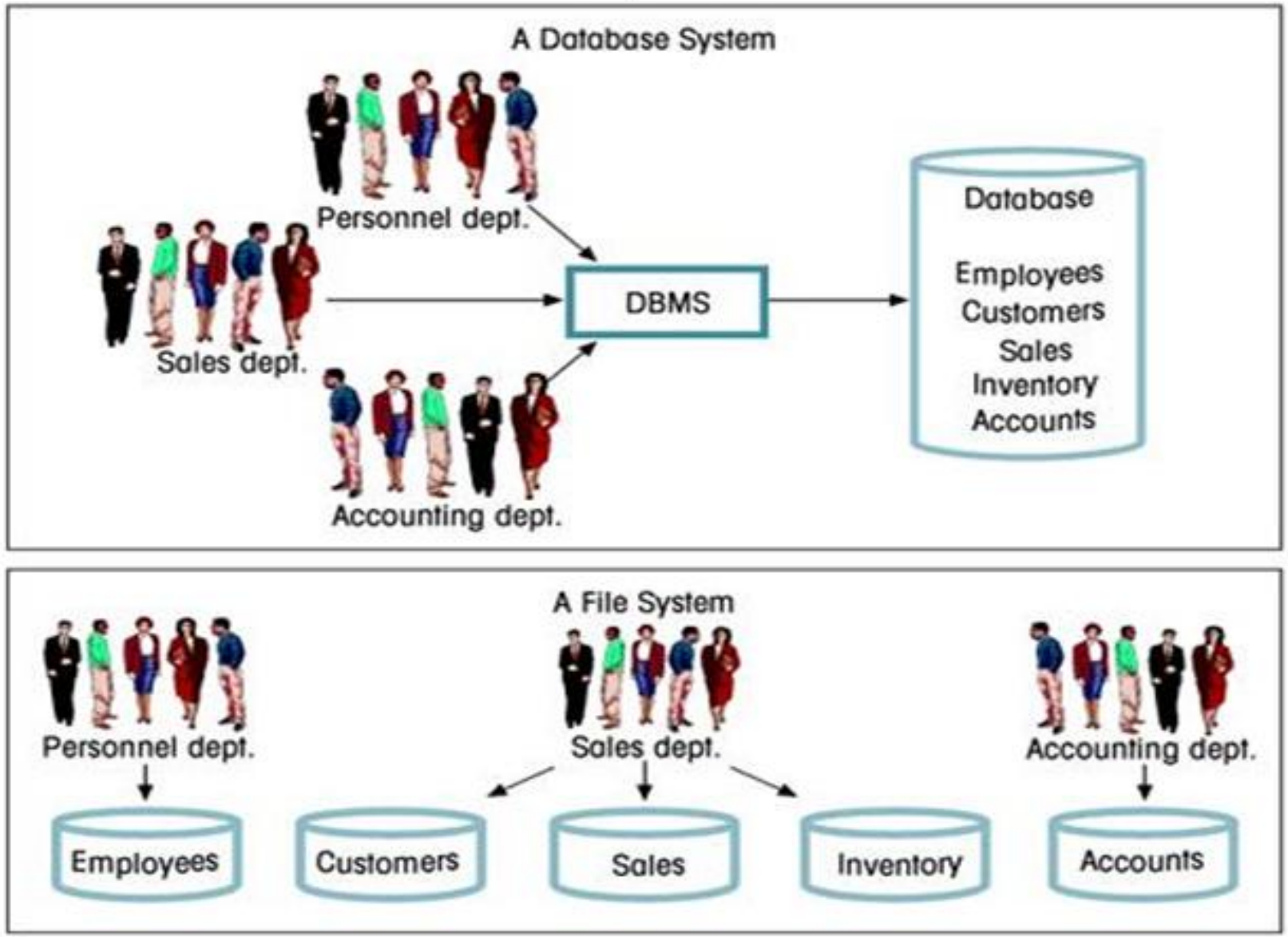
Database: A structured collection of related data



owner_id	owner_name	address	dog_name	breed	dob	microchip
1	Joe Murphy	1 main st.	rover	labrador	22/11/2011	Y
1	Joe Murphy	1 main st.	fido	poodle	02/02/2020	Y
2	Ada Traore	9 park ave.	fido	jack russell	15/06/2015	N
1	Joe Murphy	1 main st.	champ	greyhound	01/01/2010	Y
2	Ada Traore	9 park ave.	spots	dalmation	24/08/2007	N
3	James Tidy	7 bond st.	buddy	rottweiler	21/10/2012	Y



- Data is stored in tables - organised by rows (tuples) and columns (attributes)
- Each row is called a record
- Each attribute value is called a field


A Database System
Personnel dept.
Sales dept.
Accounting dept.
DBMS
Database
Employees
Customers
Sales
Inventory
Accounts
A File System
Personnel dept.
Sales dept.
Accounting dept.
Employees
Customers
Sales
Inventory
Accounts

Database Concepts

Table: A set of data elements (values) organised by rows (records) and columns (attributes)

Attribute: A characteristic of the data in the table, describing a field or cell in a table.

Primary Key: A unique identifier for a row in a table

Would **dog_name** be a good PK?

What about **breed**?

dog_id	dog_name	breed	dob	microchip
1	rover	labrador	22/11/2011	Y
2	fido	poodle	02/02/2020	Y
3	fido	jack russell	15/06/2015	N
4	champ	greyhound	01/01/2010	Y
5	spots	dalmation	24/08/2007	N
6	buddy	rottweiler	21/10/2012	Y

Creating a Flat-file database - Activity

P14 – 16

Database Activity

Primary key **people_ID** is a unique identifier for each record.

Columns (Attributes)

Rows (Records)

Name	Age	Address	Occupation	Commute Method	Distance to Work	Workplace
Paul Johnson	29	47 Main Street	Teacher at Irisheen National School	Walk	0.5 km	Irisheen National School
Michael Brown	42	23 Oak Avenue	Accountant	Bus	16 km	Town Office
Sarah Williams	35	12 Main Street	Nurse at Irisheen Community Hospital	Cycle	3 km	Irisheen Community Hospital
David Lee	28	50 Elm Drive	Software Developer	Works from Home	0 km	N/A
Mia Connor	41	Lake View House	Principal	Car	10km	Irisheen National School
Patricia Murphy	31	4 Oak Lane	Graphic Designer	Car	12 km	Glenvalley
Liam O'Connor	35	22 River Road	Gardener	Walk	1 km	Irisheen Park
Aoife Ryan	29	21 Green Street	Pharmacist	Car	8 km	Watertown Pharmacy
Michael Brown	36	5 Main Street	Bakery Owner	Walk	0 km	Brown's Bakery (Downstairs)

Database Concepts

owner_id	owner_name	address	dog_name	breed	dob	microchip
1	Joe Murphy	1 Main st.	rover	labrador	22/11/2011	Y
1	Joe Murphy	1 Main St.	fido	poodle	02/02/2020	Y
2	Ada Traore	9 Park Ave.	fido	jack russell	15/06/2015	N
1	Joe Murphy	1 Main St.	champ	greyhound	01/01/2010	Y
2	Ada Traore	9 Park Ave.	spots	dalmation	24/08/2007	N
3	James Tidy	7 Bond St.	buddy	rottweiler	21/10/2012	Y

How do add a new customer (unless they buy a dog)?

How do we update a record that occurs multiple times?

How do we ensure we don't delete too much information?

Primary Key

ID	fname	sname	address	...	email	...
1	Joe	Murphy	1 Main St.	...	jmurphy@outlook.ie	...
2	Ada	Traore	9 Park Ave.	...	at@gmail.com	...
3	James	Tidy	7 Bond St.	...	tidy@outlook.ie	...
4	Joe	Murphy	1 Park Ave.	...	murphyj@yahoo.com	...

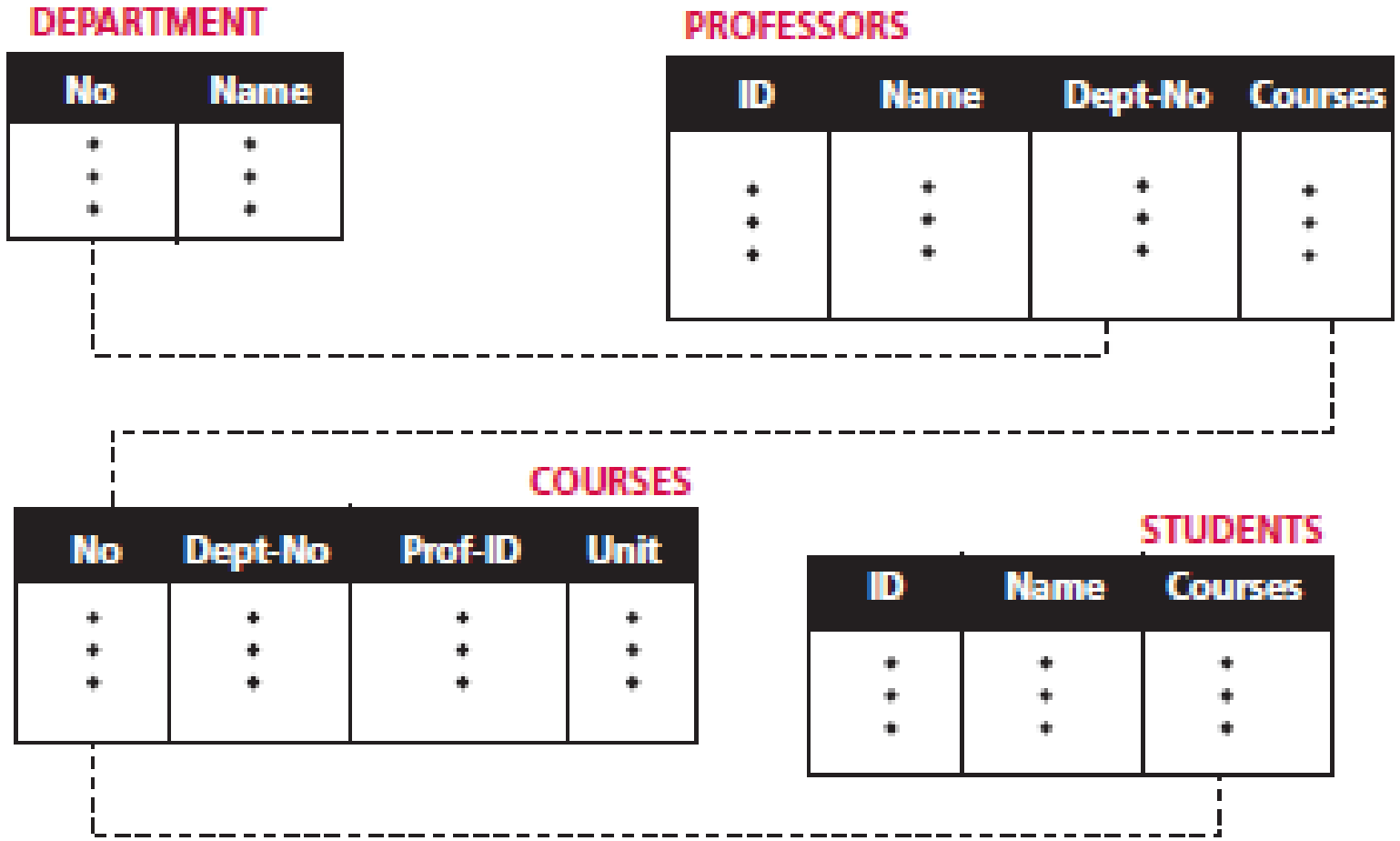
Foreign Key

Foreign Key (FK): An attribute in a table that is used as a primary key in another table.

A FK provides the relationship by linking one table to another

dog_id	name	breed	dob	microchip	owner_id
1	rover	labrador	22/11/2011	Y	1
2	fido	poodle	02/02/2020	Y	1
3	fido	jack russell	15/06/2015	N	2
4	champ	greyhound	01/01/2010	Y	1
5	spots	dalmation	24/08/2007	N	2
6	buddy	rottweiler	21/10/2012	Y	3

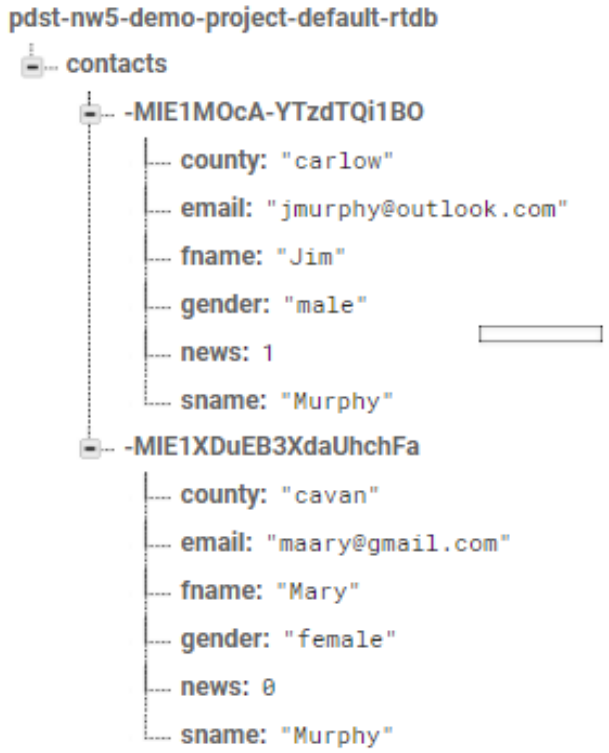
Relational Model



Structured Query Language (SQL) vs. NoSQL

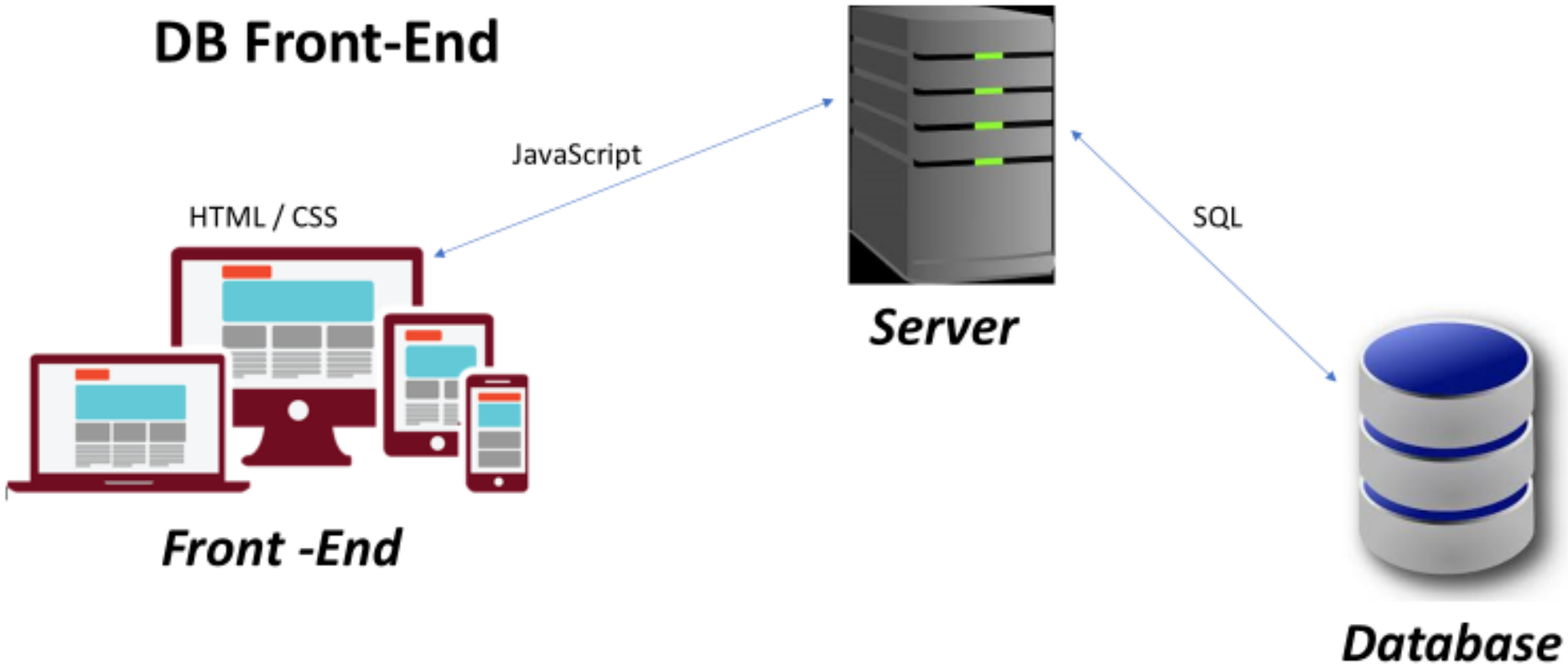
fname	sname	county	gender	email	news
Joe	Murphy	carlow	male	jmurphy@outlook.ie	Yes
Mary	Murphy	cavan	female	maary@gmail.com	No

Relational Model (SQL Based)



Cloud Model (NoSQL)

Client-Server Model
DB Front-End



Matching Exercise

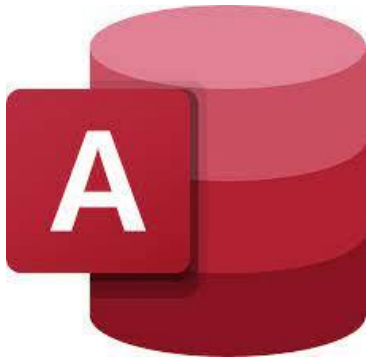
P17

Some Database Solutions

ThingSpeak

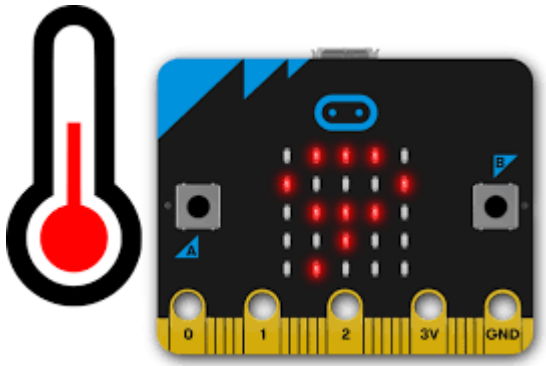
Firebase

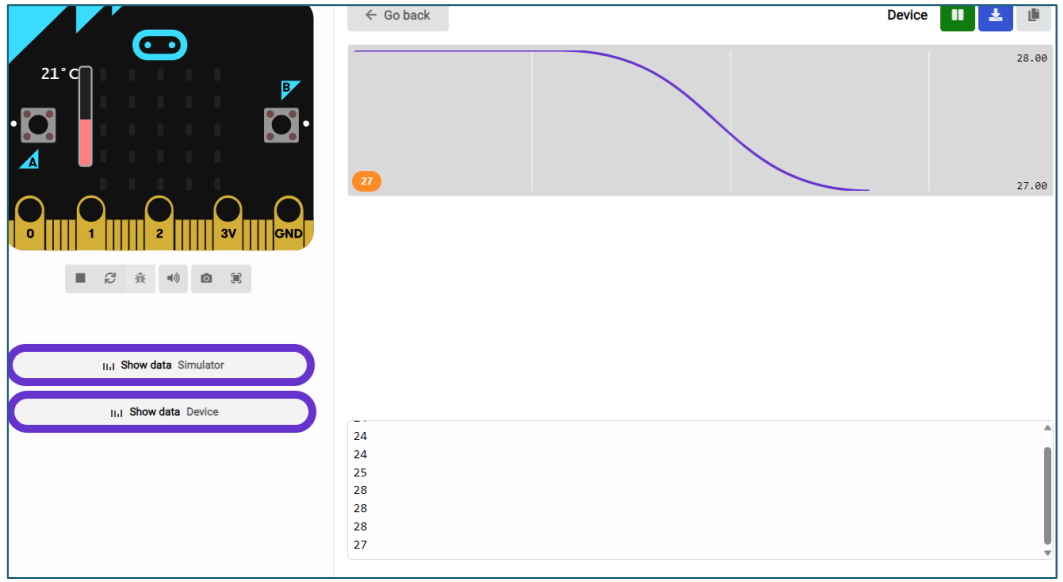
SQL



mongoDB®

micro:bit Data Logging





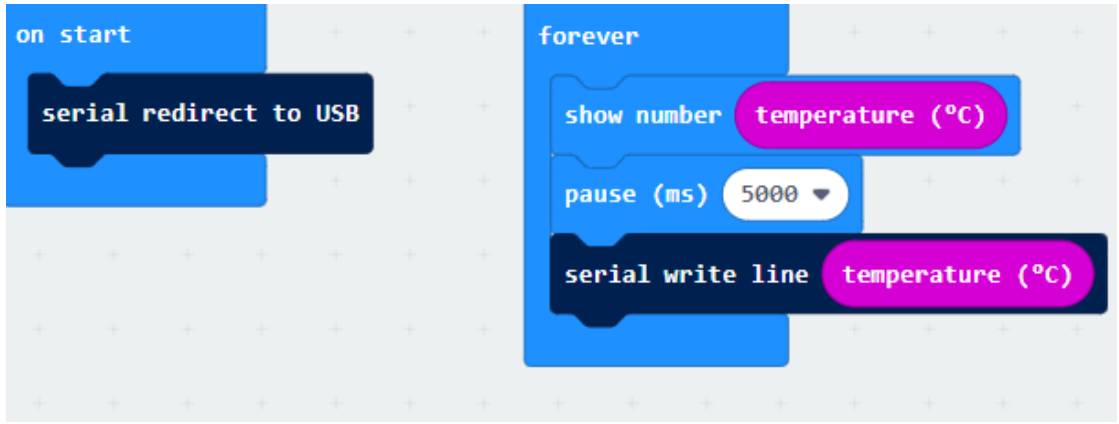
1	time (source1)	
2	0	28
3	4.76	28
4	9.52	28
5	14.28	28
6	19.04	28
7	23.8	30
8	28.559	31
9	33.32	31
10	38.08	31
11	42.839	31
12	47.599	31
13	52.359	31
14	57.119	30
15	61.879	30
16	66.64	30
17	71.4	30
18	76.161	29
19	80.919	29
20	85.678	29
21	90.439	29
22	95.198	29
23	99.958	29
24	104.719	28
25	109.478	28
26	114.238	28
27	118.997	28

Micro:bit temperature data

Data logging

CSV file

micro:bit Data Logging



Predict:

Predict what this code does

Run:

Open the makecode editor environment and run this code in the online simulator

Investigate:

Did anything change in the makecode editor environment?
Investigate what happens if you change the online temperature.
Investigate what happens if you click this icon.
Connect your micro:bit. What do you notice happens with the online simulator?

