Generative AI Empowering Talent Cultivation in Big Data Management and Application: Research on the Construction of an Innovation-Oriented Curriculum Model

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Abstract. With the in-depth advancement of China's national strategy for the development of a new generation of artificial intelligence, generative artificial intelligence, as a key technology, is profoundly reshaping the educational ecosystem. This study focuses on the emerging interdisciplinary field of Big Data Management and Application, exploring the innovative challenges faced by talent cultivation in the digital-intelligent era. The research aims to analyze the intrinsic mechanisms of generative artificial intelligence (taking "ERNIE Bot" as an example) in promoting learners' innovative thinking and innovative skills, and further construct a "generative AI-empowered, innovation-oriented project-based curriculum model". This model integrates the entire process of "pre-class preparation - teaching implementation - project conclusion", covering core links such as learner profile construction, intelligent scenario creation, personalized task distribution, dynamic feedback, and intelligent evaluation. Finally, the paper analyzes the potential challenges in implementing the model and proposes corresponding strategies centered on the "teacher-AI-student" tripartite collaboration, aiming to provide an operable and iterable digital path for cultivating innovative talents in the Big Data Management and Application major.

Keywords: Generative Artificial Intelligence; Big Data Management and Application; Innovation Capability; Curriculum Model.

1. Introduction

Currently, we are in an era of profound transformation driven by data and led by artificial intelligence. China's "New Generation Artificial Intelligence Development Plan" clearly states that great importance should be attached to the in-depth integration of artificial intelligence in the teaching process, and intelligent technology should be used to drive the innovation of educational forms. As a frontier for cultivating compound talents with data thinking, technical capabilities, and management literacy, the Big Data Management and Application major directly affects the development process of China's digital economy. However, traditional teaching in big data majors to a certain extent has a tendency of "valuing technology over thinking, tools over innovation, and theory over scenarios". Although students can master data processing tools, their ability to innovatively define problems, design solutions, and continuously iterate in the face of real, complex, and ever-changing business scenarios still needs to be strengthened.

The rapid development of Generative AI, especially the technological breakthroughs represented by large language models (such as ERNIE Bot and ChatGPT), provides new possibilities for addressing this talent cultivation dilemma. Different from traditional retrieval-based and analytical AI, the core capability of generative AI lies in understanding, summarization, creation, and dialogue. It is not only an efficiency tool but can also act as a learning companion, consultant, domain expert, and even an innovation collaborator, thereby providing an unprecedented supporting environment for cultivating students' higher-order thinking abilities—especially innovation capabilities.

Therefore, based on the talent cultivation practice of the Big Data Management and Application major, this study aims to address the following core questions: Firstly, how can generative artificial intelligence empower the systematic cultivation of students' innovation capabilities in this major theoretically and mechanically? Secondly, how to construct an innovation-oriented project-based curriculum model integrated with generative artificial intelligence? Thirdly, what are the implementation paths and potential challenges of this model? By systematically answering the above questions, this study aims to promote the effective integration of generative intelligent technology into the big data professional education system, and provide theoretical reference and practical paradigms for the innovative cultivation of China's strategic talents.

2. Literature Review and Theoretical Basis

2.1 Evolution of the Application of Generative AI in Education

The application of generative artificial intelligence in the field of education has evolved from early conceptual exploration to in-depth practical stage. Scholars at home and abroad generally believe that its value goes beyond simple knowledge Q&A. Xia Qi et al. (2023) pointed out through a systematic review that ChatGPT-like tools can act as "personalized tutors", "collaborative tools", and "catalysts for creativity" in education. Zhou Ling and Wang Hua (2023) emphasized that the interactivity of generative AI helps realize the personalized educational ideal of "enabling everyone to be themselves". At the application level, Gao Yanfei et al. (2023) explored its auxiliary role in project design in packaging professional teaching, while Lu Yu et al. (2023) looked forward to its potential in creating learning scenarios and providing real-time feedback. However, most existing studies focus on general education or basic education. In-depth research on how to use generative AI to deepen the integration of professional capabilities and innovative literacy for specific engineering majors such as big data is still insufficient.

