

AI and NLP for Secondary Education Teachers

Equipping Educators to Integrate Responsible AI into the Classroom

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This professional development course is designed to equip high school educators with the foundational knowledge, practical tools, and ethical framework needed to responsibly integrate artificial intelligence (AI), especially natural language processing (NLP) tools like Claude, into their teaching practice.

The course bridges the gap between emerging AI technologies and classroom application, empowering educators to confidently leverage AI to support instruction, enhance student engagement, and model responsible digital literacy. Participants will explore how AI systems like large language models work, how they can be safely used for educational purposes, and how to design assignments that promote critical thinking rather than shortcut learning.

Educators will leave this course with a solid understanding of AI's capabilities and limitations, along with ready-to-use strategies for introducing AI tools to students in ways that are creative, pedagogically sound, and ethically responsible.

Learning Goals

By the end of this course, educators will be able to:

- **Define** key AI concepts, including AI, machine learning, NLP, and LLMs, and explain their relevance in the classroom.
- **Demonstrate** effective use of large language models like Claude by writing, refining, and evaluating prompts for tasks such as lesson planning and content generation.
- **Design** assignments that integrate Claude to support student inquiry, creativity, and critical thinking while maintaining academic integrity.
- **Identify** ethical risks of AI use in education, such as bias, misinformation, and academic dishonesty, and develop strategies to guide students in using AI responsibly.
- **Support** students in developing AI literacy and digital citizenship skills, preparing them to think critically about AI tools and their role in a technology-driven world.

Course Structure

Module	Title	Key Focus
1	Foundations of AI and NLP	Understand what AI is, how NLP works, and master key terminology for a classroom context.
2	LLMs and the Art of Prompting	Explore how large language models like Claude function and apply effective prompting strategies for educational tasks.
3	Designing Student-Centered AI Assignments	Create assignments that integrate Claude to promote student inquiry, creativity, and engagement.
4	Teaching Ethical AI Use in the Classroom	Guide students in recognizing bias, limitations, and ethical challenges of AI tools.
5	Empowering Future-Ready Learners	Support students in building AI literacy and digital citizenship for a changing world.

Module 1: Foundations of AI and NLP

This module introduces secondary educators to the foundational concepts of AI and NLP with an emphasis on educational relevance. Participants will learn how AI systems like Claude are built and how they generate text using large language models (LLMs). The session focuses on key terminology, clarifying common misconceptions, and equipping educators with the knowledge and language needed to confidently explain AI concepts to students. By the end of this module, educators will understand how AI fits into a modern classroom and how to begin integrating it responsibly and effectively.

Learning Objectives

By the end of this module, educators will be able to:

- Define **artificial intelligence, machine learning, natural language processing (NLP),** and **large language models (LLMs)** in their own words.
- Explain how LLMs are trained using large-scale datasets and generate responses based on language prediction, not comprehension.
- Identify common misconceptions about AI and clarify them using accurate, age-appropriate language.
- Describe the relevance of AI tools like Claude within instructional planning and student engagement.
- Reflect on when and how to introduce foundational AI concepts to high school students in different subject areas.

Key Concepts

- **Artificial Intelligence (AI):** Technology designed to simulate aspects of human intelligence, such as reasoning, decision-making, learning, or language use.
- **Machine Learning (ML):** A subset of AI that enables systems to learn from data and improve performance on tasks without being explicitly programmed.
- **Natural Language Processing (NLP):** A branch of AI focused on enabling computers to understand, interpret, and generate human language.¹
- **Large Language Models (LLMs):** Advanced AI systems trained on massive text datasets that can generate human-like responses by predicting the most likely next word or phrase.
- **Generative AI:** AI systems that can create new content, such as text, images, code, or music, based on patterns learned from existing data.
- **Next-Word Prediction:** The process LLMs use to generate text by estimating the most likely next word based on input and prior training data.
- **Attention (in AI):** A mechanism that allows LLMs to focus on the most relevant parts of the input when generating a response

Module 1: Foundations of AI and NLP Slides

Course: AI and NLP for Secondary Education Teachers

- **Duration:** ~90 minutes
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Slide 1: Welcome & Module Overview

