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Collaboration, Creativity and Compassion in a Digital Society

Prompting inclusion: Development of a GenAI prototype to support UDL-aligned course design in computing education

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Universal Design for Learning (UDL) offers a valuable framework for developing inclusive and accessible courses, but educators often receive limited support in translating its broad principles into context-specific teaching and assessment practices. This paper reports on the design of a custom generative artificial intelligence (GenAI) conversational assistant prototype developed to support computing educators in Australian tertiary education in applying UDL to their courses. The prototype provides concrete, non-directive suggestions across the three tenets of UDL, multiple means of engagement, representation, action and expression. Rather than treating GenAI as a generic automation tool, the prototype explores how prompt design, scope limitation, structured outputs, and persona-informed contexts can scaffold inclusive pedagogical reflection while maintaining academic judgement. The paper presents the functional prototype as its primary contribution and describes its design considerations, prompt architecture, and early scenario-based testing.

Keywords: Universal Design for Learning, generative AI, computer science education

Introduction

Accessible, inclusive, and flexible learning design is an important priority for Australian universities (Department of Education, 2024). Universal Design for Learning (UDL) provides a proactive framework for anticipating student variability and reducing barriers to participation. However, translating its broad principles into practical course and assessment level decisions can be difficult for educators. This challenge is particularly relevant in computing education, where educators must account for varied prior technical experience, abstract and cognitively demanding content, specialised tools, technical assessment practices, and delivery across on-campus, hybrid, and online settings. Computing educators might therefore benefit from practical, context-specific support that helps them apply UDL within the specific activities, assessments, and constraints of their courses (Leif et al., 2025; Redstone & Luo, 2024).

Providing context-specific UDL support to educators presents a significant resourcing challenge. Accessibility and learning design staff often have limited capacity to work individually with every educator on course and assessment design, particularly while also supporting student access plans and other institutional requirements. Educators may also have limited time to participate in UDL professional development (PD), which is often necessarily broad rather than tailored to particular courses, assessments, and teaching contexts. As a result, a gap often exists between institutional commitments to inclusive education and the practical support available to help educators apply UDL in everyday design decisions. Generative artificial intelligence (GenAI) could offer one way of supplementing this support by enabling timely, context-specific reflection on course and assessment design. Its use in this context, however, requires careful design. Unconstrained conversational systems can produce generic or superficial advice, reproduce ableist assumptions, or generate suggestions that are poorly aligned with disciplinary, or institutional contexts. This paper presents a constrained custom GenAI prototype designed to support Australian higher education computing educators in reviewing course activities and assessments through a UDL lens. Rather than automating course design or replacing educator, accessibility, learning-design, or disciplinary expertise, the prototype is intended to be a structured reflective partner that provides practical, non-directive suggestions linked to UDL guidelines.

Related work on supporting UDL implementation in computing education

UDL has become an influential framework for designing learning environments that anticipate student variability from the outset, rather than responding to difference primarily through individual accommodations. In higher education, UDL is commonly positioned as a proactive approach to curriculum, assessment, and

learning design that encourages educators to provide multiple means of engagement, representation, and action and expression (CAST, 2024; Jwad et al., 2022). However, educators may find it difficult to translate its broad principles into concrete course-level decisions, particularly when constrained by limited time, resources, UDL knowledge, institutional support, and capacity for implementation (Duncan et al., 2025). This can create an operational gap between the inclusive potential of UDL and the practical support available to apply it to learning activities, assessments, and course resources.

This implementation challenge is particularly relevant in computing education, where disciplinary practices and diverse student cohorts can create distinctive challenges for participation. For example, computing courses often require students to engage with dynamic and abstract concepts (Alasmari et al., 2023), manage substantial cognitive load (Shin et al., 2023), and learn alongside peers with varied levels of prior technical experience (Bui et al., 2023; Medeiros et al., 2019). These aspects of computing courses can intensify barriers for students when curriculum, assessment, and feedback practices are designed around implicit assumptions about prior exposure, confidence, pace, or familiarity with technical tools. It is therefore essential that computing educators are equipped with the skills to consider how the principles of UDL can be translated into a computing context to ensure flexible pathways for students to engage with concepts, access learning materials, practise technical skills, and demonstrate understanding.