Modify:

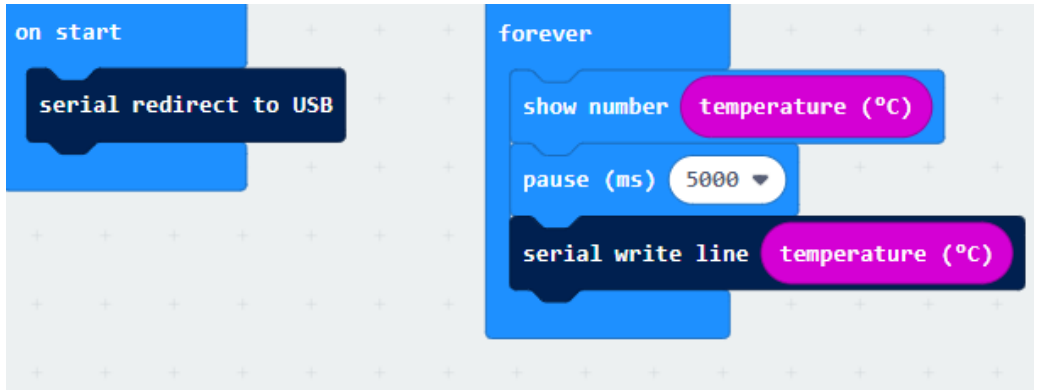
Modify your code to log the outside temperature HINT: 

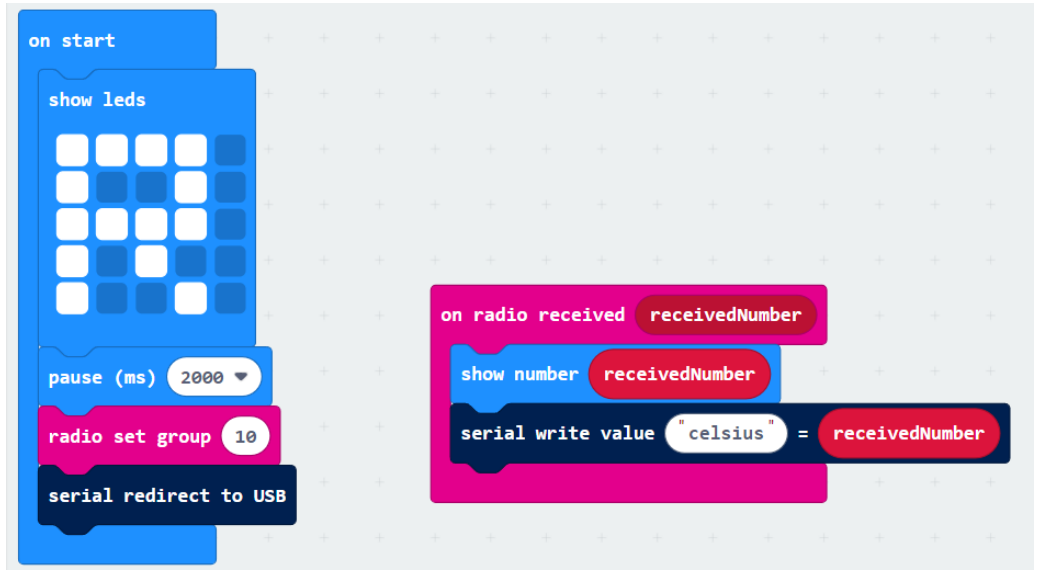
Make:

Consider how you could extend this task for your students. What could you ask them to make?

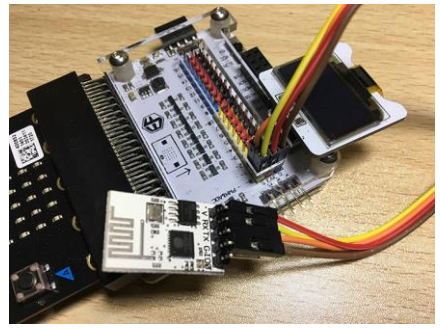
P17

micro:bit Data Logging





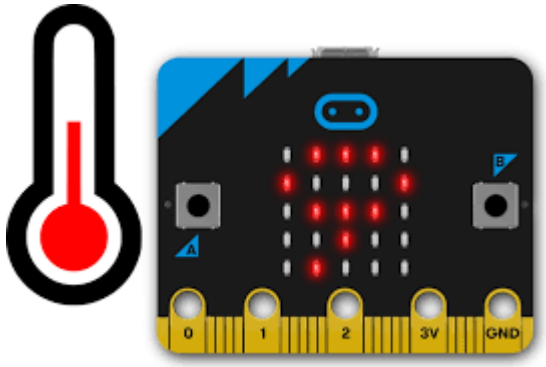
micro:bit Data to IoT Platform



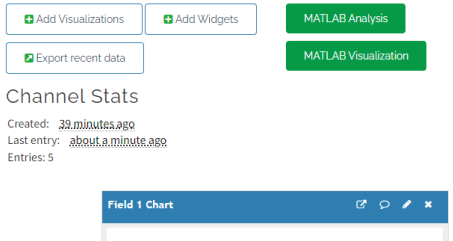
ESP8266 wifi module

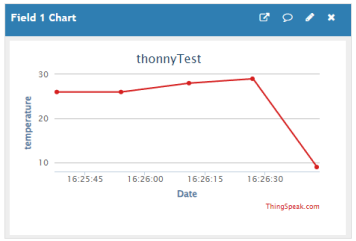
Smarthon IoT Bit

Feed data from a sensor to a website using ThingSpeak




```
13      data1 = str(ser.readline())
14      data1 = data1.replace("b","")
15      data1 = data1.replace("'","")
16      data1 = data1.replace("\\r\\n","
17      time.sleep(5)
18      print(data1)
19      msg = data1
20
21      h=urllib.request.urlopen('https:/
```



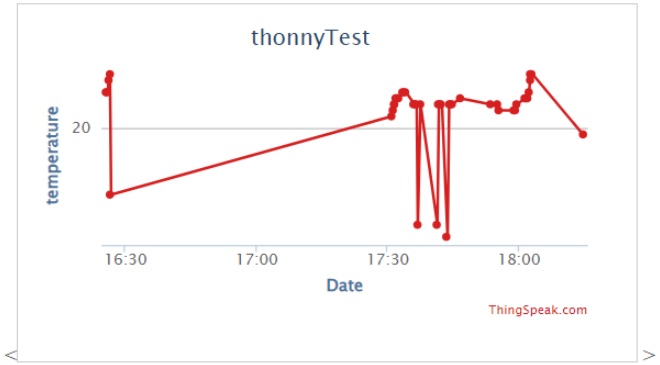


Welcome to my website...

SMART HEATING

CUSTOMER	ADDRESS	TYPE
Mary Byrne	Dublin	Oil
Karl Stone	Kildare	Oil
Sarah Reilly	Cork	Gas
XXX	YYYY	Green
?	?	
?	?	?

Temperature reading from a remote microbit



Micro:bit temperature data → Thonny (python) → ThingSpeak → Website

ThingSpeak Activity

Micro:bit Data to ThingSpeak IoT Platform

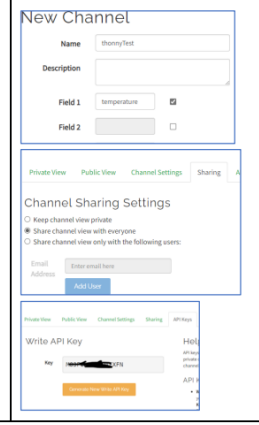
Part 1: Setting up an account on ThingSpeak

a) Set up a ThingSpeak account https://thingspeak.com/login Create a channel.

b) Fill in one field and call it "temperature".

c) Channel Sharing Settings – Click on "Share channel view with everyone".

d) Take a note of your API key – you will need this for the next part.



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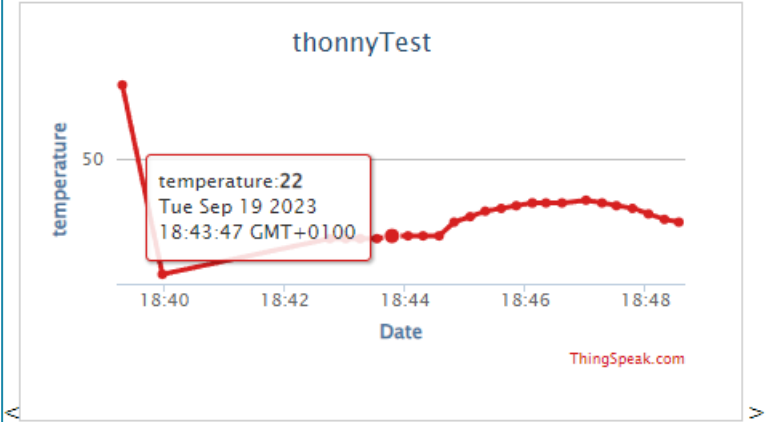
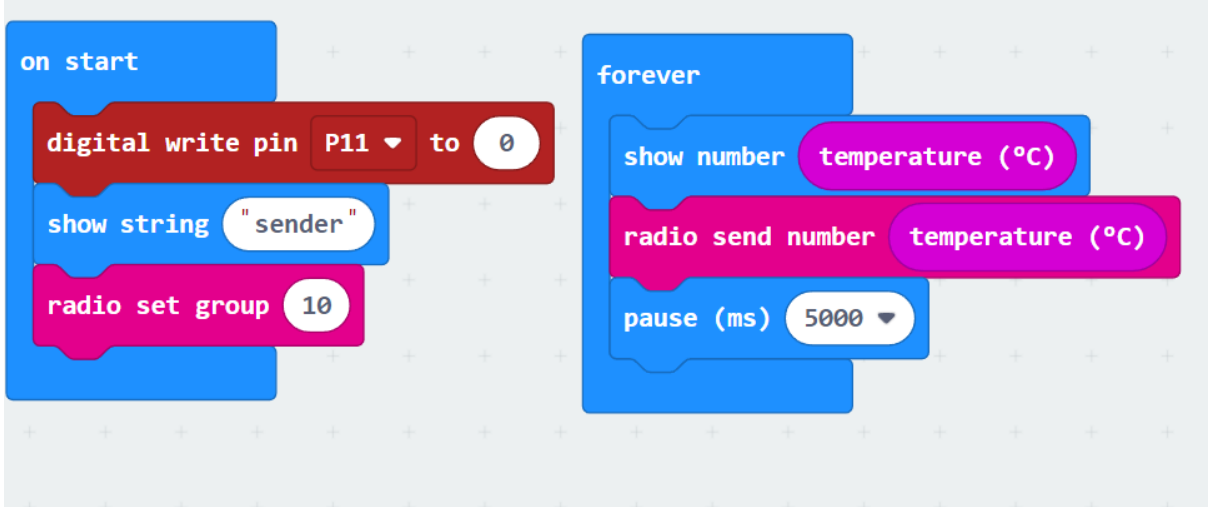
Temperature reading from a remote microbit

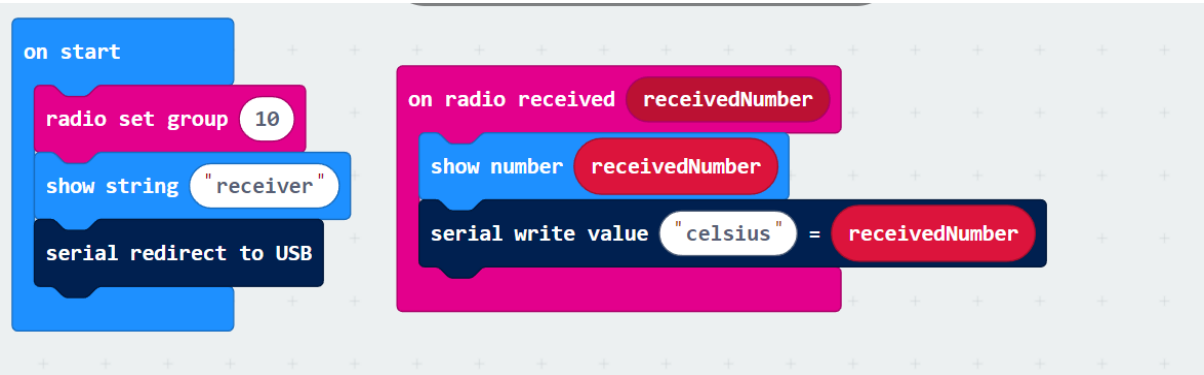


Measuring temperature remotely

Code for sender micro:bit



Code for receiver micro:bit



Oide

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Supporting the Professiona Learning of School Leaders and Teachers

Session 3

Creating an inclusive classroom: SEN in Computer Science

Curriculum planning

By the end of this session

Participants will be enabled to:

- develop an understanding of Inclusion, SEN and current policy and recognise the broad range of guidelines and resources available
- make the link with Leaving Certificate Computer Science
- bring inclusive teaching practices for CS back to the classroom
- develop a shared understanding of the challenges and possible strategies for a wide range of SEN categories
- engage collaboratively to develop a curriculum plan for the coming weeks/months guided by the LCCS specification

What is inclusion?
Some perspectives...

"Technology should be a vehicle by which students reflect and demonstrate understanding of their intersectional identities."

"Inclusion is creating space for nurturing and caring relationships.“

"*Different forms of assessment privilege different forms of understanding.*“

Shuchi Grover

"*[Our classrooms contain] … minoritised learners, rather than minority learners.*"

Professor Tia Madkins

Inclusion: Warm-up Activity

What does an inclusive classroom look like?

What does inclusion mean to you?

Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professiona Learning of School Leaders and Teachers

Current policy

Current Policy

Special Educational Needs are defined as:

"*A restriction in the capacity of the person to participate in and benefit from education on account of an enduring physical, sensory, mental health or learning disability, or any other condition which results in a person learning differently from a person without that condition."*

The EPSEN Act recognises that special educational needs may arise from four different areas of disability: • physical • sensory • mental health • learning disability.

EPSEN Act, 2004

Current Policy

An Roinn Oideachais agus Scileanna
Rannog Oideachais Speisialta
Cor na Madadh
Átha Luain
Contae na hIarmhí

Department of Education and Skills
Special Education Section
Cornamaddy
Athlone
Co. Westmeath

Circular No 0014/2017

Circular to the Management Authorities of all Post Primary Schools: Secondary, Community and Comprehensive Schools and the Chief Executive Officers of the Education and Training Boards

Special Education Teaching Allocation

1. Purpose

The purpose of this Circular is to advise schools of the revised allocation process for Special Education Teachers to mainstream post primary schools from the 2017/18 school year.

This revised allocation process will replace the Learning Support and English as Additional Language Support (LS/EAL) scheme, whereby a general allocation of resources had previously been allocated to post primary schools annually.

It will also replace the National Council for Special Education (NCSE) allocation process which provided additional resource teaching supports to schools, to support students who had been assessed as having Low Incidence disabilities, in accordance with DES Circular 70/2014 https://www.education.ie/en/Circulars-and-Forms/Active-Circulars/cl0070_2014.pdf

It will also replace the allocation process for post primary schools to support students with High Incidence special educational needs, as set out in DES Circular 0010/2012 https://www.education.ie/en/Circulars-and-Forms/Archived-Circulars/cl0010_2012.pdf

The new Special Education Teaching allocation will provide a single unified allocation for special educational teaching needs to each school, based on that school's educational profile.

