Exploring the Path of Compiling TBCL Chinese Digital Teaching Materials with Generative AI—Taking ChatGPT for Example

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Abstract

This study aims to integrate the Generative Artificial Intelligence (GenAI) platform—ChatGPT with the Taiwan Benchmarks for the Chinese Language (TBCL)[14] for digital teaching materials (DTM) composition, proposing a digital teaching material composition model, showcasing the role of GenAI plays in DTM features. At the same, it shows the necessary measures to reduce the effect caused by the hallucination phenomenon[5] on the materials. The research production will be presented by web-based DTM, combining the GenAI platform with the Taiwan Benchmarks for the Chinese Language (TBCL), introduced by National Taiwan Normal University, ROC(Taiwan)(wuqi1201@go.edu.tw). By adopting the IDEE framework[9] as foundational principles for designing web-based DTM with ChatGPT and using prompt engineering[11] as the research method, the study explores the strategies for avoiding the effect caused by the hallucination phenomenon in DTM composition with GenAI. It also delves into the potential features that GenAI can play in a web-based DTM. The procedure is as follows: (1) The instructional design is based on the Reference Guidelines for TBCL Application(RGTA) [15] and transcript as a unit outline. (2) Input the unit outline into ChatGPT through prompt engineering, and generate DTM content based on the unit outline. (3) Using the Teaching Materials Editing Assistance System(TMEAS), the text is examined to ensure the content aligns with the TBCL proficiency level. Beyond assisting in material composition, GenAI can enhance features in web-based DTM as well: (1) Utilize the “chat” from ChatGPT for “situational dialogue” and “essay review” by using prompt engineering, and (2) Integrating “chat” by using webpage builder's Hyper Text Markup Language (HTML), allowing learners to use “continue this chat” feature to replicate the “chat” to their accounts for self-practice. The study presents a web-based DTM, combining the GenAI platform with the RGTA and TMEAS for material composition and interactive features for web-based DTM. We hope to draw attention to the effect caused by GenAI in Chinese language education. The study provides preliminary insights, looking forward to offering a reference direction for the future development of GenAI-assisted Chinese language teaching and web-based DTM composition.

Keywords: Generative Artificial Intelligence, Taiwan Benchmarks for the Chinese Language (TBCL), Web-Based Digital Teaching Material, ChatGPT

1. Introduction

In the current era of globalization, the significance of Chinese language teaching materials has ascended, more so with the advent of E-learning spurred by recent pandemic challenges. The Taiwan Benchmarks for the Chinese Language (TBCL), introduced by the National Academy of Educational Research(NAER), serves as an instrumental benchmark for Chinese language competency. However, a conspicuous absence of digital teaching materials(DTM) framed within the TBCL remains. OpenAI's 2022 offering, ChatGPT, a GenAI platform based on a large language model (LLM), shows potential in this domain, presenting both opportunities and challenges. Notably, its capacity for real-time text generation and role as a virtual interlocutor holds promise for the Chinese DTM sphere. Yet, limitations arise, as evidenced by the platform’s occasional inability to retrieve specific content, such as details on TBCL and RGTA, from its database or generate unfaithful content called the hallucination phenomenon. This scenario underscores the criticality of vetting and curating AI-generated content(AIGC) for educational usage. The study will focus on presenting an actual example of applying GenAI to DTM composition by applying the IDEE framework and prompt engineering. Looking forward to exploring the path of making good use of GenAI for compiling DTM content and establishing features.

2. Literature Review

2.1. GPT Model and AIGC:
ChatGPT, built on the GPT model, is a pivotal player in the GenAI arena, deriving from the advanced natural language processing (NLP) domain. NLP, encompassing natural language understanding (NLU) and natural language generation (NLG), relies on the GPT model’s Transformer architecture[10] for precise and stable generation of words. Consequently, ChatGPT skillfully responds to user prompts, showcasing its aptitude for educational uses. However, the hallucination phenomenon, where models produce misleading or nonsensical content[5], poses challenges in GenAI applications, especially in education. Language education is specifically required with DTM content fitting the targeted learner’s proficiency level. Therefore, the content of the DTM will be generated based on prompts with the learner’s proficiency level descriptors from RGTA to encompass the GPT model for AIGC and double-checked by using the TMEAS to avoid the effect on AIGC caused by the “hallucination”.