2.2 Current Situation and Challenges of Talent Cultivation in Big Data Management and Application

The Big Data Management and Application major aims to cultivate compound talents who master data management, data analysis, data system development, and data-driven decision-making capabilities. Its curriculum system usually covers core knowledge areas such as statistics, computer science, and management. Although various universities have established relatively complete curriculum systems, several challenges have emerged in the cultivation process:

(1) The contradiction between the rapid iteration of knowledge and the lag of curriculum content is prominent. The big data technology stack and ecosystem are changing with each passing day, and traditional textbooks and curriculum syllabuses are difficult to update synchronously.

(2) Students' innovative practical capabilities are insufficient. Experiments and projects are mostly limited to standardized datasets and preset problems, and students lack comprehensive training in discovering problems, defining data needs, and innovatively solving problems in real and ambiguous business scenarios.

(3) It is difficult to implement personalized teaching. Students have great differences in programming foundation, data thinking, and interest areas, making it difficult for traditional classrooms to achieve large-scale teaching students in accordance with their aptitude.

2.3 Theoretical Framework for Cultivating Innovation Capabilities: Creative Thinking and Project-Based Learning

The core of innovation capability is the unity of creative thinking and innovative skills. The classic four-stage model of creative thinking (preparation, incubation, illumination, verification) provides a framework for understanding the innovation process. In this study, this model is specifically transformed into a big data problem-solving process: preparation (understanding business, data exploration), incubation (feature engineering, model selection), illumination (algorithm innovation, visual insight), and verification (model evaluation, business interpretation).

Project-Based Learning (PBL) is considered an effective pedagogy for cultivating innovation capabilities. Through driving questions and real project scenarios, it allows students to actively construct knowledge and develop skills in the process of solving complex problems. Introducing PBL into big data professional teaching can effectively simulate the workflow of enterprise data teams, and is an ideal bridge connecting knowledge learning and innovative practice.

2.4 The Inevitability of Integration: Generative AI as a "Catalyst" for Big Data Innovation Education

The characteristics of generative AI are highly consistent with the needs of big data innovation education. In the four stages of creative thinking, AI can provide: in the preparation stage (quickly providing domain knowledge, literature reviews, data source suggestions), in the incubation stage (assisting in code debugging, providing alternative algorithm ideas), in the illumination stage (conducting brainstorming, generating visualization sketches, stimulating new feature ideas), and in the verification stage (simulating user feedback, conducting code reviews, providing optimization suggestions). This full-process assistance makes it beyond the tool attribute and becomes an indispensable "cognitive partner" in the innovation process.

3. Mechanism Analysis of Generative AI Empowering the Cultivation of Innovation Capabilities in Big Data Majors

After establishing generative artificial intelligence as an important driving force for educational reform and its theoretical basis, it is urgent to explore the internal mechanism of its empowerment in cultivating innovation capabilities. The innovation capability of talents in the Big Data Management and Application major not only requires them to master solid data processing and analysis technologies but also needs to have the higher-order ability to creatively discover, define, and iterate solutions in complex real-world scenarios. Traditional teaching models face many limitations in supporting the achievement of this goal. However, generative artificial intelligence, with its powerful semantic understanding, content generation, and dialogue interaction capabilities, provides a new path for addressing this dilemma. This chapter will systematically analyze how generative artificial intelligence reshapes the learning process of big data professional students through its unique functional characteristics from the aspects of innovative thinking, innovative skills, learning paths, and evaluation and reflection systems, thereby providing a solid theoretical basis and practical guidance for the subsequent construction of the curriculum model.

3.1 Mechanism for Stimulating Innovative Thinking: From Data Craftsmen to Data Makers

Generative AI stimulates the innovative thinking of big data professional students in the following ways:

(1) Expanding the boundaries of problem definition. Faced with an ambiguous business requirement (such as "improving user activity"), students can instruct AI: "Based on common Internet user behavior datasets, list 10 quantifiable definitions of 'user activity' indicators and their data collection methods." This can break students' inherent thinking patterns and define problems from multiple perspectives.

(2) Promoting cross-domain knowledge association. When processing e-commerce sales data, students can ask AI: "How can the 'scarcity effect' in psychology be reflected in sales time series through data indicators? Please provide possible data analysis ideas." This kind of dialogue can guide students to combine management, psychology theories with data modeling, and spawn innovative analysis perspectives.

(3) Stimulating critical data thinking. Students can input the draft of their data analysis report into AI and instruct: "Please critically review this report from three perspectives: data bias, confusion between causal inference and correlation, and the rationality of indicator selection." Through "debating" with AI, students' critical thinking and data ethics awareness are deepened.

