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AI-Driven Reform of General Elective Courses: *The Case of Hands-On Data Analysis with Python*

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Abstract: This study addresses four critical challenges in the general elective course Hands-On Data Analysis with Python at vocational colleges: significant student competency stratification (only 14% possess programming foundations), imbalanced class-hour allocation (36 hours covering content from basic to advanced), a disconnect between learning and application, and unregulated AI usage. To tackle these issues, we developed a multi-dimensional reform framework that: (1) establishes a dual-track curriculum combining core modules in Python programming and basic data analysis with advanced electives (e.g., web scraping, machine learning); (2) implements a three-phase learning strategy—pre-class exploration, in-class intensive lectures, and post-class AI-assisted review—supported by the ChaoXing platform; and (3) designs a tri-dimensional assessment system evaluating project implementation completeness, result presentation standardization, and compliance with innovative AI-integrated practices. Moreover, integrating AI for intelligent tutoring alongside graded AI usage protocols (prohibited, restricted, encouraged and permitted) addresses individualized instruction gaps while mitigating ethical risks. Collectively, this framework provides a replicable paradigm for AI-driven reform of elective courses.

Keywords: AI-Assisted Learning, Curriculum Reform, Generative AI, Vocational Education Innovation.

1. Introduction

At the 2024 National Education Conference, President Xi Jinping emphasized: "Explore effective approaches for digital empowerment to achieve large-scale personalized teaching and innovative pedagogy, expand access to quality educational resources, and prioritize leveraging artificial intelligence to drive educational transformation." Historical evidence demonstrates that every major educational revolution has been closely linked to technological innovation. Scholars such as Anthony Seldon categorize educational evolution into four phases, noting that while the first three technology-enabled revolutions improved teaching quality and reduced teacher workload, they "failed to fundamentally alter the traditional model of large-scale offline instruction" [1].

The rapid advancement of Large Language Models (LLMs), exemplified by ChatGPT and DeepSeek, has accelerated society's entry into the "AI Plus" era. As a technology simulating human cognitive processes—including learning, reasoning, and planning [2]—AI exhibits transformative potential for education, not only enhancing efficiency through intelligent restructuring of teaching processes, but also promoting personalized learning and fostering students' creative thinking [3]. This presents a historic opportunity to implement large-scale personalized instruction.

In higher education practice, however, students' pervasive use of AI tools for information processing, content optimization, and direct answer generation has profoundly impacted teaching methodologies, learning processes, and assessment systems. At the same time, inherent risks have emerged: frequent "AI hallucinations" (fabricating facts detached from reality) [4] may mislead educators and learners, while misuse threatens academic integrity and undermines independent thinking [5]. These challenges necessitate the establishment of usage protocols and governance mechanisms alongside technological adoption.

Focusing on Higher Vocational Education (HVE), which aims to cultivate "versatile technical talents," digital literacy and lifelong learning skills have become essential competencies alongside professional and humanistic capabilities. The general elective course *Hands-on Data Analysis with Python* provides non-computer science students with critical upskilling opportunities. Yet traditional pedagogy faces three key constraints: (1) significant disparities in programming proficiency hinder personalized instruction; (2) real-time learning analytics remain underdeveloped, delaying feedback; and (3) students' low stress tolerance often leads to motivation attrition.

Consequently, reconstructing the curriculum through AI integration is imperative. This involves enhancing teaching efficiency and personalization via intelligent tools, while establishing ethical AI frameworks—including usage agreements and engagement metrics—to safeguard academic integrity and systematically develop students' AI literacy.

2. Literature Review

The current wave of artificial intelligence is driving profound transformations in education, yet the adoption of Large Language Models (LLMs) within China's higher education sector remains largely fragmented, self-initiated, and exploratory [6]. In response, the Department of Higher Education under the Ministry of Education has launched pioneering innovation paradigms through two consecutive rounds of case studies on "AI + Higher Education" application scenarios [7]. Notable examples include: Harbin Institute of Technology's AI-Empowered Teaching-Learning Scenario Innovation, which builds a cross-spatiotemporal human–machine collaborative ecosystem through 24/7 intelligent learning companions and digital virtual instructors to provide continuous adaptive learning support [8]; and Shanghai Jiao Tong University's AI + HI (Human Intelligence) Fusion Model, which systematically upgrades traditional courses—for example, deploying programmable code assistants in Medical Imaging Informatics to mitigate tutoring resource constraints [9]. Importantly, such initiatives primarily target specialized higher education courses, leaving considerable scope for expansion into vocational education contexts.

Unlike general education, which emphasizes disciplinary knowledge, vocational education is centered on imparting technical expertise and cultivating practical competencies [10]. As AI penetrates industrial sectors, AI technology itself has become an integral part of technical knowledge systems, making it essential for vocational education to cultivate "AI-plus" versatile skilled talent. For instance, Zhao Hang's team reformed the Architectural Drafting and Blueprint Reading course by systematically integrating AI software access, feature analysis methods, and operational techniques, thereby achieving deep convergence of technical knowledge and intelligent tools [11]. Similarly, the Government of Western Australia partnered with TAFE colleges and Rio Tinto to develop automation-focused programs (e.g., the Advanced Certificate in Automated Workplace Operations), directly aligning training with industry's technological upgrading needs [12].