- **Content:**
 - **Title:** Foundations of AI and NLP for Educators
 - "Today, we'll unpack key AI concepts, clarify myths, and explore classroom strategies."
 - **Timing:** 5 minutes
 - **Visual Support:** An illustration showing AI interacting with education, such as a robot next to a teacher with a banner.
 - **Activity:** A quick confidence poll asking, "Rate your comfort teaching AI on a scale of 1–5."
 - **Bloom's Level:** Remember + Understand
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Slide 2: Module Objectives

- **Content:**
 - Define **AI**, **ML**, **NLP**, and **LLMs** in your own words.
 - Explain how LLMs are trained and generate responses.
 - Identify and clarify common misconceptions about AI.
 - Describe the relevance of AI tools in instructional planning.
 - Reflect on how to introduce AI concepts to students.
 - **Timing:** 3 minutes
 - **Visual Support:** A clean checklist with five icons representing the objectives (e.g., a robot for AI, a book for LLMs, a magnifying glass for misconceptions, a lesson plan for planning, and a reflection bubble for reflection).
 - **Activity:** A Pair-Share activity asking participants, "Which objective are you most confident in? Least confident?"
 - **Bloom's Level:** Understand
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Slide 3: Why These Objectives Matter

- **Content:**
 - AI is shaping classrooms and future careers.
 - Students need AI literacy to think critically.

- Teachers are guides, not tech experts.
 - **Timing:** 5 minutes
 - **Visual Support:** An AI evolution timeline showing the progression from early computing to today and the future.
 - **Activity:** A Think-Pair-Share activity asking, "Where are your students already encountering AI?"
 - **Bloom's Level:** Analyze
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Slide 4: AI & ML Basics

- **Content:**
 - **AI:** Simulates reasoning, learning, and problem-solving.
 - **ML:** A subset of AI where systems learn patterns from data.
 - **Timing:** 5 minutes
 - **Visual Support:** A nested-circle diagram showing AI as the largest circle, containing ML, with examples like chatbots and spam filters listed within the ML circle.
 - **Activity:** Invite participants to define **AI** and **ML** in their own words, then refine the definitions as a group.
 - **Bloom's Level:** Remember + Understand
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Slide 5: ML in Action – Spam Filter

- **Content:**
 - Spam filters are powered by machine learning models trained on large datasets of labeled emails (spam vs. not spam). Instead of relying on fixed rules, these models learn to detect subtle patterns—like suspicious keywords, sender behavior, and message structure—to make predictions.
 - **Timing:** 5 minutes
 - **Visual Support:** A diagram showing the email flow: incoming email → ML model evaluates → inbox or spam folder. Highlight "learning from data" vs. a "rules-based" approach.
 - **Activity:** In pairs or small groups, brainstorm where else ML shows up in daily life. Encourage participants to go beyond obvious examples (e.g., Netflix recommendations, fraud alerts, personalized playlists) and consider less visible uses (e.g., predictive text, photo tagging, smart thermostats).
 - **Bloom's Level:** Understand + Analyze
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Slide 6: NLP & LLMs

- **Content:**
 - **NLP:** Enables computers to interpret and generate language.
 - **LLMs:** Predictive text generators trained on massive datasets.
 - **Timing:** 5 minutes
 - **Visual Support:** An evolution timeline showing the progression from simple NLP tools to voice assistants and, finally, to LLMs.
 - **Activity:** Rewrite the definition of **NLP** for a high schooler.
 - **Bloom's Level:** Understand + Apply
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Slide 7: Generative AI

- **Content:** Creates text, music, code, and visuals.
 - **Timing:** 5 minutes
 - **Visual Support:** A three-panel graphic with icons representing text, a paintbrush, a music note, and code.
 - **Activity:** A Gallery Walk where groups classify different AI-generated outputs.
 - **Bloom's Level:** Analyze
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Slide 8: LLM Training Pipeline

- **Content:** Data → Tokenization → Training → Predictions → Output.
 - **Timing:** 7 minutes
 - **Visual Support:** A pipeline infographic with icons for each stage.
 - **Activity:** In small groups, create a kid-friendly analogy for the training pipeline (e.g., a recipe book or autocomplete).
 - **Bloom's Level:** Apply + Analyze
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Slide 9: Next-Word Prediction & Tokens

