AI in Education – Track A

Empowering Students to Model Biology

Demystifying modelling in biology by removing the coding barrier

Disclaimer: Some contents in this poster were generated or refined with the assistance of GenAI tools.

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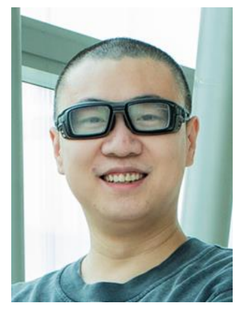


Takeaway for Educators

GenAI can democratize access to complex concepts like computational modelling, but its power is maximized when students are taught to challenge, test, and interpret GenAI outputs, not just use them.

Teaching Context & Challenge

LSM3236 – Patten Formation & Self-organisation in Biology

Modelling is a core skill in quantitative biology, but many CHS students **lack the math and coding background** to engage with it meaningfully. In traditional courses, these prerequisites often **exclude or discourage** capable students, leading to high failure rates even in otherwise popular classes in many universities. We set to **remove coding barrier** to focus on **model interpretation** and **critical thinking** instead of coding proficiency.

Our GenAI-Enabled Solution

ChatGPT for coding + Google Colab for simulation

We leveraged on **GenAI tools and free, cloud-based coding environment** to generate simulation-ready code for biological models, enabling students to run and explore models without advanced programming skills. This helped focus student learning and classroom time for **conceptual discussion**, **interpretation**, and **model critique**.

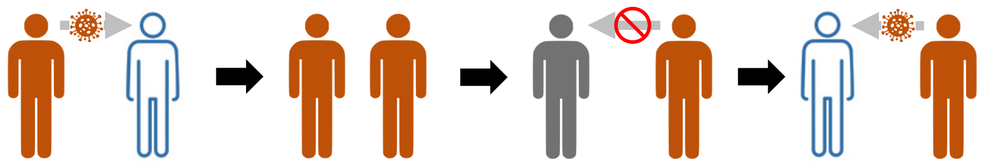
Implementation Workflow

Preparation	Lecture		In-class guided practice			After class
Pre-Class Design	**Teach Concept**	**In-Class AI Demo**	**Ethics & Pitfalls**	**Guided Practice**	**Presentation & Discussion**	**GenAI Assignment**
Test questions that CANNOT be answered by GenAI outright	Introduce theory/concept in lecture w/o simulations	Show in lecture AI-generated simulations to illustrate value	Discuss responsible use and common errors	Students generate, troubleshoot, and refine code	share results, compare outputs, guided critique	Apply concepts in graded, AI-assisted problem sets.

Case study (2024-2025)

The compartmental model of epidemiology

We set out the problem set to model a flu-like disease spread, where recovered patients progressively lose their immunity.



Success and reflection

In 2024, ChatGPT-generated code for the epidemiological model **ran correctly** but included an **error in the analytical solution** (wrong equilibrium and nullcline). Students were tasked to identify the mistake using knowledge from lecture, transforming an AI error into a **learning opportunity**.

Some students managed at this troubleshooting task, demonstrating not only **mastery** of the course concepts but also the **critical thinking** skills needed to verify and improve GenAI-generated outputs.

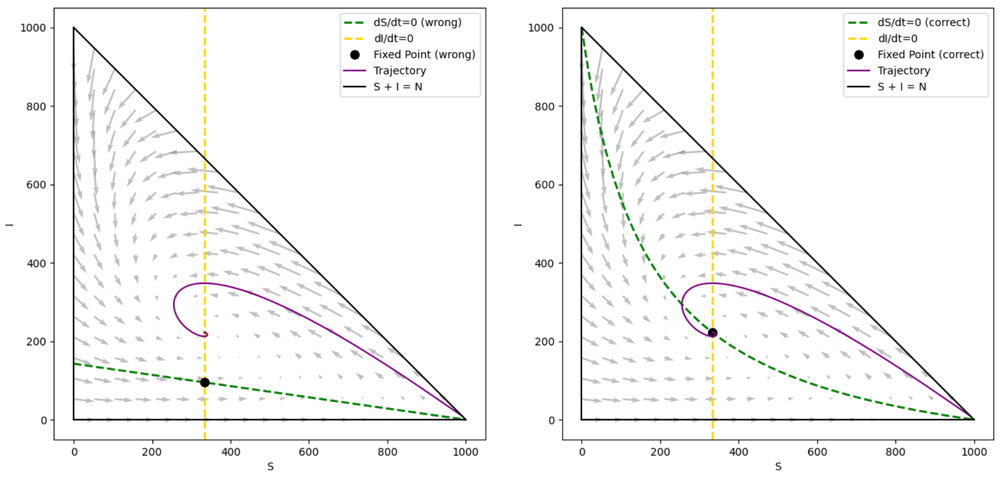
Caveat and opportunity

In 2025, the same model was generated **correctly from a one-sentence prompt**, showing the growing accuracy of GenAI. **Key insight:** as AI gets better, teaching should shift from code generation to **model validation, assumption testing, and model interpretation**.

Reflections & Key Insights

- Students adopted GenAI faster than expected.
- Many initially failed to get correct results without applying lecture concepts, reinforcing the **value of foundational knowledge**.
- Discovering AI's limitations increased engage-ment and confidence in problem-solving.
- One student developed a **UTOP peer-learning project** using their GenAI-assisted notes.

Wrong model by GenAI (2024) **Correct model by GenAI (2025)**



(Left) Simulation runs but **analysis error** misplaces the fixed point (black dot) and nullcline (green dotted line).
(Right) Correct analysis aligns equilibrium with trajectories. Students used the discrepancy to practice **verifying AI outputs** and deepen model understanding.