Journal of Digital Media & Culture Technology Vol.5, No.2, December (2025), pp.105-116
ISSN 2983-0664(p) 2983-0850(e) *http://dx.doi.org/10.29056/jdmct.2025.12.02*

A Convergence Teaching Model for Tax Accounting Education Using Generative AI and Digital Design Tools : A Project-Based Learning(PBL) Approach

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Abstract

In the rapidly changing era of the Fourth Industrial Revolution, the field of taxation and accounting demands practical convergence competencies that go beyond simple knowledge acquisition to actively utilize generative AI and digital tools. Therefore, this study aims to accelerate the digital transformation of tax and accounting education by proposing a convergence instructional model that integrates generative AI and digital design tools as a teaching strategy to foster practice-oriented professionals. To this end, the study analyzed recent Edutech trends through a literature review and developed the 'AI-Design Tool Convergence 5-Step PBL Instructional Model', which was conceptually designed based on systematic instructional design principles and expert consultation. Rather than empirically testing the model in classroom settings, its practical applicability was examined through scenario-based validation including the development of concrete guidelines and major-related project scenarios such as the production of comprehensive income tax refund promotional content. This study holds academic and educational significance as it moves beyond traditional theory-centered tax accounting education and presents a conceptually grounded and practice-oriented instructional framework capable of cultivating learners' digital literacy and creative problem-solving skills.

Keyword : Generative AI, Digital Design Tools, Tax Accounting Education, PBL, Digital Literacy

1. Introduction

With the advent of the 4th industrial revolution, the paradigm of the accounting and tax fields is changing rapidly. Simple and repetitive bookkeeping or reporting tasks are being automated, and now high-value-added work capabilities that provide new value to customers by interpreting and creatively using vast amounts of data are becoming more important. In particular, the rapid development of Generative AI requires fundamental innovation in the method of using and expressing knowledge beyond the method of acquiring professional knowledge. Recent studies emphasize that AI is actively introduced in accounting practice as well, requiring not only traditional knowledge but also technical competencies

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Received(September 7, 2025), Review Result(1st: September 25, 2025, 2nd: October 15, 2025), Accepted(December 12, 2025), Published(December 31, 2025)

from accounting experts [1].

These changes affect not only higher education but also the field of primary and secondary education, and exploring the educational applicability of Generative AI has become a global research topic [2].

However, according to previous studies, current university tax accounting education remains in the traditional method of acquiring theory and acquiring certificates, leading to a decrease in interest of learners and a lack of practical adaptability [3]. This educational method has limitations in cultivating the ability to creatively solve complex problem situations that students will face in the field using AI tools or to communicate effectively with non-professional customers.

Therefore, this study seeks to actively introduce the latest Edutech Generative AI and web-based digital design tools into tax accounting major classes. The purpose of this study is to simultaneously improve students' creative problem-solving and practical digital use skills by developing a ‘convergence teaching method model’ that collaborates with AI to derive ideas based on knowledge of the tax accounting major and produces them into effective visual content through digital design tools.2. Theoretical Background

2. Theoretical Background

2.1 Educational Applications of Generative AI

Generative AI is recognized for its potential as a ‘cognitive partner’ in the field of education. In recent years, in the educational field, attempts have been made to reinterpret the traditional instructional design model, ADDIE (analysis-design-development-execution-evaluation), in order to effectively integrate Generative AI. In the study of Lim & Kim [4] through a study based on the AADDIE model, teachers revealed that AI plays a decisive role in motivating learners and improving learning strategies in the implementation stage. This suggests that AI tools can go beyond simple class preparation assistance and act as a key mechanism that promotes interaction with learners in the actual classroom. According to the study of Ann et al., it was found that in the educational field, Generative AI are already playing specific roles such as ‘personalized tutors’ and ‘learner-generated content’ support [2]. In addition, Park's study presented empirical results that the use of AI has a positive effect on the improvement of students’ analysis capabilities through a case study of accounting data analysis classes [1]. In particular, Wood et al. emphasized the importance of ‘human-in-the-loop’ education, pointing out that AI has the potential to solve accounting problems faster and more accurately than students, but at the same time can make serious errors [5]. Therefore, this study defines AI as a collaborative object that needs to

expand and verify thinking, not just a tool for generating correct answers.