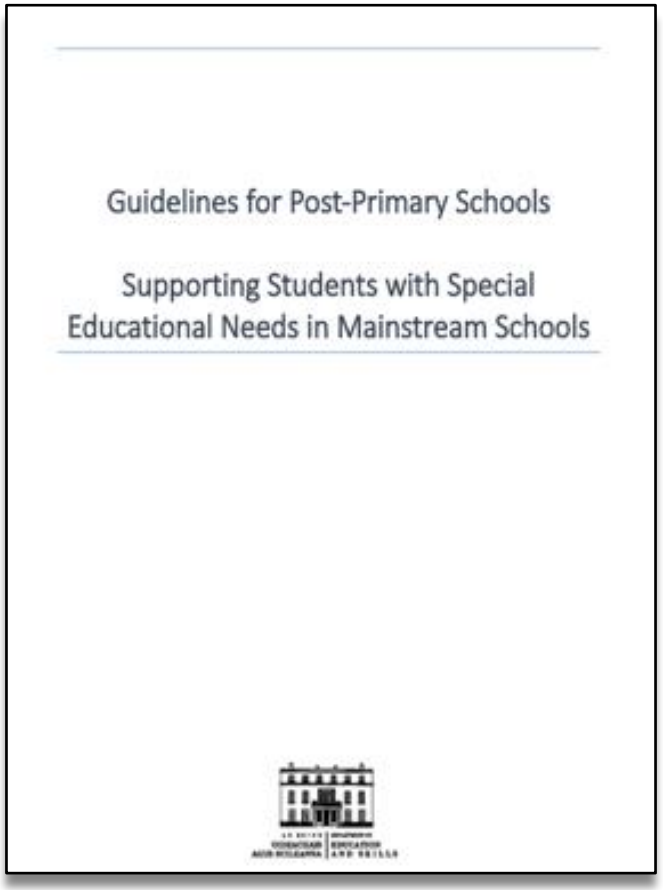
1

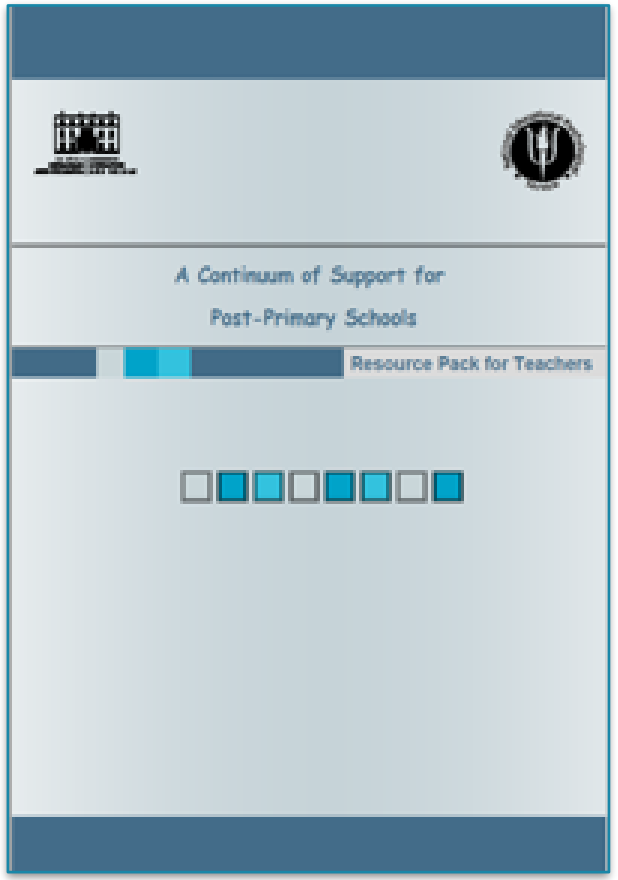
Circular No 0014/2017

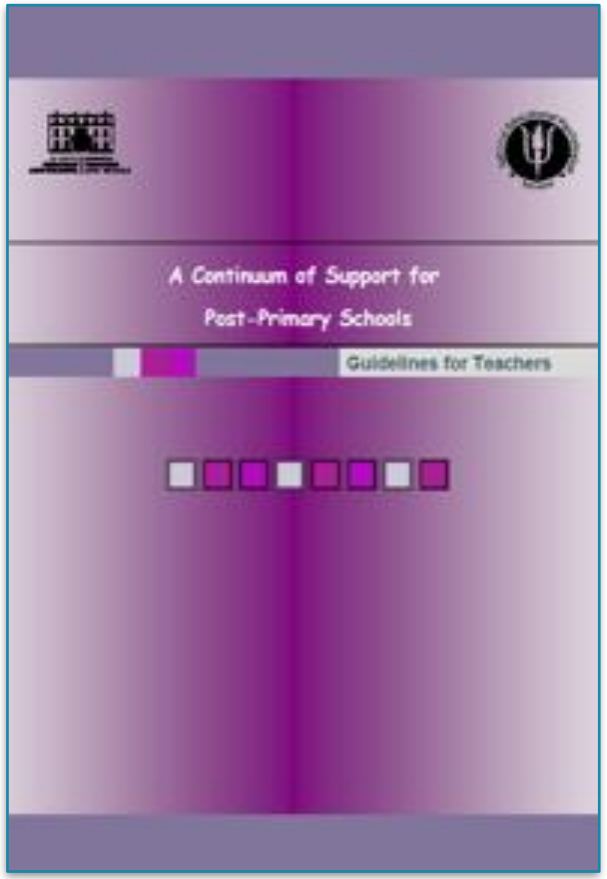
"It is the responsibility of the classroom teacher to ensure that each student is taught in a stimulating and supportive classroom environment where all students feel equal and valued."

13. The Role of the Classroom Teacher

Current Policy

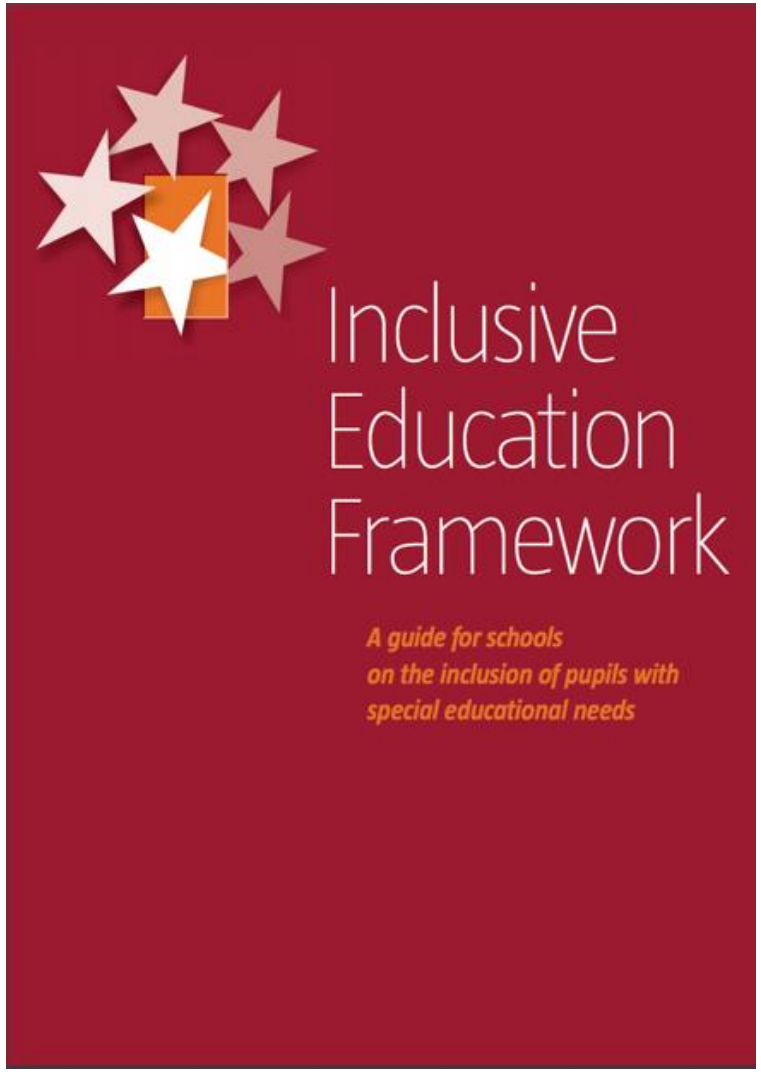






Current Policy

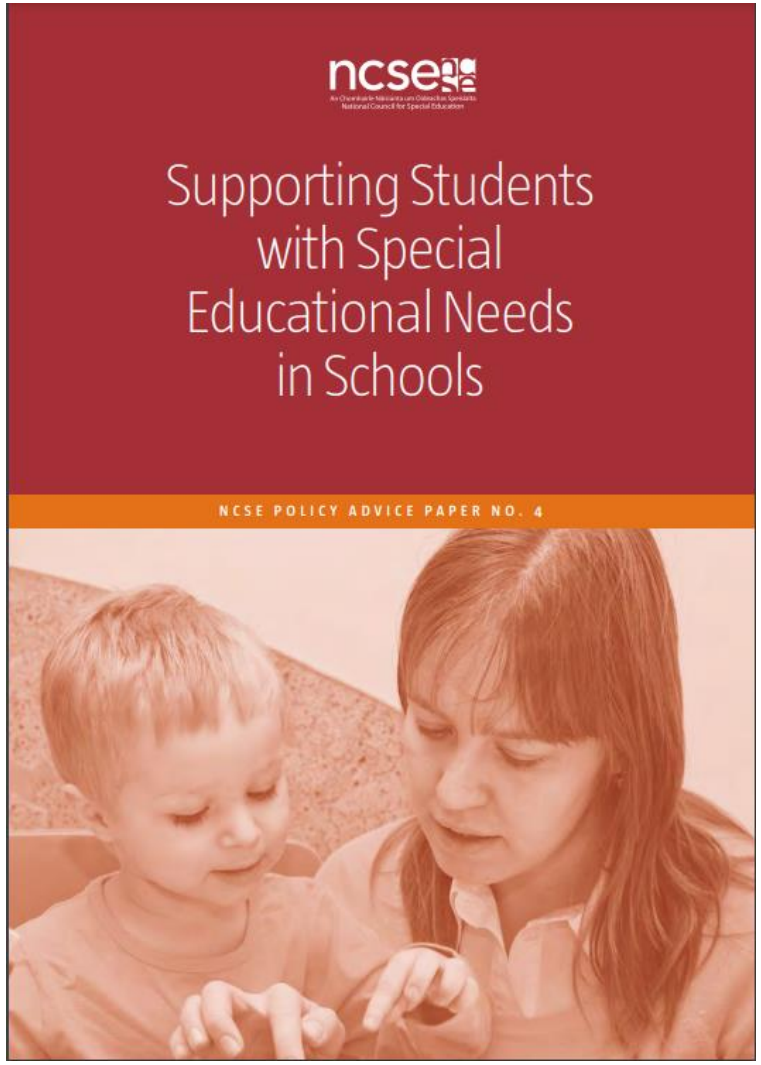
ncse
An Chomhairle Náisiúnta um Oideachas Speisialta
National Council for Special Education



Oide

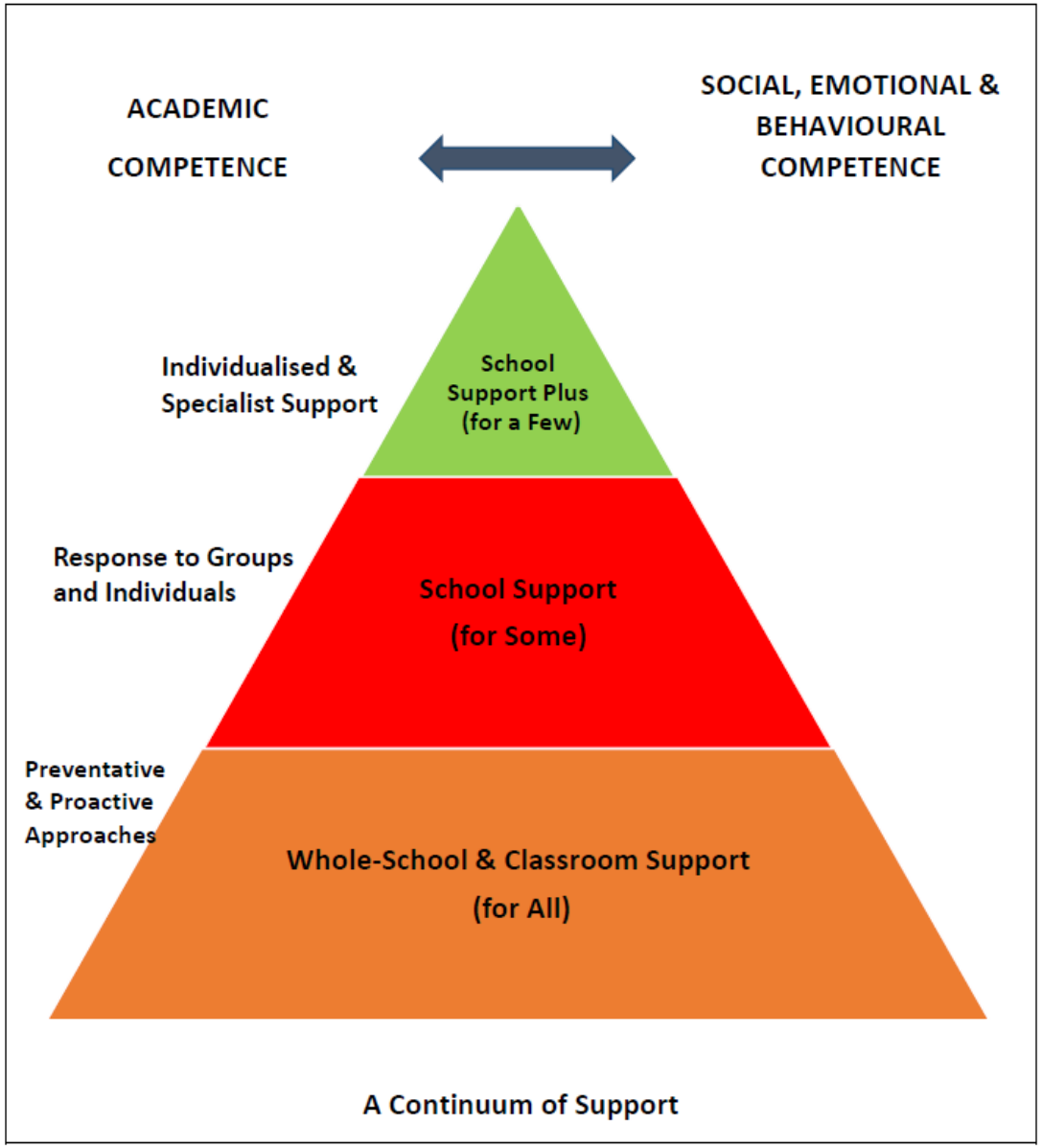
Current Policy

ncse
An Chomhairle Náisiúnta um Oideachas Speisialta
National Council for Special Education



Oide

Continuum of Support



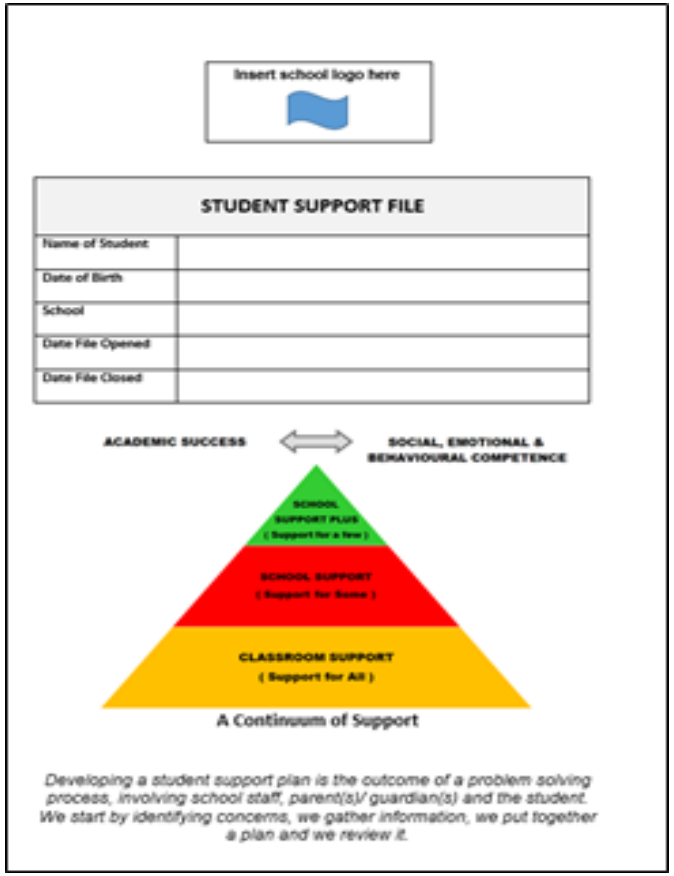
The Student Support File

Highlights a student's particular Strengths and Needs.

Sets a small number of goals and targets for the year/term.

Gives teachers insight into areas of skills/interests for the student.

Allows teachers to create specific supports to help meet students' current needs/targets.



Oide

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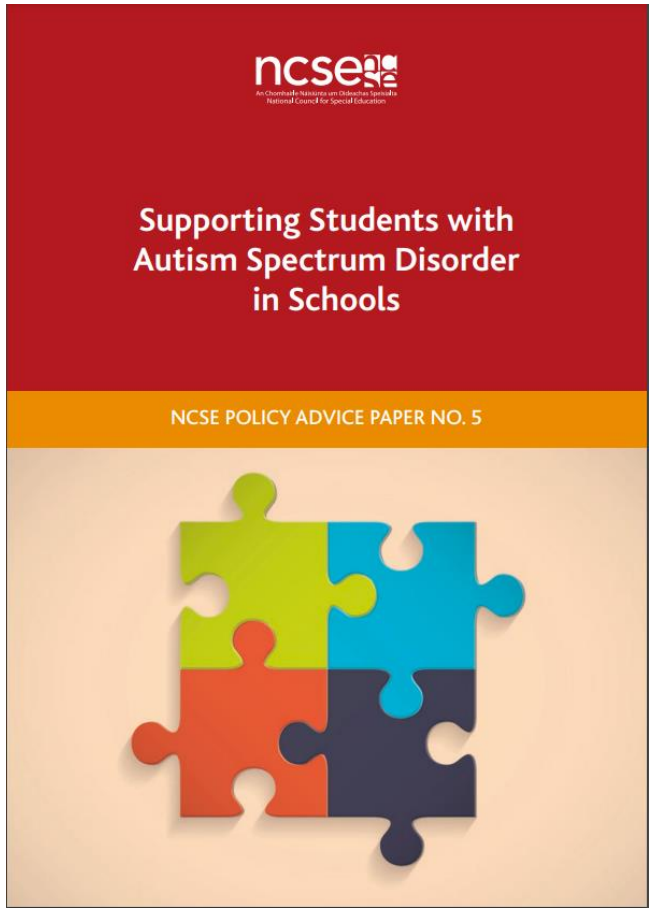
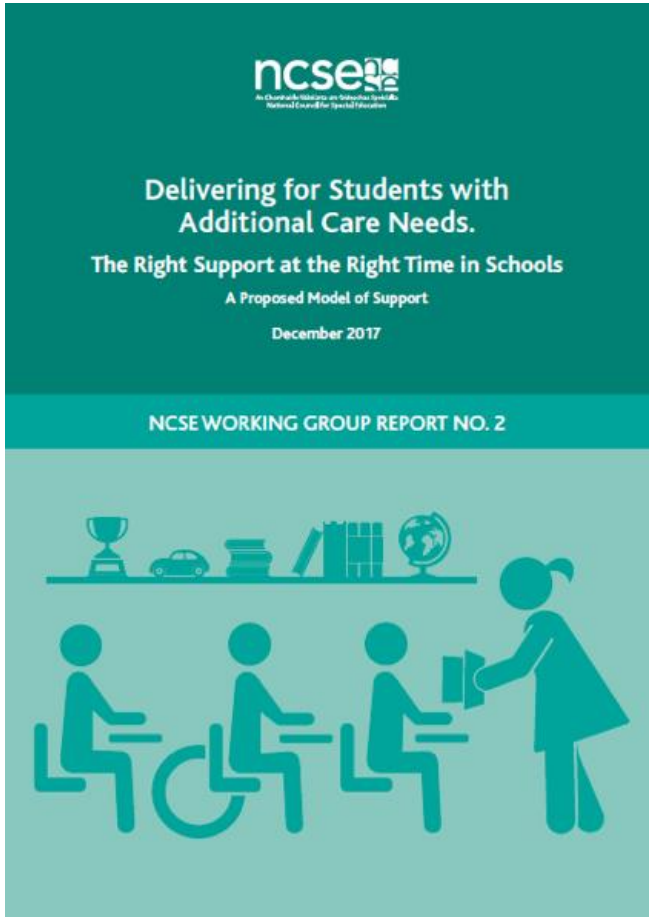
Supporting the Professiona Learning of School Leaders and Teachers

SEN Guidelines & Resources

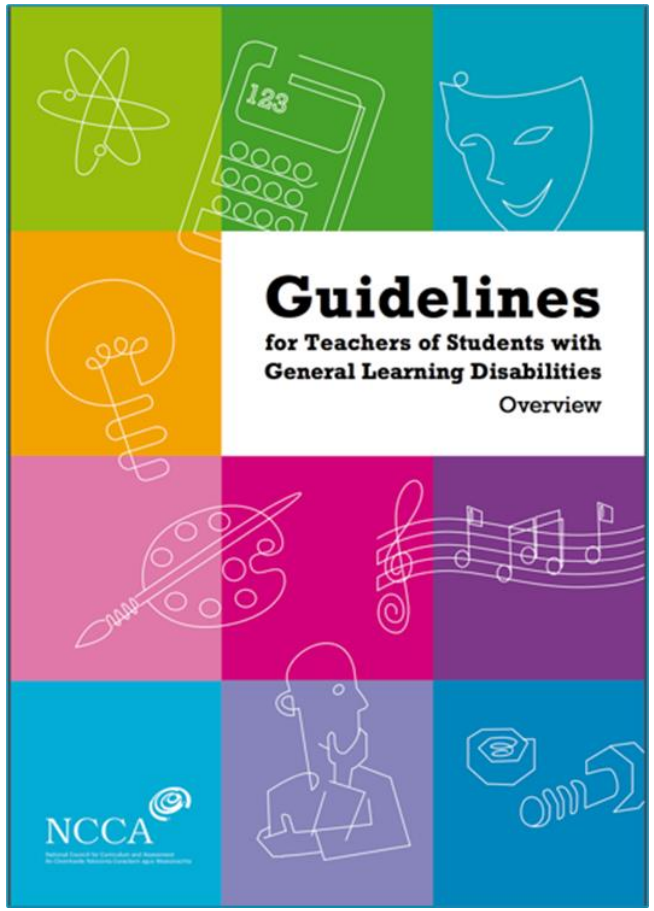
Additional Supports





ncse
An Chomhairle Náisiúnta um Oideachas Speisialta
National Council for Special Education

