PDST
Professional Development Service for Teachers
An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

An Roinn Oideachais agus Scileanna
Department of Education and Skills

National Workshop 7

LEAVING CERTIFICATE
COMPUTER SCIENCE

By the end of this session / Learning Outcomes

Participants will be enabled to:

- Understand the plans for post Phase 1 CPD for LCCS teachers.
- Review Senior Cycle Skills relating to Computer Science and reflect on their implementation in the classroom
- Bring different approaches and techniques for approaching various Computer Science areas (LOs 1.11-1.14. 1.18, 1.23)
- Explore Higher-Order Questioning in CS as part of Formative Assessment / Assessment As Learning (LOs 2.11 – 2.15, 2.17, 2.22, 1,19, 1.23)
- Introducing Formative Assessment / *Assessment As Learning* in areas Software Methodologies and Modelling

slack

COMPSCI.IE

Community of Practice

Phase 1 Mentor

Overview of Framework

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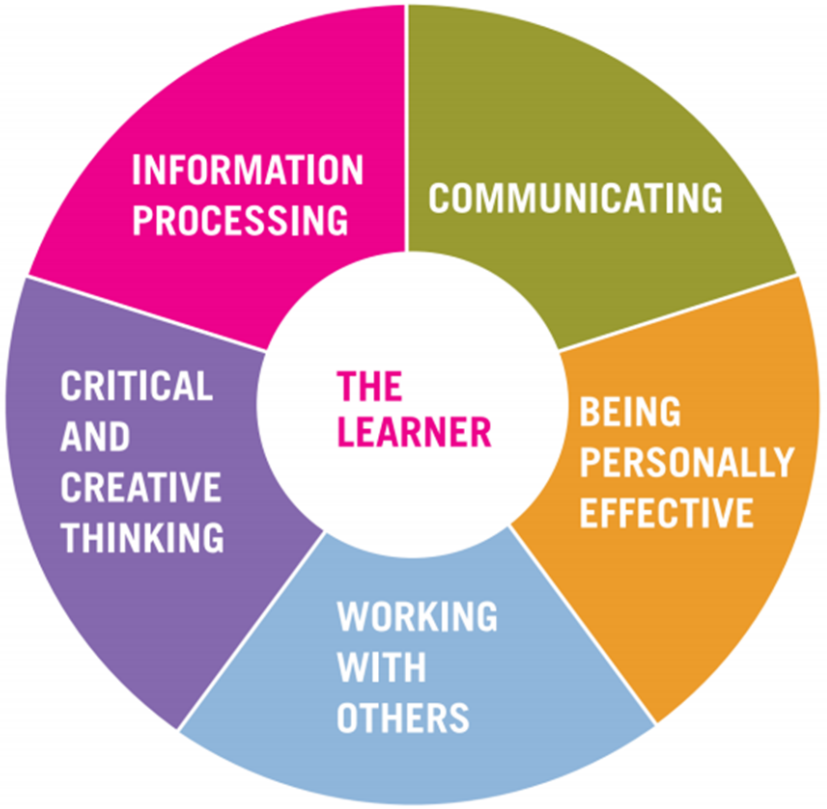
Leaving Certificate Key Skills

Activity

Teachers in groups discuss how key skills were demonstrated in their classrooms, and which skills were particularly enhanced during the course.



Senior Cycle Key Skills - NCCA

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Exploration of challenging LCCS themes through Formative Assessment

Summative vs Formative Assessment

Assessment OF Learning (Summative)	**Assessment FOR Learning (Formative)**
Happens after learning takes place	***An integral part of learning process***
Information is gathered by teacher	Information is shared with learner
Information is usually transferred into marks	Information is available on quality of learning
Comparison with performance of others	Is linked to learning intentions and success criteria
Looks back on past learning	***Looks forward to the next stage of learning***

Assessment for Learning / Assessment As Learning (Formative)

Assessment for learning involves teachers using evidence about students' knowledge, understanding and skills to inform their teaching. Sometimes referred to as 'formative assessment', it usually occurs throughout the teaching and learning process to ***clarify student learning and understanding***.

Assessment as learning occurs when students ***are their own assessors.*** Students monitor their own learning, ***ask questions*** and use a range of strategies to decide what they know and can do, and how to use assessment for new learning.

Sections A+B

Apply Higher Order Questions:

Discuss / Compare and Contrast / Distinguish / Evaluate / Assess / Analyse …

Questions

Sample Key Examination Words

Term	Explanation
Analyse	Examine in detail and/or break down into components.
Assess	Describe the positives and negatives, identify the importance of.
Calculate	Find out by way of mathematical formula or numerical data.
Compare	Show the similarities and differences between.
Contrast	Show the differences between.
Criticise/Critique	Point out weaknesses as well as strengths.
Define	Give the precise meaning of.
Derive	Work out from basic principles.
Describe	Give the details of properties, events, processes etc.
Discuss	Examine or describe in detail. Make arguments for and against.
Distinguish	Point out the differences.
Draw	Make a picture or diagram.
Evaluate	Discuss and make a judgement on.
Examine	Take apart and describe a concept in great detail.
Explain	Make clear in a detailed manner.
Identify	Show you recognise.
Illustrate	Give examples including figures, diagrams or examples
Interpret	Explain, comment on and pass judgement.
Justify	Give reasons to support the statement.
List	Provide parts, reasons or qualities in itemised point form.
Prove (or disprove)	Give evidence.
Relate	Show the links, connections and associations.
Review	Comment on the main aspects of a subject.
Show	Explain with example, diagram or chart.
State	Write briefly without further comment.
Suggest	Give possible reasons and ideas.
Summarise (outline)	Give the key points without details.
Trace	Show the steps or stages to be followed.

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Formative Assessment in LCCS Context

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Summative v Formative Assessment