3.2 Mechanism for Improving Innovative Skills: An Intelligent Scaffold from Theory to Practice

At the specific skill training level, generative AI plays the role of an "intelligent scaffold". It can be an intelligent collaborator for code generation and debugging. When students are engaged in data cleaning or model construction, they can ask AI to generate specific functional code snippets (such as "Write a Python function to process JSON nested data") or explain and correct error codes. This reduces the threshold for technical implementation, allowing students to focus more cognitive resources on problem-solving strategies themselves. It can also be a creative partner for data visualization and storytelling: based on data analysis results, AI can suggest a variety of visualization schemes (such as "In addition to line charts, what more vivid visualization methods can reflect the periodicity of data?") and assist in drafting the narrative framework of data stories, improving students' ability to present data insights innovatively. It can also be a simulator for complex system design. When designing a big data platform architecture, students can ask AI to play different roles such as "system architect", "operation and maintenance engineer", and "security expert" to examine the rationality, scalability, and security of their design from multiple perspectives, thereby systematically improving their engineering innovation capabilities.

3.3 Mechanism for Constructing Personalized Learning Paths: Intelligent Navigation Based on Learner Profiles

The combination of generative AI and intelligent teaching platforms (such as Superstar Learning) can realize true personalized learning. The system constructs dynamic learner profiles by analyzing students' learning behavior data (such as code submission frequency, model debugging trajectory, project participation). Based on this profile, AI can recommend personalized learning resources and projects. For students interested in social network analysis, AI can recommend them to participate in the micro-project "False Account Detection Based on Graph Neural Networks"; for students with weak foundations, it can recommend the task "Python Data Processing Core Skills Challenge".

At the same time, it can adaptively adjust task difficulty. In the same "user profile modeling" project, AI can generate subtasks of different complexities for students of different levels, ensuring that each student is challenged within their "zone of proximal development".

3.4 Intelligent Evaluation and Reflection Mechanism: Unity of Process-Oriented and Developmental Evaluation

Generative AI has innovated the traditional learning evaluation method. It can not only conduct automated reviews of final codes or reports but also track and evaluate the innovation process. For example, by analyzing the dialogue records between students and AI during the project and the iterative history of codes, AI can evaluate their problem decomposition strategies, information retrieval capabilities, and the depth of trial and error and reflection, and generate personalized "innovation capability development reports" to provide students with specific and feasible improvement suggestions.

4. Construction of a Project-Based Curriculum Model for Big Data Majors Supported by Generative AI

The previous chapters have deeply analyzed the internal mechanisms of generative artificial intelligence in stimulating innovative thinking and improving innovative skills. However, if these mechanisms are not effectively organized and guided, they are likely to fall into fragmentation and blindness in technology application. To ensure the directionality and educational nature of technological empowerment and realize the leap from "instrumental use" to "ecological integration", it is necessary to construct a structured teaching practice framework with cultivating innovation capabilities as the fundamental goal.

Based on this, this study proposes the "teacher-AI-student" tripartite collaboration model as the meta-model guiding the construction of the curriculum model in this chapter. This model aims to redefine and interpret the role functions and interaction relationships of the three core subjects in the intelligent educational environment, and its basic structure is shown in Figure 1.