Concurrently, the global education community is actively investigating critical issues such as the role of AI-generated content and the extent of AI involvement in student work [13]. Since 2023, leading U.S. universities have pioneered institutional AI policies that: (1) clarify technological accountability; (2) establish instructor–student negotiation mechanisms; (3) define application boundaries; and (4) standardize citation requirements [14].

Meanwhile, Shanghai Jiao Tong University has developed China's first institutional framework for AI usage in education, proposing a graded classification system for "AI + Education" to enhance ethical awareness and foster self-regulation among stakeholders [15]. These regulatory efforts, however, remain exploratory and will require continuous refinement through iterative reform.

3. Analysis of Course Current Status

The general elective course *Hands-on Data Analysis with Python* (offered to all college disciplines) faces four structural contradictions:

(1) Significant Disparity in Student Prerequisites and Lack of Tiered Instruction: Students from diverse majors exhibit wide variation in programming and data analysis foundations. Only 14% have computer-related backgrounds with prior experience, while diagnostic testing reveals a long-tailed, skewed distribution (mean ≈ 64/100): 37.5% scored below 60 (insufficient fundamentals), whereas 22.5% scored above 80 (advanced proficiency). This substantial competence gap makes uniform instruction ineffective for such heterogeneous needs.

(2) Imbalance Between Content Scope and Contact Hours: To accommodate absolute beginners (over one-third of the cohort), the curriculum must cover basic Python modules, which creates redundancy for proficient learners (nearly one-fourth). At the same time, the compressed 36-hour format (compared with 48+ hours in major courses) forces excessive condensation of content. As a result, novices fail to internalize core concepts, while advanced learners find the material trivial. This dual dilemma exemplifies the paradox: superficial for the skilled, overwhelming for the unskilled.

Disconnection Between Pedagogy and Vocational Demands: The current linear, chapter-by-chapter progression—from introductory to advanced topics—lacks personalized adaptation. More critically, the course does not align with actual career skill requirements, resulting in a disconnect between technical training and real-world applications and limiting the transferability of professional competencies. This learning–practice decoupling severely constrains the development of students' essential skills.

Unregulated AI Adoption Without Effective Guidance: Although students frequently employ AI tools for learning, exercises, and assessments, their usage remains largely spontaneous and unregulated. This has fostered excessive dependence on AI-generated code and analytical outputs, while undermining independent thinking and knowledge internalization. The root of the problem lies in misconceptions about AI's role—viewing it as a mere task executor rather than a facilitator of the learning process. This misperception, coupled with a failure to recognize AI as "a context- and pattern-based content generator," ultimately deepens technological dependency and weakens students' technical capabilities.

4. Research Objectives and Contents

As shown in Fig. 4.1, this study is situated in the era of AI-driven educational transformation, leveraging generative artificial intelligence as the central impetus to systematically reconstruct the general elective course *Hands-On Data Analysis with Python* across four dimensions: teaching content, methodology, delivery mode, and assessment. Its primary objective is to examine how AI technologies can drive teaching reform and promote innovative talent cultivation in vocational education.

Focusing on this course as a case study, the research aims to redesign the entire instructional process through generative AI, while establishing an innovative "Dual-Track · Tri-Phase · Tri-Dimension" pedagogical paradigm. This framework integrates a dual-track curriculum system that combines mandatory foundational modules with elective advanced modules, a tri-phase blended learning model that connects pre-class exploratory research, in-class delivery of key concepts, and post-class AI-assisted review, and a tri-dimensional evaluation mechanism that assesses project implementation efficacy, outcome presentation quality, and innovation practice level. Through these reforms, the initiative seeks to achieve three transformative breakthroughs: enhanced teaching quality, personalized talent cultivation, and digital educational transformation.

The study specifically addresses the critical gap in personalized guidance within the course, a challenge arising from significant disparities in student competencies and limited faculty coverage. To bridge this gap, course content is restructured through deep integration of AI technologies via the dual-track tiered system, teaching methodology is innovated with AI-empowered heuristic pedagogy implemented through project-driven instruction, delivery models are optimized by establishing an intelligent platform-based blended learning pathway that integrates online and offline resources and consolidates multi-source materials, and assessment is reformed with a process-oriented approach emphasizing learning outcomes while rigorously enforcing AI governance protocols. Collectively, this systematic reconstruction fosters students' AI application literacy and exemplifies a replicable paradigm for AI-driven elective course reform.