Summative	Formative
a **OF** l	a **FOR** l
	…. a **AS** l

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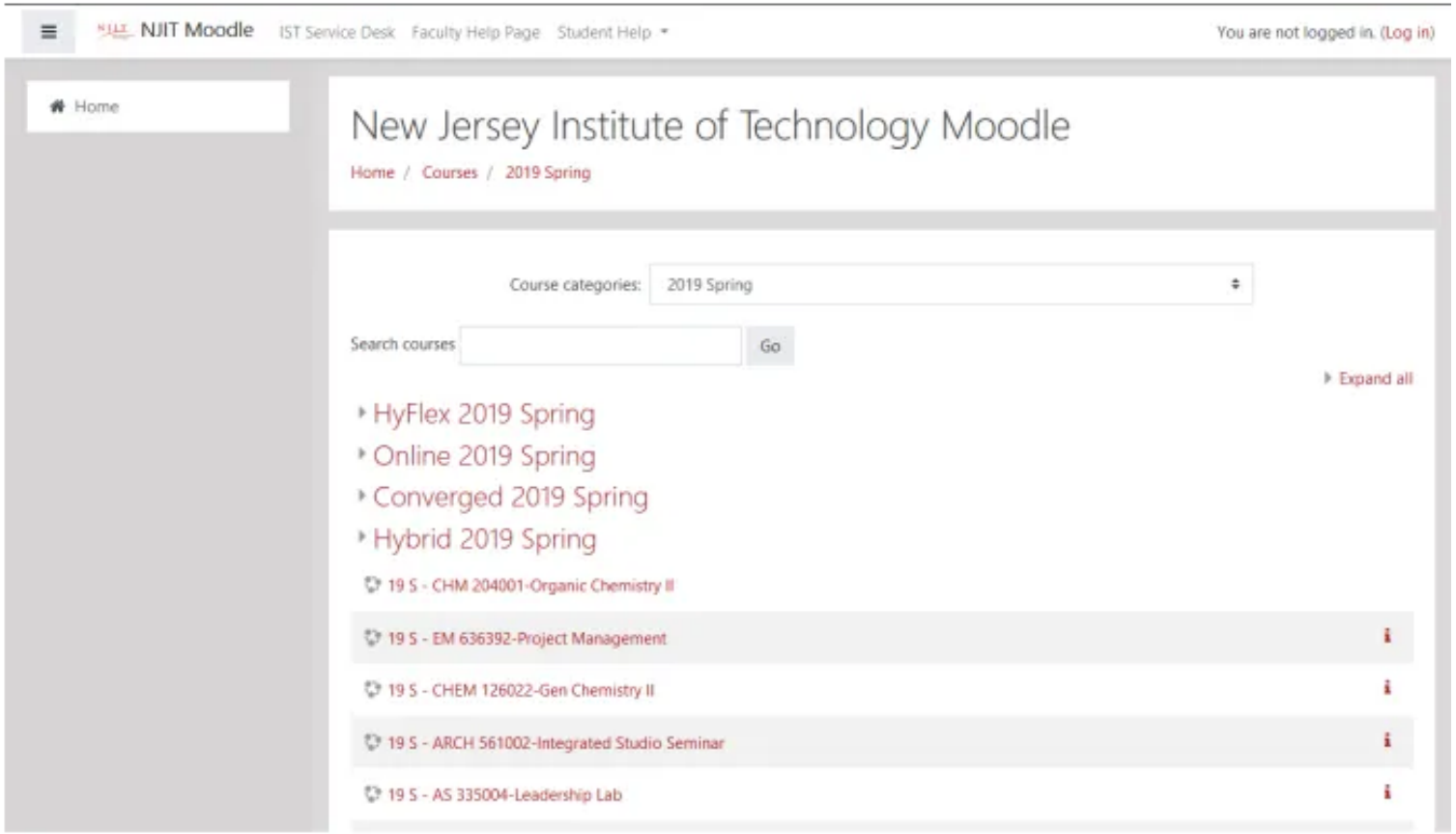
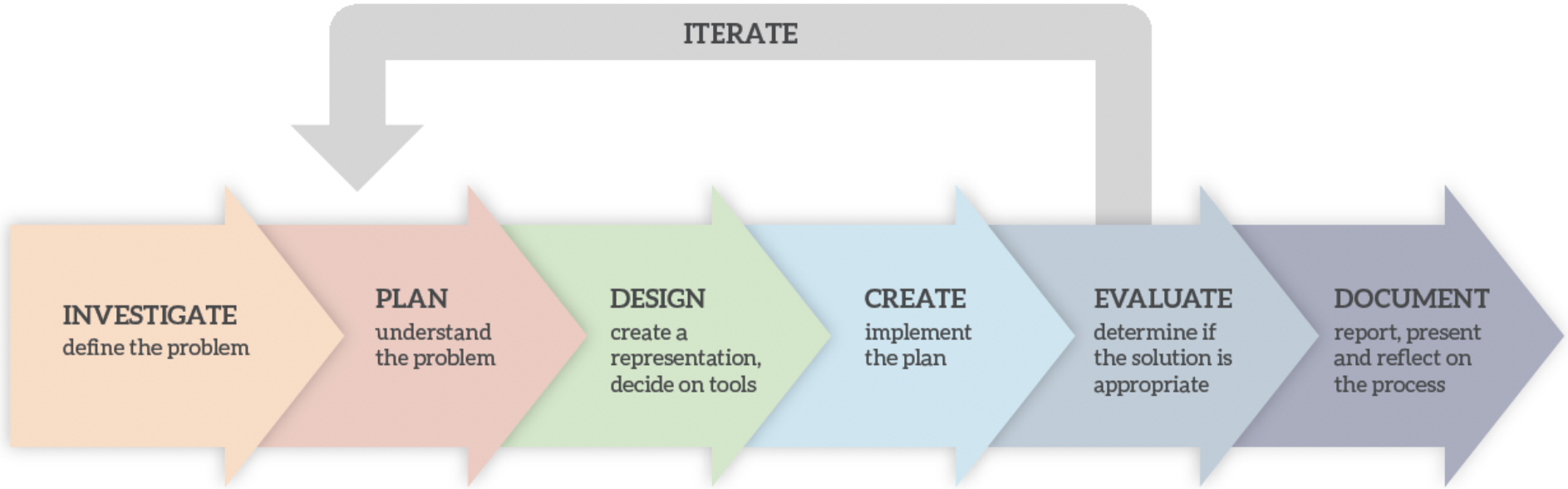
Activity based on Case Study

Read the Smithfield Software Company (SSC) case study and answer the questions which follow.