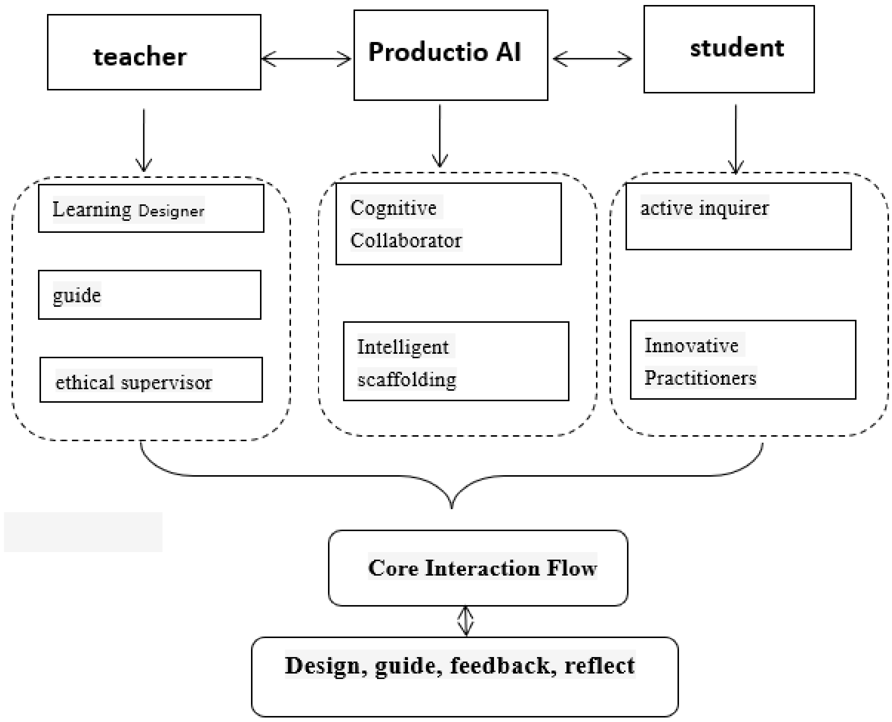

Figure 1. "Teacher-AI-Student" Tripartite Collaboration Model

Under the guidance of the "teacher-AI-student" tripartite collaboration model as the meta-framework, this chapter constructs a model named "generative AI-empowered, innovation-oriented project-based curriculum model". This model is not a simple technical overlay of traditional Project-Based Learning (PBL), but takes tripartite collaboration as the core engine to systematically reshape and intelligently upgrade the entire curriculum process. Its overall structure is shown in Table 1. This model divides teaching activities into three stages, forming a closed loop.

4.1 Pre-class Preparation Stage: Data-Driven Precise Teaching Design

(1) Construction of learner profile model. Using platform data, teachers integrate students' basic information, prerequisite course scores, programming ability labels, project experience, and interest topics in forums to form multi-dimensional learner profiles. For example, a profile may show that a student "is good at SQL queries but has a poor understanding of machine learning algorithms and is interested in the field of financial risk control".

(2) Teaching design and goal decomposition. Guided by teaching goals (such as "master classification models and apply them in business scenarios"), teachers input prompts into generative AI: "Design a PBL project for undergraduate students majoring in big data, themed on telecom customer churn prediction, covering data cleaning, feature engineering, comparison and tuning of multiple classification models (logistic regression, decision tree, random forest), and writing of business suggestion reports. Please output the project assignment, initial evaluation rubric, and phased teaching guidance suggestions." Teachers then make professional revisions and contextual deepening of the AI-generated plan.

Table 1. Generative AI-Empowered Project-Based Curriculum Model for Big Data

Stage	Core Activities	Teacher-Led	Generative AI Support	Student-Centered
Pre-class Preparation	Learner profile construction	Define profile dimensions	Data analysis, label generation	Provide data foundation
	Teaching design and goal decomposition	Determine core curriculum goals, review plans	Provide PBL project draft, initial evaluation rubric	
Teaching Implementation	Intelligent scenario creation	Design roles, set rules	Play roles such as CEO, customer, domain expert for dialogue	Enter roles, respond to challenges
	Personalized task release	Set unified goals, supervise processes	Generate differentiated task lists based on profiles	Receive and understand personalized tasks
	Learning inquiry and dynamic feedback	Patrol, guide, answer questions	Act as learning companion/expert:- Provide materials- Code debugging- Brainstorming- Real-time analysis of learning data and push prompts	Active inquiry, in-depth interaction with AI
Project Conclusion	Visual presentation and evaluation of results	Organize defenses, conduct teacher evaluation	Generate process-oriented evaluation reports Assist in visualization design	Display results, conduct review
	In-depth reflection and iteration	Guide metacognitive thinking	Propose forward-looking and critical review questions	Complete reflection, plan iteration

4.2 Teaching Implementation Stage: Human-Machine Collaborative Inquiry and Practice

(1) Creation of intelligent scenarios. AI is assigned specific roles to create real work scenarios. In the "e-commerce sales data analysis" project, AI can play the role of a "demanding business department manager", continuously questioning student groups about the business implications of analysis results and the representativeness of data, thereby forcing students to think deeply about the connection between data and business. For example, take the "financial risk control" project as an example:

Project goal: Construct a credit risk scoring model for a virtual P2P online lending platform.

First, AI role assignment:

Role 1: Strict regulatory official.