2.2. Applying GenAI for Education:

The application of GenAI in educational sectors has seen increasing attention, underscored by frameworks such as Su & Yang’s (2023) IDEE, which offers structured guidelines for ChatGPT’s integration in education. While research, including works by Kasneci et al. and Baidoo-Anu et al., extols GenAI’s merits in personalized tutoring, automated grading, and adaptive learning, challenges such as biases in training data and concerns about data privacy persist. Based on the research, we can see the potential of GenAI applied as personal tutoring and risks lies in AIGC for language educational uses. The IDEE Framework provides a perspective of applying GenAI in educational scenarios.

2.3. Web-based Digital Teaching Materials

Teaching materials, tailored to a unit outline, can be classified as discrete, correlated, or integrated[12]. This study focuses on integrated materials, derived unit outline from RGTA, using ChatGPT for generating DTM content and forming “integrated” DTM content. The research applied AIGC as DTM content and chatbot functions to DTM features. By using the Gamma. app, leveraging its HTML capabilities to structure content and embed media, aiming to create a web-based DTM that integrates AIGC digitalized with other platforms, such as Quizlet and Ricciwawa[16] and ChatGPT’s “continue this chat” feature along with prompt engineering making it as a chatbot[2] assistant of “situational dialogue” and “essay review” features of the web-based DTM.

3. Research Question

(1) How is AIGC applied in compiling a Chinese web-based DTM that follows TBCL?
(2) What features can a GenAI platform offer in a self-made web-based DTM?

4. Research Method

4.1. IDEE Framework for Compiling Teaching Materials:

In this study, the IDEE framework guides the process of compiling AIGC DTM with GenAI features. This framework covers 4 dimensions: (1) Identifying desired outcomes, the input prompts for AIGC of the DTM will be based on the proficiency level descriptors in RGTA and so does the AI-powered features of DTM; (2) Determining the level of automation, the DTM composition will be semi-automated as for the AI-powered features will be fully automated; (3) Ensuring ethical considerations, emphasizing the need for educators to inspect AIGC for DTM by themselves or using tools, such as the TMEAS and verify dialogues between the GenAI and learners; and (4) Evaluating effectiveness, assessing if AIGC fits the TBCL proficiency level descriptors and the results of “situational dialogue” and “essay review” features, and effectiveness on real-time teaching scenarios requires quantitative data in future studies.

4.2. Prompt Engineering for Compiling Teaching Materials:

The concept of prompt engineering aims to automate software development tasks for generative AI. Based on the White et al (2023) study, it enhances prompt references ChatGPT, aiming to suggest prompts specifically for AIGC. Such strategies include providing the GenAI a name and classification, the intent or motivation of the task, the structure or an example demand of the AIGC, and giving adjustments based on the generated consequences[11]. They delve into GenAI’s abilities to generate content for DTM along with TMEAS addressing the hallucination phenomenon. The research presents templates for text, vocabulary, drills, and classroom activities. The final objective is to establish a web-based DTM infused with AIGC and AI-powered DTM features.
5. Results
5.1. **AIGC as Core Content of DTM – Text Content**

Firstly, based on RGTA, the unit outline was drafted as a prompt for the text content was formulated as follows: “你現在是一位在美國教學的華語老師，聽完我提供單元大綱、教學方案，請協助我編寫教材內容（插入單元大綱），課文的形式應為「課文」，難度應該落在華語中級，字數大約 500 字左右，分為 3 段”(You are now a Mandarin teacher teaching in the U.S. Having listened to the teaching outline and the teaching plan I provided, please follow my teaching outline [insert unit outline content] for the content. The text should comprise [lesson content]. The difficulty level should be [intermediate] in Chinese, and the word count should be around [500 words] divided into [3 paragraphs]). The generated content is shown in Fig. 01-DTM Text. Fig. 01-DTM TMEAS Analysis shows how the system works with the AIGC. By using TEMAS, the researcher can inspect if the AIGC fits the learner’s TBCL proficiency level and make adjustments to the AIGC for the DTM.