2.2 Systematic Instructional Design

The instructional model proposed in this study is based on the theory of systematic instructional design. Systematic instructional design refers to a systematic approach that organically analyzes, designs, develops, and evaluates all components of the teaching process to effectively achieve educational goals [6]. The Generative AI based teaching and learning (GATe) framework was applied to the procedural system of the Dick & Carey model [7]. Specifically, it encompasses a series of processes of specifying performance goals through Needs Analysis, Learner and Context Analysis, and developing evaluation tools and teaching strategies based on this. This study attempted to analyze the specificity of the tax accounting major by applying this systematic approach and to design an AI convergence model optimized for this.

2.3 Project-Based Learning and Convergence Education

Project-based learning (PBL) is a learner-centered teaching method that builds knowledge and cultivates competencies on its own in the process of solving practical problems. According to the study of Thomas [8], PBL is a very effective teaching strategy for inducing intrinsic motives for learners and enhancing high-order thinking skills. In particular, in tax accounting education, PBL is known to be effective in narrowing the gap between theory and practice and in developing problem-solving and collaboration skills [1][3]. This study proposes a new type of convergence education model in which learners use AI as a 'cooperative partner' and design tools as a 'creative expression tool' by incorporating Generative AI and digital design tools into this PBL model

2.4 Digital design tools and Visual Literacy

In modern society, visual literacy, which processes and delivers complex accounting information in an easy-to-understand form, has become an essential competency for tax accounting experts. Bamford defined visual literacy as the ability to think and communicate through images, emphasizing that this is the core knowledge of modern society [9]. According to the study of Shao et al., data storytelling that combines data visualization and narrative greatly increases the understanding and decision-making efficiency of information recipients [10]. In other words, visual literacy is essential in order for accounting information to become a convincing message rather than a simple number. Web-based tools

such as Canva and Gamma, which have recently emerged, enable users without professional design skills to produce high-level visual materials. The use of these tools can contribute to arousing students' interest and increasing learning immersion. Son [3] presented a case in which game elements were introduced into accounting education to increase students' interest and immersion, and creative activities using design tools can also be an effective strategy to reinforce learning motivation in a similar context.

3. Research Methods

3.1 Research Procedure

This study was conducted centering on the Tax Accounting Department Teaching Method Research Group by applying the systematic instructional design procedure of the Dick & Carey model. Reflecting the convergent nature of the subject of this study, four doctoral experts from various interdisciplinary backgrounds in accounting, computer science, engineering, and humanities participated as researchers. The researchers derived a five-step teaching model through three in-depth meetings through the Expert Group Agreement method.

Step 1 (analysis and planning): Set research directions, analyze learners (tax accounting students) and the environment (available tools), select major tools (Generative AI, digital design tools), and divide roles (June 2025)

Step 2 (design): In-depth analysis of functions by tool, investigation of cases of convergence of other majors, search for ways to apply tax accounting courses, and design a draft PBL teaching model in step 5 (August 2025)

Step 3 (Development): Establishment of guidelines for convergence teaching methods, development of customized teaching scenarios and evaluation rubric for majors (October 2025)

3.2 Research Contents

The following multi-faceted analysis was performed to develop an effective teaching model.

AI Tool Analysis: GPT-4, Gemini's text summary, idea generation, accuracy and educational applicability of the tax law Q&A function were reviewed. As emphasized in Park's study, the importance of prompt engineering learning, including the limitations of AI and ethical considerations, was confirmed.

Design Tool Analysis: By comparing and analyzing the strengths and weaknesses of major tools such

as Canva and Gamma, tools suitable for practical classes were selected.

Analysis of convergence cases and guidelines: By analyzing the research results of KERIS's Teaching and Learning Operation Guide Using Generative AI [7] and Ann et al., a standardized framework suitable for the situation of our university was derived [2].

Instructional Model Design: By synthesizing the above analysis, an optimal teaching model was designed that combines the characteristics of the tax accounting major and the advantages of digital tools.

