

Revolutionizing Flipped Learning with ChatGPT: A Strategic Framework for Enhanced Educational Engagement

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Abstract

This paper proposes a novel framework for integrating ChatGPT in flipped learning environments, enhancing both asynchronous and synchronous content delivery. It explores leveraging Large Language Models (LLMs) like ChatGPT to personalize and streamline educational content, utilizing Bloom's Taxonomy and Constructive Alignment for pedagogical design. The paper emphasizes the transformation of the educator's role and the creation of custom assessments using AI. It also outlines practical applications, including case studies, to demonstrate the improved learning outcomes and engagement through ChatGPT's integration. The proposal envisions an optimized educational landscape, rich in quality, diversity, and efficiency.

Keywords: *Personalized Learning, Constructive Alignment, Large Language Models (LLMs), Flipped Learning*

1. Introduction

This paper outlines a framework for using ChatGPT and other Large Language Models (LLMs) to enhance flipped learning environments, highlighting its ability to mimic human language through complex algorithms. It proposes a pedagogical model that uses ChatGPT as a co-creative agent to improve both asynchronous and synchronous instruction in these settings. The paper aims to propose a novel framework for integrating ChatGPT into flipped learning environments to enhance both asynchronous and synchronous educational content delivery. By integrating educational theories like Bloom's Taxonomy and Constructive Alignment, it presents a methodologically sound instructional design that promotes higher-order thinking, content generation, and custom assessments. The integration of ChatGPT as a co-creative partner is posited to transform flipped learning by enriching engagement and enabling the creation of personalized, adaptive content. The intention is for a shift to improve educational

resource use, content quality, and relevance. Case studies and evidence will demonstrate the practical benefits of this approach on learning outcomes and student engagement.

This paper is significant for educators as it presents a comprehensive framework for integrating ChatGPT into flipped learning environments, offering a methodological approach to enhance both asynchronous and synchronous learning. By leveraging Large Language Models like ChatGPT, educators can personalize educational content, streamline content delivery, and improve learning outcomes. The paper emphasizes the transformative potential of AI in education, showcasing practical applications and case studies that demonstrate the benefits of ChatGPT for engaging students and fostering deeper cognitive engagement.

2. Flipped Learning Approach

Flipped Learning is the process of reversing the typical learning structure. In the traditional model, a learner attends a lecture for knowledge acquisition and then engages in post-session activities to apply that knowledge (Bergmann & Sams, 2012). In the flipped learning approach, the learner completes knowledge acquisition activities asynchronously before attending a synchronous session to apply that knowledge. A fundamental aspect of flipped learning is transforming the role of educators from mere disseminators of knowledge to facilitators of knowledge application activities (Abeysekera & Dawson, 2015). Another pivotal element is the group-based application sessions, which conventional lecture-based teaching does not easily accommodate (Beichner, 2008). This approach is rooted in Social Constructivist Theory (Vygotsky, 1978) and facilitates higher order thinking activities in a structured environment. Using ChatGPT in this context can enhance the development of flipped activity content.

2.1. Bloom's Taxonomy

Bloom's Taxonomy categorizes cognitive tasks into a hierarchy of six levels:

- Remembering: Recalling facts or concepts.
- Understanding: Interpreting material's meaning.
- Applying: Using learned information in new situations.
- Analysing: Dissecting material to understand its structure.
- Evaluating: Judging based on set criteria.
- Creating: Synthesizing elements to form a unique whole.

The first three levels represent Lower Order Thinking Skills (LOTS), while the last three signify Higher Order Thinking Skills (HOTS). The goal is for learners to transition from LOTS to HOTS, fostering deeper thinking essential for problem-solving and informed decision-making (Bloom et al., 1956). Bloom's Taxonomy is significant here to ensure that ChatGPT's integration into flipped learning environments methodically enhances the progression from lower to higher-order cognitive skills, essential for effective educational engagement.

2.2. Constructive Alignment

Constructive alignment refers to the intentional integration of learning outcomes, teaching materials, and assessment tasks. The learning outcomes delineate the skills and knowledge that students are expected to acquire in each session. These outcomes provide the criteria against which students' assignments are assessed. Accordingly, the assignments are designed to ensure that they address all specified learning outcomes. Similarly, the teaching and learning materials are purposefully tailored to guide students towards achieving these outcomes (Biggs, 1996). Constructive alignment should be undertaken alongside the ideas outlined by Bloom et al. (1956) when creating materials using ChatGPT.

3. Asynchronous Content Development

Asynchronous learning entails a process where learners engage in guided learning activities without being constrained by a specific time frame or the necessity of an educator's presence" (Hrastinski, 2008). These activities comprise a series of tasks, curated or created by an educator, following a strict pedagogical structure. It is pivotal to differentiate asynchronous learning from independent learning. In the latter, although an educator may provide a general direction for inquiry, students ultimately exert control over the structure and activities they undertake. The generation of asynchronous content creation can be time consuming so using ChatGPT as a co-creator of these materials can save time and have additional benefits as laid out in the following process.

