



Oide

Tacú leis an bhFoghlaim
Ghairmiúil i measc Ceannairí
Scoile agus Múinteoirí

Supporting the Professional
Learning of School Leaders
and Teachers



LEAVING CERTIFICATE
COMPUTER SCIENCE

National Workshop 5

Professional Learning Booklet



Contents

Key Messages	2
Session 1 Computers and Society	3
Stimulate a Debate	5
Agree/Disagree Line	6
The Trolley Problem	7
Artificial Intelligence (AI)	8
AI Scenarios	10
Final Reflection (3-2-1)	11
Session 2: Databases	12
Creating a Flat-file database	13
Matching Exercise	16
Micro:bit Data logging	17
Session 3 – Inclusion and Curriculum Planning	18
What is inclusion?	18
Inclusive teaching in the LCCS classroom	18
Group task: Creating an Inclusive Classroom	19
Session 4: Introduction to ALT 1	22
Matching Exercise	23
UX Design	24
Web site analysis	25
Adaptive and Assistive Technologies	26
Web Development	27
Session 5: Investigating and Planning ALT 1	28
ALT 1: Investigate	28
ALT 1: Plan	29
Session 6: Designing and Creating ALT 1	30
ALT 1: Design	30
ALT 1: Create	31

Key Messages

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

LCCS can be mediated through a constructivist pedagogical approach.

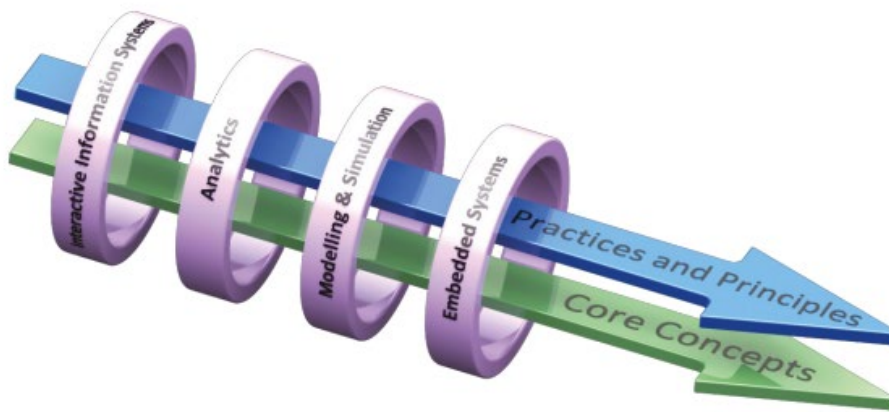
ALTs provide an opportunity to teach theoretical aspects of LCCS.

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

LCCS is suitable for all.

Session 1 Computers and Society

Strand 1: Practices and principles	Strand 2: Core concepts	Strand 3: Computer science in practice
<ul style="list-style-type: none"> ▶ Computers and society ▶ Computational thinking ▶ Design and development 	<ul style="list-style-type: none"> ▶ Abstraction ▶ Algorithms ▶ Computer systems ▶ Data ▶ Evaluation/Testing 	<ul style="list-style-type: none"> ▶ 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



Students learn about: ²	Students should be able to:
<p>S1: Computers and society</p> <p>Social and ethical considerations of computing technologies</p> <p>Turing machines</p> <p>The Internet</p> <p>Machine learning</p> <p>Artificial intelligence</p> <p>User-centred design</p>	<p>1.11 discuss the complex relationship between computing technologies and society including issues of ethics</p> <p>1.12 compare the positive and negative impacts of computing on culture and society</p> <p>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</p> <p>1.14 explain when and what machine learning and AI algorithms might be used in certain contexts</p> <p>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</p> <p>1.16 compare two different user interfaces and identify different design decisions that shape the user experience</p> <p>1.17 describe the role that adaptive technology can play in the lives of people with special needs</p> <p>1.18 recognise the diverse roles and careers that use computing technologies</p>

How might you approach Computers and Society with your students?

What are your plans for/experiences of teaching and learning Computers and Society? (Consider interweaving learning outcomes with other parts of the course in particular the ALTs, prior student knowledge/experience and teaching and learning strategies).



Stimulate a Debate

The 4 steps of the 'Stimulate a Debate' classroom strategy are:

- 1.
- 2.
- 3.
- 4.