4. Development of Convergence Teaching Model

4.1 The 5-Step PBL Instructional Model Utilizing AI and Design Tools

In this study, drawing upon the ADDIE model and the GATe framework by KERIS [7], the 5-Step Convergence PBL Instructional Model specialized for the tax accounting major is proposed as shown in [Table 1].

[Table 1] 5-Step Convergence PBL Teaching Model

Step	Main Activities (Learning Stage)	Utilized Tools	Roles of Instructor and Learner
1. Problem Definition	Present realistic major-related job scenarios (Problem Recognition)	LMS, Lecture Materials	(Instructor) Present a specific, practice-based project scenario. (Learner) Analyze the problem situation, form teams, and derive Key Questions.
2. Planning & Research	Idea expansion and data collection using AI (Exploration & Inquiry)	GPT, Gemini	(Instructor) Coach on prompt engineering (e.g., Role-playing), guide source-checking. (Learner) Refine ideas and explore relevant tax regulations through interaction with AI.
3. Drafting	Derive key messages and compose text draft (Result Derivation)	GPT, Gemini	(Instructor) Induce fact-checking and legal validity review of AI-generated information. (Learner) Critically revise and supplement the AI draft based on major knowledge (Human-in-the-loop).
4. Visualization	Content creation using design tools (Creative Output)	Canva, Gamma	(Instructor) Provide guidance on principles of readable information visualization and copyright ethics. (Learner) Convert text information into persuasive visual media (e.g., card news, infographics).
5. Sharing & Reflection	Present results and reflect on the AI utilization process (Evaluation & Reflection)	Presentation Platform	(Instructor) Conduct a comprehensive evaluation of the output quality and the AI utilization process (prompt history). (Learner) Exchange peer feedback and write a Reflection Log on the AI collaboration experience.

4.2 Detailed Guidelines for Class Application

In this study, specific utilization guidelines for instructors and learners were developed as follows, in order to proactively address issues related to AI's information accuracy and ethical concerns.

4.2.1 Preparation Guide for Instructor

Tool selection and pre-verification: Select AI models and design tools optimized for achieving class goals, identify possible errors or functional limitations in advance and reflect them in class scenarios [1]. Ethics Education Curriculum Design: Prepare case-based educational materials regarding issues such as the possibility of AI Hallucination, data bias, and potential copyright infringement to raise learners' awareness [2][7].

4.2.2 AI Utilization Guide for Learners (Digital Literacy)

Prompt Engineering: Learners are taught how to clearly specify the Persona, Context, and Format to the AI to derive desired results. As emphasized in the KERIS [7] guidelines, they are made aware that the ability to ask good questions is a core competency.

Critical Verification: Learners internalize the habit of fact-checking answers generated by AI, especially sensitive tax law information, by cross-verifying them against official data from sources like the National Tax Service or legal statutes. This aligns with the necessity of Human-in-the-loop verification, as emphasized by Wood et al. [5].

Ethical Responsibility and Agency: Learners are reminded that AI is merely an auxiliary cognitive partner and that the ultimate responsibility for the final decision-making and results rests with the user themselves [2].

4.2.3 Development of Evaluation Rubric

An evaluation rubric was developed to comprehensively assess the entire project process, not just the final output, weighting the project execution process (60%) and the final results (40%). For this comprehensive evaluation, the specific assessment items and scoring criteria are presented in [Table 2].

4.3 Comprehensive Income Tax Refund Promotion Project

To verify the practical applicability and effectiveness of the convergence instructional model developed in this study, a standard project scenario that can be conducted in an actual tax accounting course was

developed as shown in [Table 3], and examples of learner outputs were derived accordingly.