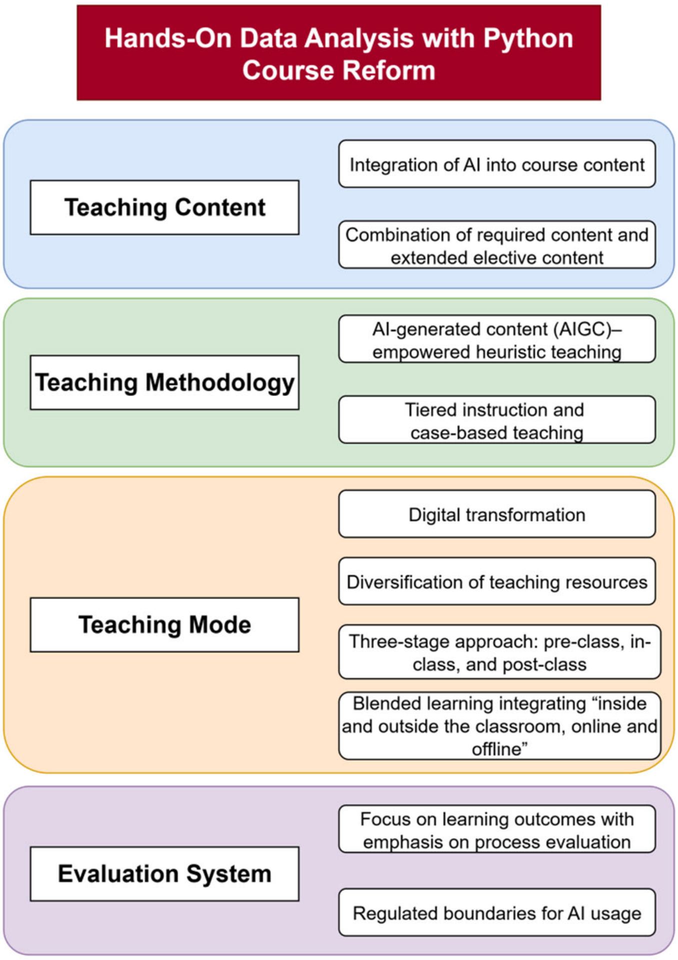

Figure 4.1. *Hands-On Data Analysis With Python* Course Reform

5. Methodology

5.1. Curricular Restructuring

To enhance pedagogical relevance, this reform integrates emerging technologies—particularly artificial intelligence—into the curriculum, while balancing core and elective modules to support both classroom instruction and independent study.

5.1.1. Integration of Advanced AI Technologies

As a critical supplementary course for non-computer science majors acquiring programming and data analysis skills, *Hands-On Data Analysis with Python* must remain contemporary by aligning with technological advancements. Artificial intelligence, given its research significance and broad real-world applications, offers substantial pedagogical value. The course's dual emphasis on Python programming fundamentals and Pandas-based data analysis provides a natural foundation for AI integration: Python is the predominant language for AI development, while data analysis constitutes the essential precursor to data mining, a discipline closely intertwined with AI methodologies. Introducing elementary machine learning concepts alongside applied case studies can enhance student engagement while cultivating interdisciplinary thinking and practical AI competencies.

Python' s extensibility through third-party libraries further supports this integration. For example, the scikit-learn library provides core machine learning functions such as dataset partitioning, model initialization, training, and validation. A representative case study involves applying linear regression to predict movie revenue patterns. This practical exercise introduces students to AI modeling frameworks, training methods, and validation techniques, while fostering deeper exploration of artificial intelligence.

The movie revenue analysis serves as a pedagogical example, with course objectives categorized into knowledge acquisition, skill development, and competency enhancement, as detailed in Table 5.1. Instructional delivery combines structured knowledge transfer with task-driven, project-based learning.

As a critical supplementary course for non-computer science majors acquiring programming and data analysis skills, *Hands-On Data Analysis with Python* must maintain contemporary relevance through continuous alignment with technological advancements. Artificial intelligence, with its demonstrable research significance and pervasive real-world applications, offers substantial pedagogical value. The course's dual focus on Python programming fundamentals and Pandas-based data analysis naturally accommodates AI integration: Python serves as the predominant language for AI development, enabling seamless incorporation of practical applications into foundational instruction, while data analysis forms the essential precursor to data mining—a discipline intrinsically intersecting with AI methodologies. Introducing elementary machine learning concepts alongside applied case studies will not only increase student engagement but crucially cultivate interdisciplinary thinking and comprehensive AI implementation skills.

Python's extensibility through third-party libraries facilitates this integration. For instance, the scikit-learn library provides essential machine learning functionalities including dataset partitioning, model initialization, training, and validation. A practical implementation involves employing linear regression to analyze and predict movie revenue patterns. Such case studies establish foundational understanding of AI modeling frameworks, training methodologies, and validation techniques, thereby stimulating further exploration of artificial intelligence.

The movie revenue analysis case study exemplifies this approach, with specific course objectives categorized into knowledge objectives, skill development objectives, and competency enhancement as detailed in Table 5.1. Instructional delivery combines didactic knowledge transfer with task-driven methodologies.