Additional notes:

Some examples of Stimulus Videos:

A large empty rectangular box intended for listing examples of stimulus videos.

Agree/Disagree Line

Could you be friends with a robot?

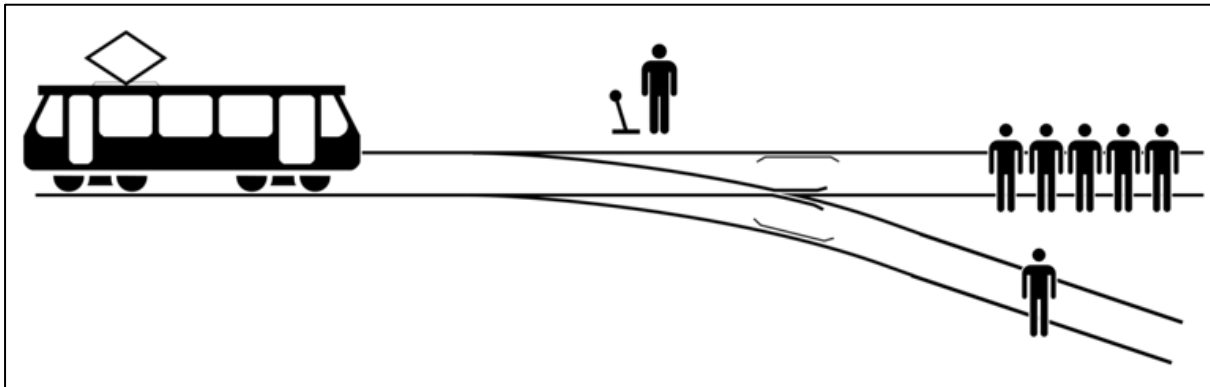


100% AGREE 100% DISAGREE

Notes

Blank area for notes.

The Trolley Problem



Notes

Blank area for notes.

Artificial Intelligence (AI)

Examples of AI

Definition

Terminology / Concepts

Notes



AI Scenarios

Discuss whether the following applications should or should not be considered applications of AI:

Scenarios

1. A system that predicts the likelihood that a criminal will re-offend based on a description of the person.
2. A recommendation system suggests movies to users based on their past viewing history and user ratings.
3. The Spotify search service that allows a user to enter the name of an artist and returns all of their songs.
4. An automated vacuum cleaner uses sensors to navigate a room and avoid obstacles while cleaning the floor.
5. A computer program analyses a large dataset of weather patterns and predicts the likelihood of rainfall in a specific region.
6. A chatbot answers customer questions by matching keywords in the inquiry to predefined responses in a database.
7. A language translation app converts text from one language to another using pre-trained language models.
8. A robot on a manufacturing assembly line repetitively performs a set of predefined tasks without deviation.
9. A chess-playing program evaluates possible moves using a combination of heuristics and search algorithms to determine the best move.
10. A spam filter identifies and filters out unwanted emails based on patterns and characteristics typical of spam messages.

Final Reflection (3-2-1)

Complete the 3-2-1 reflection with regards to LCCS Computers and Society.

List 3 things you learned.

- 1.
- 2.
- 3.

List 2 areas you would like to learn more about.

- 1.
- 2.

One question you still have.

- 1.

Session 2: Databases

	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				
Attribute				
Primary Key				
Foreign Key				
System Architecture				
Client-server Model				
Front-end system				
Back-end system				
HTML				
CSS				
JavaScript				

*Adapted from “An Integrated Approach to Learning, Teaching and Assessment”, p28

<https://pdst.ie/sites/default/files/Integrated%20Approach.pdf>



Creating a Flat-file database

Scenario

You're to create a paper-based contact list database for a community in the town of Irisheen.

This database will store contact information and details about how each person commutes to work and the distance they need to travel.