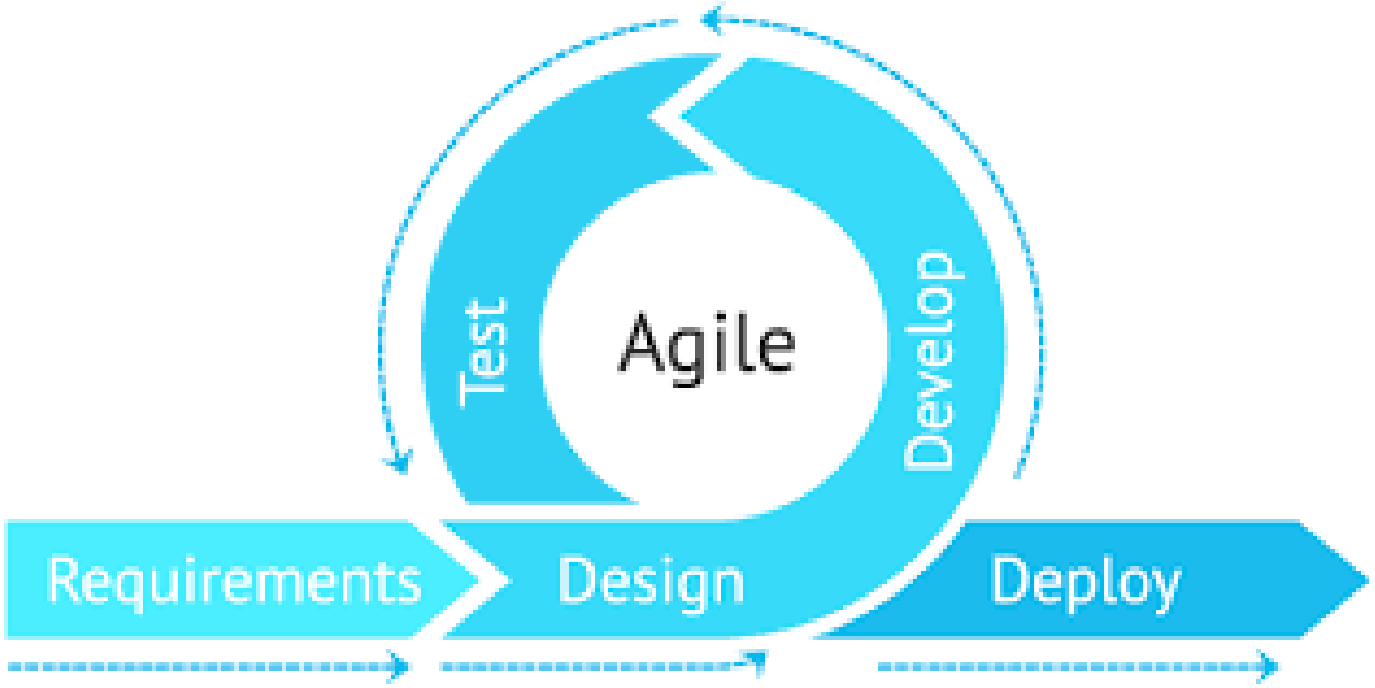




The Design Process

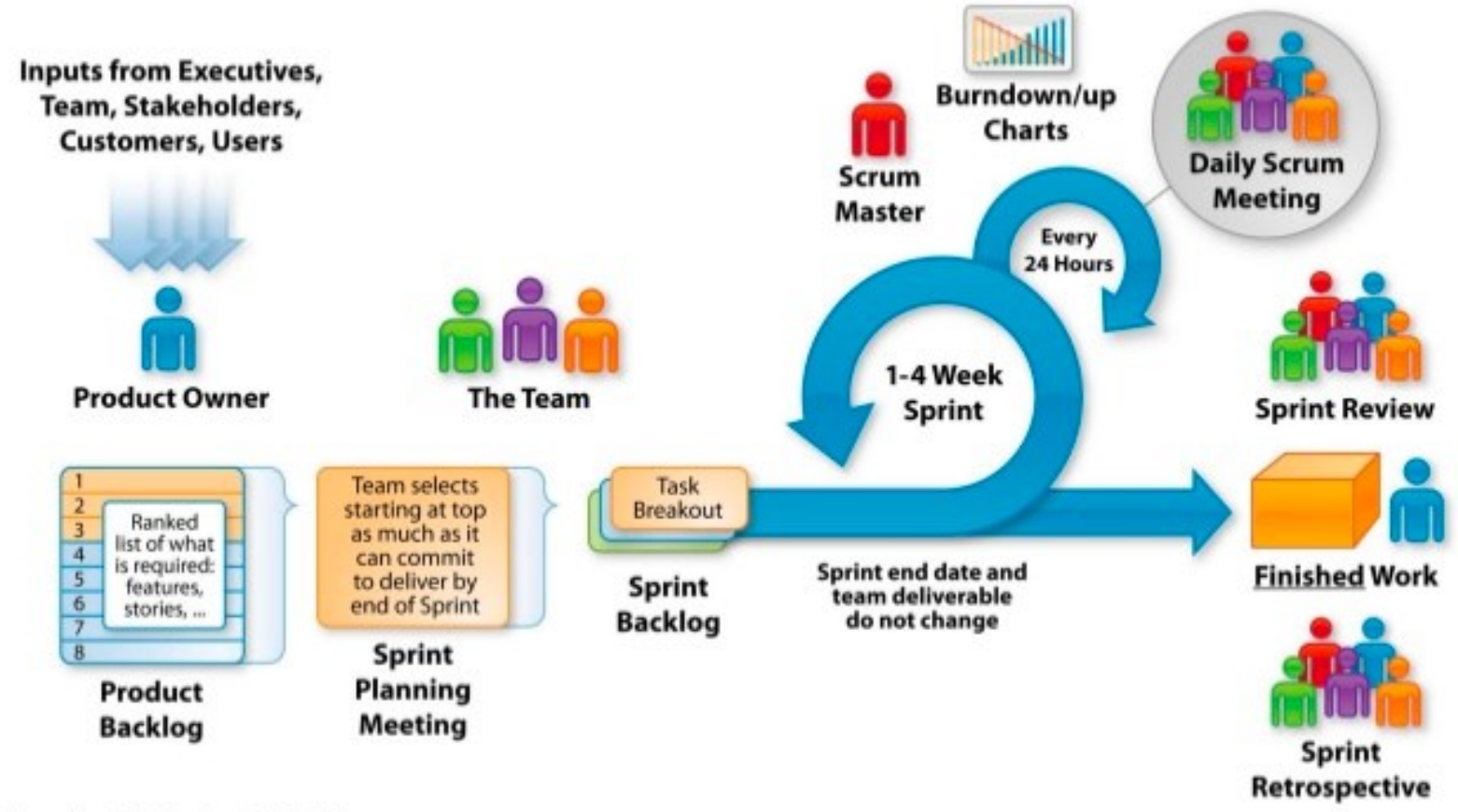
LCCS Specification: p11

Agile Software Development



Scrum

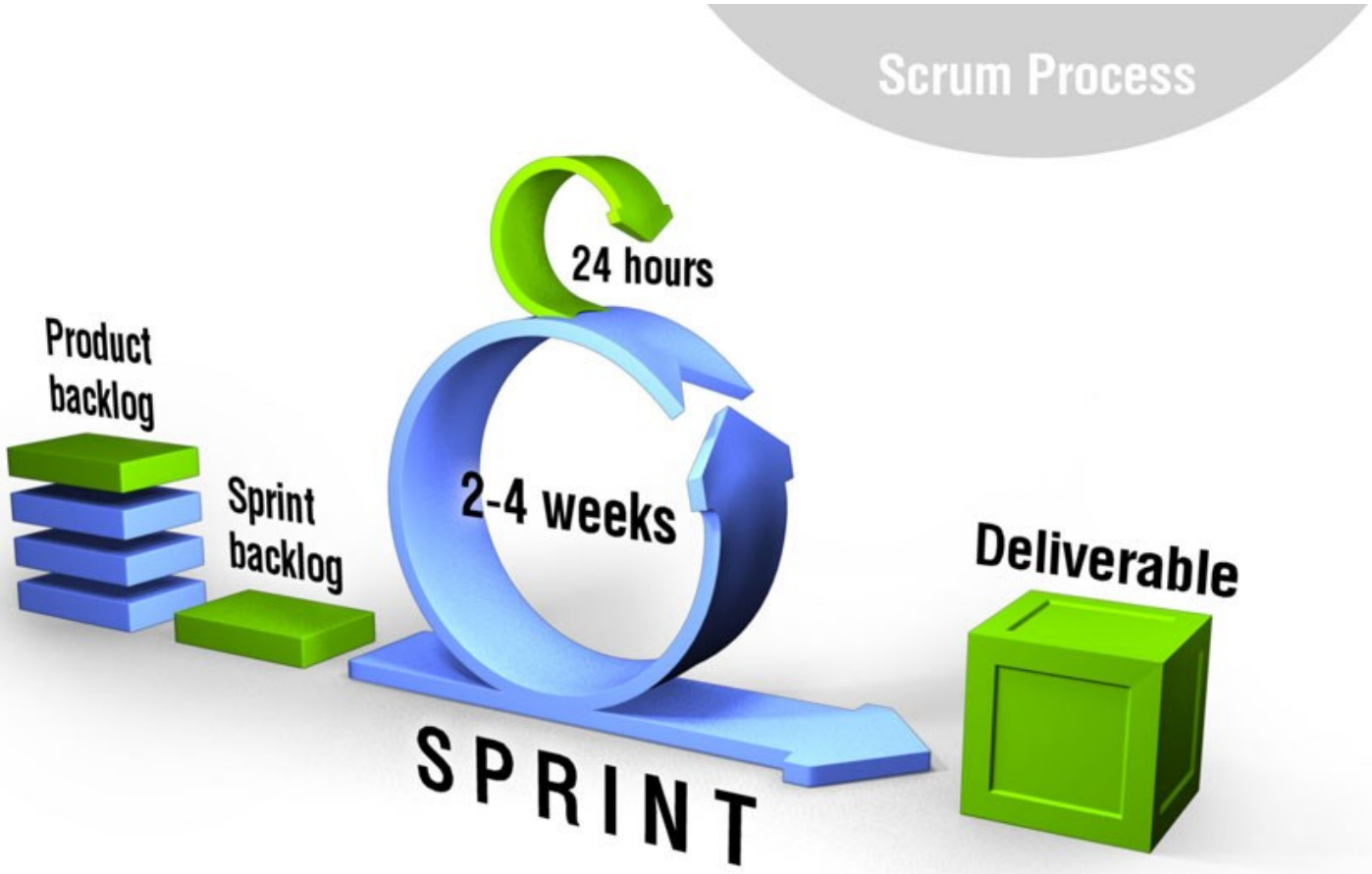