Table 5.1. Course Objectives

Course Objective Categories	Specific Objectives
Knowledge Objectives	Understand fundamental machine learning concepts and their relationship to data mining; Comprehend core principles, advantages, and limitations of regression analysis; Master essential techniques for implementing linear regression (key focus area); Acquire data preprocessing skills, particularly normalization and numerical transformation; Grasp dataset partitioning methodologies, including training, testing, and validation sets.
Skill Development Objectives	Apply linear regression models using scikit-learn to analyze movie revenue data (key focus area); Implement data normalization through scaling functions in scikit-learn.
Competency Enhancement Objectives	Demonstrate commitment to excellence and uphold professional ethics; Apply analytical rigor in identifying relational patterns within datasets to ensure accountability; Internalize data-driven values and professional ethos essential to the big data field.

The following outlines the instructional sequence design of the movie revenue analysis case study:

(1) Course Introduction

Using the anticipated 2025 release of Nezha 2 as the instructional anchor, this module examines the relationship between film release timing and box office performance. It establishes a problem-solving context for predicting movie revenue through exploratory analysis of historical box office datasets and their key features.

(2) Objective Clarification

The case study aims to construct a basic machine learning model capable of predicting future viewership patterns from historical data analysis, thereby establishing clear learning expectations.

(3) Theoretical Foundations

This phase introduces core concepts including machine learning principles and historical development; connections between data mining and machine learning; supervised learning paradigms with emphasis on regression problems; general machine learning workflows; and theoretical frameworks for simple linear regression modeling.

(4) Case Demonstration & Implementation

The demonstration is decomposed into sequential subtasks followed by guided practical exercises. Stepwise procedures include dataset loading, preprocessing, partitioning, model construction, training, and evaluation. This scaffolded approach enables application of theoretical knowledge while employing Socratic questioning to stimulate critical engagement.

(5) Collaborative Analysis

Structured group discussions explore practical applications and scalability of the developed models. Facilitated brainstorming sessions with targeted feedback help cultivate analytical communication skills and support conceptual transfer.

(6) Regulated Practical Exercises

AI tool usage follows strict protocols: data extraction and preprocessing prohibit AI assistance. Students independently replicate the machine learning workflow while investigating parameter tuning effects on model accuracy. This phase emphasizes methodological precision and adheres strictly to regulated use of the ChaoXing platform’s AI assistant.

(7) Differentiated Instruction

Advanced learners access polynomial regression materials to compare algorithmic performance against baseline models. This tiered resource provision accommodates diverse proficiency levels and creates growth opportunities for high-achieving students.

(8) Synthesis & Extended Learning

The module concludes with knowledge consolidation through workflow review and discussions on future learning trajectories. Students submit comprehensive lab reports containing reflective summaries of acquired competencies. Supplemental materials on multiple linear regression and random forest regression are provided via the course platform to encourage self-directed exploration.

5.1.2. Implementation of Differentiated Elective Modules

The Python programming language distinguishes itself through its expansive open-source ecosystem, enabling students to extend functionality via specialized third-party libraries across domains such as web development, web scraping, data mining, and artificial intelligence. *Hands-On Data Analysis with Python* strategically enhances curricular depth and breadth, thereby cultivating comprehensive data literacy.

Significant learner heterogeneity characterizes public elective contexts, with divergent motivations, varying engagement levels, and disparate Python proficiency. This necessitates tiered learning pathways that accommodate individualized development trajectories. Consequently, the course integrates differentiated elective modules alongside core content (as schematically represented in Fig 5.1.), providing scaffolded advancement and optimizing personalized learning experiences.