Additional Supports



NCCA
An Chomhairle Náisiúnta Curaclaim agus Measúnachta
National Council for Curriculum and Assessment

Oide

Additional Supports

AS I AM .IE

dyslexia association of ireland

ncse
An Chomhairle Náisiúnta um Oideachas Speisialta
National Council for Special Education

ahead
creating inclusive environments in education and employment for people with disabilities

NDA

Oide

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Supporting the Professiona Learning of School Leaders and Teachers

Inclusive teaching in the LCCS classroom

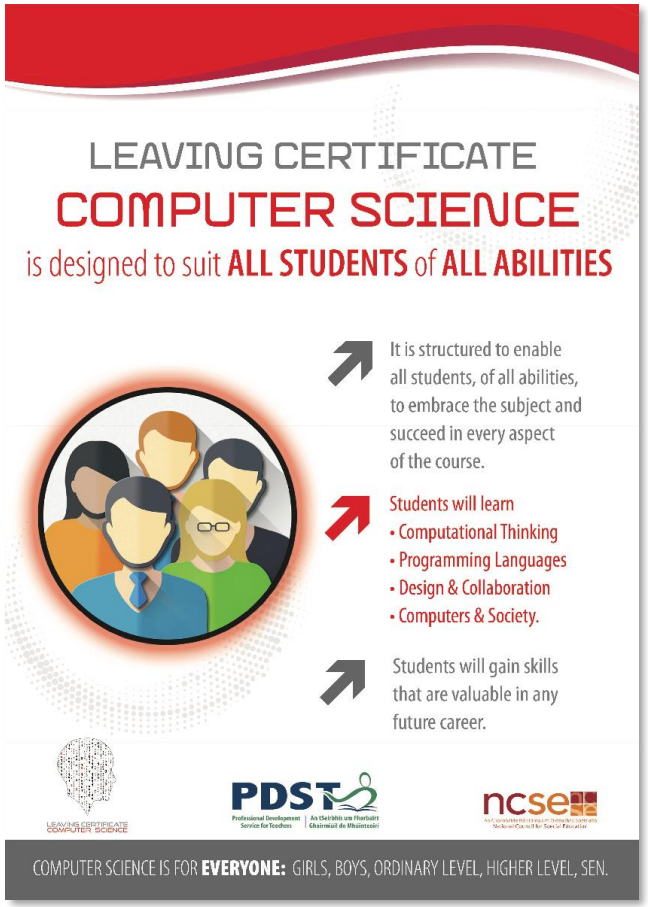
Inclusive approaches for teaching CS

Leaving Certificate Computer Science

CSforALL

For all students who want to do it!

https://www.csforall.org/

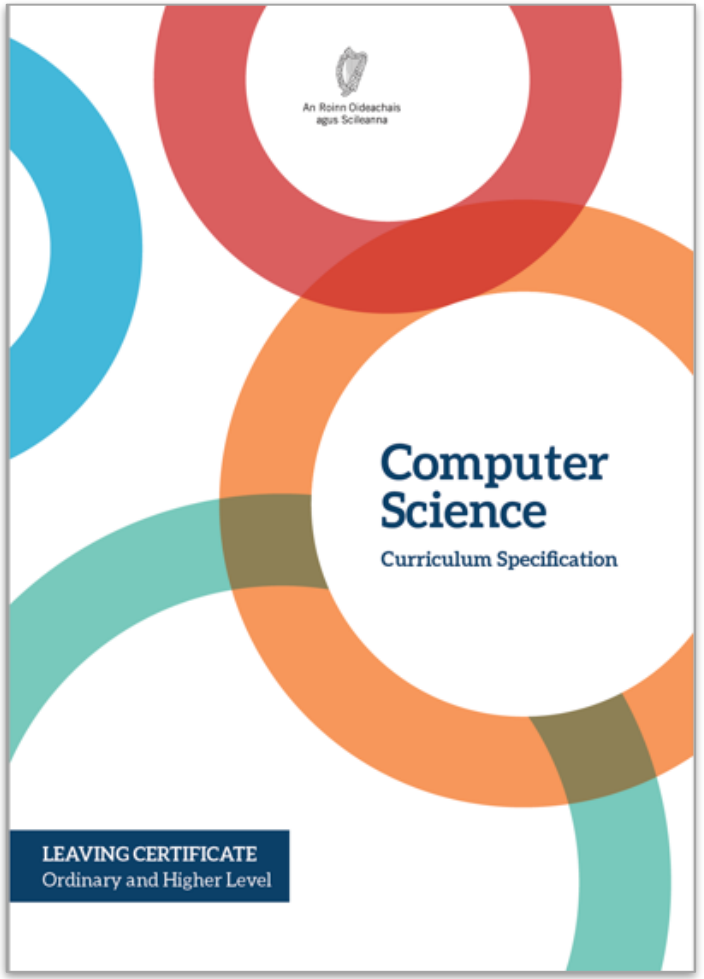


LCCS Specification

"Students will explore the role that adaptive technology can play in the lives of people with special needs and how access to, and engagement with computing and technology is of ever-increasing importance to societies, democracies and human progress."

1.15 consider the quality of the user experience when interacting with computers and list the principles of universal design, including the role of a user interface and the factors that contribute to its usability.

1.17 describe the role that adaptive technology can play in the lives of people with special needs.



Inclusive Approaches for Teaching CS

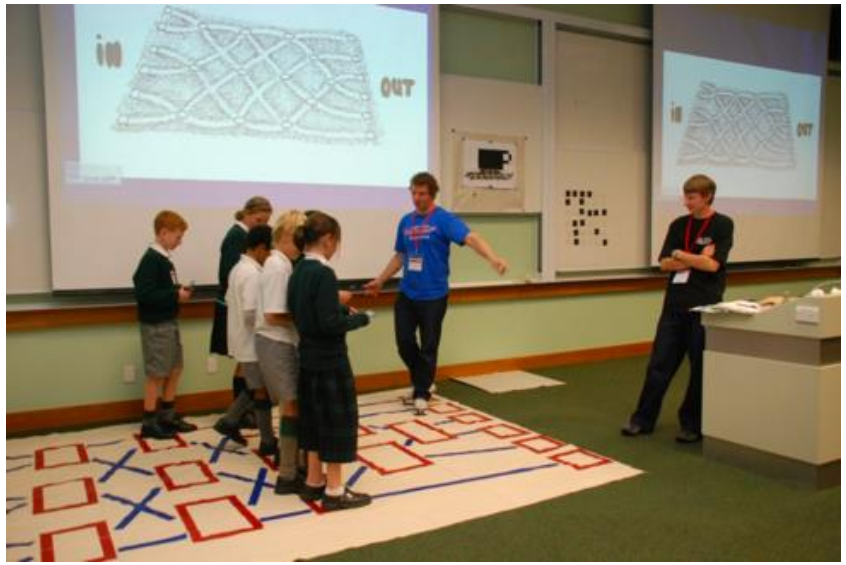
- Reduce cognitive load
- Use unplugged activities
- Physical computing
- Teach to the emergent skill
- Scaffold group work
- Use proven pedagogies and methodologies to teach programming

Use unplugged activities

Making the abstract tangible

Harnessing authentic and familiar contexts

Generalising knowledge and making links



Physical computing

Bee bot

Dash and dot

Sphero

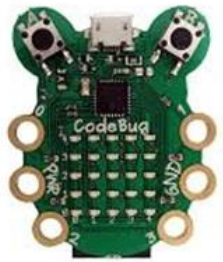
Botley the coding robot

Code-a-Pillar

Lego Mindstorms

Physical computing

Arduino

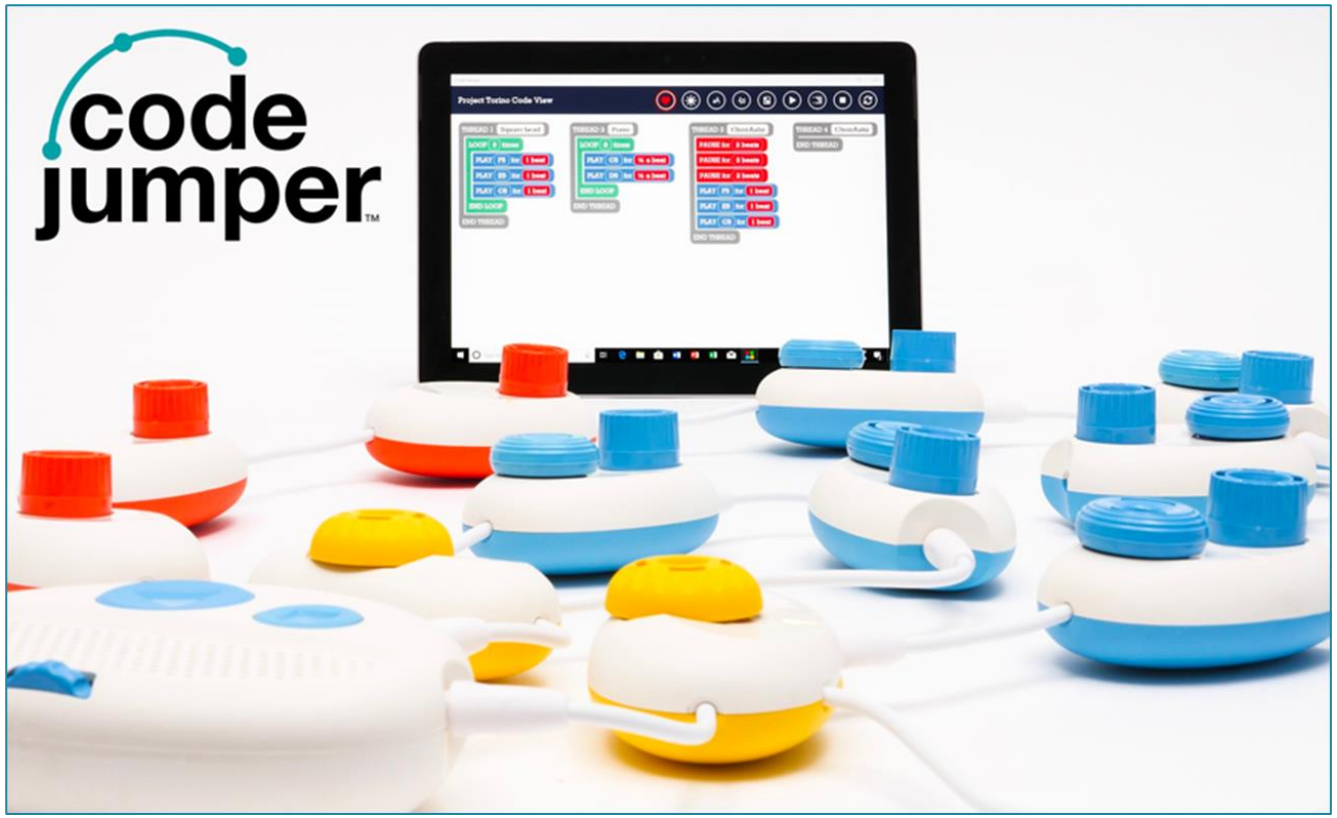


Codebug

Circuit Playground

Crumble

Physical computing



Use proven pedagogies and methodologies to teach programming

- PRIMM
- Use-Modify-Create
- Parson's Problems
- Collaborative programming approaches – Pair & Peer
- Scaffolding
- Block-based languages
- Sensory outputs for screen-based programming
- Thonny/ IDLE

Oide

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Supporting the Professiona Learning of School Leaders and Teachers

Inclusive teaching in the LCCS classroom

Reframing your neurodiverse classroom

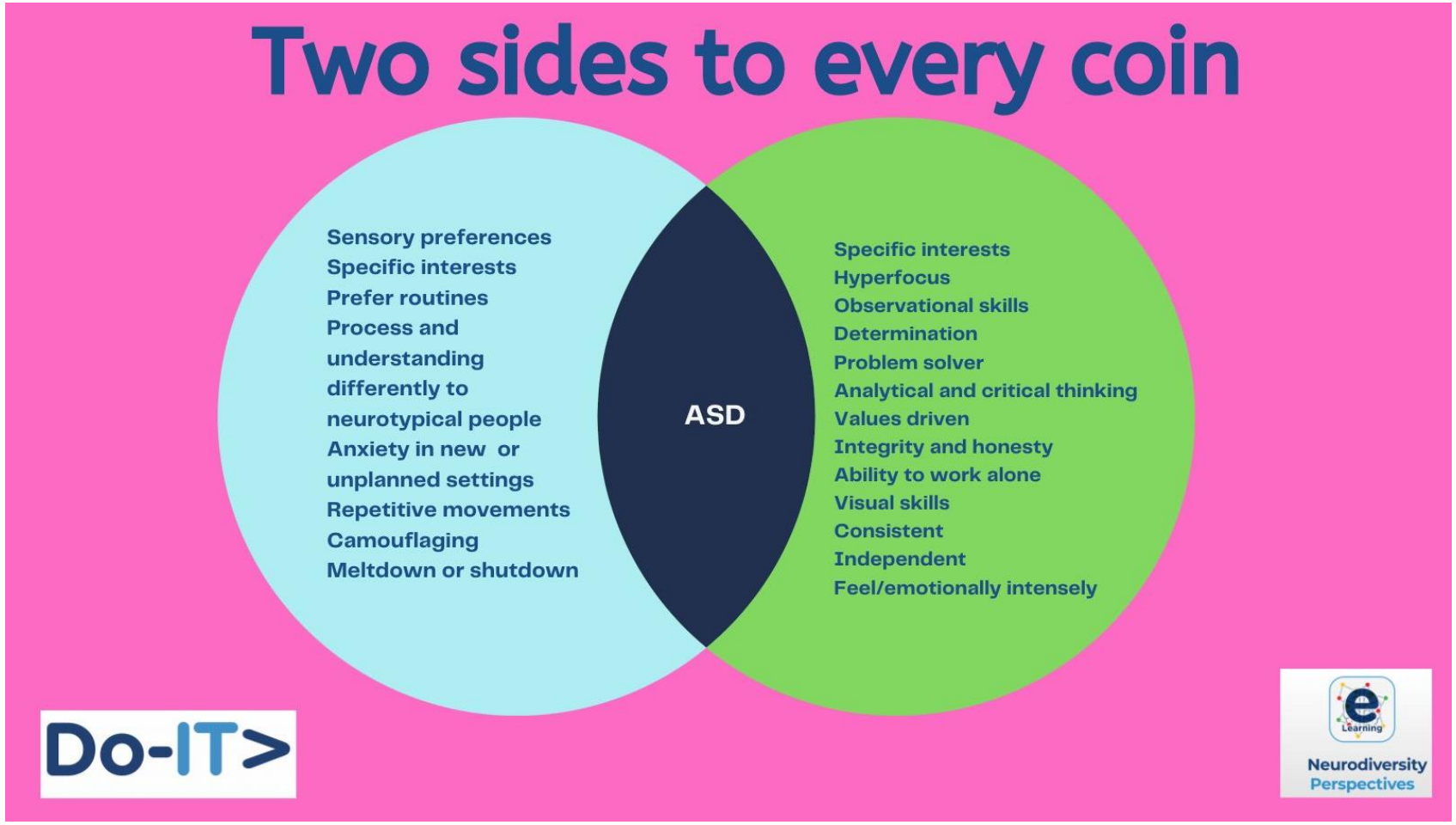
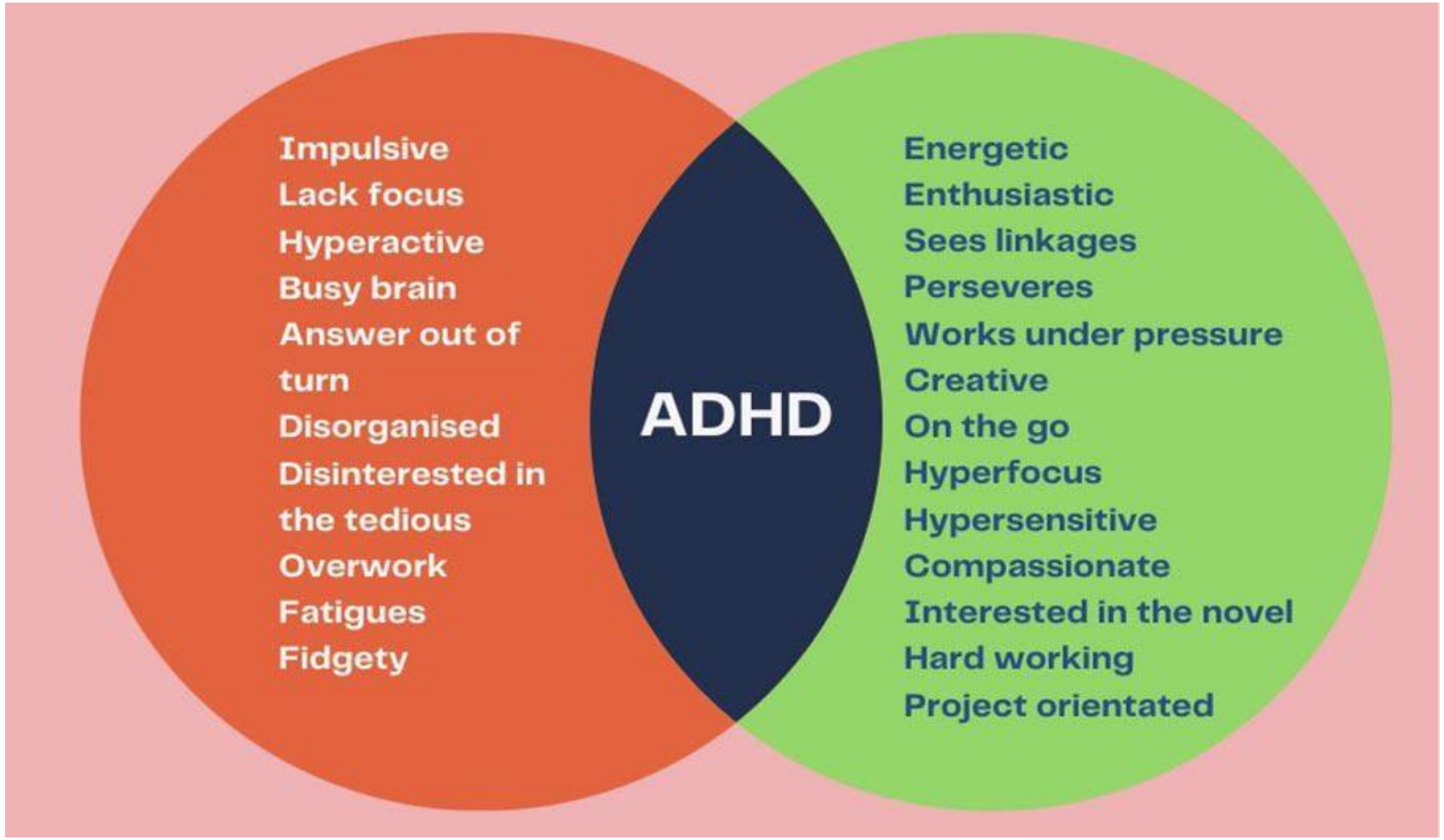