Agile: Scrum Framework



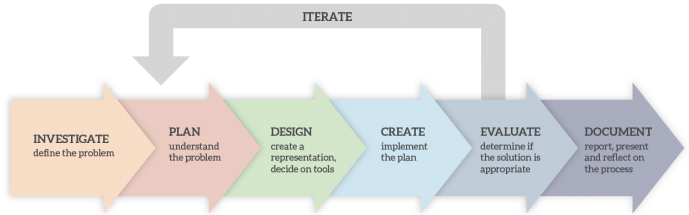
Source: Neon Rain Interactive – Agile For All

Scrum Process

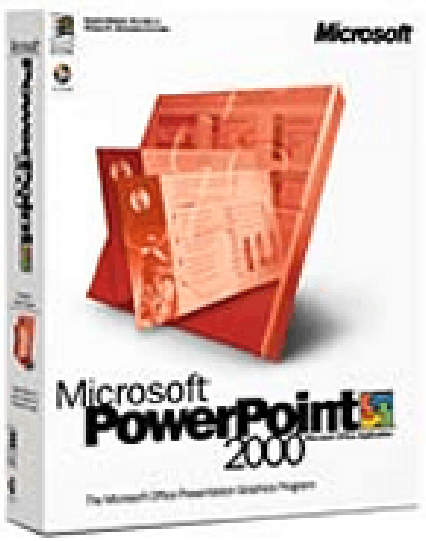
Scrum (Agile)