- **Content:** Models tokenize text and choose the next token based on probability.
 - **Timing:** 5 minutes
 - **Visual Support:** An example of tokenization: "The cat sat..." with probability bars for the next word.
 - **Activity:** Predict the next word in a sentence before revealing the model's choice.
 - **Bloom's Level:** Apply
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Slide 10: Attention Mechanism

- **Content:** The Attention mechanism highlights key words for better context.
- **Timing:** 5 minutes
- **Visual Support:** A heatmap highlighting words like "teacher" and "students" in a sentence to show where the model's "attention" is focused.
- **Activity:** Analogy brainstorm: How does "attention" in AI compare to reading comprehension strategies?
- **Bloom's Level:** Analyze

Slide 11: Misconceptions About AI (Interactive)

Misconception	Clarification
AI thinks like humans.	No consciousness; it's based on patterns.
AI is always right.	It's prone to bias and hallucination.
AI is creative.	It recombines patterns, it does not create true novelty.
AI replaces jobs.	It augments roles and shifts them.

- **Timing:** 10 minutes
- **Visual Support:** Icons for each misconception (e.g., a brain for "thinking," a warning sign for "right," a paintbrush for "creative," and a briefcase for "jobs").
- **Activity:** A carousel activity where groups rotate through each misconception, writing how students might believe it, and then clarifying it.
- **Bloom's Level:** Analyze + Evaluate

Slide 12: AI in the Classroom – Educator Tools

Use Case	Example
Lesson Planning	Generate hooks, outlines
Differentiation	Adjust reading levels

Assessment	Create rubrics/quizzes
Feedback	Write comments

- **Timing:** 5 minutes
 - **Visual Support:** A graphic of a teacher at a laptop with arrows pointing to different educational tools.
 - **Activity:** Brainstorm one lesson to enhance with AI.
 - **Bloom's Level:** Apply
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Slide 13: AI in the Classroom – Student Uses

Use Case	Example
Research	Summarize texts
Creativity	Brainstorm essays
Study Skills	Create flashcards/quizzes

- **Timing:** 5 minutes
 - **Visual Support:** A student silhouette with icons representing books, creativity, and study skills.
 - **Activity:** Share one subject-specific AI activity idea.
 - **Bloom's Level:** Apply + Create
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Slide 14: Introducing AI to Students

- **Content:**
 - **Practical ideas by subject:**
 - **English:** Writing prompts, citation.
 - **History:** Bias analysis.
 - **Science:** Research tools.
- **Timing:** 5 minutes
- **Visual Support:** Subject icons around a central AI hub.
- **Activity:** A roundtable discussion on how to explain AI in a specific subject in two minutes.
- **Bloom's Level:** Apply + Evaluate

Slide 15: Sample Classroom Activity

- **Content:** Analyze an AI-generated article for bias or inaccuracy; reveal the source.
 - **Timing:** 10 minutes
 - **Visual Support:** A screenshot of a fake article with highlighted sections.
 - **Activity:** Small group analysis and a discussion on the implications.
 - **Bloom's Level:** Analyze + Evaluate
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Slide 16: Call to Action Exit Ticket

- **Content:**
 - Explore one AI concept.
 - Try one AI tool this week.
 - Plan one AI activity.
- **Timing:** 3 minutes
- **Visual Support:** A three-step arrow graphic.
- **Activity:** Write one concrete step for your classroom and share it with your table group.
- **Bloom's Level:** Create

Materials Needed

- **Slide deck:** Visuals for AI concepts and diagrams explaining how LLMs are trained.
- **Internet-enabled device:** Necessary for each participant to access and use an LLM.
- **Glossary handout:** A physical or digital handout with key terms and definitions.
- **Worksheet:** A printed or digital worksheet for participants to record their prompts, responses, and reflections.
- **Optional:** A diagram of a transformer or attention mechanism for deeper discussion

Optional Extensions / Homework

- **Reading:** A short article like "How Large Language Models Work (Without the Jargon)."
- **Prompt Revision Task:** Participants take one of the LLM's explanations and refine it, using their subject-specific knowledge and age-appropriate scaffolding to improve it for student use.