Raw Data:

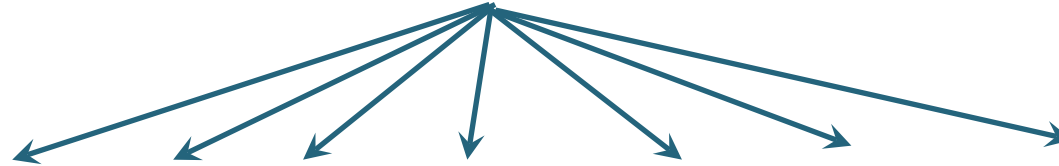
- Paul Johnson, 29, 47 Main Street - Paul works as a teacher at Irisheen National School, which is just half a kilometre from his home. He enjoys a peaceful stroll through the town to get to work.
- Michael Brown, 42, 23 Oak Avenue - Michael is an accountant and gets the bus to work, 16 kilometres away in the nearby big town. The scenic drive takes him about 20 minutes.
- Sarah Williams, 35, 12 Main Street - Sarah is a nurse at Irisheen Community Hospital, located 3 kilometres from her home. She cycles to work, covering the distance in 10 minutes.
- David Lee, 28, 50 Elm Drive - David works as a software developer and works from home in Irisheen, avoiding the need to commute.
- Mia Connor, 41, lives at Leake View House, the principal of Irisheen National School, drives 10 km to work and enjoys reading in her free time.
- Patricia Murphy, 31, 4 Oak Lane - Patricia is a graphic designer who drives 12 kilometres to work in the town of Glenvally.
- Liam O'Connor, 35, 22 River Road - Liam is a gardener who walks 1 kilometre to Irisheen Park every day.
- Aoife Ryan, 29, 21 Green Street - Aoife is a pharmacist who also drives to her pharmacy in the nearby town of Watertown, which is 8 kilometres away.
- Michael Brown, 36, 5 Main Street – Michael, who recently won the national bake-off competition, lives above his bakery shop.

Prompt Questions

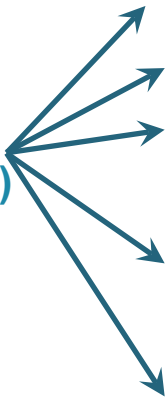
1. What attributes or pieces of information do we need to store for each person in our contact list?
2. How can we ensure that each person in our contact list is uniquely identifiable within our database? What could be used as a primary key?
3. How can we apply the concept of abstraction in our database design?
4. On the following page, create the database on paper, including tables, attributes, and primary keys, based on the given scenario.
5. Emma Clarke, 24, a trainee teacher at Irisheen National School, also works part-time as a baker at Brown's Bakery. She lives just a short walk from the bakery but 1 kilometre away from the school.
*How can we add Emma to the database while maintaining its' current format?
Would you add a new column or a new record?
Are there limitations to this flat-file database?*

People Database

Columns (Attributes)



Rows (Records)



	Name						
	Paul Johnson				Walk		
				Accountant	Car		
	Sarah Williams			Nurse			
	David Lee			Software Developer			
	Mia Connor			Principal			
			4 Oak Lane				
	Liam O'Connor						
	Aoife Ryan	29					
	Michael Brown	36		Bakery Owner	Walk		



Matching Exercise

Field	A unique identifier in a database table that ensures each record can be uniquely identified and retrieved.
Raw Data	Non-relational databases designed for flexible and scalable storage of unstructured or semi-structured data.
Primary Key	A network architecture where clients (user interfaces) request services or data from central servers.
Database	Unprocessed, unstructured information collected or generated by various sources before any analysis or transformation.
Attributes	A single data element within a database record, representing a specific attribute or piece of information.
SQL	Software that facilitates the creation, maintenance, and retrieval of data in a database
DBMS	Refers to the server-side components of a software application responsible for data processing and logic execution.
Foreign Key	Characteristics /properties that describe an entity. They provide details about the data being stored and help define the structure of a database. Can be thought of as columns or fields within a database table, and they hold specific pieces of information about the records or entities represented by that table.
Back end system	A collection of related data fields within a database table, representing a single unit of information.
Client-server model	A programming language used for managing and manipulating relational databases.
Record	Refers to the user interface and presentation layer of a software application that interacts with users.
noSQL	A structured collection of data organised and stored in a systematic way for efficient data management and retrieval.
Front end system	A field in a database table that establishes a link between two tables by referencing the primary key of another table.

Micro:bit Data logging

Prompt Questions

Predict:

Predict what this code does.

```
on start
  serial redirect to USB

forever
  show number temperature (°C)
  pause (ms) 5000
  serial write line temperature (°C)
```

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. How will we do this?