Prompt setting: "Please act as a financial regulatory official. Your task is to ensure the fairness, compliance, and interpretability of the model. You will continuously inquire about the model's 'fairness indicators' (such as approval rate differences among different genders and age groups), 'counterfactual explanations' (why an application was rejected), and 'data privacy' protection measures."

Role 2: Aggressive product manager.

Prompt setting: "Please act as a product manager pursuing business growth. Your core KPI is to improve the loan approval rate. You will question whether the model is too conservative, ask us to 'identify those good customers mistakenly rejected by the model under controllable risks', and hope that we introduce non-traditional data (such as social data) to improve model performance."

Implementation process: Student groups need to conduct written communication with these two "AI roles" simultaneously, respond to their inquiries and needs, and revise their model strategies and reports accordingly. For example, the challenges from the product manager may prompt students to study "reject inference" technology; the inquiries from the regulatory official force students to think deeply about model ethics and learn to use interpretable AI tools such as SHAP.

Effect: The single model construction task is placed in a real business environment full of tension and trade-offs, which greatly cultivates students' communication, trade-off, and compliance awareness, which are important components of innovation.

(2) Release of personalized learning tasks. Based on unified project goals and different learner profiles, AI generates differentiated task lists for each group or individual. For example, provide more detailed data dictionaries and processing step prompts for basic groups, and propose open-ended challenges for advanced groups, such as "try to introduce external data sources (such as weather data) to improve the prediction accuracy of the model".

(3) Dynamic data analysis and real-time feedback. The intelligent learning platform records students' behaviors such as code writing, model training, and document viewing in real time. AI conducts real-time analysis of these data streams. When detecting that a group has been stuck in a certain link for a long time, it can take the initiative to push prompts: "It is detected that you are having difficulty in feature combination. Do you need to view some classic cases of feature engineering?" or directly initiate a guided dialogue.

(4) Multi-dimensional support in learning inquiry. At this stage, generative AI fully exerts its triple functions of "tool, learning companion, and expert" to assist students in completing various tasks such as information retrieval, code debugging, brainstorming, and model evaluation, ensuring the depth and fluency of the inquiry process. For example, take the "data visualization" link as an example:

Scenario: Students have completed the preliminary analysis of sales data and are ready to make visualization charts to report to the "management".

Dialogue between students and AI:

Student (as an intelligent assistant): "I have a data table of sales volume and profit of each product category in different quarters. I can use a stacked bar chart to show sales volume, but how to elegantly show the change of profit margin at the same time?"

AI suggestion: "You can consider using a dual Y-axis chart, with the left Y-axis for sales volume (bar chart) and the right Y-axis for profit margin (line chart). Alternatively, use small multiple charts, with one sub-chart for each category, showing the trends of sales volume and profit margin respectively."

Student (as a creative partner): "Dual Y-axis charts may be a bit ordinary. 'Small multiple charts' is a good idea! In addition, can you generate descriptions of 3 more creative and impactful visualization scheme sketches? The goal is to allow the management to see at a glance which category is a 'star business' and which is a 'problem business'."

AI-generated creativity:

"Scheme 1: Tree-like heatmap. Use area to represent total sales volume and color to represent profit margin (dark green for high profit, dark red for loss)."

"Scheme 2: Sankey diagram. Show the flow of sales volume among different quarters and different categories...."

"Scheme 3: Customized pictorial unit chart. Use different numbers of 'coin' icons to represent sales volume and the color of icons to represent profit margin...."

Student (as a virtual expert): "I chose the Sankey diagram. This is my Python code and preliminary results (paste code and chart). Please put forward 5 specific improvement suggestions for my chart from the perspective of visual design (color, layout, labeling)." AI provides professional feedback.

Effect: In this process, AI supports students' innovative practice in data visualization from providing basic schemes, stimulating creative inspiration, to providing professional reviews.

4.3 Project Conclusion Stage: Visual Presentation and Metacognitive Improvement

(1) Visual presentation of learning outcomes. Instead of directly generating the final report, AI guides students on how to use visualization tools (such as Tableau, Echarts) to integrate and present their data results, model performance, and business insights. AI can review students' visualization works and put forward improvement suggestions.

(2) Intelligent-driven comprehensive evaluation. The system integrates teacher evaluation, peer evaluation, and process-oriented evaluation reports generated by AI (based on dialogue logs, code iterations, document quality, etc.) to form a comprehensive "innovation capability evaluation radar chart", intuitively showing students' performance in dimensions such as critical thinking, technical execution, collaborative communication, and business understanding.