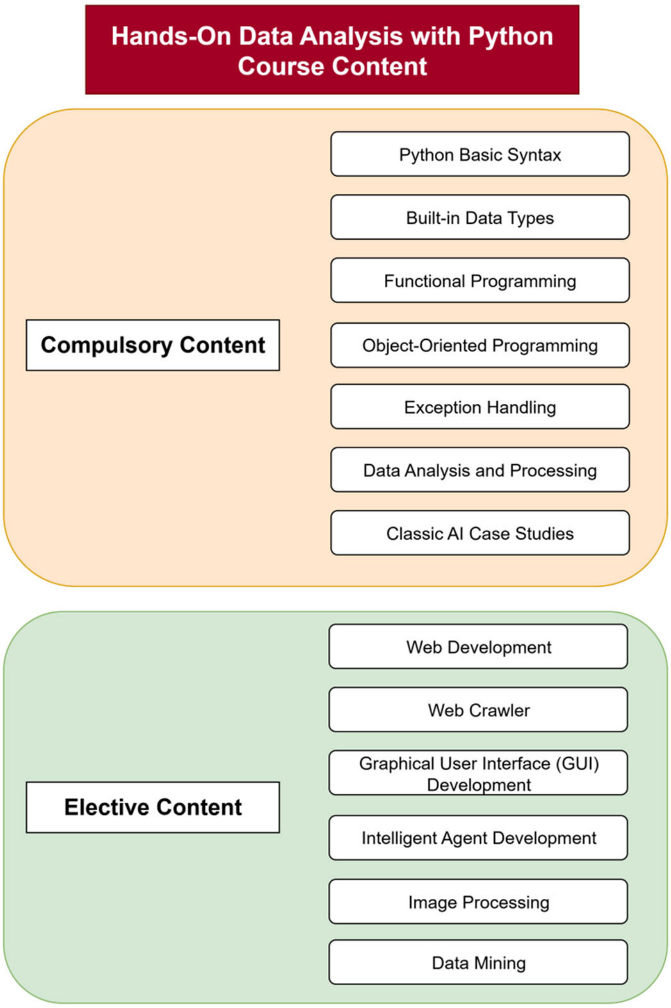

Figure 5.1. *Hands-On Data Analysis with Python* Course Content

The curriculum incorporates six specialized elective domains—web development, web scraping, GUI development, natural language processing, image processing, and data mining—to cultivate multidisciplinary technical competencies and enhance graduates' employability. These modules undergo continuous refinement in response to technological evolution and labor market dynamics, ensuring disciplinary rigor and maintaining cutting-edge relevance through adaptive content updates.

All elective resources are hosted on the ChaoXing online platform, with each module featuring an introductory orientation video, a concept map outlining learning trajectories, and career pathway visualizations. This tripartite framework provides comprehensive overviews, clarifies the competencies acquired in each module, and supports informed career development decisions.

Each elective module delivers a comprehensive suite of pedagogical resources—including video lectures, presentation slides, supplementary readings, software tools, and code repositories—complemented by project-based tasks that reinforce applied learning.

5.2. Pedagogical Innovation

The *Hands-On Data Analysis with Python* course confronts significant pedagogical challenges stemming from pronounced heterogeneity in students' programming proficiency. This disparity often manifests in practical sessions through widespread difficulties with code debugging and algorithmic conceptualization. Large cohort sizes further constrain individualized guidance, frequently resulting in learner attrition from unresolved frustrations. The absence of personalized mentorship thus emerges as a critical bottleneck within conventional teaching paradigms.

Generative artificial intelligence (GenAI) offers an innovative resolution by enabling real-time responsiveness to diverse learning queries while transforming instructional dynamics through Socratic scaffolding. Specifically, when learners invoke the AI Assistant on the ChaoXing platform, they receive targeted intellectual support that includes:

(1) Stimulating problem-solving through heuristic questioning;

(2) Deconstructing code progressively;

(3) Mapping knowledge contextually.

Such dialogic engagement facilitates personalized mentoring previously unattainable in traditional classrooms. Crucially, this technology liberates instructors from repetitive consultation tasks, allowing them to reorient toward higher-order pedagogical design. For example, when learners encounter programming obstacles during practical sessions, the system automatically generates tailored prompts, delivering immediate and precise academic scaffolding via the learning assistant.