[Table 2] Evaluation rubric model

Evaluation Area	Points	Excellent	Good	Needs Improvement
Planning ability	30	(30point) ·Clearly identifies the core information and logically organizes it for the target audience. ·The AI prompt is specific and clear, perfectly reflecting the planning intent.	(20point) ·Includes core information, but the customized organization for the target audience is somewhat insufficient. ·The AI prompt is somewhat broad, or its reflection of the planning intent is lacking.	(10point) ·The information's organization is illogical, and core content is missing. ·The AI prompt is inappropriate or irrelevant to the planning intent.
AI Utilization & Ethics	30	(30point) ·Effectively utilizes AI as a 'cognitive expansion partner' throughout all 5 steps. ·Complies with the provided ethical guidelines and faithfully performs cross-verification.	(20point) ·Utilizes AI in a limited manner, such as for simple information retrieval or initial drafting. ·Shows effort to comply with ethics, but cross-verification or source citation is partially omitted.	(10point) ·AI utilization is minimal, or the AI-generated output is submitted as-is (plagiarized). ·Shows no evidence of cross-verification or violates ethical principles.
Design Completion	20	(20point) ·Visual literacy (visual delivery of information) is outstanding. ·Readability, consistency, and aesthetics are implemented with high quality, aligning with the planning intent.	(13point) ·Information is conveyed, but visual appeal and readability are average. ·Lacks consistency or detailed refinement in the design.	(7point) ·Information is difficult to grasp visually and is distracting. ·The design is crude or in an incomplete state.
Reflection Report & Presentation	20	(20point) ·The reflection log describes the AI utilization process (e.g., prompts) and lessons learned in depth. ·The presentation is logical, and peer feedback is constructively accepted.	(13point) ·Content in the reflection log is partially omitted or the description is superficial. ·The presentation content is delivered, but reflection or acceptance of feedback is lacking.	(7point) ·The reflection log is merely a formality or is not submitted. ·The presentation is poorly prepared.

[Table 3] Project Scenario

1. Project Overview
Course Title: Convergence Content Design Project Theme: Production of promotional card news for 'Post-deadline Comprehensive Income Tax Filing (Refund)' targeting N-job workers and freelancers in their 20s. Educational Objectives: To cultivate practical communication skills by reinterpreting complex and rigid tax information into an easily understandable format tailored to the target audience (MZ Generation), and producing it as visual content.

Utilized Tools: Idea planning and copywriting (Gemini), design production (Canva).

2. Detailed Step-by-Step Process

This project proceeds as follows, according to the 5-step model previously proposed.

a. Planning Stage (AI Collaboration): Learners utilize generative AI (Gemini) as a brainstorming partner to derive creative phrases that can spark the interest of the target audience. (Prompt Example) "Please recommend 5 witty promotional phrases for a comprehensive income tax refund that a freelancer in their 20s with little tax knowledge would want to click on." (AI Response Example) "May, finding hidden money with one click!", "The only free money... no, my money... that the government allows!" etc.

b. Verification & Revision Stage (Utilizing Major Knowledge - Human-in-the-loop): Learners critically review the AI's suggestions based on their specialized knowledge. For example, they identify that the expression 'free money' (꽁돈) could distort the true nature of a refund, which is 'getting back overpaid tax.' Accordingly, they refine the terms to 'finding my hidden money' or 'unclaimed refund' to secure both information accuracy and elements of interest simultaneously.

c. Visualization Stage (Utilizing Design Tools): Based on the finalized text message, the content is visualized using Canva's card news templates. In this process, information delivery is maximized by visually emphasizing key phrases such as 'One-Click' and 'Deadline Approaching.'

3. Student Output Examples and Analysis

The following is a 4-cut card news result, produced as a pilot by the research group based on the above scenario.

(1) Page 1: The Hook

[Fig. 1] intuitively emphasizes the 'easy process' by utilizing the core keyword 'NTS One-Click' and a mouse cursor icon.

[Fig. 1] Card News Page 1 Example

[Fig. 2] Card News Page 2 Example

(2) Page 2: Providing Information (Inform)
[Fig. 2] restructured the information to focus on the refund benefits rather than the complexity of the filing process, by using the simpler term 'recipient' (수령 대상) instead of difficult tax terminology.

(3) Page 3: Presenting the Method (How-to)
[Fig. 3] effectively lowered the psychological barrier and burden that taxpayers might feel, using the phrase "The government has already calculated everything."

[Fig. 3] Card News Page 3 Example

(4) Page 4: Call to Action (CTA)
[Fig. 4] induced immediate action (filing) with witty warning phrases utilizing the speech style (Memes) of the MZ Generation, such as "The button disappears" and "It'll basically be an automatic donation to the country."