At the start of any module, key terminology will need to be introduced. A glossary of terms or a bank of words may already exist which explains these terms when they arise organically. Using ChatGPT to outline all the common key pieces of terminology within a specific topic can be beneficial for learners. Even subject-specific specialists could have potential blind spots; ChatGPT can highlight the possibility of unconscious biases.

Example prompts:

"What are the key terminologies related to [specific topic or module]?"
"List common terms used in a module about [specific topic or module]?"
"Are there any advanced or less-common terminologies related to [specific topic or module] that might not be widely known?"
"How can biases impact the creation of educational materials on [specific topic or module]?"

Applied example: "What are the key terminologies in Macroeconomic theory?"

3.1. Definitions Overview

Initiating the educational process by presenting simple definitions enables learners to effectively integrate foundational knowledge. It is beneficial to tailor explanations of key terminology to

the context of the broader module being studied. Utilising analogies to convey these definitions in a non-technical and relatable manner enhances learner comprehension. Modifying the formality of the definitions ensures they extend beyond mere dictionary explanations, providing a deeper, more nuanced understanding. Additionally, developing scripts for academic video presentations can transform these definitions into engaging, multimodal educational experiences.

Example prompts:

"Provide a simple definition of [term]"
"Explain [term] in the context of [specific topic/module]"
"Can you provide an analogy to explain [term] in a way that's easy to understand for beginners?"

"How can [term] be defined in an informal or conversational manner?"
"What visuals could be used to explain [term/ concept] in a video presentation?"
"How can [term/ concept] be explained in a way that is engaging for video content?"

Applied example: "How can price elasticity in Economics be explained in a non technical way?"

3.2. Introduction Text Summary

Summaries of existing materials containing key terminologies can be created from extensive texts. These summaries prepare learners for the in-depth explanations of terms they will encounter, priming their understanding of the content to follow. Formats for these summaries may vary, ranging from shortened paragraphs to more concise forms such as bullet point sentences or three-word bullet point explanations. Furthermore, the tone of the summary may be tailored to fit the context and audience.

Example prompts:

"Summarize the key concepts and terminologies from the following text: [insert large text, e.g. lengthy textbook]"

"Create a brief overview of [specific term] in a learner-friendly tone"

"Summarize the concept of [term] using only three words per bullet point"

"Provide a summary of [text/term] in a [specific tone, e.g., casual/formal/enthusiastic] tone"

Applied example: "Provide a summary of Economic Policy in the UK since WWII"

3.3. Knowledge Acquisition

Upon the creation of definitions and summaries, educators may transition learners from passive to active participants in their educational journey. ChatGPT can be employed to help create various types of quiz tools within the Virtual Learning Environment, including simple drag-and-drop activities, true/false questions, multiple-choice questions, and more. Questions may be

crafted for students to engage with and respond to actively. These inquiries should be designed to target Lower Order Thinking Skills (LOTS), thereby facilitating differentiated learning that caters to a diverse range of cognitive abilities.

Example prompts:

“Create a drag and drop activity for the key concepts in [topic/module]”.
“Develop a true or false quiz based on the following material: [insert summary/definitions]”.

“Create a set of LOT-based questions for [specific topic] suitable for H5P implementation”.

“Provide examples of recall and understand-level questions related to [specific topic]”.

“Generate questions that require simple identification or recollection related to [specific topic or concept]”.

Applied example: “Create multiple choice questions related to UK Economic history with varying difficulty levels”

4. Synchronous Content Development

Synchronous delivery is learning that is delivered in a specific place, at a specific time, to all students. Synchronous delivery provides students with immediate feedback from their teacher and / or fellow learners (Algonquin College, n.d.). Generative AI can assist with more traditional, teacher-centric models of delivery (Todorovic, 2020). Synchronous content delivery, despite being more traditional in style, can still be enhanced using content produced by ChatGPT. For example, Bagshaw (2022) outlines how ChatGPT can be used to examine a subject area, provide an essay style question, then provide an answer to that question within a set word limit. It is then outlined how that answer can be summarised and shortened

ChatGPT can also be used as a tool for customisation of assessment, to be given alongside synchronous material. Assessment briefs can be adjusted so that each student or group of students has a different version, accounting for a range of criteria including difficulty, language, type of assessment and more. ChatGPT facilitates the possibility of adjusting assessment briefs based solely on material entered or can be enhanced by the existing model used.

Example prompts:

“Generate a case study based on [topic], with a focus on [sub-topic]”

“Examine [previous answer given]. Generate a follow-up question based on this response”

“Adapt this question for [non-native language]”

Applied example: “Generate an essay style question on Game theory”

4.1. Scenario-Based Problem Solving

Generative AI, like ChatGPT, can enhance seminar-based learning by developing case studies, creating relevant scenarios or problems, and offering variations to diversify student tasks. For example, it can generate detailed scenarios based on course content, involving real-life situations that apply specific theories, incorporate current issues, and provide three complexity levels to suit different student understanding levels. Additionally, ChatGPT can facilitate seminars, offering guidance, hints, and real-time feedback, beneficial for online or hybrid learning. It can also serve as a research assistant for both staff and students, manipulating prompts to present information in tailored ways, supporting traditional learning materials.

