LESSON 92

Overview of ALT 3: Introduction to Modelling and Simulation

80 minutes (2 periods) | Applied Learning Tasks (ALTs) | Outcome 3.8 | Outcome 3.9 | Outcome 3.10 | Outcome 1.20 | Outcome 1.23 | Outcome 1.11 | Outcome 1.12

WHAT THIS LESSON DOES

In this lesson, you'll explore the essentials of modelling and simulation. Learn about the task requirements, review key skills from past modules, brainstorm creative ideas for models, form collaborative teams, and reflect on the societal impacts of simulations.

CURRICULUM OUTCOMES

Outcome	What the specification asks for
3.8	develop a model that will allow different scenarios to be tested
3.9	analyse and interpret the outcome of simulations both before and after modifications have been made
3.10	explain the benefits of using agent-based modelling and how it can be used to demonstrate emergent behaviours
1.20	collaborate and assign roles and responsibilities within a team to tackle a computing task
1.23	reflect and communicate on the design and development process
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

WHAT STUDENTS SHOULD BE ABLE TO DO

- Understand the fundamental concepts and purposes of modelling and simulation across various disciplines.
- Apply prior computational skills to design and develop simulation artefacts for real-world scenarios.
- Analyse simulation outcomes to identify emergent behaviours and test scenario modifications.
- Collaborate effectively in teams to brainstorm, plan, and execute interdisciplinary modelling projects.
- Reflect on the societal impacts and ethical considerations of modelling and simulation applications.

BEFORE THE LESSON

- This is a planning and orientation lesson, so no interpreter or starter code is needed today. Have a way for teams to record their plan, whether shared document or the platform.
- Read the full ALT 3 requirements yourself first so you can answer questions about testable models, before and after analysis, and agent-based behaviour with confidence.
- Have a fallback for team formation ready in case numbers are awkward, so no student is left without a group.

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HOW THE LESSON RUNS

Introduction
Reviewing Key Concepts
Understanding the Task Requirements
Brainstorming Ideas
Forming Your Team
Planning Your Project
Reflection Time

TEACHING MOVES

- 1. Introduction. Anchor the abstract with one concrete example the whole class can picture: traffic congestion emerging from individual cars, or a predator-prey population swing. Make clear ALT 3 is a team task, not the individual Coursework Project.
- 2. Reviewing Key Concepts. Frame this as reassurance, not new learning. Ask who can already write a loop or use a list, then point out that a simulation is mostly those tools repeated over many steps.
- 3. Understanding the Task Requirements. Slow down on agent-based modelling. Give the plain definition: many simple agents following simple rules produce behaviour nobody programmed directly. That emergent behaviour is what ALT 3 wants demonstrated.
- 4. Brainstorming Ideas. Push teams toward scenarios that are testable. Ask of every idea: what one variable could you change, and would you see a different outcome? Reject ideas where nothing can be modified.
- 5. Forming Your Team. Steer teams toward complementary strengths, not just friendships. Insist each team names who owns the algorithm, who owns visualisation, and who owns writing up analysis before they leave this step.
- 6. Planning Your Project. Circulate and read each plan for one thing: does it state a clear scenario and a specific modification to test? A plan without a before and after comparison will stall later.
- 7. Reflection Time. Keep this spoken and open. Draw out the ethical edge: what happens when people trust a model that is wrong, as in flawed disaster prediction. Do not ask for written answers.

WHAT TO WATCH FOR

- Students think a simulation just needs to produce a nice-looking output to be finished. Insist the point is comparison. A simulation is only useful if you can change something and interpret how the outcome differs. Have teams state their test up front.
- Confusing this team-based Applied Learning Task with the individual, externally assessed Coursework Project. State plainly that ALT 3 is collaborative and formative, done in class, and is not the 30% project. The two are separate pieces of work.
- Believing emergent behaviour must be explicitly programmed in. Use the traffic example: no line of code says congestion, yet it appears from many cars each following simple rules. Emergence is a result, not an instruction.

DIFFERENTIATION

- Emerging: For a student stuck on choosing a scenario, offer the two worked examples from the lesson, traffic flow or predator-prey, and let them adapt one rather than invent from scratch. Pair them with a team where a role, such as visualisation or write-up, gives a clear entry point.
- Developing: Have them explain their chosen scenario back to you, naming the agents and the one variable they will change, before they commit it to the plan. Ask them to sketch a flowchart of the iterative steps, connecting back to the systematic problem-solving skills reviewed earlier.
- Proficient: Ask them to justify why an agent-based approach suits their scenario better than a single equation, which is the Higher Level treatment of the same idea. Have them identify what evidence of before and after analysis they will capture, so it is ready to cite in the ALT.