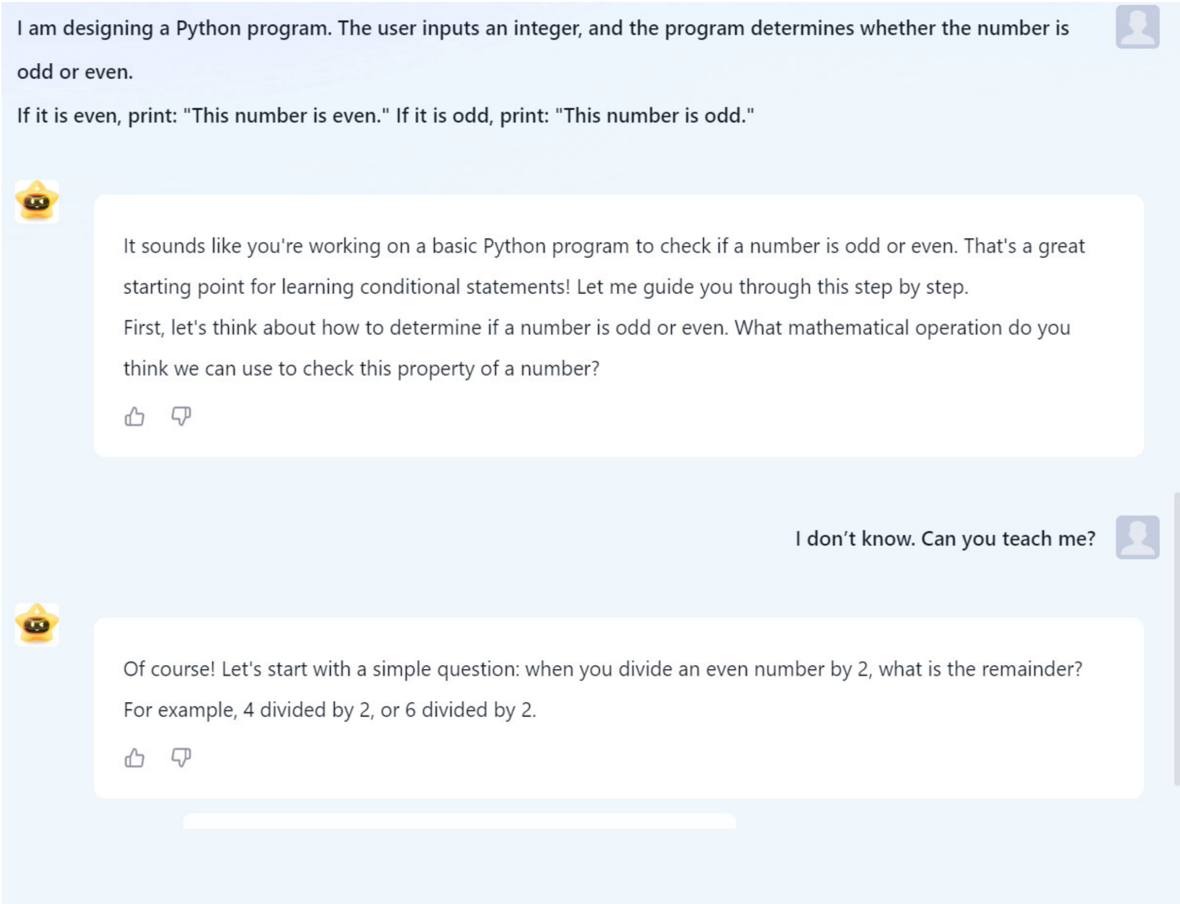

Figure 5.2. AI Assistant Guiding Integer Parity Determination

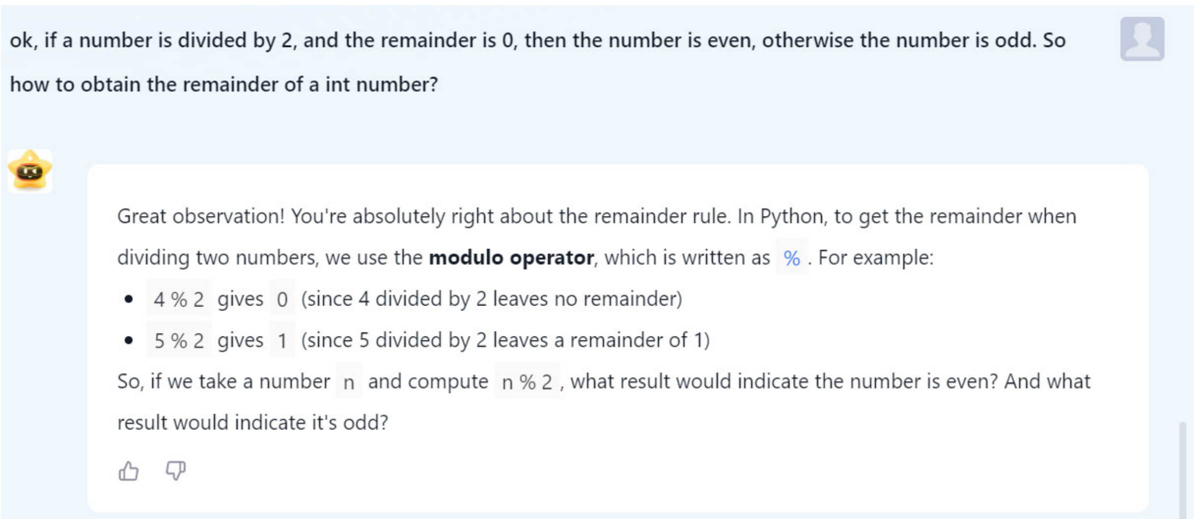

Figure 5.3. AI Assistant Guiding Modulo Operator Application

Heuristic pedagogy distinguishes itself by withholding direct solutions and instead employing illustrative cases and probing questions to guide students toward independent problem-solving. The AI Assistant on the ChaoXing platform effectively operationalizes this methodology. As shown in Fig. 5.2, when students encounter conceptual obstacles in determining integer parity, the assistant provides mathematical exemplars that scaffold logical reasoning. Likewise, Fig. 5.3 demonstrates how learners unfamiliar with Python's modulo operator receive targeted explanations and computational examples, thereby facilitating code implementation. This scaffolding technique cultivates critical thinking and nurtures learner autonomy. Moreover, AI-mediated interactions enhance engagement by fostering proactive participation in the discovery of solutions.

5.3. Pedagogical Model Innovation

5.3.1. Hybrid Online-Offline Framework

The course employs an innovative hybrid teaching model that integrates digital and physical learning environments. Core resources—including instructional videos, scholarly references, lecture materials, pre-class preparation tasks, and practical assignment briefs—are consolidated on the ChaoXing learning platform to optimize the quality of the learning experience. In parallel, the Python123 programming platform supports in-class coding exercises by providing automated code evaluation, test case verification, and solution benchmarking, thereby significantly enhancing practice efficiency.