Image: Amanda Kirby, twitter.com/profAmandaKirby



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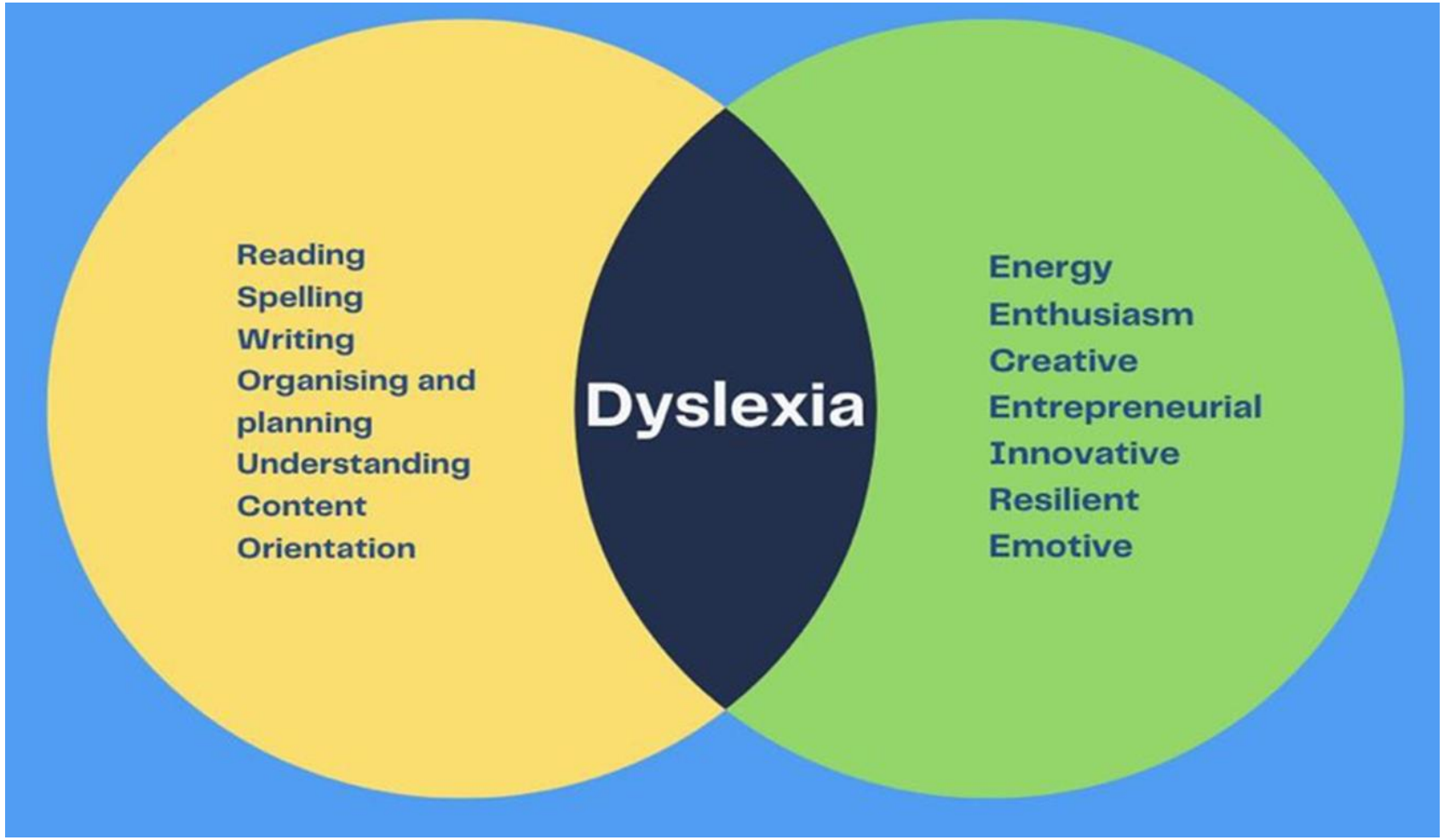

Image: Amanda Kirby, twitter.com/profAmandaKirby

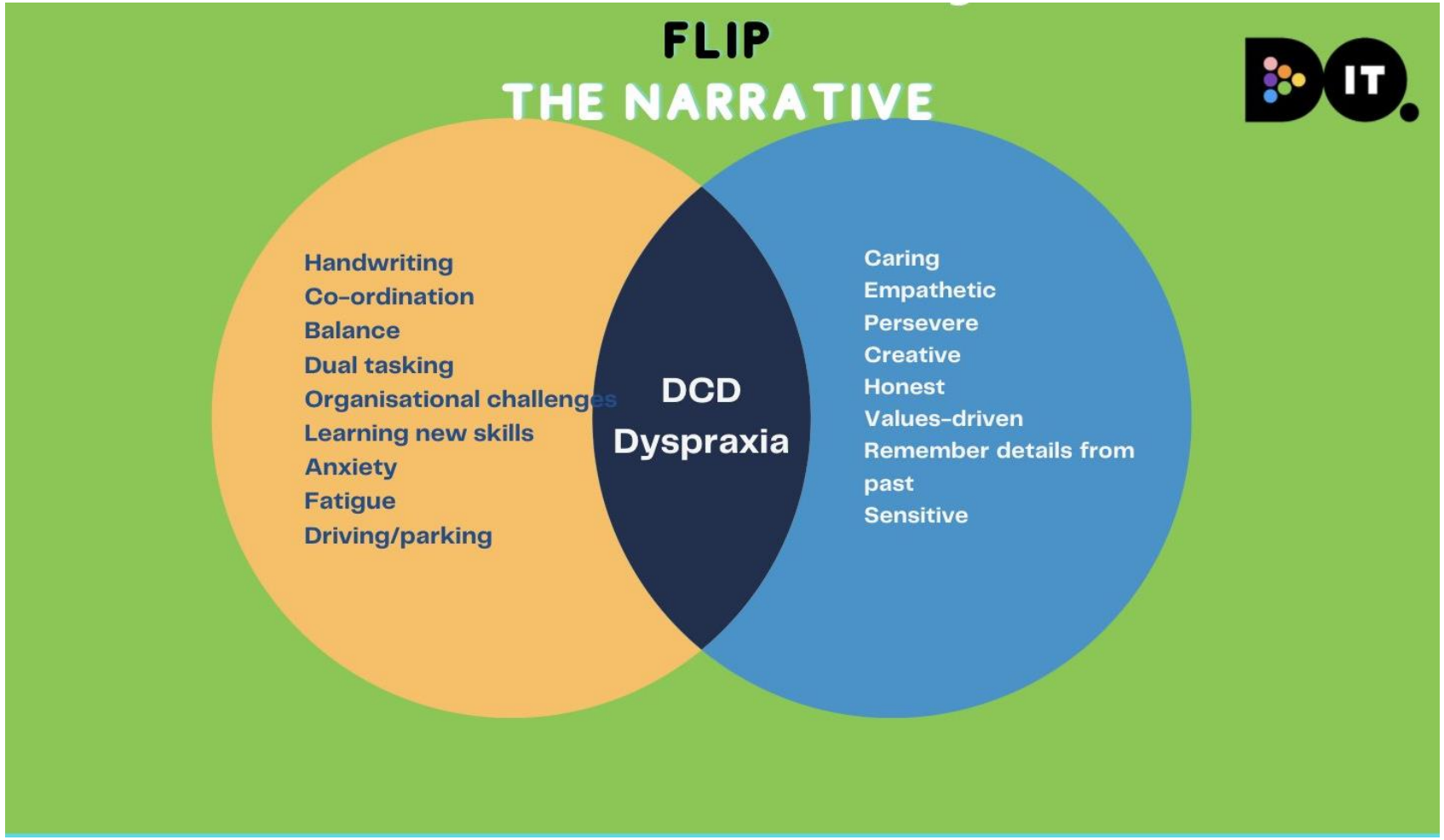

Image: Amanda Kirby, twitter.com/profAmandaKirby

Oide

Tacú leis an bhFoghlaim Ghairmiúil i measc Ceannairí Scoile agus Múinteoirí

Supporting the Professiona Learning of School Leaders and Teachers

Group activity

Creating an inclusive classroom

Creating an Inclusive Classroom: Group Task

Your LCCS classes each have a wide variety of students and most likely several students presenting with a wide variety of special educational needs. What supports might you need to put in place to create a classroom that includes these learners?

What are the **challenges** this student might face in engaging with the learning in your classroom?

What **supports** can you put in place to mitigate these challenges?

Consider also the **strengths** these students bring to the classroom - how might you use these to their (and your) advantage?

Creating an Inclusive Classroom: Group Task

Group 1:

Autism Spectrum Disorder (ASD)

Group 2:

Emotional/ Behavioural Disorder

Group 3:

Physical Disability

Group 4:

Dyslexia

Group 5:

Attention Deficit/Hyperactivity Disorder (ADHD)

Group 6:

Dyspraxia (DCD)

Group 7:

Profound sight loss

Group 8:

Hearing impairment

Creating an Inclusive Classroom: Feedback

Your LCCS classes each have a wide variety of students and most likely several students presenting with a wide variety of special educational needs. What supports might you need to put in place to create a classroom that includes these learners?

What are the **challenges** this student might face in engaging with the learning in your classroom?

What **supports** can you put in place to mitigate these challenges?

Consider also the **strengths** these students bring to the classroom - how might you use these to their (and your) advantage?

General tips

Differentiate the learning experiences

Encourage support for the student from classmates

Consider physical access issues such as ramps, toilets, lifts and classroom layout

Incorporate advice from the SEN coordinator in the school

Use computers and audio-visual aids in the student's learning and teaching programme

Specialised equipment may also be necessary such as adapted keyboards, page turners, word boards or special desks.

General tips

Encourage communication to prevent isolation

Allow students extra time to complete tasks

Students may have a low self-image; therefore, it is important to ensure that the student feels included and is encouraged and praised

As students tend to become distracted quite easily, minimise distractions in the classroom environment

Read each students' Student Support File and think about where LCCS fits into helping these students achieve the goals therein

Oide

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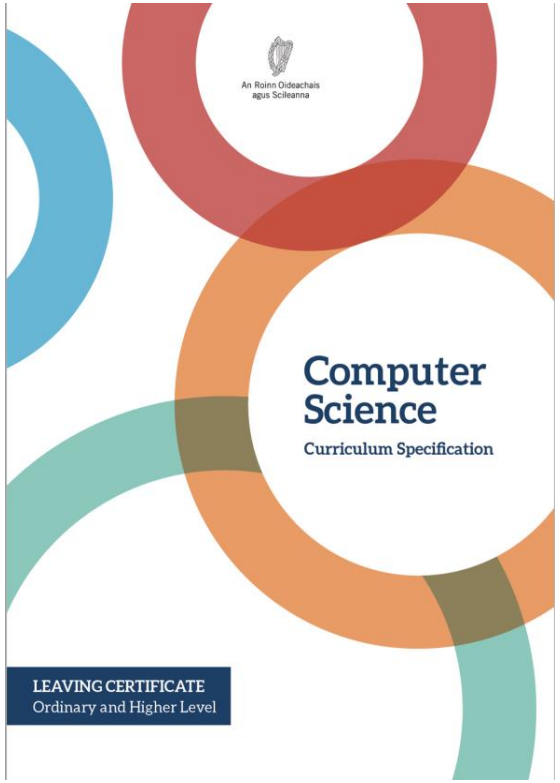
Supporting the Professiona Learning of School Leaders and Teachers

Curriculum planning

LCCS Specification & Learning Outcomes



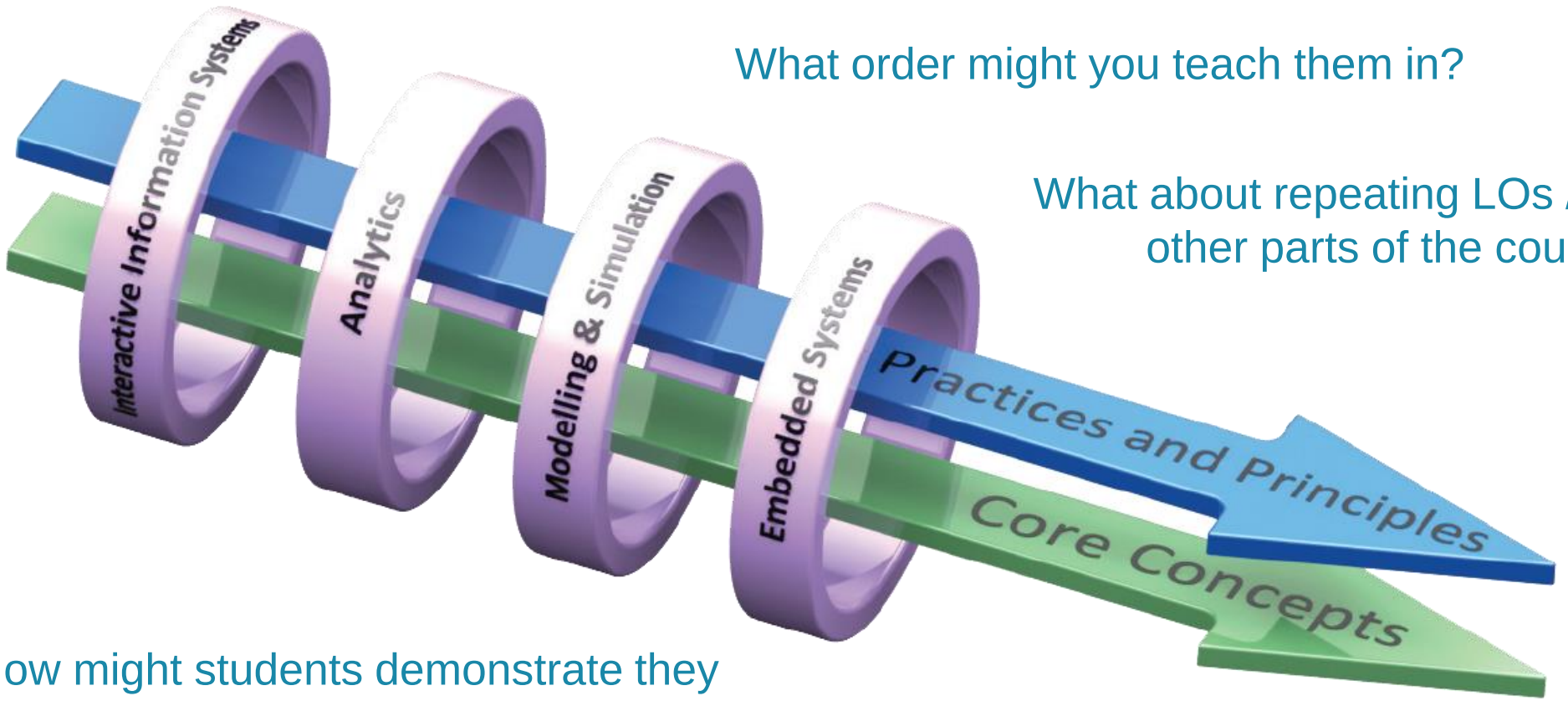
"Learning outcomes can best be defined as statements of what a learner knows, understands and is able to do after completion of learning."

CEDEFOP (2009)

How might you work with the learning outcomes?

What order might you teach them in?

What about repeating LOs / linking to other parts of the course?



How might students demonstrate they have achieved the learning outcomes?

What content or resources might you need?

Curriculum Planning: Group Task

How do you intend to approach LCCS in your classroom (next 4 weeks/until mid-term/Christmas)?

Work in your group and consider – Timeframe, Topics / LOs / Resources / Assessment / Build up to ALTs / ALTs / Equipment etc.

Nominate:

1. a notetaker to summarise your group's work
2. a spokesperson to provide feedback

Curriculum Planning: Group Task

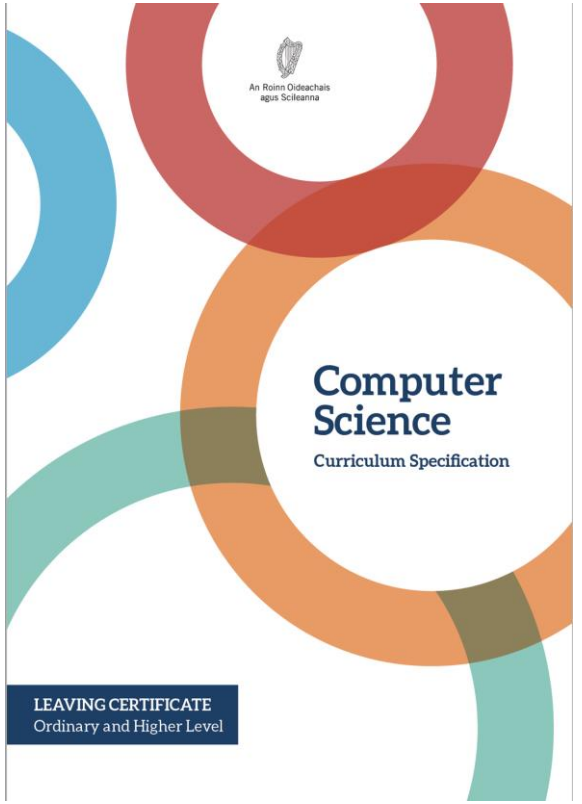
How do you intend to approach LCCS in your classroom (next 4 weeks/until mid-term/Christmas)?

Work in your group and consider – Timeframe, Topics / LOs / Resources / Assessment / Build up to ALTs / ALTs / Equipment etc.

Nominate:

1. a notetaker to summarise your group's work
2. a spokesperson to provide feedback

Key message: Explore and teach the learning outcomes through the lens of ALTs. There are several ways to achieve this.



Use the LCCS specification for this activity

Group Activity

Curriculum Planning: Feedback

How do you intend to approach LCCS in your classroom (next 4 weeks/until mid-term/Christmas)?

Work in your group and consider – Timeframe, Topics / LOs / Resources / Assessment / Build up to ALTs / ALTs / Equipment etc.

Nominate:

1. a notetaker to summarise your group's work
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padlet

Oide

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Supporting the Professiona Learning of School Leaders and Teachers

Leaving Certificate Computer Science

National Workshop 5

Day 2

Workshop Overview

Session 1 09:00 - 11:00	ALT1 – Introduction
Tea/Coffee 11:00 - 11:30	
Session 2 11:30 - 13:00	ALT1 - Investigate and Plan
Lunch 13:00 - 14:00	
Session 3 14:00 - 15:30	ALT1 – Design and Create

Key Messages

All learning outcomes (LOs) are interwoven. This means that the specification can be used in many ways.

ALTs provide an opportunity to teach theoretical aspects of LCCS.

LCCS is suitable for all! This includes students with SEN and of all ability levels.

LCCS can be mediated through a constructivist pedagogical approach.

Group work is a key feature in the teaching, learning and assessment of LCCS.

Oide

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Supporting the Professiona Learning of School Leaders and Teachers

Session 1

Introduction to Interactive Information Systems (ALT 1)

By the end of this session

Participants will be enabled to:

- reflect on what the specification says about ALTs and particularly ALT 1 (Interactive Information Systems)
- develop an understanding of Interactive Information Systems
- gain an appreciation of UX design and principles of good design
- consider the use of assistive and adaptive technologies
- acquire additional skills, knowledge and ideas on how to facilitate ALT1 in their own classrooms

Oide

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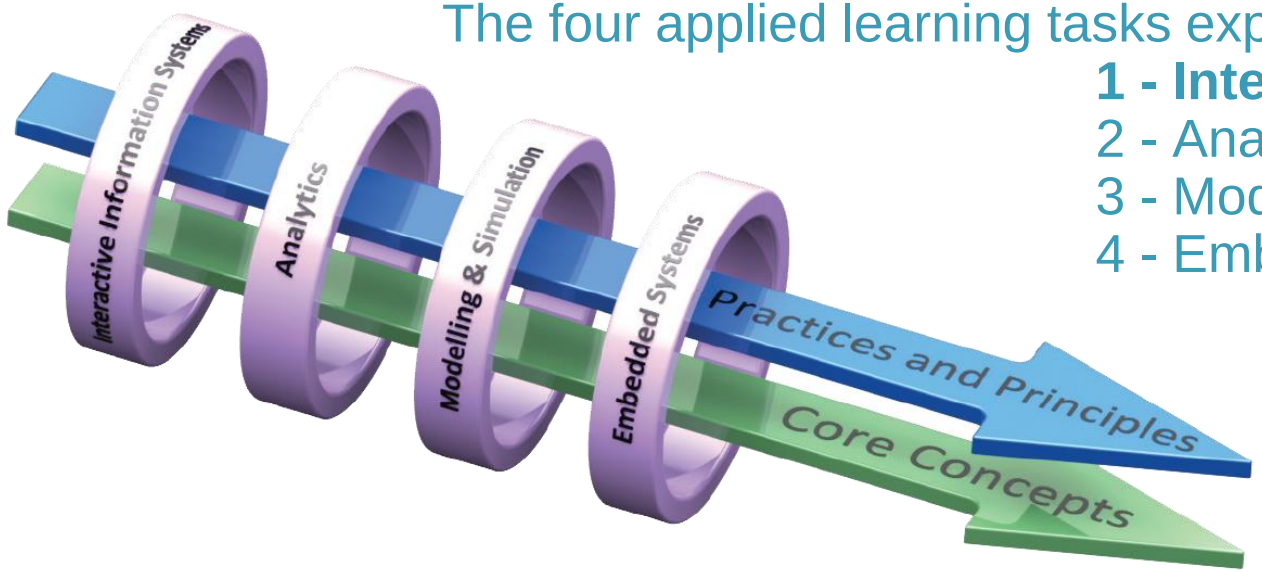
Introduction to ALTs (recap)

LCCS Interwoven



The four applied learning tasks explore the four following contexts:

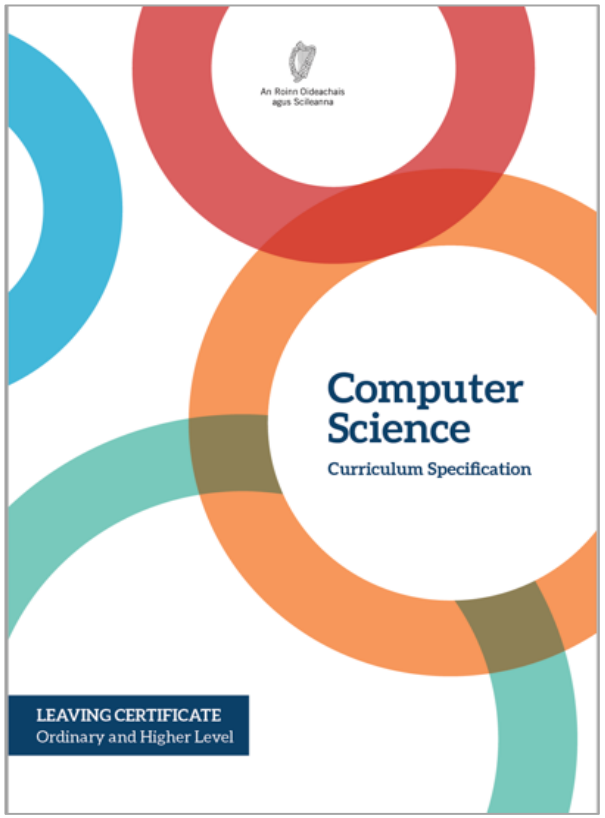
1 - Interactive information systems
2 - Analytics
3 - Modelling and simulation
4 - Embedded systems

Key point to remember: explore and teach the LOs through the lens of ALTs.