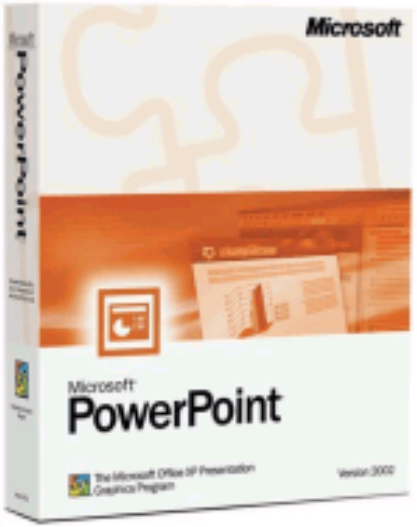


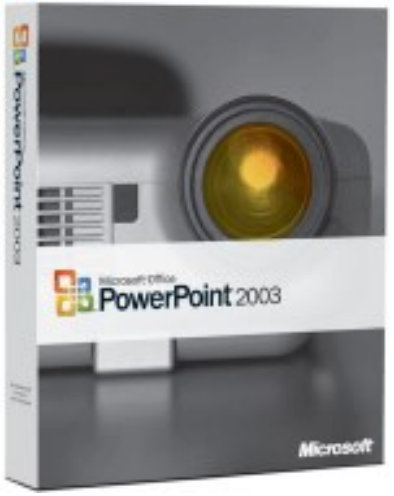
Waterfall Example – MS Powerpoint

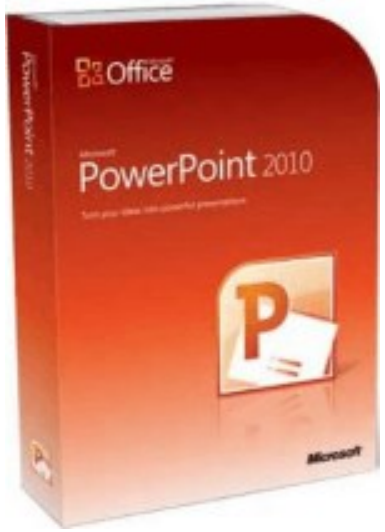


Versions of Microsoft *Powerpoint*

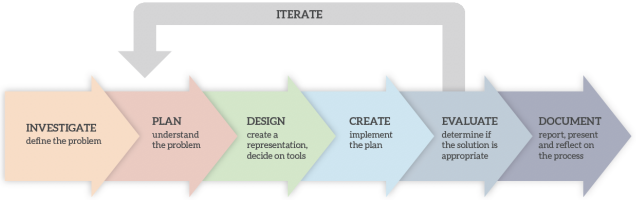


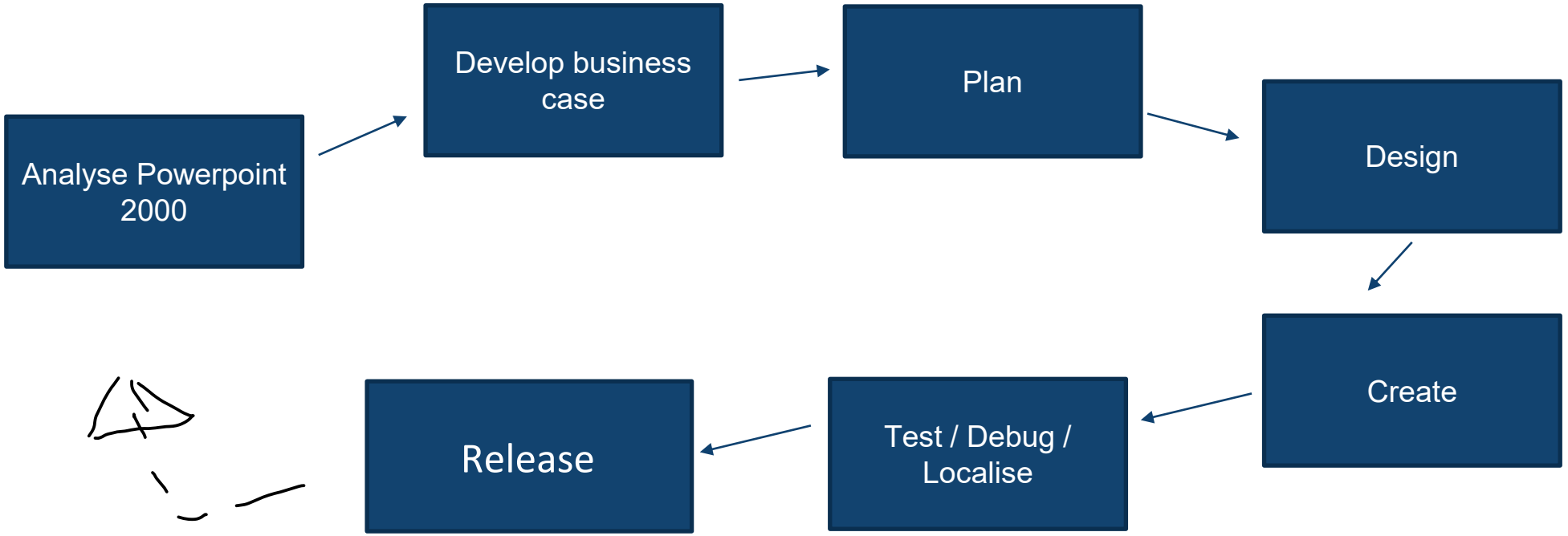






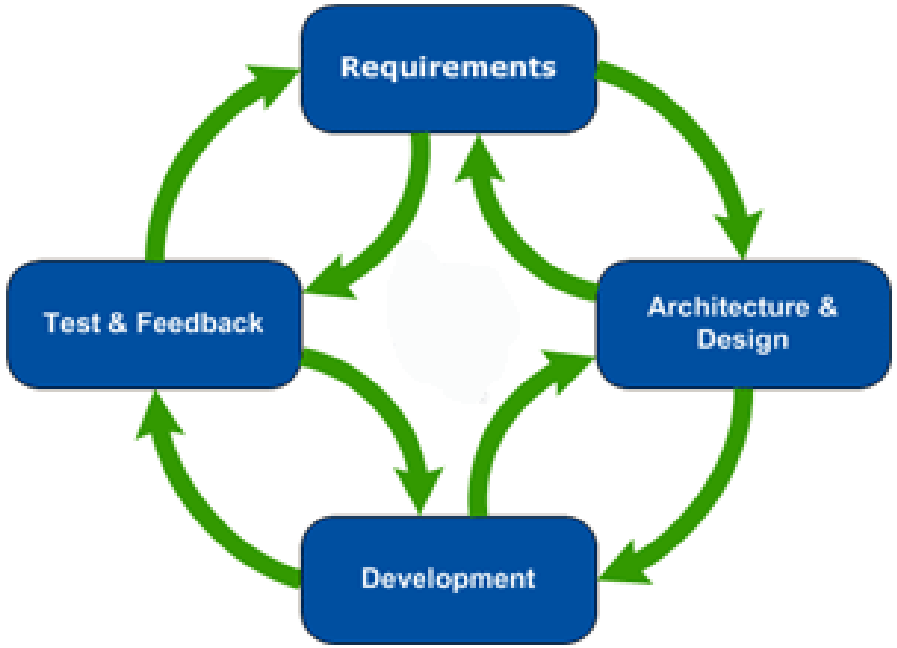
Microsoft *Powerpoint* 2002 – 2 years

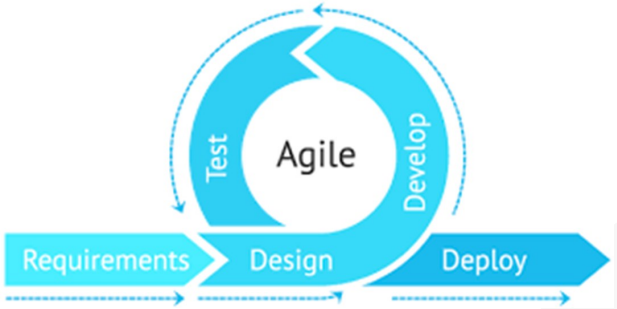




Agile Example – Moodle

Introducing Moodle in a College





Part Implementation – almost from Day one

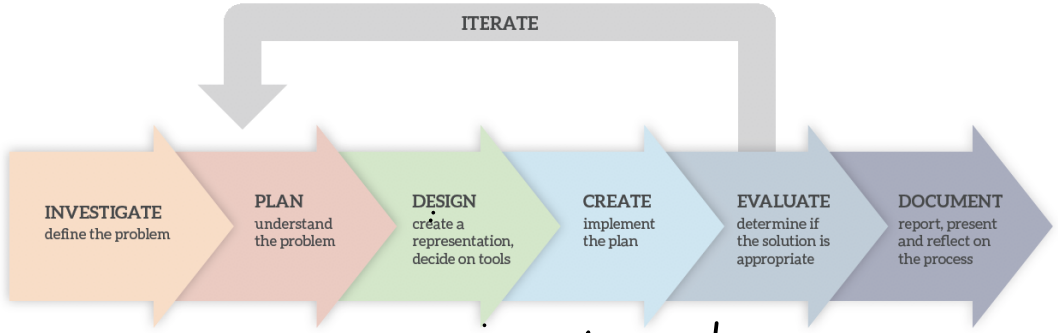
Regular Reprioritising (eg email function / database of student details / access course materials / submitting assignments…)

Numerous meetings which can change project direction

Retesting required at regular intervals

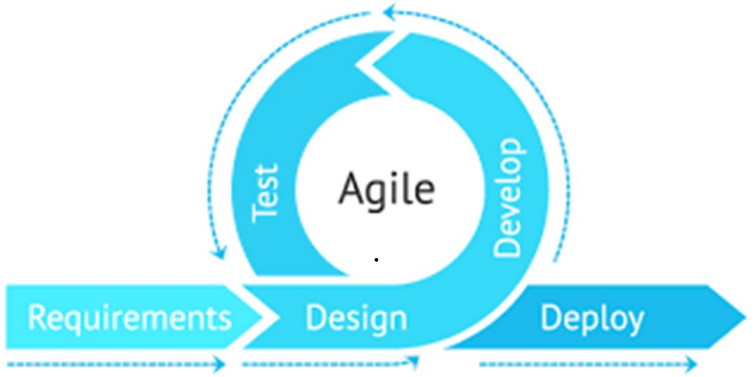
Agile and ALT3

Projects too small to analyse?
Always Waterfall / Traditional?
Could have traditional / agile characteristics?