(3) In-depth reflection and iteration guidance. AI can guide students to review the project and propose questions such as "If the data volume is expanded by 100 times, how should your technical scheme be adjusted?" and "What is the biggest assumption of this project? If this assumption is not valid, what will happen to the conclusion?" to promote the formation of students' metacognitive ability and continuous iteration awareness.

5. Implementation Path and Challenge Analysis

The innovation of any educational paradigm cannot stay at the theoretical construction level; it must be supplemented with a clear and feasible implementation blueprint, and have a clear understanding and full preparation for the obstacles on the way forward. This chapter will deeply explore the specific paths, required conditions, and core contradictions to be resolved for the implementation of the "generative AI-empowered project-based curriculum model" in the Big Data Management and Application major.

5.1 Systematic Implementation Path: From Top-Level Design to Large-Scale Promotion

The implementation of this model should not be an isolated exploration by individual teachers, but a systematic project that requires systematic planning and phased advancement.

5.1.1 Phase 1: Strategic Preparation and Infrastructure Construction (3-6 months)

The core tasks of this phase are to build consensus, remove technical barriers, and lay a solid foundation for subsequent practice.

(1) Establish an inter-departmental special working group: The working group should be composed of college leaders, professional directors, core teachers, representatives of the information technology center, and enterprise mentors. Its responsibilities are not only to purchase technology but also to formulate an AI integration strategy consistent with the professional training program in an overall manner and approve relevant teaching ethics and management norms.

(2) Technology platform selection and security integration: The focus of technical evaluation is not the performance of a single AI model, but its usability, stability, and compliance. Priority should be given to selecting localized generative AI services that provide clear API interfaces to ensure that their data interaction complies with the requirements of the "Cybersecurity Law" and the "Personal Information Protection Law". The key task is to achieve the safe and in-depth integration of AI services with the university's existing intelligent teaching platforms and campus data cloud. This means that middleware needs to be developed to seamlessly embed AI capabilities into links such as course release, task distribution, learning data analysis, and grade management, rather than making teachers and students switch between multiple fragmented systems.

(3) Formulate an initial teacher development plan: Organize training workshops for the first batch of seed teachers. The training content should go beyond simple tool operation and focus on cultivating "human-machine collaborative teaching design capabilities". Specifically, it includes:

Design of precise prompts: How to design a questioning framework that can stimulate students' higher-order thinking instead of directly obtaining answers.

Critical evaluation of AI output: Lead teachers to jointly analyze possible errors, biases, or outdated information in AI's code generation, case provision, and theoretical explanation, and cultivate teachers' "digital critical literacy".

(4) Sandbox simulation of typical teaching scenarios: Simulate how teachers should guide the dialogue process and intervene in ineffective or deviated interactions when AI acts as a customer, expert, or learning companion in PBL projects.

5.1.2 Phase 2: Pilot Operation and Model Iteration (1 academic year)

After the basic conditions are met, select 1-2 core courses (such as "Data Mining", "Big Data Analysis and Visualization") for small-scale pilots.

Develop "intelligence-enhanced" teaching resource packages: Cooperate with instructional designers, seed teachers develop standard teaching resource packages for pilot courses. This not only includes traditional syllabuses and courseware but also:

(1) AI role script library: Pre-written AI role Prompt templates (such as "demanding business party", "rigorous architecture review expert") for different project stages to reduce the planning burden of teachers' lesson preparation each time.

(2) Differentiated task generation rule library: Clearly define how AI should adjust the complexity, openness, and support of project tasks for students of different ability levels.

(3) Process-oriented evaluation data collection list: Clearly define which interaction data between students and AI need to be recorded in the project (such as the quality of questions, the number of code iterations, the adoption and revision of AI suggestions) as the basis for process evaluation.

(4) Establish an agile feedback and iteration mechanism: During the pilot period, the working group should regularly (such as every two weeks) convene seed teachers and representatives of participating students for discussions to collect front-line feedback. Focus on: Is the teaching process smooth? Is there any abuse or dependence among students? Does AI's response meet the teaching expectations? Based on the feedback, quickly adjust and optimize the resource packages and implementation strategies.