"Students work in teams to carry out four applied learning tasks over the duration of the course each of which results in the creation of a real or virtual computational artefact."

"These artefacts should relate to the students' lives and interests."

"Examples of computational artefacts include programs, games, web pages, simulations, visualisations, digital animations, robotic systems, and apps."



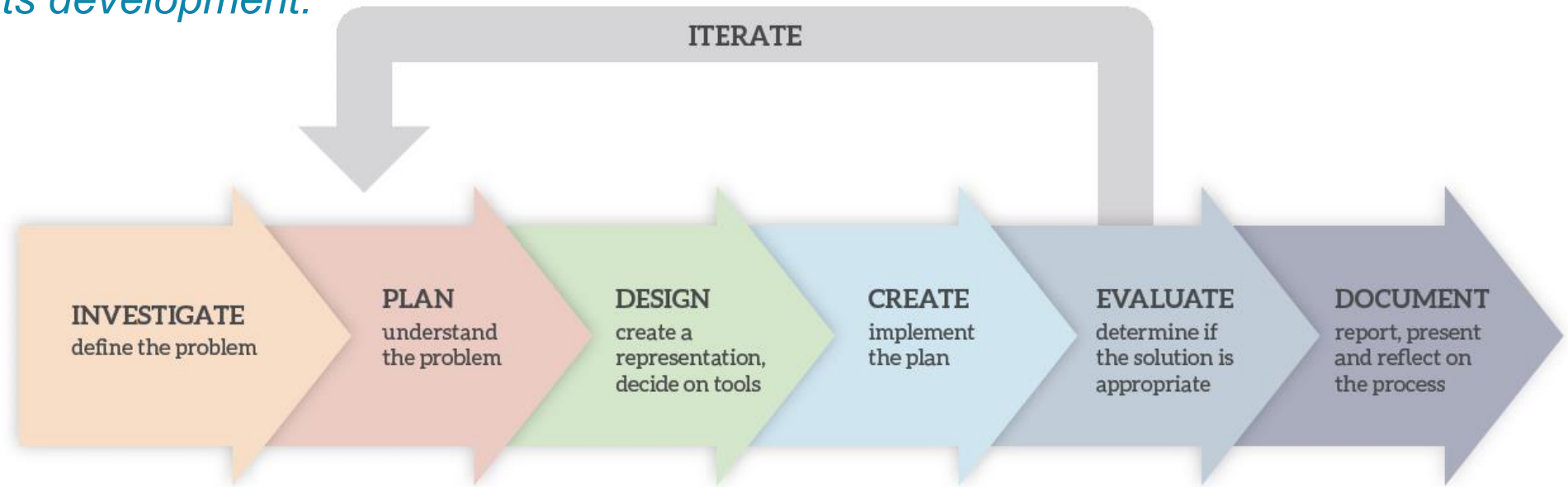
"Where possible, the artefacts should be beneficial to the community and society in general."

"Students…document, reflect and present on each applied learning task."

LCCS Specification: pgs. 10 & 22

ALT Output

"The output from each task is a computational artefact and a concise individual report outlining its development."



"The structure of the reports should reflect the design process…"

LCCS Specification: p11

ALT Reporting

"In the report, students outline where and how the core concepts were employed."

Strand 1: Practices and principles	Strand 2: Core concepts	Strand 3: Computer science in practice
▸ Computers and society ▸ Computational thinking ▸ Design and development	▸ Abstraction ▸ Algorithms ▸ Computer systems ▸ Data ▸ Evaluation/Testing	▸ Applied learning task 1 - Interactive information systems ▸ Applied learning task 2 - Analytics ▸ Applied learning task 3 - Modelling and simulation ▸ Applied learning task 4 - Embedded systems

LCCS Specification: p11

Learning outcomes interwoven

The learning outcomes from all strands are interwoven and to complete their strand 3 applied learning tasks students:

- approach problems in a systematic way and use abstraction to identify tasks and select appropriate strategies to generate solutions
- create visual representations or models, and decide which tools to use and which algorithms to use, adapt or create as they employ appropriate techniques to develop their solution
- develop computer systems as they use programming, analysis and design skills combined with hardware knowledge to create network/Internet/cloud-based applications
- evaluate and test their solutions to identify and remove errors from their programs and base their solutions upon integration, analysis and evaluation of qualitative and quantitative information and data

LCCS Specification: p16

ALT 1

"Design is one of the key practices and principles of computer science. As designers and creators of technology, students can be innovative and expressive through the creation of artefacts."

"Students will develop an interactive website that can display information (either local or remote data) from a database to meet a set of user needs."

"Students will develop their knowledge of the role computer systems can play in communicating with and providing information about the world around them."

LCCS Specification: p22

ALT 1: Learning outcomes

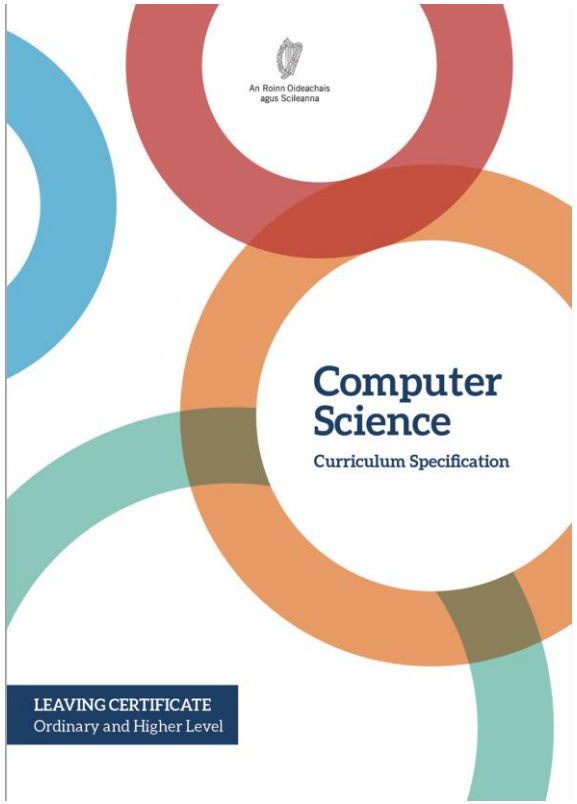
Students learn about:	Students should be able to:
Information systems User-centred design Web design File systems and **relational** databases Design process	3.1 understand and list user needs/requirements before defining a solution 3.2 create a basic **relational** database to store and retrieve a variety of forms of data types 3.3 use appropriate programming languages to develop an interactive website that can display information from a database that meets a set of users' needs

Considering links to other strands...

Strand 1: Practices and principles	Strand 2: Core concepts	Strand 3: Computer science in practice
▸ Computers and society	▸ Abstraction	▸ Applied learning task 1 - Interactive information systems
▸ Computational thinking	▸ Algorithms	▸ Applied learning task 2 - Analytics
▸ Design and development	▸ Computer systems	▸ Applied learning task 3 - Modelling and simulation
	▸ Data	▸ Applied learning task 4 - Embedded systems
	▸ Evaluation/Testing	

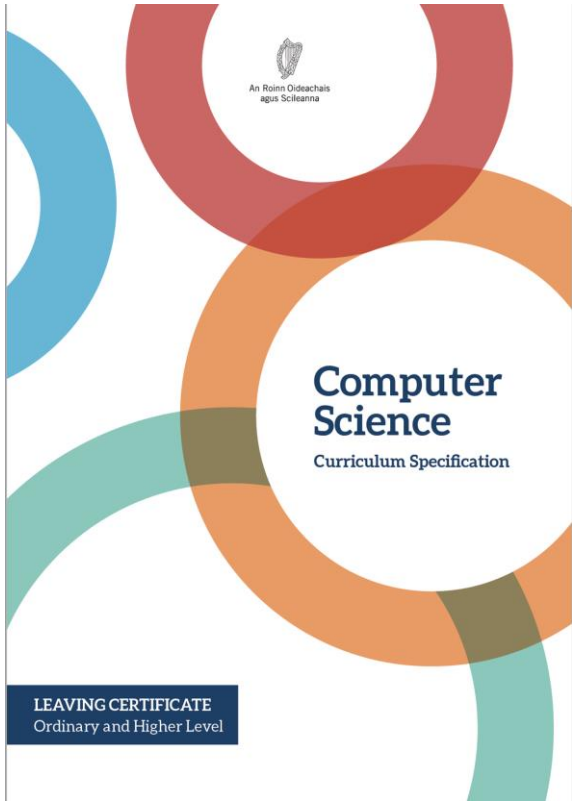
S1: Computers and Society

S1: Computers and society Social and ethical considerations of computing technologies **Turing machines** The Internet Machine learning Artificial intelligence User-centred design	1.11 discuss the complex relationship between computing technologies and society including issues of ethics 1.12 compare the positive and negative impacts of computing on culture and society 1.13 identify important computing developments that have taken place in the last 100 years and consider emerging trends that could shape future computing technologies 1.14 explain when and what machine learning and AI algorithms might be used in certain contexts 1.15 consider the quality of the user experience when interacting with computers and list the principles of universal design, including the role of a user interface and the factors that contribute to its usability **1.16 compare two different user interfaces and identify different design decisions that shape the user experience** 1.17 describe the role that adaptive technology can play in the lives of people with special needs 1.18 recognise the diverse roles and careers that use computing technologies



S2: Computer systems

S2: Computer systems **CPU: ALU, Registers, Program counter, Memory** Basic electronics: voltage, current, resistors, capacitors, transistors Operating system layers: Hardware, OS, Application, User Web infrastructure - Computer Network Protocols: HTTP, **TCP, IP, VOIP**	2.11 describe the different components within a computer and the function of those components 2.12 describe the different types of logic gates **and explain how they can be arranged into larger units to perform more complex tasks** 2.13 describe the rationale for using the binary number system in digital computing and how to convert between binary, hexadecimal and decimal 2.14 describe the difference between digital and analogue input 2.15 explain what is meant by the World Wide Web (WWW) and the Internet, including the client server model, hardware components **and communication protocols**



Oide

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Supporting the Professiona Learning of School Leaders and Teachers

Interactive Information Systems

Activity: Think-Pair-Share

Participants spend time in silence writing or thinking about their own ideas

Participants turn to the person beside them to discuss their ideas

Pairs share their answers with other pairs (square) or the wider group

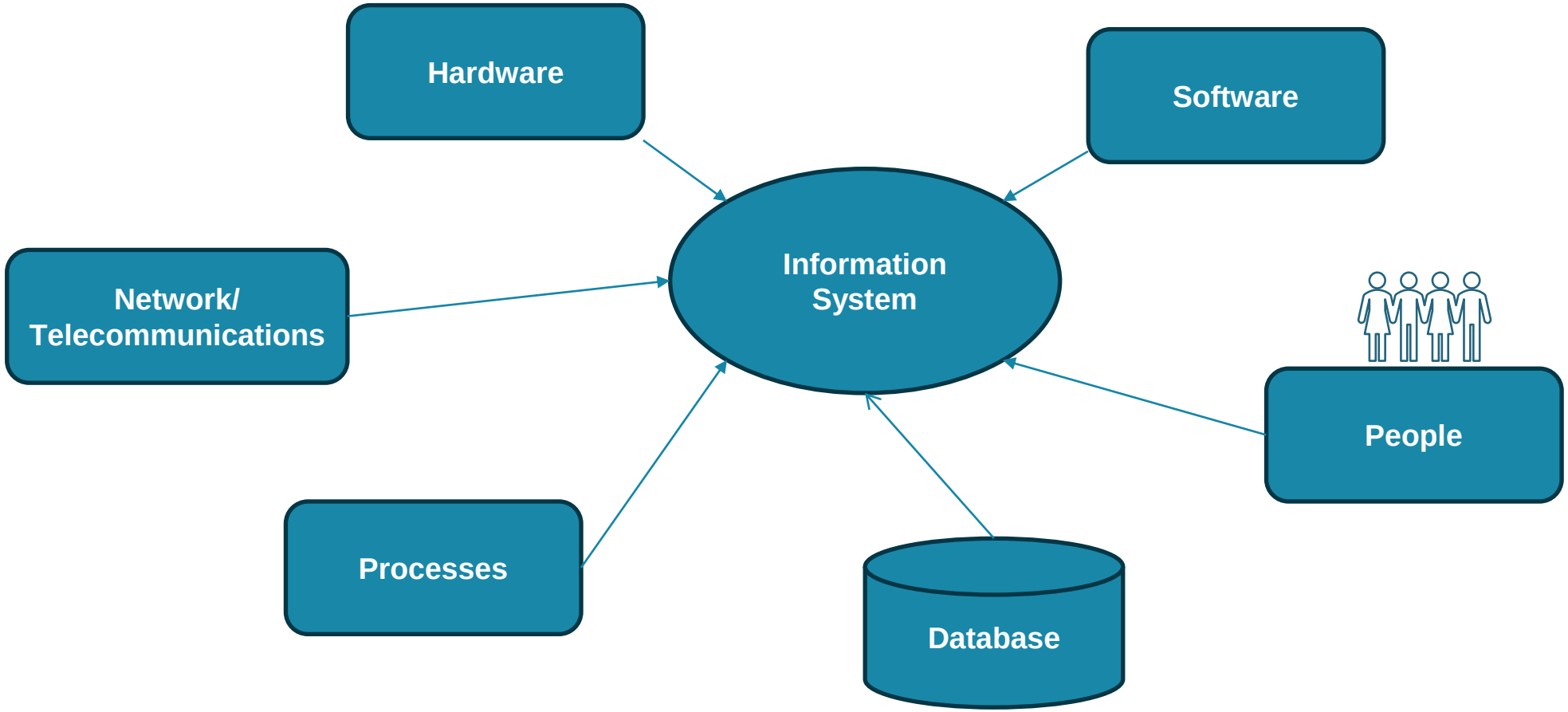
Consider and discuss:

1. What are Interactive Information Systems?

2. Give some examples of Interactive Information Systems.

P23

Components of an Information System

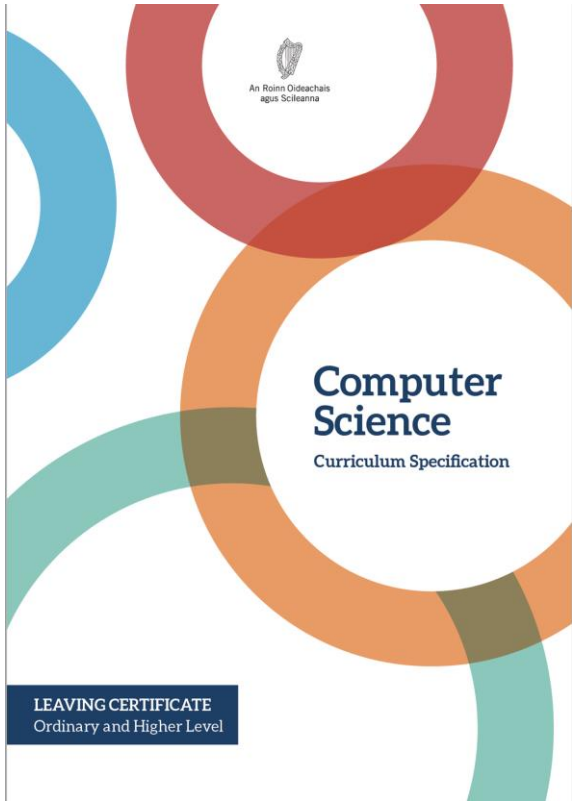


Matching Exercise

P24

S1: User-centred design

Artificial intelligence	algorithms might be used in certain contexts
User-centred design	1.15 consider the quality of the user experience when interacting with computers and list the principles of universal design, including the role of a user interface and the factors that contribute to its usability **1.16 compare two different user interfaces and identify different design decisions that shape the user experience** 1.17 describe the role that adaptive technology can play in the lives of people with special needs 1.18 recognise the diverse roles and careers that use computing technologies



UX/UI Design

P25

UX vs UI Design

UX vs UI

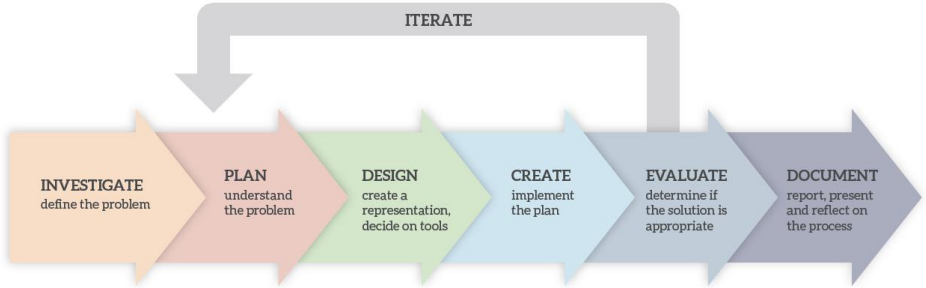
User Experience (UX):

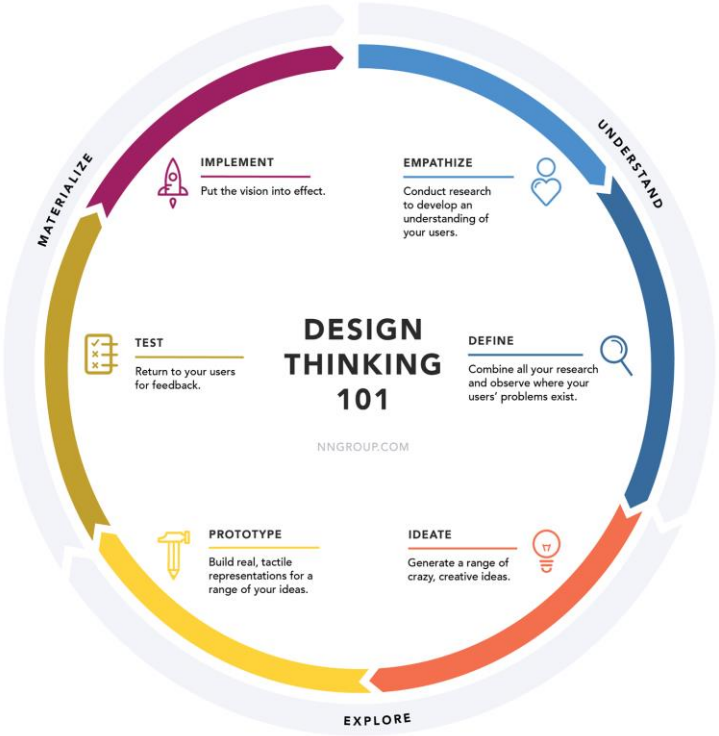
UX design concentrates on the overall experience a user has when interacting with a product or service. It aims to make the interaction as efficient, enjoyable, and effective as possible.