traditional

Waterfall

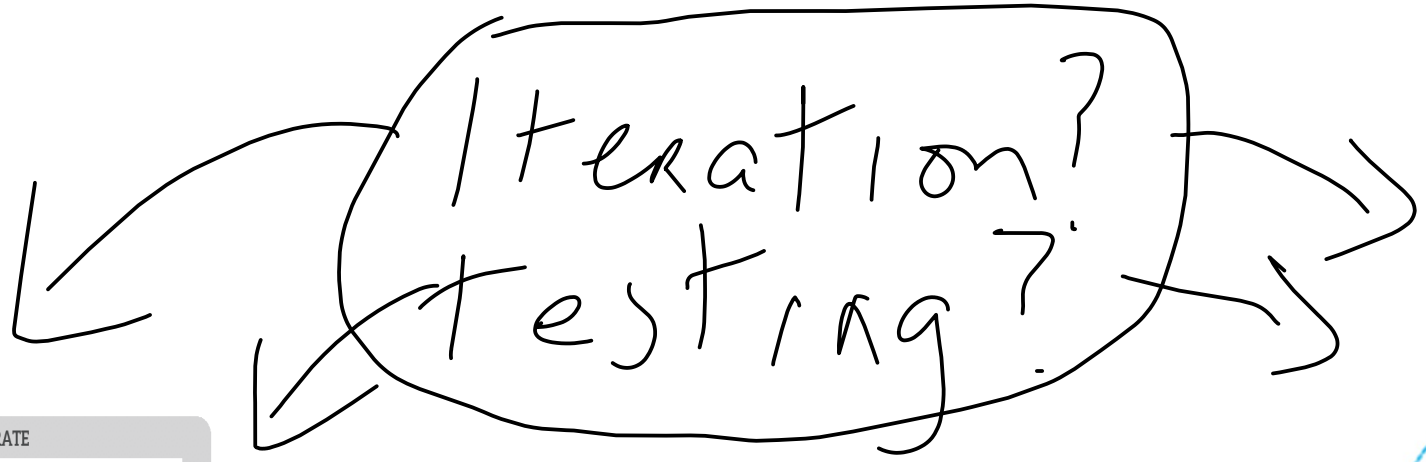


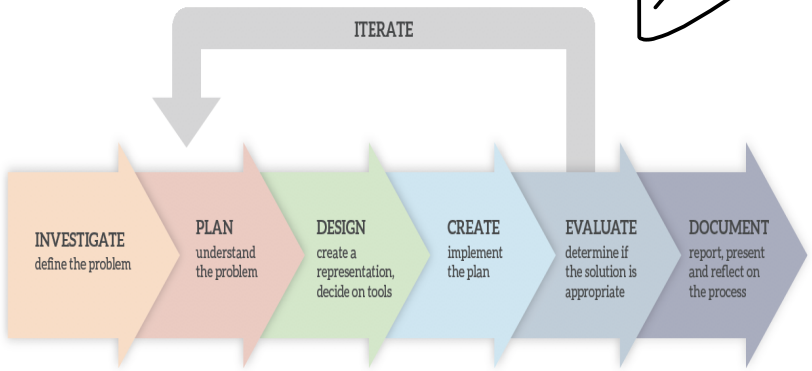
Agile

SCRUM,
XP

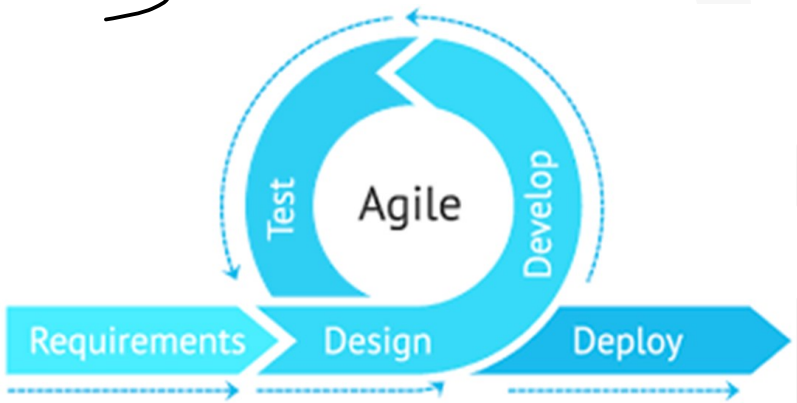
Waterfall vs Agile: Iteration / Testing

Traditional





Agile



Case Study: Smithfield Software Company (SSC)

SSC develop IT solutions for different companies. One of their specialities is the development of education management software (e.g. Moodle).

Read the Case Study document of the introduction and customisation of Moodle into two educational establishments.

Case Study – 1. Faculty of Dentistry

Week 1 / 2:
Meeting with College steering group made up of management, lecturers, tutors and students. SSC demonstrate Moodle and note the various needs, requests of the stakeholders.
SSC then plan the project, including milestones.
Week 3:
SSC meet to analyse the needs of the Dental faculty, and begin the design process.

Week 4 / 5 / 6:
SSC design the complete solution, code the solution with functional and non-functional testing carried out in-house.

Week 7 / 8 / 9:
The solution is implemented in the Dental Faculty's system and is tested extensively, including User Acceptance testing.

Week 10 / 11:
The solution is introduced on a pilot basis for first years for two weeks, with further testing and tweaking of the solution.

Week 12 / 13:
The solution is rolled out to all students.

Week 16:
A maintenance agreement is agreed between SSC and the Dental Faculty. An over performance review of the new system is planned six months after roll-out.

Case Study – 2. School of Architecture

Week 1/ 2:
SSC met separately with College management, lecturers, tutors and students, and listen to their individual needs and requests.
Frequent meetings between SSC and representatives of students and management were scheduled, so issues around the could be project could be raised and discussed.
At one of the early meetings, students and management requested that the passwords used for the new Moodle system be the same as those used for college systems. This was designed, coded by SSC, with functional testing and User Acceptance testing.

Week 3 / 4 / 5
SSC begin to analyse the needs of the School of Architecture, and the School would like to prioritise one aspect of the project – the School mentioned at a meeting that they require the setting-up of that part of Moodle system, which allows for on-line submission of assignments.
This on-line submission facility is designed / coded / tested in house at SSC and by end-users in the School.

Week 6 / 7 /8 /9:
SSC design and code other parts of the overall solution, and ask the School, at a meeting, if they require links to on-line repositories of Academic Journals. This is required by the School and it is designed, coded and tested as a priority.

Week 10 / 11 / 12:
The solution is implemented in the Dental Faculty's system and is tested extensively, including User Acceptance testing.

Week 13 / 14 / 15:
The solution is trialled by all students and SSC are made aware and deal with issues and suggestions on a daily basis for this time.,

Week 16++:
Weekly meeting continue to allow issues, ideas for the improvement to be discussed between SSC and the School, and acted upon.

Case Study Questions

- Which of the two implementations could be described as Waterfall Software Development and which as Agile Software Development?

- Draw a Development Cycle diagram for each of these.

- Evaluate both Methodologies and give advantages and disadvantages of each.

Discussion

Sections A+B

Assessment as Learning:
Research the higher-order questions

Activity – Exploring ‘challenging’ areas (AaL)

Choose an area from the specification which you may consider challenging and pose a question from the list of higher-order questions shown.

Teachers will choose questions from other groups, research and come back with their results.

Example:
Distinguish between Artificial Intelligence and Machine Learning.