[Fig. 4] Card News Page 4 Example

In this way, students can cultivate high-level practical competencies through the project specifically, the ability to translate tax law knowledge into the public's vernacular and to visually persuade them.

5. Discussion

This study extends prior research on AI-in-education and project-based learning by proposing a

convergence instructional model that repositions generative AI from a productivity-oriented tool to a cognitive partner within professional education. Unlike earlier studies that primarily emphasize efficiency gains or automated content generation, the proposed model conceptualizes AI as an active collaborator that supports ideation, inquiry, verification, and reflective thinking throughout the learning process. This positioning aligns with human-in-the-loop perspectives while concretely operationalizing AI's role within domain-specific problem solving in tax accounting.

In addition, this study advances the discussion on visual literacy in accounting education by framing digital design tools as epistemic instruments rather than supplementary presentation aids. By structurally integrating visualization into the instructional process, the model enables learners to translate complex legal and numerical tax information into persuasive visual narratives tailored to non-expert audiences. This approach expands existing visual literacy research, which has largely focused on general data visualization, by demonstrating its pedagogical relevance within a rule-based, professional discipline such as tax accounting.

Furthermore, the proposed AI-design-PBL framework contributes to convergence education literature by extending interdisciplinary instructional models into a non-technical field. While convergence education has often been discussed in engineering, computer science, or media-related disciplines, this study demonstrates how convergence principles can be systematically adapted to professional education contexts that require both regulatory accuracy and communicative competence. The structured differentiation between AI-supported cognitive processes and design-based expressive processes offers a transferable framework for other non-technical domains facing similar challenges in digital transformation.

6. Conclusion

This study exploratorily developed and proposed a 5-step PBL instructional model that converges generative AI and digital design tools while seeking to overcome the limitations faced by traditional tax accounting education in the era of digital transformation. The proposed model is conceptually developed and scenario-validated through literature review and expert consultation, rather than empirically tested in actual classroom settings. This model, derived through literature review and expert consultation, aims to simultaneously cultivate the practical application of tax accounting knowledge and the competency to utilize the latest digital technologies. As noted by Son [3], this holds significant academic and practical importance as it moves away from existing theory- and memorization-based education to promote active learner participation and strengthen practical competencies.

The key contributions of this study are as follows: First, it presented an AI-convergence teaching method specialized for the professional field of tax accounting, complete with a concrete 5-step model and guidelines. This aligns with attempts to graft AI onto accounting education, such as the accounting data analysis case presented by Park [1], and it materializes the motivational and strategic improvement effects of AI during the 'Implementation' phase, as emphasized by Lim & Kim [4], through the PBL framework. Second, the study clearly distinguished the roles of AI as a 'cognitive partner' supporting idea expansion and inquiry in the planning and research phase, and digital design tools as 'creative expression tools' enabling visual communication and persuasion in the visualization phase. Third, to address concerns about AI's information accuracy and ethical issues noted by Ahn et al. [2], the study incorporated explicit ethical guidelines and a process-oriented evaluation rubric, thereby fostering critical thinking and digital literacy beyond simple technology utilization.

Nevertheless, this study has the following limitations. First, this study focuses on the developmental stage of instructional model design and scenario construction, and therefore lacks empirical verification through actual course implementation, such as the 'summative evaluation' emphasized by Dick & Carey [6]. Second, the model was developed through discussions among a small interdisciplinary expert group (N = 4) within a single institutional context, which limits the generalizability of the findings to other educational environments.

Therefore, future studies suggest the following directions. First, there is an urgent need for empirical research to quantitatively and qualitatively verify the effects of the model developed in this study on learners' academic achievement, problem-solving ability, digital literacy, and learning interest by applying it to regular subjects [8]. Second, considering the importance of teacher competency commonly emphasized by Ann et al. [2] and KERIS [7], a follow-up study is needed to develop a training program that helps instructors operate this model effectively and to verify its effectiveness. Third, it is necessary to accumulate various convergence education cases by expanding this model to adjacent academic fields that need to easily convey complex expertise such as management, economy, and law to the public as well as tax accounting.

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