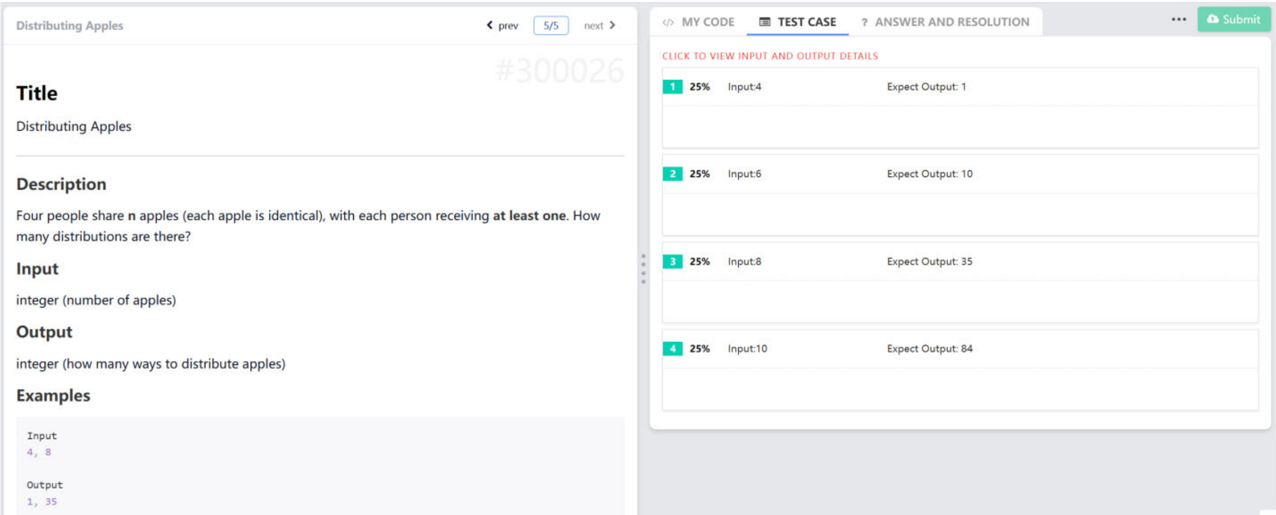

Figure 5.4. Python123 Platform Implementation of In-Class Programming Exercises

As shown in Fig. 5.4, students practice coding through exercise modules displayed in the left-hand panel, while the right-hand panel presents automated evaluation results, including test case verification and scoring. If execution errors occur, learners can review diagnostic feedback or request guided troubleshooting through ChaoXing' s AI assistant.

5.3.2. Integrated In-Class and Extracurricular Learning

This pedagogical approach establishes a tripartite learning structure comprising pre-class, in-class, and post-class phases. As detailed in Table 5.2, during the pre-class phase, instructors distribute preparatory task lists and exercises through the ChaoXing platform, where students engage with instructional videos and complete preliminary exercises. This process enables instructors to identify potential learning difficulties via data-driven diagnostics.

During the in-class phase, instruction emphasizes core concepts and case demonstrations while also integrating value-based education with disciplinary knowledge. This dual-focus strategy develops professional competencies while fostering ethical awareness, with particular attention to responsible AI implementation. Critical learning obstacles are addressed through structured Q&A sessions.

In the post-class phase, students complete practical assignments and engage in structured knowledge review. Instructors provide personalized feedback through the platform's assessment mechanisms, reinforcing both conceptual mastery and applied problem-solving skills.

Table 5.2 Instructor and Student Activities in the Pre-class, In-class, and Post-class Phases

Teaching Phase	Instructor Activities	Student Activities
Pre-class	Disseminate preparatory task lists; Deploy course resources; Assign pre-class exercises; Monitor learning progress; Adjust teaching strategies	Complete pre-class modules; Submit pre-class exercises; Engage in self-directed study
In-class	Deliver focused instruction on core concepts; Demonstrate case studies; Integrate value-based education; Facilitate classroom interactions; Emphasize responsible AI usage; Conduct Q&A sessions and monitor student progress	Comprehend, analyze, and discuss content; Complete in-class exercises; Perform hands-on practice; Use AI assistant for learning support; Follow AI usage guidelines
Post-class	Assign post-class projects and AI practice tasks; Grade and evaluate assignments; Reflect and optimize teaching strategies	Submit post-class assignments; Review key concepts; Explore supplemental materials; Use AI assistant for learning reinforcement; Follow AI usage guidelines

5.4. Evaluation System Reform

5.4.1. Talent Development-Oriented Assessment

The course *Hands-on Data Analysis with Python*, a public elective for all disciplines, enhances the professional curriculum to cultivate versatile, technically competent professionals. This talent development approach emphasizes student autonomy, prioritizes skill enhancement, and adopts a project-driven pedagogy. An integrated online-offline teaching model grounded in the "talent development orientation" philosophy focuses on tangible outputs, such as project deliverables and lab reports, thereby establishing a closed-loop instructional model that integrates theory with practice to reinforce the mutual advancement of learning and application.