5.1.3 Phase 3: Comprehensive Promotion and Systematic Deepening

After the successful pilot and model solidification, promote it to other courses in the major and promote in-depth reforms of the system. Incorporate the verified teacher development plan into the regular teacher training system, and let seed teachers guide more teachers to participate through the "mentorship" mechanism. When revising the professional training program, systematically review the goals and content of each course, and integrate the role capability requirements of AI collaborators (such as prompt engineering, information screening, human-machine collaboration) as implicit teaching goals into the curriculum system. Reform the traditional evaluation method of one final exam. Construct a multi-evaluation system integrating teacher evaluation, AI process-oriented evaluation, peer evaluation, and student self-reflection. Among them, the process-oriented analysis report generated by AI (see Figure 2) should be an important reference, but it must be combined with teachers' qualitative evaluation to jointly depict a dynamic map of students' innovation capability growth.

5.2 Potential Challenges and Prudent Responses

Opportunities and challenges coexist. We must face up to its core challenges with a prudent and rational attitude, recognize the risks of dependence and degradation of thinking ability. What is most worrying is not the technology itself, but that students may regard AI as an "all-purpose answer machine", thereby abandoning in-depth independent thinking.

Response strategies:

(1) Set "AI-free" independent thinking links: At key nodes of the project, such as problem definition, core algorithm selection, and conclusion derivation, students are forced to submit personal or group written ideas first before using AI for auxiliary verification or expanding ideas. This aims to ensure that the "first kilometer" of innovation is completed independently by students.

Table 2. AI Usage Log

Task Link	Specific Problems I Encountered/My Initial Ideas	The Prompt I Asked AI	Summary of AI's Response	My Evaluation of AI's Response and How to Use It	My Final Solution/Code
Data Cleaning	The user address field is messy, and I need to extract unified "city"-level information.	"I have a Pandas DataFrame column containing Chinese addresses with inconsistent formats. Please write a Python function that can extract city names (such as 'Beijing City', 'Hangzhou City') from strings as accurately as possible."	Provided a code snippet using regular expressions with the pattern `r	suggested combining thestr. extract` method.	Evaluation: The code is effective in most cases, but it does not handle "autonomous regions" well and misses municipalities directly under the Central Government such as "Beijing City". Usage: Taking AI's code as a starting point, I checked the regular expression documentation, modified the pattern to better match municipalities directly under the Central Government and autonomous prefectures, and added exception handling logic.
Model Optimization	My random forest model has acceptable accuracy on the test set, but low recall. I initially think it is caused by an imbalanced dataset.	"I am dealing with a binary classification problem of credit card fraud detection, with very few positive samples (fraud cases). My random forest model has low recall. Besides adjusting class weights, what other strategies can improve recall?"	AI suggested: 1. Use SMOTE oversampling technology; 2. Try XGBoost and adjust the scale_pos_weight parameter; 3. Change the classification threshold; 4. Use anomaly detection algorithms such as Isolation Forest or One-Class SVM.	Evaluation: SMOTE and threshold adjustment provided by AI were what I ignored before. Usage: I first in-depth studied the principle and potential defects of the SMOTE algorithm. Then I designed a comparative experiment.	I chose the scheme of using SMOTE oversampling combined with adjusting the random forest class_weight, and determined the optimal classification threshold through the ROC curve, which increased the recall by 15%.

(2) Implement the "AI usage log" system: Require students to append a detailed log to the project report, recording the original problems encountered when seeking help from AI, their initial thinking, the complete response of AI, and their critical review and final adoption of the response (see Case

Detail 5.2.1). This log will become key evidence for evaluating their critical thinking and independent learning ability.

(3) Design open-ended questions beyond AI's standard answers: The design of teaching tasks should deliberately pursue openness and non-standardization, such as "Design a narrative structure that can evoke emotional resonance for our data story". Such questions have no unique solutions and can effectively prevent students from directly copying AI output.

5.2.1 Boundary Challenges of Academic Integrity and Data Privacy

The powerful capabilities of generative AI make thesis ghostwriting and code ghostwriting more convenient and hidden. At the same time, the dialogue, code, and other data generated during the teaching process involve students' privacy.

Response strategies:

(1) Revise academic integrity norms and clarify the boundaries of AI use: At the university or college level, issue official guidelines on the use of generative AI in academic activities. Clearly define which behaviors are reasonable use (such as code debugging, obtaining inspiration) and which are academic misconduct (such as directly submitting entire reports generated by AI). The key is to emphasize "transparency" and "transformation", that is, the parts assisted by AI must be clearly marked, and personal deepening and verification of the content must be reflected.