PD is one established means of supporting educators to develop the knowledge and skills needed to apply UDL. Common approaches include workshops, online courses and webinars, and professional literature (Duncan et al., 2025; Hakel & Magin, 2026). However, access to these opportunities is uneven (Duncan et al., 2025) and sustained UDL implementation appears to depend on more than one-off training, with longer-term professional learning and ongoing opportunities for discussion associated with more effective UDL practice (Hakel & Magin, 2026; Leif et al., 2025). These findings suggest that educators need accessible, contextualised, and ongoing support that enables them to apply, discuss, and refine UDL within their own teaching contexts. How universities can provide this form of support consistently and at scale remains an open challenge. These challenges highlight the need for scalable approaches that can extend existing PD support options. Such support should complement formal PD by providing discipline-specific guidance and opportunities for educators to reflect on and refine their application of UDL. To explore this potential, we developed a GenAI prototype designed to support educators in translating UDL principles into course-level decisions. The following section describes the prototype and the design considerations (DCs) that informed its development.

Prototype

The UDL Consultant is a constrained custom GenAI prototype designed to provide accessible, scalable, and context-specific guidance to Australian higher education computing educators, while remaining supplementary to educator judgement and existing professional expertise. It was developed as a custom ChatGPT application to help educators review course activities, assessments, and materials through a UDL lens.

Development approach

This is a formative prototype-development process rather than a full design-based research study and evaluation with intended users remains future work. Development proceeded through three linked stages. These included identifying considerations from the literature, translating the considerations into the prompt and knowledge-base used in the GenAI prototype, testing representative scenarios and revising the configuration in response to observations.

Design considerations for the UDL consultant prototype

The central design objective of our prototype was to provide Australian higher education computing educators with timely, low-effort, and context-specific support for reviewing learning activities, assessments, and course materials through a UDL lens. The first author developed an initial set of DCs from the literature on supporting educators to implement UDL, together with considerations arising from the capabilities and limitations of GenAI. These considerations informed the prototype's instructions, knowledge resources, and output constraints, which were refined through scenario testing.

DC1: The prototype should support, rather than automate, professional judgement. Its role is to help educators identify potential barriers, consider learner variability, and generate possible modifications, while leaving decisions about feasibility and appropriateness with the educator. This reflects the importance of educator agency in applying UDL to practice (Hakel & Magin, 2026; Leif et al., 2025). Operationalised through non-directive language and educator-controlled decision-making.

DC2: The prototype should produce discipline-specific rather than generic advice. UDL implementation literature highlights the value of contextualised and discipline-specific support (Hakel & Magin, 2026; Leif et al., 2025). The prototype was therefore restricted to computing education within Australian higher education, where learner experiences may be shaped by factors such as prior programming experience and the demands of learning technical concepts (Bui et al., 2023; Medeiros et al., 2019). Operationalised through computing-specific scope.

DC3: The prototype should consider learner variability. Learner variability is central to UDL (CAST, 2024) and is particularly relevant in computing, where students may enter courses with substantially different levels of prior experience (Bui et al., 2023; Medeiros et al., 2019; Salguero et al., 2024) and varying equity considerations (Department of Education, 2025; Toti et al., 2025). Computing specific personas (Baaki et al., 2017) were therefore included as prompts for anticipating potential barriers when educator provided learner context was absent. The personas were developed as part of a separate research project. Operationalised by prioritising educator context but providing personas as background.

DC4: The prototype should maintain an explicit connection between its suggestions and the UDL framework. UDL organises inclusive design around multiple means of engagement, representation, and action and expression (CAST, 2024). The prototype therefore links suggestions to relevant UDL guidelines so that educators can see how proposed modifications relate to the framework. Operationalised through required UDL headings, tabular format, and UDL guideline links.

DC5: Guardrails should establish clear boundaries around the system's purpose. GenAI systems can produce inaccurate or generic advice (NIST, 2024) and reproduce ableist assumptions (Li et al., 2024). The prototype was therefore designed to remain within a defined UDL-support role, avoid presenting outputs as authoritative advice, and refuse or redirect out-of-scope requests. Operationalised through explicit scope rules and prescribed out-of-scope responses.