Make:

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

Session 3 – Inclusion and Curriculum Planning

What is inclusion?

Reflection: What does an inclusive classroom look like? What does inclusion mean to you?

Inclusive teaching in the LCCS classroom

General tips



Group task: Creating an Inclusive Classroom

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?



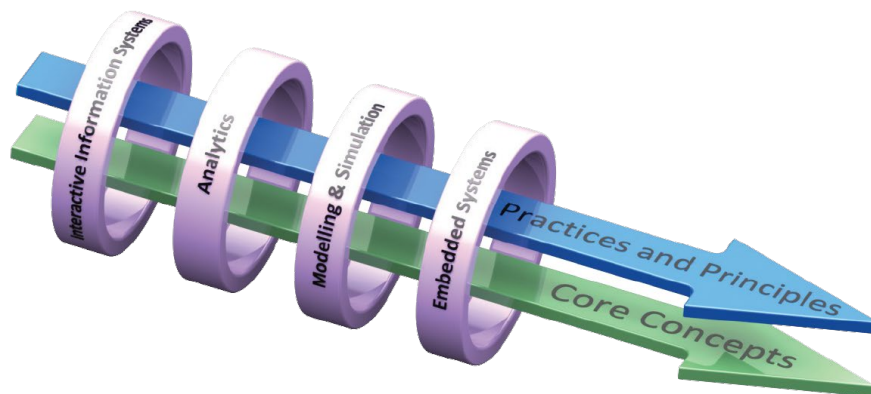
Curriculum Planning

"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?

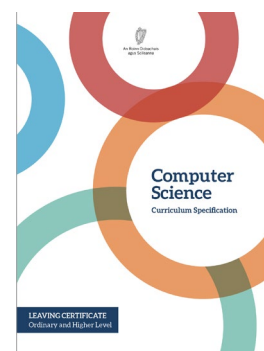
What content or resources might you need?

Group activity

Using the LCCS specification, consider the following question:
How do you intend to approach LCCS in your classroom
(over the next 4 weeks/until mid-term/until Christmas)?

Work in groups and consider:
Timeframe / Topics / LOs / Resources / Assessment /
Build up to ALTs / ALTs / Equipment etc.

Key Message: Explore and teach the LOs through the lens of ALTs.
There are several ways to achieve this.



Session 4: Introduction to ALT 1

- 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

Think, Pair, Share

1. What are Interactive Information Systems?

2. Give some examples of Interactive Information Systems.

Matching Exercise

Information System	a collection of data that is specially organised for rapid search and retrieval by a computer
Database	a website that communicates and allows for interaction with users.
User-centred design	an interconnected set of components used to collect, store, process and transmit data and digital information
Interactive website	a type of database that organises data into tables and creates links between these tables, based on defined relationships
Relational database	an iterative design process in which designers focus on the users and their needs in each phase of the design process

UX Design

1. What are your thoughts on UX Design?

2. What are the most important aspects?



Web site analysis

In groups, analyse several websites from the user experience point of view.



Adaptive and Assistive Technologies

Choose two adaptive / assistive technologies and describe how they support the user of computer systems.



Web Development

Discuss as a whole group tool / editors used in creating Web pages



Session 5: Investigating and Planning ALT 1

ALT 1: Investigate

What is an interactive information system? Give examples from the world around us.

What are your hobbies/interests/passions? Can you think of example interactive information systems that might support these?

What about other examples – for users other than yourself e.g., family members, friends, school, community organisation, society?

Investigate



ALT 1: Plan

In your assigned groups, evaluate your potential ideas for ALT 1.

Choose one idea for further development - dissect the idea.

You may use the following prompt questions to help you:

- What will your project do? Aims? Limitations?
- Who are the end users and how will they interact with it?
- Is there a broad theme or a specific topic?
- What tools or materials are needed? What technology/technologies could you use?
- What is new and must be researched further? What upskilling do you need to do?
- Does your project idea cover all the LOs for this ALT?
- What other LOs can be taught through the lens of this project?
- What are the roles in the group?

Plan

Session 6: Designing and Creating ALT 1

ALT 1: Design



Wireframing

A large, empty rectangular box intended for wireframing.

ALT 1: Create

Notes