5.2. **AIGC as Extended Content of DTM – Vocabulary, Drills, and Activities**

After revising the core DTM text through human inspection and using TMEAS, the “詞表”(vocabulary list) feature of the system was utilized to produce the targeted vocabulary items. Through prompt engineering, non-target-level vocabulary items were filtered out. Further, a simple explanation and example sentences were extended for each vocabulary item. The prompt for the vocabulary list was formulated as follows: “貼上詞表，幫我去除上面的非目標級別的詞彙，並去除中間的詞頻。並且為剩下的詞彙加上漢語拼音與簡單的解釋，以及提供每一個詞彙一個例句”([Paste the original vocabulary list] This is a vocabulary list. Please help me remove the [non-target teaching level] and eliminate [grade] and [word frequency]. Also, add Pinyin, an explanation, and a sample sentence for each vocabulary item). The generated results are as Fig. 01-DTM Vocabulary List.

The prompt for the drills was formulated as follows: “請幫我根據上面的課文、詞彙，出 10 題，4 題詞彙題，4 題對話完成選擇題，一個延伸閱讀題組，且需要包含兩個子題(每個題目要有四個選項，閱讀題的題幹約 200 字)”(Based on the teaching materials provided above, please generate [10 multiple-choice] questions with [4 options] each, 4 [vocabulary] questions, 4 [dialogue completion multiple-choice] questions, and an [extended reading] question with [2 sub-questions] (the stem of the drills should be around [200 words])). Results are shown in Fig. 01-DTM Voc and Reading Drills.

The prompt for the classroom activities was formulated as follows: “請幫我根據上面的教案設計 3 項以真實情境為基礎的任務，並說明任務的實施細節與注意事項”(Based on the teaching plan mentioned above, please generate [3 real-world situational tasks], and detail the execution specifics and considerations for each.) The generated results are as Fig. 01-DTM Classroom Activities.

ChatGPT can enable learners to achieve self-directed learning effects by interacting with it through a natural language based on the research mentioned before. I have crafted prompts for two DTM features: situational dialogues and essay review. A prompt for situational dialogue was formulated as follows: “you are now a [interviewer for a graduate position]. Please ask me questions, wait for my response, and continue asking. The language used in the interview should be of moderate difficulty and not overly complex. Conclude when appropriate). The chat history of the feature is shown in Fig. 02-DTM Situational Dialogue.

The prompt for essay review was formulated as follows: “you need to correct the text based on the input. I will input Chinese paragraphs or sentences that I want to be checked. The more detailed and complete my text is, the more precise your correction suggestions will be. You should provide correction suggestions based on my input, addressing aspects like grammar, vocabulary, punctuation, etc. Errors and suggestions will be marked and explained). The generated result is as Fig. 02-DTM Essay Review.

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By using the HTML embedding technology in the Gamma. app, the digitalized AIGC with Edtech features and AI-powered features, such as situational dialogue, and essay review can be presented as a web-based DTM. (The prototypical web-based DTM link will be provided in the reference[15].)

6. Conclusion and Discussion
This study explored how GenAI integrates with the TBCL for developing Chinese web-based DTMs. The research found that prompt engineering based on the unit outline of RTGA and a cross-referencing inspection platform (TMEAS) is required to overcome the potential hallucination issue since ChatGPT can’t inherently recognize RTGA proficiency descriptors. The web-based DTM of the research shows the effectiveness of integrating GenAI in compiling DTM. While ChatGPT proves its value in generating teaching resources and aiding learners, platforms like LingoTeach.ai[17] highlight a more precise use of GenAI in compiling DTM content, CoolE Bot[18] demonstrates applying chatbot to situational dialogue, and Linggle Write[19] presents how GenAI assists essay review. In conclusion, while GenAI’s role in compiling DTMs or even language education is growing, the focus should be on enhancing the learning experience, with GenAI platforms potentially allowing educators to concentrate on tailored teaching and improving overall Chinese language education quality.

References

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