Bloom – Questions

Bloom's Taxonomy of Critical Thinking - *Sample Questions*

1. Knowledge
- What happened after . . .?
- How many . . .?
- Define
- Who was it that . . .?
- Can you name the . . .?
- Describe what happened at . . .?
- Can you tell why . . .?
- Find the meaning of . . .?
- What is . . .?
- Which is true or false . . .?

2. Comprehension
- Can you write in your own words . . .?
- Can you write a brief outline . . .?
- What do you think might happen next . . .?
- Who do you think . . .?
- Can you distinguish between . . .?
- What differences exist between . . .?
- Can you provide an example of what you mean . . .?
- Can you provide a definition for . . .?

3. Application
- Do you know another instance where . . .?
- Could this have happened in . . .?
- Can you group by characteristics such as . . .?
- What factors would you change if . . .?
- Can you apply the method used to. . .?
- What questions would you ask of . . .?
- From the information given, can you develop a set of instructions about
- Would this information be useful if you had a . . .?

4. Analysis
- Which events could have happened . . .?
- How was this similar to . . .?
- What do you see as other possible outcomes?
- Why did . . . changes occur?
- Can you compare your . . . with that presented in . . .?
- Can you explain what must have happened when . . .?
- How is . . . similar to . . .?
- What are some of the problems of . . .?
- Can you distinguish between . . .?

6. Synthesis
- Can you design a . . . to . . .?
- Can you see a possible solution to . . .?
- Why don't you devise your own experiment to . . .?
- What would happen if . . .?
- How many ways can you . . .?
- Can you create new and unusual uses for . . .?
- Can you develop a proposal which would . . .?

6. Evaluation
- Is there a better solution to . . .?
- Can you defend your position about . . .?
- Do you think . . . is a good or a bad thing?
- How would you have handled . . .?
- What changes to . . . would you recommend?
- How could this be applied to.....?
- How would you feel if . . .?
- How effective is . . .?
- What do you think about . . .?

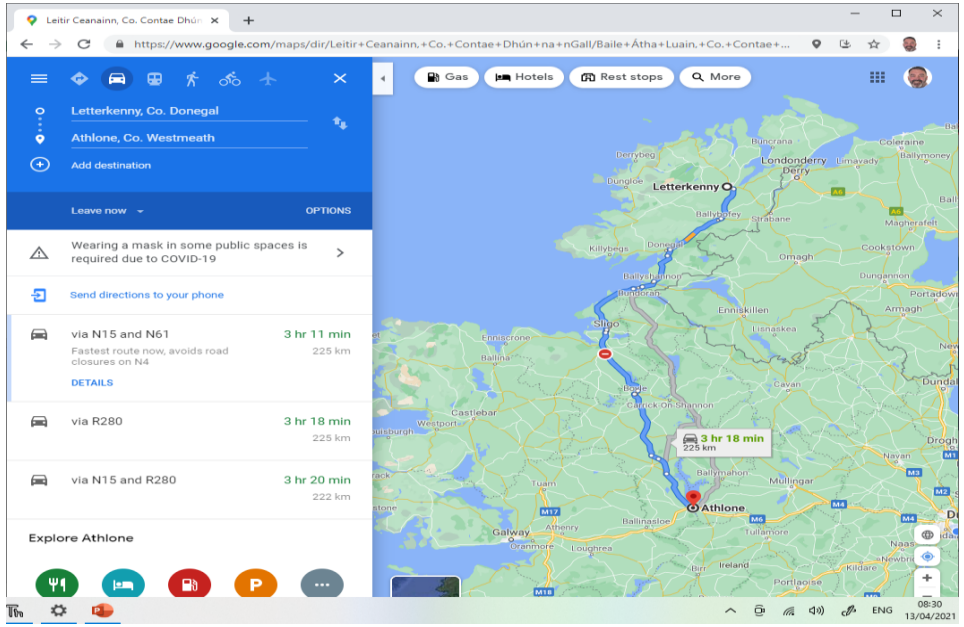
Activity - 2

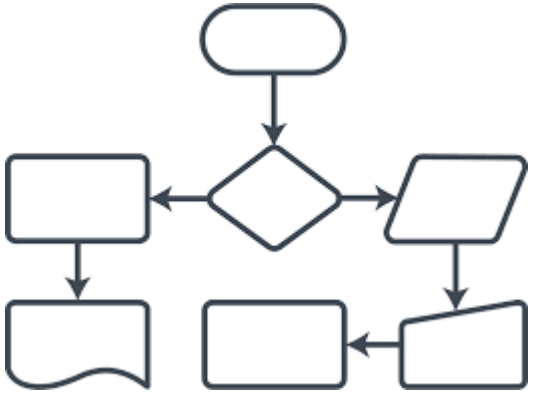
Other possible areas:

- Pillars of Computational Thinking
- Internet, WWW
- Heuristics
- Impact of Computing in Culture and Society
- Universal Design Principles
- Careers using Computer Technologies
- Software Testing
- Computer components and their function
- Communication Protocols
- ASCII and Unicode
- Analytics
- Modelling and Simulation

Physical Models

Schematic Models

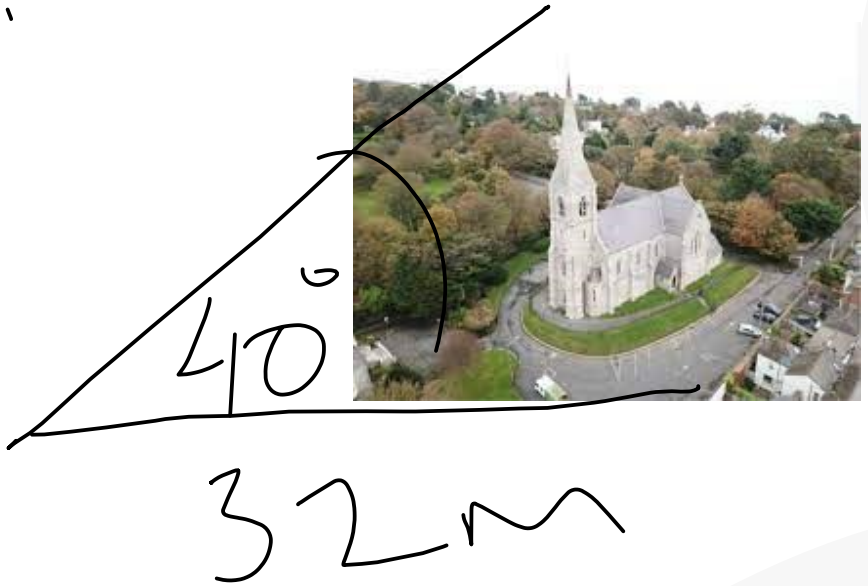




Mathematical Models

Mathematical language / algebra / leads to formulae, algorithms, coding…

Example:
Trigonometry – 2nd year class – get height of spire in Killiney Church



Model / Simulation Video

https://www.youtube.com/watch?v=M0iZ52kUOiQ

Assessing Models

George Box – “All Models are wrong but some are useful”

Features / Characteristics:

Future

Forecasting / Predicting

Messy

Real-life

Not easily solved by other means

Assessing Models - Mentimeter

Rough plan and analysis of models for 2 tax situations:

(Sisters Penny and Freda ask their brother, Seán, a LCCS student, to help them with their tax)

1. **Penny**: ***PAYE*** **– develop an outline model for tax due for a PAYE employee – for example a full-time teacher.**

2. **Freda: Develop a model for a *free-lance* musician, who does not have up-to-date accounts, and who teaches some classes, private tuition, does some gigs, especially in the summer.**

Analyse the 2 models and give an opinion as to which is the most useful for our purposes.