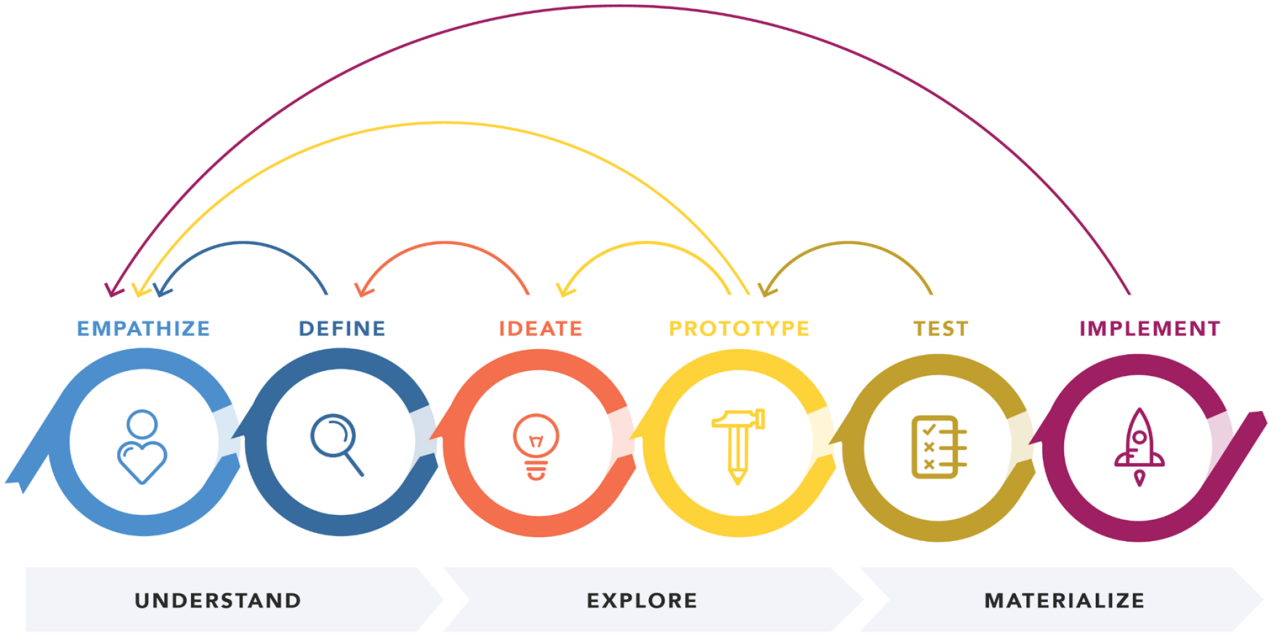
User Interface (UI):

UI design focuses on the visual and interactive elements of a product or service. It deals with the layout, aesthetics, and interactivity of the user interface.

Design process

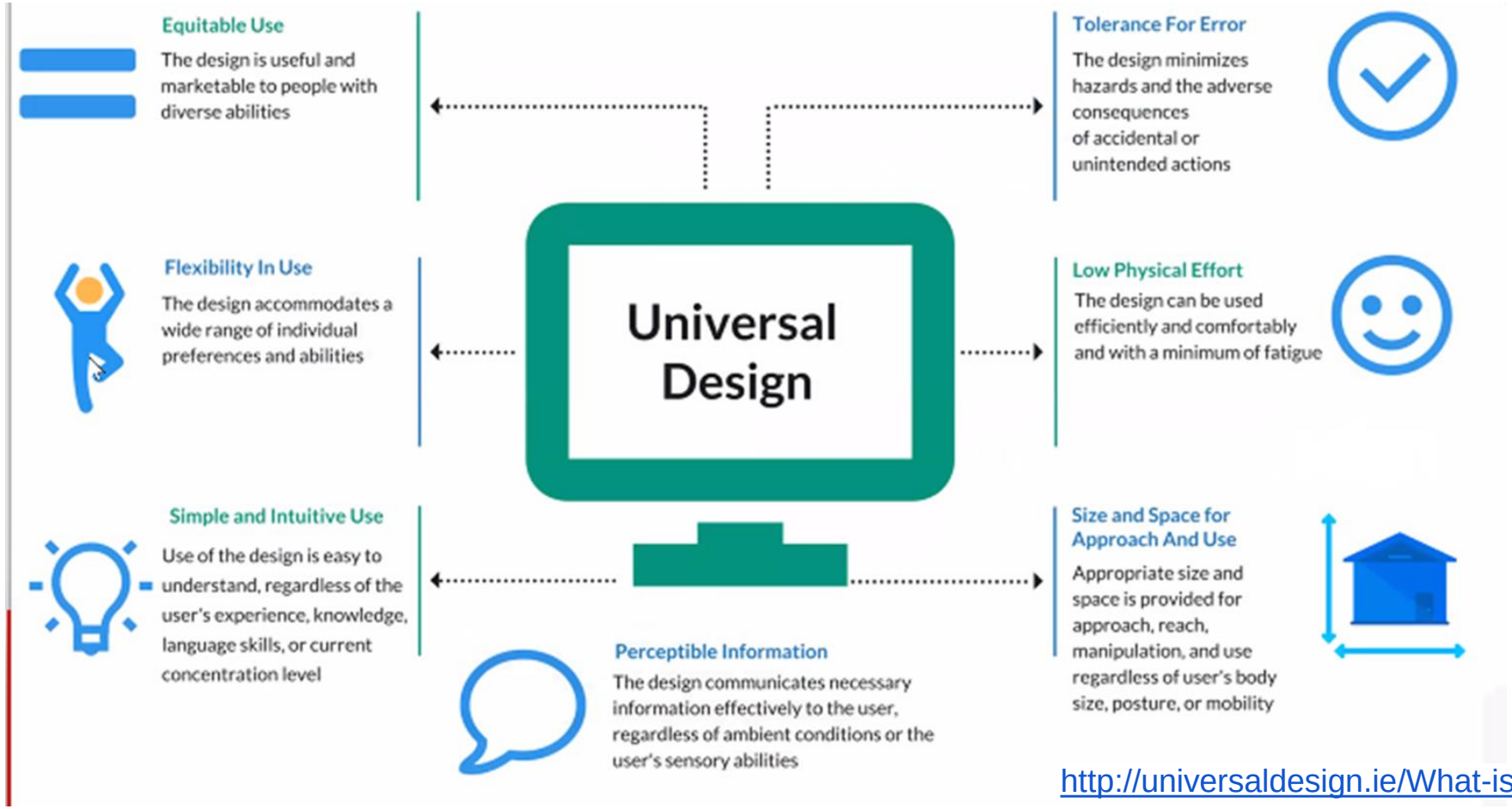






Source: https://www.nngroup.com/articles/design-thinking/

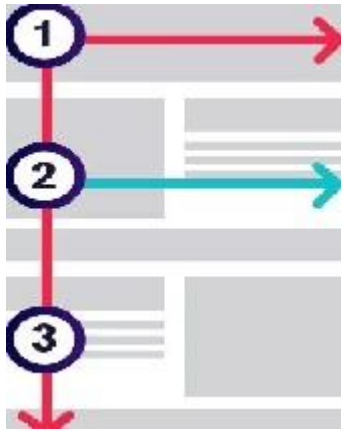
Universal Design Principles



http://universaldesign.ie/What-is-Universal-Design/The-7-Principles/

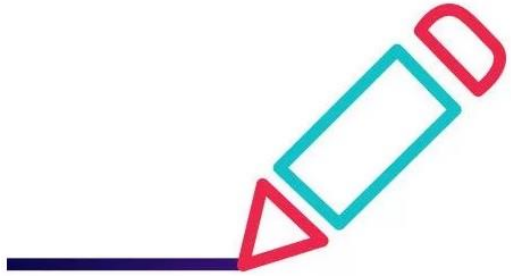
Principles of Good Website Design

1. Website Purpose
2. Simplicity – Colour, Type, Imagery
3. Navigation
4. F-Shape Reading Pattern



Principles of Good Website Design

5. Visual Hierarchy



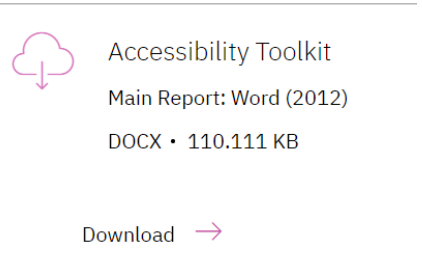
6. Content – webpage needs good design and good content

7. Grid-based layout

8. Mobile-friendly

https://www.feelingpeaky.com/9-principles-of-good-web-design/

Údarás Náisiúnta Míchumais
National Disability Authority



Oide

- text equivalent for everything that's not text?
- Can customers get all the important information from your videos and audio, even if they can't see /hear them?
- customer's technology understand its structure?
- enough colour contrast between the website's written information and its background?
- enough volume contrast between your website's spoken information and its background noises?
- visual alternatives to textual material?
- Can your customers use your website with only a keyboard?
- enough time to read and use your website?
- nothing flashes quickly?
- Can customers find what they're looking for?
- Can customers read your information easily, and can they understand it?
- Does your website work as your customers would expect it to work?
- Does your website help prevent your customers making mistakes? explain your customers' mistakes clearly?
- Will it work on as many modern computers, phones, and browsers as possible?

https://nda.ie/publications/accessibility-toolkit

Centre for Excellence in Universal Design

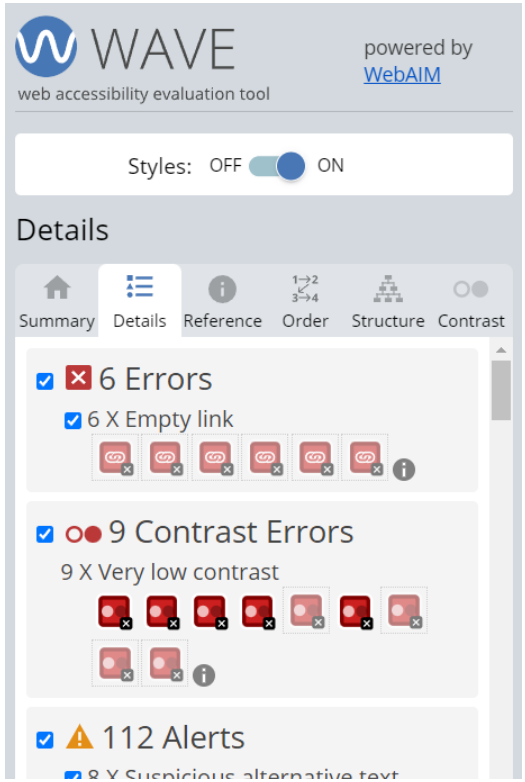
The Centre for Excellence in Universal Design (CEUD) is dedicated to enabling the design of environments that can be accessed, understood and used regardless of a person's age, size, ability or disability. The CEUD is part of the National Disability Authority.

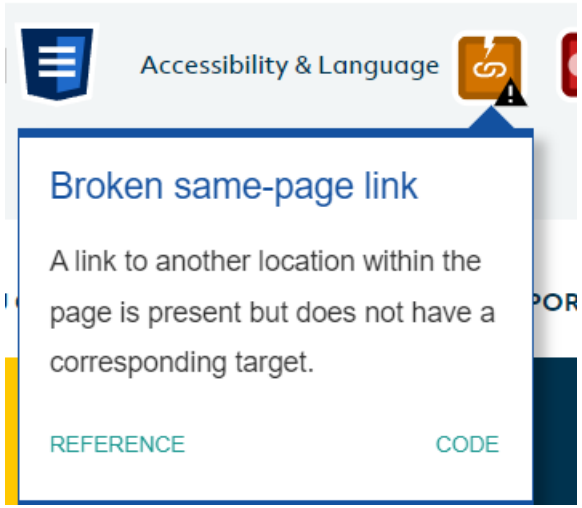
"Take a quick look at your site":

https://universaldesign.ie/technology-ict/universal-design-for-ict/web-accessibility-auditing/take-a-quick-look-at-your-site/

WAVE


WAVE
web accessibility evaluation tool


WAVE
web accessibility evaluation tool
powered by
WebAIM
Styles: OFF ON
Details
Summary
Details
Reference
Order
Structure
Contrast
6 Errors
6 X Empty link
9 Contrast Errors
9 X Very low contrast
112 Alerts


Accessibility & Language
Broken same-page link
A link to another location within the page is present but does not have a corresponding target.
REFERENCE
CODE

Activity: Website Analysis

- Agree on 4 principles of good web design to use for this activity
  - *include accessibility (from NDA guidelines)
- Pick two websites of your choice
- Using your selected principles compare the two websites

1. **Usability (Ease of Use)**
2. **Layout Design (Alignment, Use of Space, Images)**
3. **Visual Design (Typography, Colour)**
4. **Content & Language**
5. **Accessibility**
6. **Feedback**
7. **Navigation**
8. **Hierarchy (structure)**

P 26

National Disability Authority

WAVE web accessibility evaluation tool

Assistive Technology

"Assistive Technology (AT) concerns the practical tools that can support the functional needs of people who experience difficulties linked to disability or ageing"

Údarás Náisiúnta Míchumais
National Disability Authority

An Roinn Oideachais
Department of Education

Digital Strategy for Schools to 2027

enable ireland

Activity:

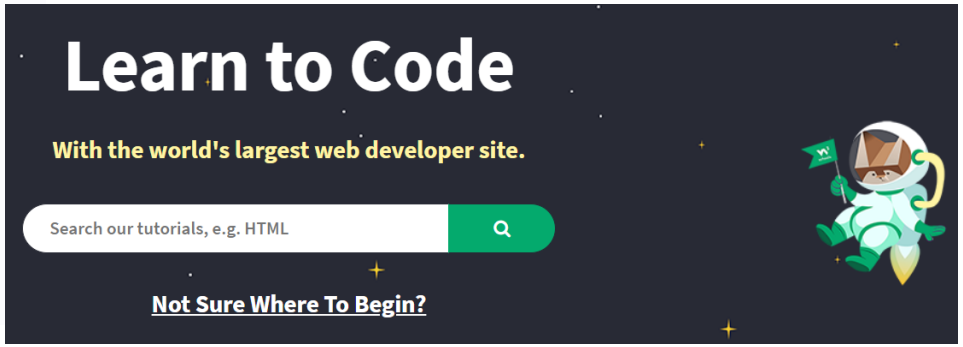
Question: *“…adaptive and assistive technologies are in place for anyone who should need them. Name two types of such technologies and describe…”*

P 27

Web Editors

What Web Editor to use?

WiX



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Supporting the Professiona Learning of School Leaders and Teachers

Session 6

ALT 1
Design and Create

By the end of this session

Participants will have:

- experienced the design phase for an original ALT1 project
- enhanced their team working, communication and collaboration skills
- acquired additional skills, knowledge and ideas on how to facilitate ALT 1 in their own classrooms
- enhance their understanding of the Design and Create stages of the Design Process with a particular focus on ALT 1

The Design Process

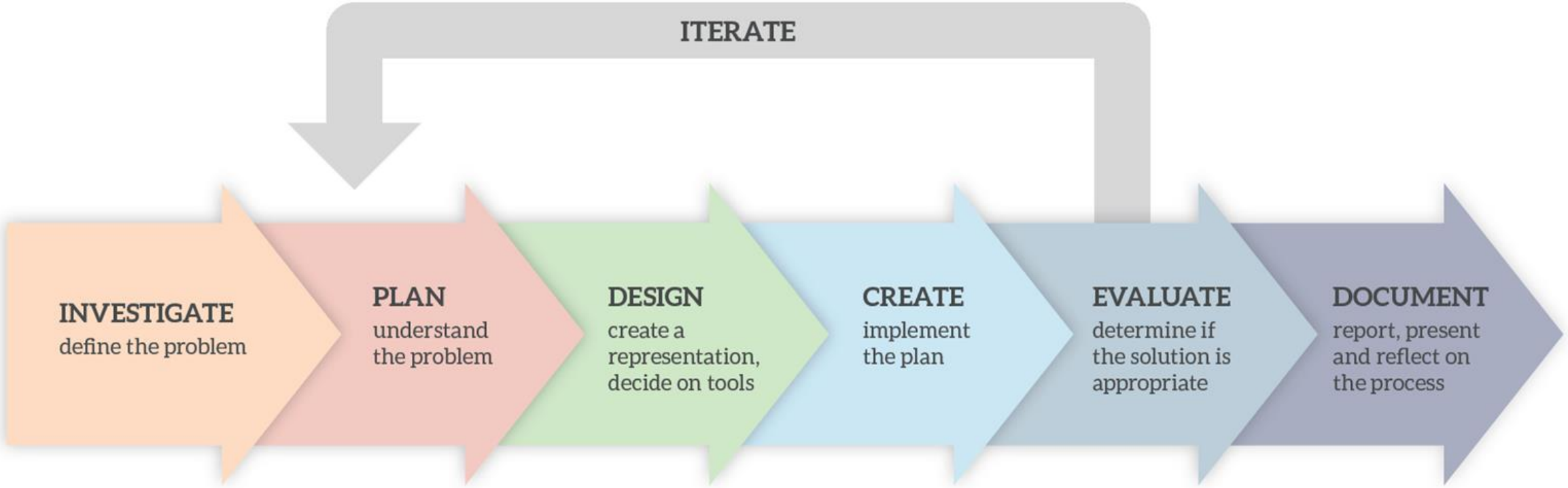
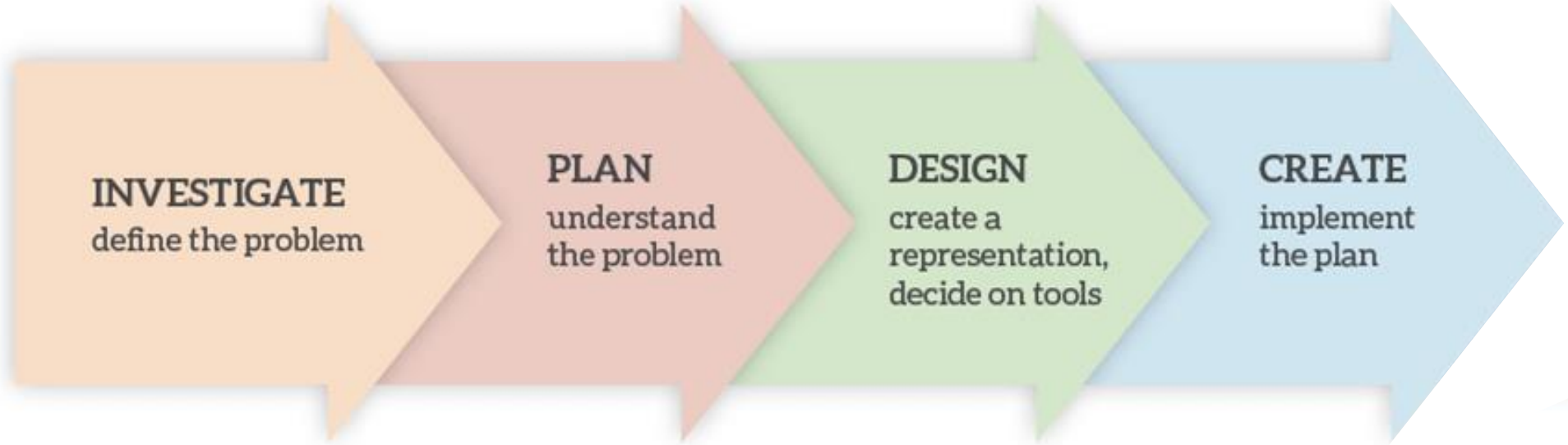
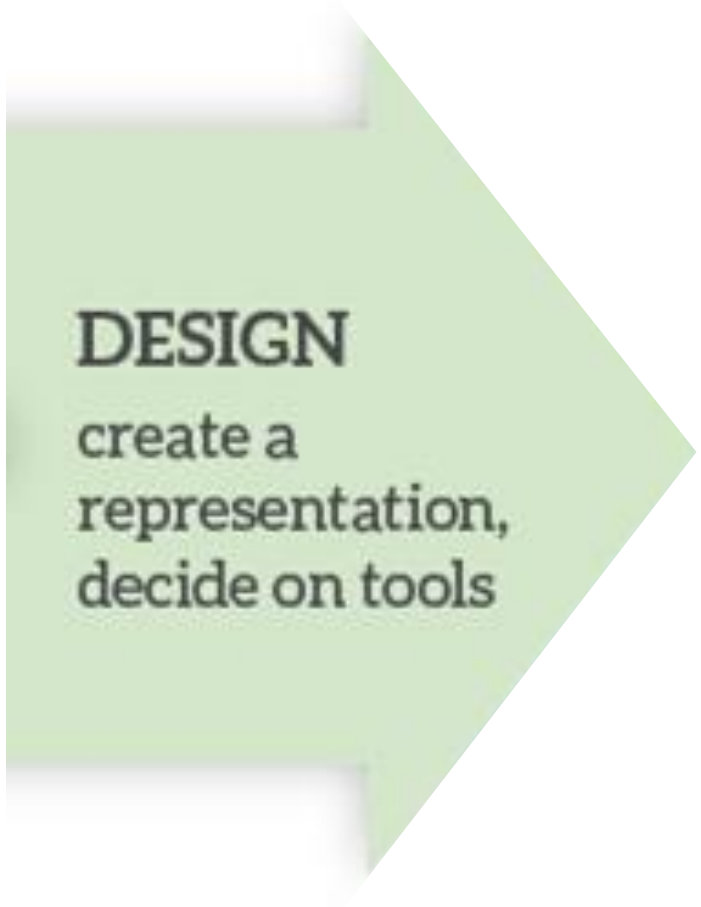


Figure 3: Overview of a design process

The Design Process





Map

Diagram

Storyboard

Mock-up

Wireframe

Paper Prototype

Learning Outcomes

Students learn about:	Students should be able to:
Information systems	3.1 understand and list user needs/requirements before defining a solution
User-centred design Web design	3.2 create a basic **relational** database to store and retrieve a variety of forms of data types
File systems and **relational** databases	3.3 use appropriate programming languages to develop an interactive website that can display information from a database that meets a set of users' needs
Design process	

Learning Outcomes
(don't try and do too much!)

