

Bridging Learning Outcomes and Module Specifications: GenAI Framework for Curriculum Development in CS Education

Anonymous Author(s)

Anonymous Institution(s)

Anonymous City, Anonymous Country
anonymous@anonymous.anonymous

Abstract

Recent developments in generative artificial intelligence (GenAI) have enabled the production of high-quality content in many domains, including education and computing. These advances offer opportunities to support tutors in curriculum development and to enhance the learning experience for students. This paper presents an end-to-end pipeline that automatically suggests a set of module specifications based on user input and structured guidelines.

CCS Concepts

• **Computing methodologies** → **Artificial intelligence**; • **Social and professional topics** → **Computer science education**.

Keywords

Artificial Intelligence, Natural Language Processing, Generative AI, Large Language Models, Curriculum Development, CS Education

ACM Reference Format:

Anonymous Author(s). 2018. Bridging Learning Outcomes and Module Specifications: GenAI Framework for Curriculum Development in CS Education. In *Proceedings of Make sure to enter the correct conference title from your rights confirmation email (Conference acronym 'XX)*. ACM, New York, NY, USA, 1 page. <https://doi.org/XXXXXXX.XXXXXXX>

Recent proprietary and open-access large language models (LLMs), such as OpenAI's ChatGPT, Anthropic's Claude, and Alphabet's Gemini/Gemma, can generate enriched content from structured prompts. This opens opportunities to modernise educational practices for both tutors [3] and students [1]. Building on prior work generating educational materials in CS education [2], this paper addresses GenAI suggestions for module specifications.

The proposed framework consists of four main stages: **(1) Input:** The framework receives metadata describing the target module, including intended learning outcomes (ILOs), related modules, recommended reading lists (e.g. academic textbooks), and CATS/ECTS module credit value. **(2) Knowledge Engine:** To avoid the risk of GenAI hallucinations, Retrieval-Augmented Generation (RAG) techniques are used to retrieve relevant information from trusted educational and professional sources. These sources are categorised into

two levels: (2-i) University-level sources: student handbooks, and learning and teaching practice policies. (2-ii) Sector-level sources: QAA Computing Subject Benchmark, ACM/IEEE curriculum recommendations, BCS accreditation requirements, and FHEQ/SCQF/RQF qualification framework descriptors. **(3) Suggestion Engine:** the framework combines the user-provided inputs with the retrieved contextual knowledge to suggest module specifications using LLMs: (3-i) **Syllabus Design:** a week-by-week teaching schedule aligned with the specified ILOs, including learning and teaching activities and the associated allocation of hours across scheduled learning, independent study, and placement activities where applicable. (3-ii) **Assessment Design:** formative and summative assessment components, each annotated with corresponding weighting, mapped ILOs, marking rubrics, and the permitted level of GenAI usage. (3-iii) **Teaching Materials:** weekly lecture slides, tutorial and laboratory exercises (with starter code and solutions), and supplementary worked examples. **(4) Consistency Verification:** The generated module specifications go through a verification process consisting of both automated and human-in-the-loop validation mechanisms. (4-i) **Automated Verification:** rule-based checks are performed to evaluate quantitatively (e.g. validating the ratio between the module credit value and the total learning hours) and qualitatively (e.g. verifying that all intended learning outcomes are adequately covered within the syllabus, teaching materials, and assessment components). (4-ii) **Human Review:** designated academic staff review the outputs to assess their correctness, pedagogical effectiveness, and institutional suitability. Manual feedback from reviewers, together with any failed automated checks, is iteratively fed back into the suggestion engine to refine the generated content. This process continues until a satisfactory module specification is produced.

In conclusion, this paper proposes a GenAI-driven pipeline for automated suggestion of computing module specifications, integrating trusted academic and accreditation sources with a hybrid verification mechanism to ensure regulatory compliance and pedagogical validity, while future work will focus on incorporating international institutional constraints and extending support to joint-institutional curriculum development.

References

- [1] Hyoseok Kim and Thomas KB Koo. 2026. The impact of generative AI on syllabus design and learning. *Journal of Marketing Education* 48, 1 (2026), 20–41.
- [2] Stephen MacNeil, Andrew Tran, Juho Leinonen, Paul Denny, Joanne Kim, Arto Hellas, Seth Bernstein, and Sami Sarsa. 2022. Automatically Generating CS Learning Materials with Large Language Models. In *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 2*. 1176–1176.
- [3] Nishat Raihan, Mohammed Latif Siddiq, Joanna CS Santos, and Marcos Zampieri. 2025. Large language models in computer science education: A systematic literature review. In *Proceedings of the 56th ACM technical symposium on computer science education V. 1*. 938–944.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted by ACM, provided that the copies are not made for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than the author(s) must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.
Conference acronym 'XX, Woodstock, NY
© 2018 Copyright held by the owner/author(s). Publication rights licensed to ACM.
ACM ISBN 978-1-4503-XXXX-X/2018/06
<https://doi.org/XXXXXXX.XXXXXXX>