4.2. Chain of Density

The Chain of Density technique assists in crafting a summary by iteratively refining it through a series of successive attempts. Initially, a sparse summary is created which is gradually refined by adding more important entities from the original content, increasing its density. This iterative process, visualized as a chain, helps in packing substantial information into the summary while managing its length (Eliot, 2023). Figure 1 displays this graphically, outlining how knowledge is developed over time.

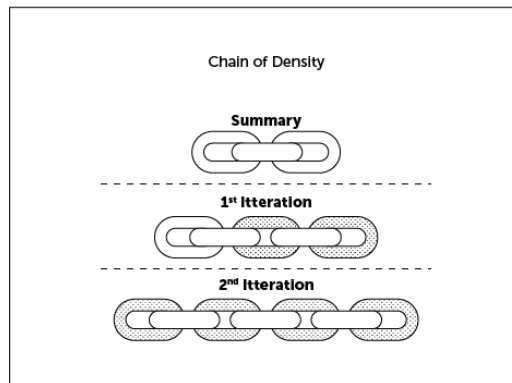


Figure 1. Chain of Density prompting diagram

4.3. Chain of Thought

Chain of Thought prompting encourages Large Language Models (LLMs) to explain their reasoning process by providing few-shot exemplars outlining the reasoning process, which the model then follows when answering a given prompt. This technique improves the model's performance on complex reasoning tasks. This is shown in figure 2, displaying how increased complexity of input enhances output. Moreover, an Automatic Chain-of-Thought (Auto-CoT)

process is introduced to automate the crafting of reasoning chains, thus saving manual effort and potentially improving the model's reasoning abilities further (Mayo, 2023).

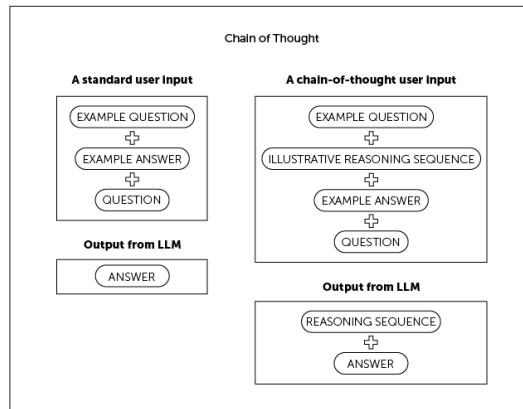


Figure 2. Chain-of-Thought Prompting Elicits Reasoning in Large Language Models

4.4 Perspectives/identity

This approach leverages generative AI's ability to assume varied identities or perspectives, enriching responses and offering nuanced insights. For instance, directing ChatGPT to embody a journalist yields tailored answers, reflecting the profession's unique viewpoint. Gewirtz (2023) outlines how instructing it to simulate the roles of a product manager, caregiver, or journalist while discussing a product like the Amazon Echo demonstrates how perspective-shifting can diversify and deepen the AI's responses. This strategy not only enhances the quality of the output but also broadens the scope of understanding by incorporating diverse professional insights.

5. Discussion

The article presents a framework for integrating ChatGPT into flipped learning environments, highlighting its potential to transform both asynchronous and synchronous content delivery through tailored, dynamic, and interactive pedagogical methods that enhance cognitive engagement and personalize learning. In terms of future research around generative AI, there are numerous directions which could be taken. Longitudinal Studies of ChatGPT Implementation: Investigate the long-term effects of integrating ChatGPT into the curriculum. How does consistent use over time impact student engagement, understanding, and retention? ChatGPT and Teacher Roles: Explore how ChatGPT shifts the educator's role further. What new pedagogical strategies do educators adopt, and how do they manage these alongside traditional teaching methods? Ethical Considerations and Bias Mitigation: Discuss the ethical implications of using AI in educational settings. How can educators ensure that the content generated by ChatGPT remains unbiased, accurate, and respectful of diverse perspectives?

This article implies that ChatGPT can significantly enhance the production of learning materials by individual academics. It achieves this by shifting the academic's role from initially creating content to revising and improving upon what ChatGPT generates. We hope that the systems demonstrated are versatile and straightforward enough to be applied across various subjects and types of content. However, it is predicated on the assumption that all subjects involve some degree of technical knowledge acquisition, and that assessments in every field could be enriched by using worked examples that are tailored to the specific content being taught.

6. Conclusion

The future of AI in education lies in its systematic integration into the classroom, where it supports student learning directly. While some educators are already using AI in an ad hoc and intuitive manner, a structured and consistent approach to its application is not yet widespread. Besides, as outlined by Brynjolfsson (2022), it is not the tasks that humans can do, or the tasks that machines could automate which represent the most potential, it is the new tasks which humans can do with the help of machines which opens an endless frontier of new abilities and opportunities; this holds true for education, both synchronous and asynchronous.

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