Module 1 Recommended Readings

Core Readings (Start Here)

Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I. (2017). *Attention is all you need. Advances in Neural Information Processing Systems*.
<https://arxiv.org/abs/1706.03762>

Introduces the Transformer architecture that powers large language models like GPT and Claude.

Supports Objectives 1 and 2 (definitions, training pipeline, attention mechanism).

Bender, E. M., & Koller, A. (2020). *Climbing towards NLU: On meaning, form, and understanding in the age of data. Proceedings of ACL*.
<https://aclanthology.org/2020.acl-main.463/>

Explains why LLMs generate text based on statistical form rather than comprehension.

Supports Objectives 2 and 3 (prediction vs. understanding, misconceptions).

Jurafsky, D., & Martin, J. H. (2023, draft). *Speech and language processing* (3rd ed.).
<https://web.stanford.edu/~jurafsky/slp3/>

Comprehensive NLP textbook; covers tokenization, LLM training, and attention clearly.

Supports Objectives 1 and 2 (core NLP/LLM concepts).

ISTE (International Society for Technology in Education). (2023). *AI in education: A guide for educators*. <https://iste.org>

Practical guide to AI literacy, ethics, and classroom strategies.

Supports Objectives 4 and 5 (relevance for teachers, classroom integration).

Common Sense Media. (2023). *AI literacy for educators*. <https://commonsense.org/education>
Accessible activities and K–12 classroom guidance on responsible AI use.

Supports Objectives 4 and 5 (student-facing introduction strategies).

Extended Resources (Deep Dives)

Brown, T., Mann, B., Ryder, N., Subbiah, M., Kaplan, J., Dhariwal, P., ... & Amodei, D. (2020). *Language models are few-shot learners. Advances in Neural Information Processing Systems*. <https://arxiv.org/abs/2005.14165>

Introduces GPT-3, scaling laws, and few-shot learning.

Supports Objectives 1 and 2 (training scale, prediction, architecture).

Devlin, J., Chang, M. W., Lee, K., & Toutanova, K. (2019). *BERT: Pre-training of deep bidirectional transformers for language understanding. NAACL-HLT*.

<https://arxiv.org/abs/1810.04805>

Seminal model introducing bidirectional transformers.

Supports Objectives 1 and 2 (model evolution, NLP concepts).

Bommasani, R., Hudson, D. A., Adeli, E., Altman, R., Arora, S., von Arx, S., ... & Liang, P. (2021). *On the opportunities and risks of foundation models. arXiv:2108.07258*.

<https://arxiv.org/abs/2108.07258>

Explores foundation models, capabilities, and ethical challenges.

Supports Objectives 2, 3, and 5 (risks, future considerations, pedagogy).

Crawford, K. (2021). *Atlas of AI: Power, politics, and the planetary costs of artificial intelligence*. Yale University Press.

Examines ethics, bias, and systemic issues in AI development.

Supports Objectives 3 and 5 (ethical implications, critical literacy).

Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning*. MIT Press.

<https://www.deeplearningbook.org/>

Classic reference for understanding neural networks and model training.

Supports Objectives 1 and 2 (technical depth for educators).

Luckin, R. (2018). *Machine learning and human intelligence: The future of education for the 21st century*. UCL IOE Press.

Bridges AI technical concepts with educational implications.

Supports Objectives 4 and 5 (pedagogical strategies, teacher-facing applications).

UNESCO. (2021). *AI and education: Guidance for policy-makers*.

<https://unesdoc.unesco.org/ark:/48223/pf0000376709>

Policy guide on AI ethics, inclusion, and implementation in schools.

Supports Objectives 3, 4, and 5 (policy, ethics, integration frameworks).

Stanford HAI (Human-Centered AI Institute). (2023). *AI index report*.

<https://aiindex.stanford.edu/>

Global annual report on AI development, trends, and educational relevance.

Supports Objectives 3, 4, and 5 (context, trends, adoption data).

OpenAI. (2023). *How large language models work*.

<https://openai.com/research/how-large-language-models-work>

Visual overview of tokenization, prediction, and attention.
Supports Objectives 1 and 2 (training mechanics, technical visuals).