Prompt architecture and knowledge base

The five DCs were operationalised through the custom ChatGPT prototype's system instructions, knowledge files, and required response structure, which together defined the prototype's prompt and output logic. The prompt defined the prototype's role as a UDL Consultant for computing education in Australian higher education and restricted responses to matters concerning UDL, accessibility, inclusion, learner variability, assessment, and course design. Educator-supplied context was prioritised, however, where learner context was absent, the nine computing-specific personas in the knowledge base were used to anticipate barriers. Outputs were required to organise suggestions under engagement, representation, and action and expression, linked to relevant UDL guidelines. Instructions also required practical, non-directive language, sensitivity to stated constraints, and prescribed responses for out-of-scope requests. The architecture therefore encoded a visible sequence of context, learner variability, UDL mapping, and guardrails rather than an unconstrained request to "apply UDL." The prototype is accessible to educators with a free or paid ChatGPT account. The prototype is available at: https://chatgpt.com/g/g-697a843c7f888191a49b80d57b1d4d57-universal-design-for-learning-consultant

Early scenario-based testing

Early scenario-based testing was conducted by the first author to iteratively refine the prototype. The prototype was tested using plausible educator requests, including whole-course reviews, assessment-specific questions, prompts describing particular learner contexts, and requests outside the intended scope. Responses were reviewed for disciplinary relevance, use of the learner personas, alignment with UDL guidelines, practicality, and adherence to the defined boundaries. Testing identified several early failure modes. The

prototype sometimes produced generic UDL advice without using the default personas and occasionally responded to unrelated requests despite its stated purpose. The prompt was therefore revised to require persona use when no alternative learner context was provided, introduce explicit scope rules and out-of-scope examples, and standardise the response structure. This testing was formative and intended to improve prompt behaviour rather than establish the prototype's effectiveness or validity. Future work will evaluate the prototype with intended users. Table 1 illustrates how an educator request is translated through the prototype's configured design logic into UDL-aligned suggestions for educator consideration.

Table 1
Illustrative prototype response logic

Stage	**Example of prototype use**
Educator input	The educator asks the prototype to review a computing assessment or course. Example prompt "review the assessments for <<course link>>"
Context used	The prototype uses the educator provided course context. If learner context is absent, it draws on the computing-specific personas.
Configured design logic	The response is organised through the three UDL principles and constrained by scope, non-directive language, and educator-controlled decision-making.
UDL connection	Suggestions are linked to relevant UDL guidelines or considerations.
Example output	**Design Options** — **Multiple Means of Engagement** Access — **Design Options for Welcoming Interests & Identities.** The Semester 2, 2026 pattern includes Class Engagement 5%, Lab Engagement 10%, three 5% homeworks, two 10% redeemable tests, and a **50% hurdle final exam.** ANU Programs ... The computing personas suggest that fixed attendance, fluctuating capacity, caring responsibilities, fatigue, travel, and anxiety around observed performance can affect participation independently of programming capability. You could retain engagement with the course while allowing students to earn some engagement marks through equivalent asynchronous activities or documented preparation rather than requiring physical presence as the primary evidence of engagement. This would support choice and autonomy and reduce participation barriers (UDL 7.1, 7.4).
Intended educator action	To consider whether the suggestion is feasible and appropriate in their own course context.

Conclusions

This paper has presented a constrained custom GPT application intended to support Australian higher education computing educators in translating UDL principles into practical design options. The prototype combines discipline-specific guidance, computing learner personas, explicit alignment with UDL guidelines, and scope guardrails to support structured reflection. As this formative testing did not involve the intended users, future work will evaluate the prototype with computing educators to examine the relevance, practicality, accuracy, and accessibility of its suggestions and how educators interpret and use them. The current work is limited by testing being conducted solely by the first author and by reliance on access to ChatGPT. GenAI-based UDL guidance also raises risks relating to the disclosure of sensitive learner or course information, inaccurate or inappropriate recommendations, changes in model behaviour over time, and the possibility that conversational outputs may be treated as authoritative accessibility advice. The prototype therefore positions its suggestions as non-directive and supplementary to educator judgement and consultation with students, accessibility professionals, learning designers, and disciplinary experts. Future evaluation will help establish the value and limitations of GenAI as a scalable, discipline-specific support for inclusive course design.

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