(2) Sign data security agreements with AI service providers: Ensure that all interaction data generated during the teaching process is only used to improve the learning experience, not for model training or other commercial purposes, and is stored on domestic servers.

(3) Strengthen the weight of process-oriented assessment: Reduce the score ratio of the final project report, and significantly increase the weight of process-oriented performance (such as classroom discussions, phased achievement displays, AI usage logs), making it difficult for those who attempt to muddle through by relying on AI at the last minute.

5.2.2 Trust Crisis of Model "Hallucinations" and Knowledge Authority

Generative AI may generate seemingly reasonable but actually incorrect codes, formulas, or theoretical explanations. Such "hallucinations" are extremely harmful to students whose knowledge systems are not yet solid.

Response strategies:

Make "information screening and verification" a compulsory skill. At the beginning of the course, clearly inform students of the possibility of AI "hallucinations". Through case teaching, show how to verify the accuracy of information provided by AI through official documents, authoritative textbooks, and cross-validation. This is itself an important research literacy in the information age.

Encourage the "triangulation verification" method: Require students not to rely on a single AI conversation. For key knowledge or codes, they should ask questions multiple times, from different angles, or use different AI tools for mutual confirmation. Strengthen the teacher's role as the "ultimate knowledge anchor". In teaching, teachers need to transform from "the sole disseminator of knowledge" to "the captain of knowledge navigation". When students get lost in the information ocean of AI, teachers should be able to intervene in a timely manner and guide students to discover contradictions and return to the correct cognitive track through Socratic questioning.

5.2.3 Teachers' Role Transformation and Reconstruction of Professional Authority

Some teachers may feel anxious due to unfamiliarity with new technologies, worrying that AI will weaken their professional authority or significantly increase their lesson preparation costs due to its introduction.

Response strategies:

(1) Reshape the connotation of authority: Guide teachers to recognize that their new authority in the digital age does not come from mastering all knowledge, but from their rich teaching experience, in-depth understanding of disciplinary ideas, grasp of students' cognitive laws, and noble personality

charm. These are irreplaceable by AI. Teachers' roles should focus more on "guidance", "design", and "empowerment".

(2) Provide continuous technical and pedagogical support: Establish teacher learning communities, share successful teaching cases and Prompt scripts, and form a "co-construction and sharing" resource library to reduce the innovation cost of individual teachers.

(3) Reform teaching evaluation and incentive systems: Schools should give preferential treatment to teachers who actively carry out such teaching innovations in terms of workload recognition and professional title evaluation, and recognize the complex labor they have invested in curriculum design and human-machine collaborative teaching.

In short, integrating generative artificial intelligence into big data professional education is a complex and long-term systematic project. It requires educators not only to have the enthusiasm to embrace technology but also the courage to face challenges, prudent and detailed planning, and persistent practical wisdom. Only in this way can we harness this powerful technology and truly transform it into a tool for cultivating future innovative data talents.

6. Conclusion and Outlook

This study systematically demonstrates the great potential and practical path of generative artificial intelligence as a key enabling technology in cultivating the innovation capabilities of students majoring in Big Data Management and Application. By analyzing its internal mechanisms of stimulating innovative thinking, improving innovative skills, realizing personalized learning, and intelligent evaluation, a "generative AI-empowered project-based curriculum model" integrating the entire teaching process is constructed. The core innovation of this model lies in elevating AI from a peripheral tool to a "cognitive collaborator" embedded in the innovation process, realizing the organic unity of knowledge learning, technical practice, and innovation capability cultivation.

Looking forward to the future, the application of generative artificial intelligence in education is still in its early stage. Future research can be further carried out in the following directions: Firstly, explore the integration of generative AI with metaverse, digital twin and other technologies to build a more immersive big data project practice environment for students; Secondly, carry out long-term empirical research, and quantitatively evaluate the actual effect of this model on the development of students' innovation capabilities through scientific methods such as controlled experiments; Thirdly, conduct in-depth research on the application paradigms and ethical boundaries of generative AI in different majors and different course types. It is foreseeable that with the continuous maturity of technology and the continuous evolution of educational concepts, the new form of intelligent education featuring human-machine collaboration will surely open up a broader and more imaginative space for talent cultivation in cutting-edge scientific and technological fields such as big data.

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