The assessment framework consists of formative and summative evaluations, each accounting for 50% of the final grade. As detailed in Table 5.3, formative assessment evaluates classroom participation, online engagement, in-class exercises, and hands-on practice, ensuring rigor through comprehensive monitoring of learning progress. Summative assessment measures learning outcomes via a final project. Self-organized teams (5–6 members) may either select analysis topics and datasets aligned with individual career interests for innovative implementation or choose standardized tasks from a predefined repository. Teams break projects into subtasks with clearly assigned responsibilities. Final evaluations are based on project completeness, analytical accuracy, and innovation.

Submitted deliverables must include technical reports and source code, assessed across three dimensions:

(1) Holistic Design: functional completeness, code quality, and team collaboration;

(2) Analytical Outcomes: completeness and clarity of reports, standardized code documentation, and responsible AI implementation;

(3) Project Innovation: novelty of solutions and proper, standardized use of AI tools.

Table 5.3 Course Assessment Framework

Assessment Type	Assessment Component	Evaluation Criteria
Formative Assessment (50%)	Classroom Participation (10%)	(1) Attendance and classroom discipline; (2) Engagement in group discussions and interactive activities
	Online Learning (10%)	(1) Completion of required content (e.g., instructional videos, online exercises); (2) Optional learning activities (bonus opportunity: e.g., supplementary videos, advanced exercises)
	In-Class Exercises (10%)	Completeness and accuracy of exercise submissions;
	Comprehensive Practical Training (20%)	(1) Task completion progress; (2) Execution accuracy; (3) Adherence to responsible AI protocols; (4) Optional advanced tasks (bonus opportunity)
Summative Assessment (50%)	Project Design	(1) Holistic Design: Functional completeness, code quality, and team collaboration; (2) Analytical Outcomes: Report integrity, standardized code annotations, and compliant AI implementation; (3) Project Innovation: Solution novelty and normative utilization of AI tools

5.4.2. Cultivating AI Literacy

While training students to utilize AI tools for task and project execution, the course emphasizes the technical essence of generative artificial intelligence: an advanced autocompletion system based on token sequence probability prediction. This approach guides students to recognize programming as an artistic discipline—transcending mere code writing to involve creative cognitive processes. Before coding, programmers must conceptualize functional implementation strategies while optimizing efficiency and reliability, demanding creative ideation translated into executable solutions.

Generative AI fundamentally operates by learning grammatical rules to assemble symbol sequences. Consequently, it should serve as an auxiliary instrument for programming cognition, not a replacement for foundational skill development.

Therefore, a dedicated AI Usage Protocol is established to steer responsible tool adoption under three principles:

(1) Auxiliary Learning: AI as a supplementary resource

(2) Efficiency Enhancement: Productivity acceleration

(3) Risk Mitigation: Prevention of capability substitution

As specified in Table 5.4, instructors shall implement tiered supervision across all learning phases—pre-class preparation, in-class instruction, post-class practice, and final projects—ensuring efficient learning while proactively monitoring AI usage risks.

Table 5.4 AI Usage Protocol

Usage Tier	Constraints	Recommended Practices	Prohibited Behaviors
Prohibited	Any AI-generated or modified code is strictly forbidden; Violators receive zero credit for the assignment	N/A	Any AI usage
Restricted	Seek heuristic guidance via Chaoxing AI Tutor; Require attribution in submissions (platform, prompts, modifications)	Code debugging (e.g., error analysis); Code comment generation; Syntax clarification	Using non-whitelisted AI tools; Verbatim copying of AI-generated code
Encouraged	Document discrepancies between AI suggestions and final solutions	All Restricted-tier practices; Code optimization suggestions; Standard/third-party library queries	Copying complete AI-generated code blocks
Permitted	Accuracy verification required (no formal reporting)	Package installation/management; Python data analysis & visualization learning	N/A

6. Conclusion

Amid the continuous evolution of artificial intelligence, we are committed to leveraging AI to drive transformative changes in education and innovate talent development models. *Hands-on Data Analysis with Python*, a public programming elective for vocational colleges, represents a crucial extension beyond the core curriculum, highlighting the significance of its pedagogical reform. This course redesign focuses on reconstructing teaching methodologies using generative AI technologies to achieve systematic AI-curriculum integration.

By harnessing the heuristic capabilities of AI assistants and implementing tiered instructional strategies, we have developed a diversified digital resource ecosystem through smart learning platforms. This fosters a cohesive educational model that integrates classroom and extracurricular activities through blended online-offline delivery. The framework also follows a talent development-oriented philosophy, using personalized project development as a key evaluation benchmark. It implements regulated AI usage guidelines, guiding students to treat AI as an auxiliary tool rather than a replacement, while progressively raising awareness of AI misuse. Ultimately, these measures establish a future-ready Python elective teaching system that accelerates the digital-intelligent transformation of education, enhances personalized talent development, and offers replicable models for cultivating versatile technical professionals in vocational institutions.

Looking ahead, we will continue to track academic frontiers, update elective content modules, advance course reform initiatives, and continually enhance the quality of talent development.

Acknowledgements

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