Picking Models that are useful

Do they have one or more of they following ?:

Messy

Real-life

Not easily solved otherwise

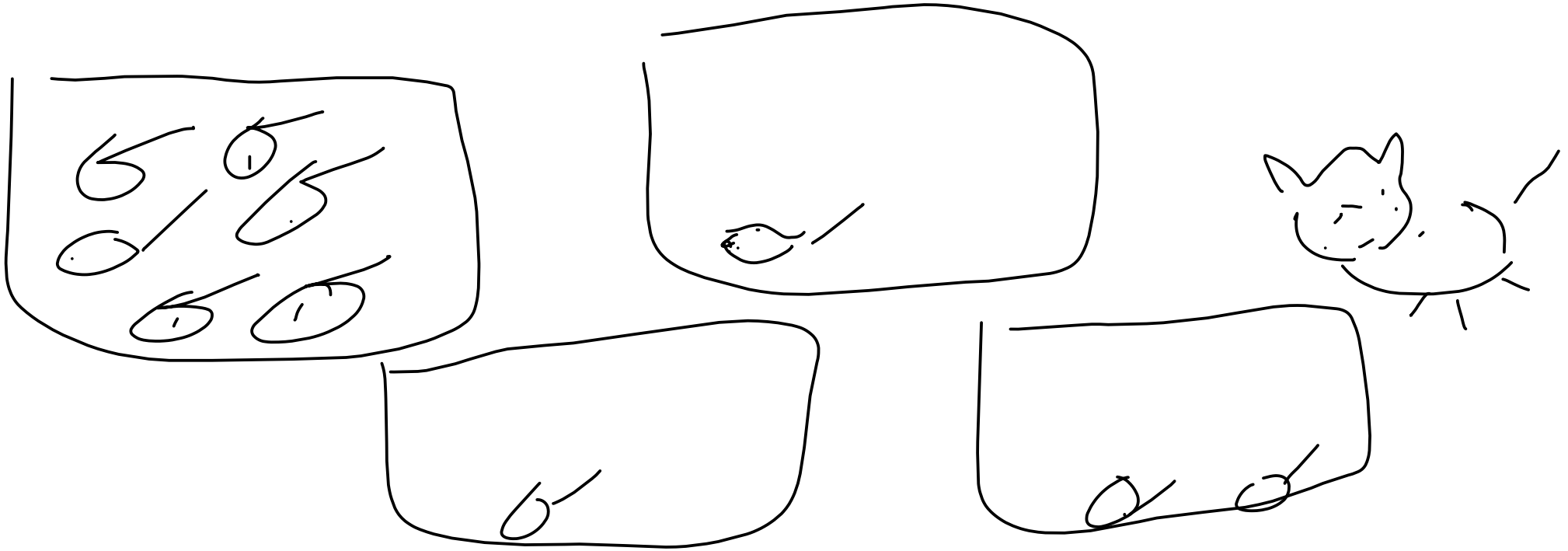
In the future – difficult to predict / forecast

Involve assumptions

Difficult to predict

Involve probabilities / random

Cat and Mice

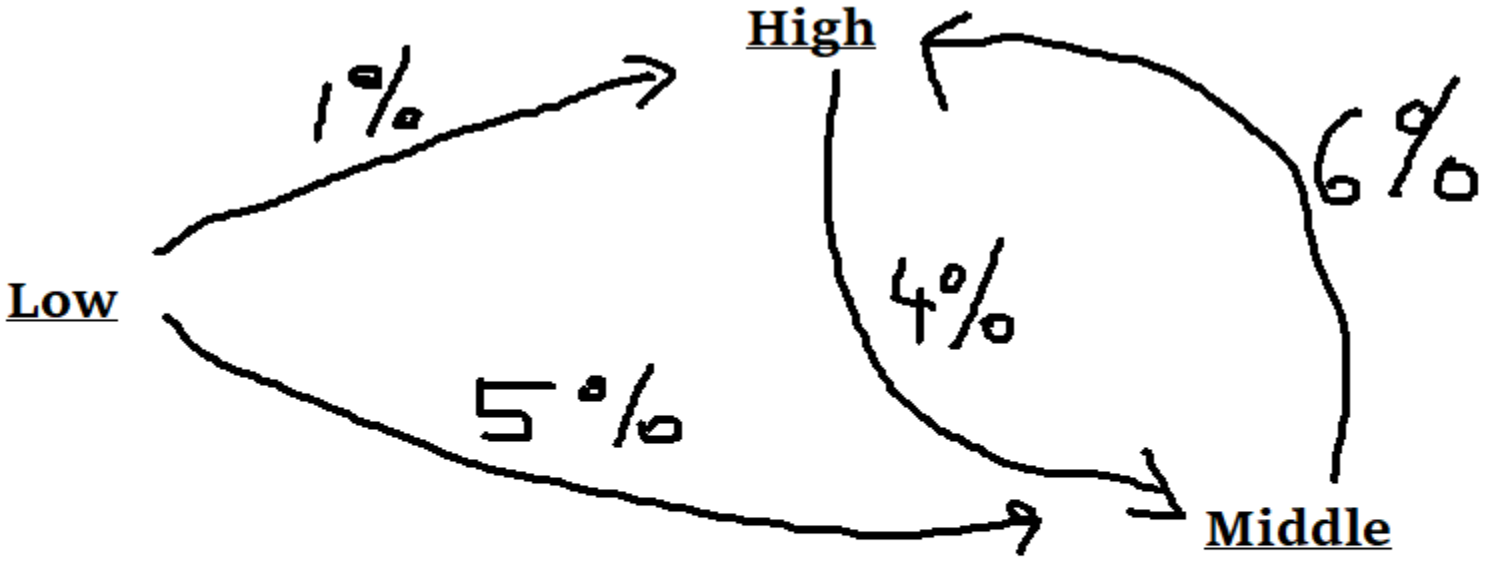


4 buildings in a factory plant – with a problem with mice.
Various different features of the model: Some rooms allow extra mice in. Cat is more efficient at catching mice in some of the rooms rather than others. Cat is randomly placed in one of the rooms for 2 hours at a time. Some of the numbers change by %, by addition, or through a random function.

The code is here – it runs 3 simulations: https://docs.google.com/document/d/1SdcQMoVCu7dL2FQrLC7iisKn-c6_BCDvAhZk00StK6M/edit?usp=sharing

Social Mobility

What happens in FairlyRich Ville, Ca?



Start - 2,000 Middle; 1,200 High; 700 Low

When Low goes under 600, it is increased by 250

Discussion

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Department of Education and Skills