1.15	consider the quality of the user experience when interacting with computers and list the principles of universal design, including the role of a user interface and the factors that contribute to its usability
1.16	**compare two different user interfaces and identify different design decisions that shape the user experience**
1.17	describe the role that adaptive technology can play in the lives of people with special needs
1.18	recognise the diverse roles and careers that use computing technologies

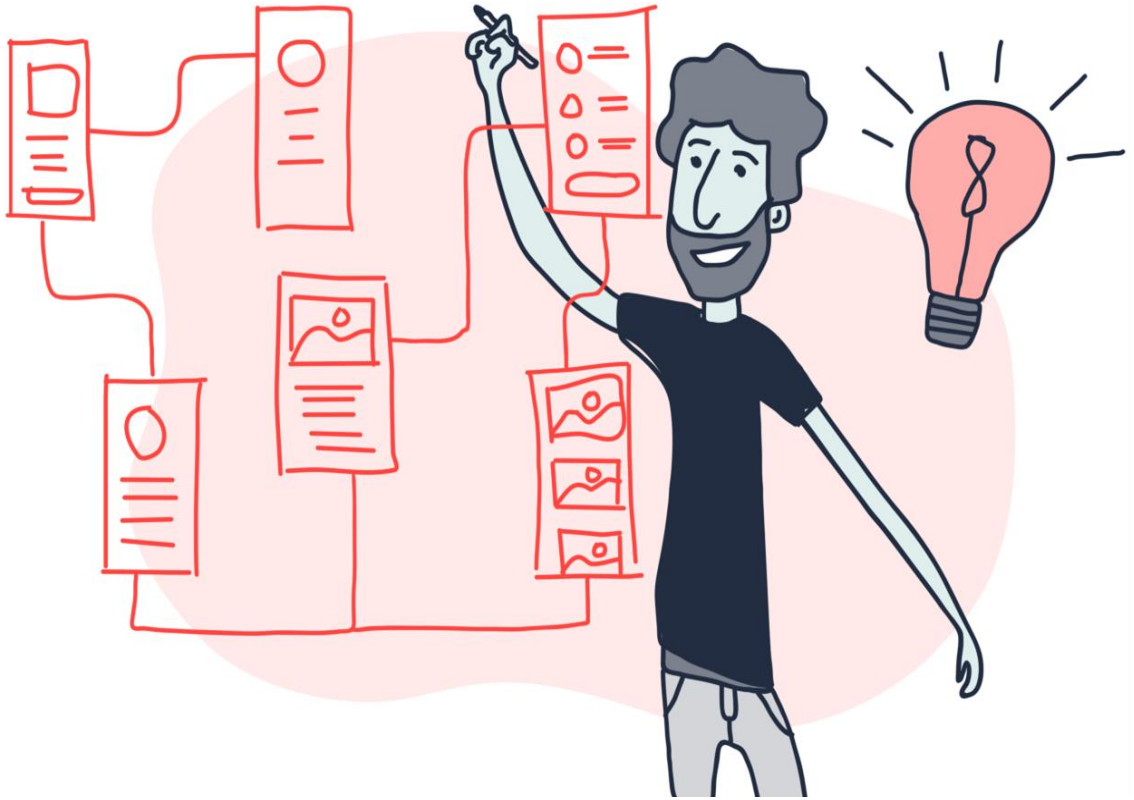
S1: Designing and developing	
Design process	1.19 identify features of both staged and iterative design and development processes
Working in a team, assigning roles and responsibilities	1.20 collaborate and assign roles and responsibilities within a team to tackle a computing task
Communication and reporting	1.21 identify alternative perspectives, considering different disciplines, stakeholders and end users
	1.22 read, write, test, and modify computer programs
Software development and management	1.23 reflect and communicate on the design and development process

S2: Abstraction	
	2.1 use abstraction to describe systems and to explain the relationship between wholes and parts
	2.2 use a range of methods for identifying patterns and abstract common features
	2.3 implement modular design to develop hardware or software modules that perform a specific function
	2.4 illustrate examples of abstract models

S2: Evaluation and testing	
Debugging	2.19 test solutions and decisions to determine their short-term and long-term outcomes
Testing: Unit test, **Function test, System test**	2.20 identify and fix/debug warnings and errors in computer code and modify as required
	2.21 critically reflect on and identify limitations in completed code **and suggest possible improvements**
	2.22 explain the different stages in software testing

2.5 use pseudo code to outline the functionality of an algorithm

Wireframes



Wireframing

https://www.youtube.com/watch?v=8-vTd7GRk-w&feature=youtu.be

Benefits of Wireframing

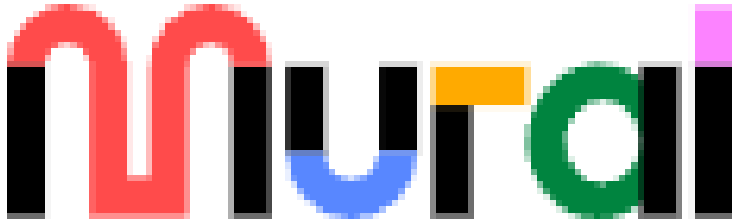
- ✓ Structure
- ✓ Layout (hierarchy)
- ✓ Content
- ✓ Functionality
- ✓ Refinement
- ✓ Understanding

Tips for using Wireframes

- ✓ Keep it simple
- ✓ Use a grid
- ✓ Develop a user-flow
- ✓ Encourage feedback

Digital wireframing tools

What collaborative whiteboard platforms have you used?



ALT1: Design

Create a wireframe for your ALT 1

P30

ALT1: Design - Feedback

Create a wireframe for your ALT 1

P30

Prototyping

https://www.youtube.com/watch?v=JMjozqJS44M&feature=youtu.b

The Design Process

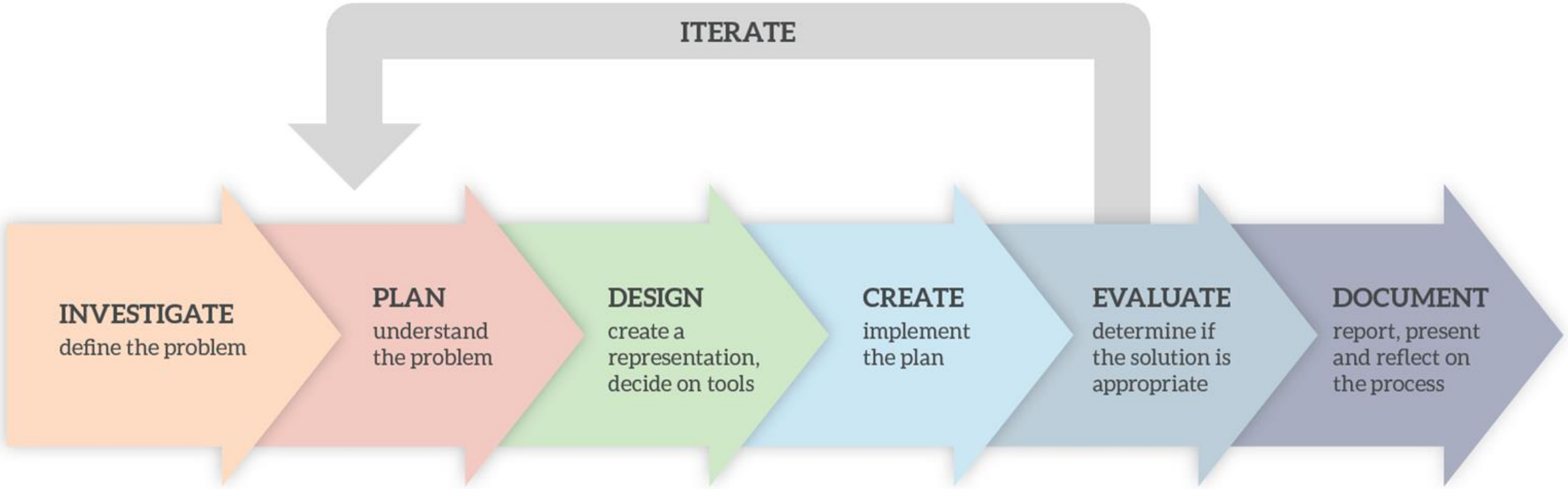
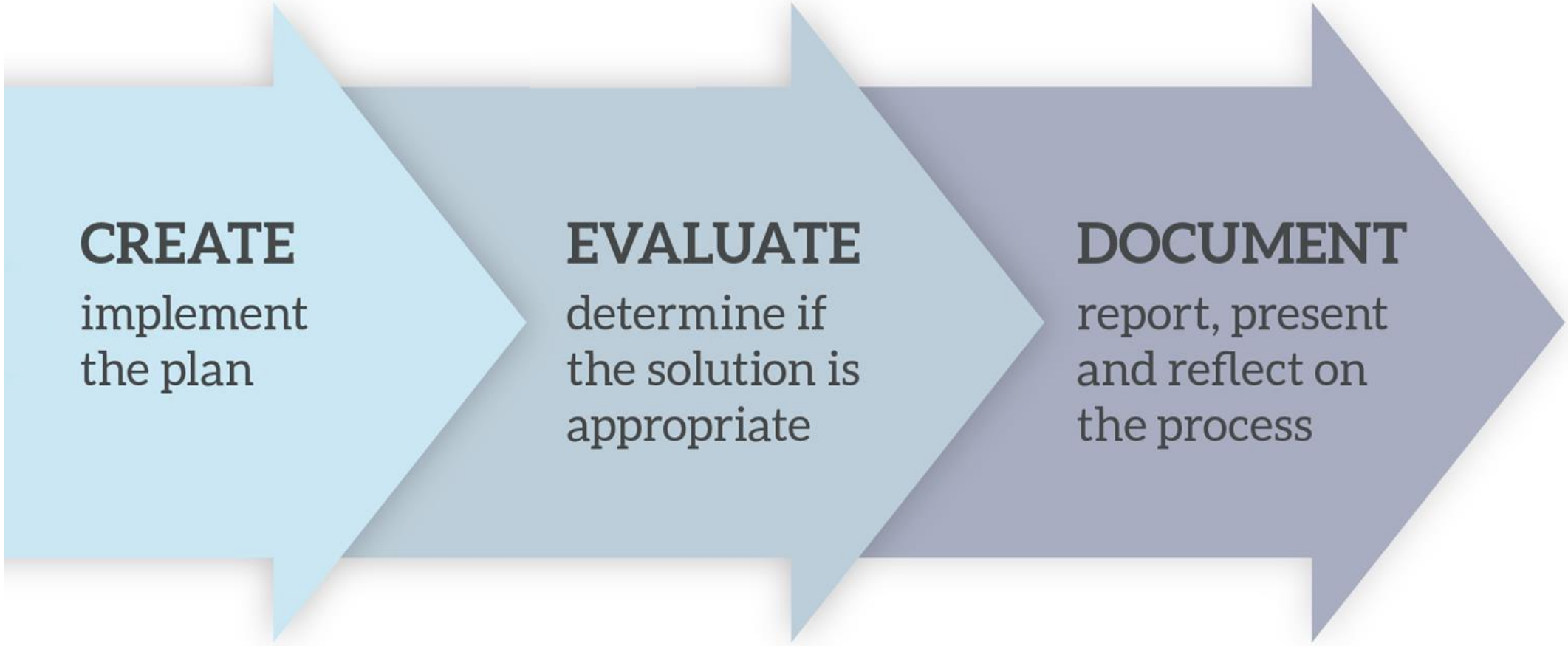


Figure 3: Overview of a design process

Create Evaluate Document



From the Specification

The output from each task is a computational artefact and a concise individual report outlining its development.

In the report, students outline where and how the core concepts were employed.

The structure of the reports should reflect the design process shown above in Figure 3.

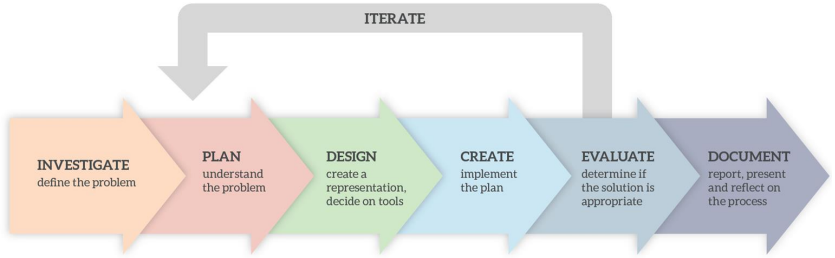
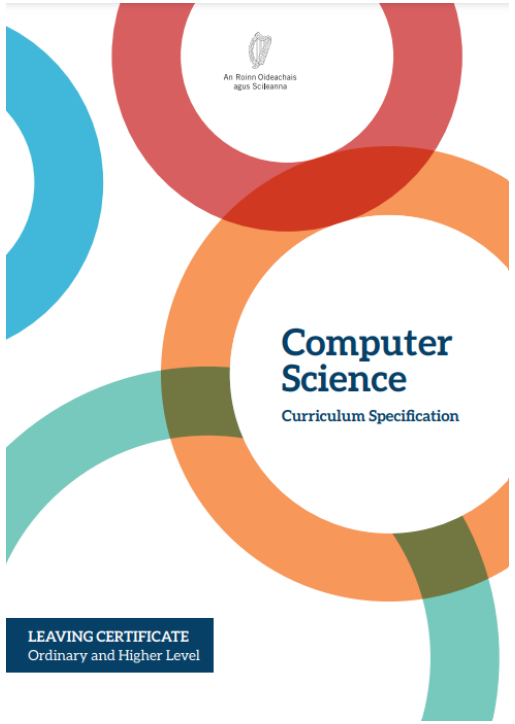


Figure 3: Overview of a design process

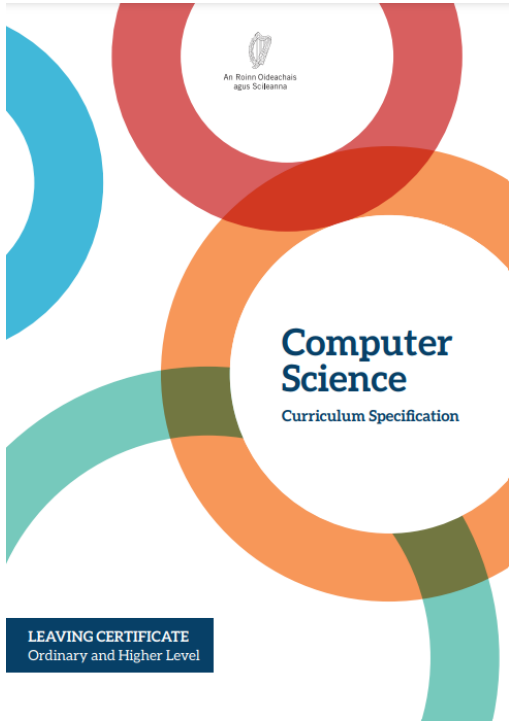


From the Specification

Initial reports could be in the form of structured presentations to the whole class.

As students progress, reports should become detailed and individual.

Reports are collected in a digital portfolio along with the computational artefact and must be verified as completed by both the teacher and the student.



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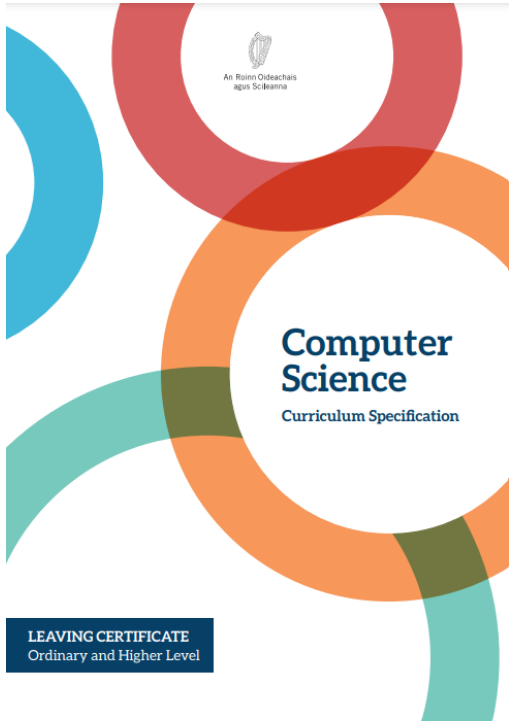
Create Evaluate Document From the Specification

Students are expected to document, reflect and present on each applied learning task.



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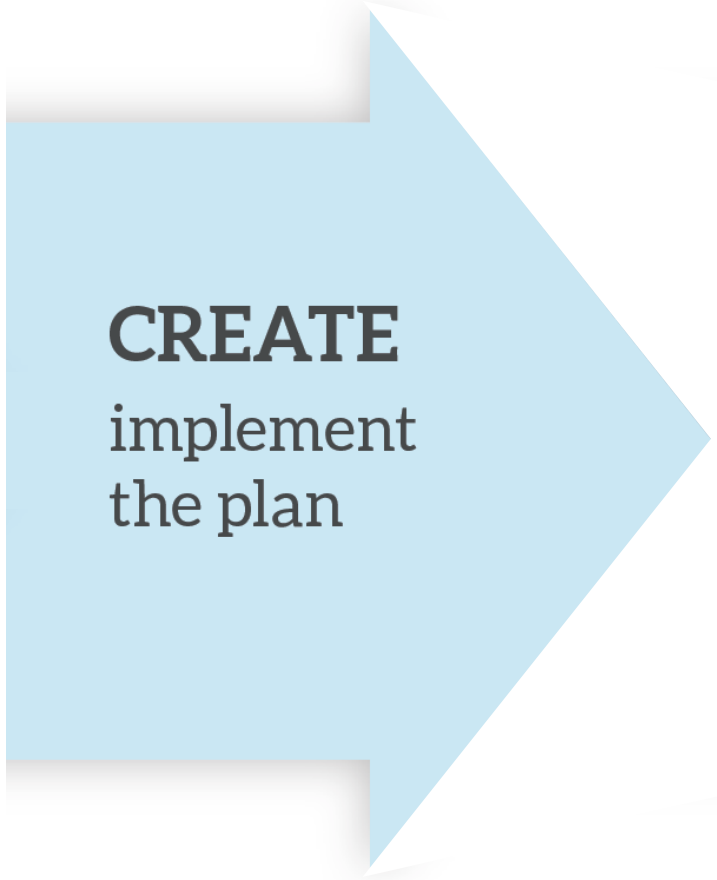
Create



Oide

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