Smart Teaching Design and Smart Teaching Platform Development in the "AI +" Era

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Abstract. After personalized training, AGI large models transform into various intelligent agents, enabling functions like intelligent question generation, test paper compilation, and assignment grading. These agents effectively undertake teaching tasks as teachers' assistants. However, their independent functions and weak logical connections fail to meet the needs of student-centered process-oriented teaching. Further improvements to smart teaching systems are required to ensure the effective implementation of this teaching philosophy and process-oriented teaching. Starting from the student-centered concept, this paper focuses on enhancing students' active course participation, analyzes teaching processes and their inherent logic, and explores opportunities for students to engage in courses. To facilitate immersive learning, it proposes reconstructing course content around themes, optimizing process tasks, and implementing the teacher-student-machine collaborative teaching mode—empowering students to use AGI for autonomous learning and teachers to leverage smart platforms to analyze students' learning data and feedback, identify key and difficult teaching points, and deliver targeted instruction. To ensure learning initiative, a process assessment mechanism with interrelated constraints is designed based on the inherent logic of teaching processes. In order to enhance the implementation of new teaching theories, recommendations for the developing of smart education platforms are also promoted.

Keywords: Smart Education; Theme; AGI; AI +; Teacher-Student-Machine Collaboration.

1 Introduction

With the rapid development of artificial intelligence (AI), Generative Artificial Intelligence (AGI)has been evolving continuously and has enhanced its cognitive capabilities, making it a super knowledge entity and productivity multiplier [1, 2]. This has effectively promoted the development of new-quality productive forces and profoundly transformed traditional education systems [3-5]. In the "AI +" era, AI applications have expanded in depth and width, reshaping social production methods [6-10]. Most of cognitive

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tasks are increasingly handled by efficient AI agents, putting knowledge-based students in competition with AI for jobs. Thus, innovative talent cultivation has become a top priority.

Facing the rise of AI and its potential impacts, higher education institutions must deepen teaching reforms. Their social function should shift from knowledge transmission to value creation, talent training goals from knowledge mastery to nurturing technology navigators with innovative abilities, and teaching modes from traditional indoctrination to AI-supported, student-centered, teacher-guided collaborative learning [11-13]—integrating immersive and embodied learning [14-17]. These shifts will drive profound changes in educational mechanisms, fostering new-quality productive forces and high-quality education development.

Smart teaching systems, as natural products of AI, are crucial for implementing new educational mechanisms. However, current teaching systems suffer from independent AI agents with weak correlations and logical constraints, hindering the practice of student-centered and process-oriented teaching. So, the current systems should be improved further based on new educational mechanisms.

2 The Six- Stage Teaching Process

Cultivating innovative talent is the fundamental response to challenges posed by AI. It is essential to explore educational opportunities and improve innovation ability.

Traditional teaching focuses primarily on in-class learning, underutilizing pre-class and post-class periods and failing to tap into students' active learning potential. The student-centered philosophy emphasizes fostering initiative, requiring expanded and improved teaching processes to create more immersive learning scenarios. This paper proposes a six-stage teaching model, extending the teaching process to pre-class preview, in-class instruction, post-class consolidation, final comprehensive assessment, innovative practical projects, and curriculum adjustment. Improvements should be made in curriculum organization, teaching methods, and assessment mechanisms to optimize learning processes and enhance teacher-student-machine collaboration.

The six-stage model aims to systematically explore active learning opportunities, optimize knowledge acquisition, and cultivate students' initiative and innovation. Students preview basic theories, field developments, and key difficulties to participate effectively in class. Teachers use preview feedback to identify focus areas and deliver targeted in-class instruction. Post-class assignments assess knowledge comprehension and application. Final assessments evaluate systematic knowledge mastery. Innovative practical projects focus on cultivating problem-discovery, problem-analysis, and innovative problem-solving abilities. The phase of adjustment analyses the existing problems of this term, revises teaching strategy for the next term of course.

Phased teaching tasks and goals reflect the interconnection between processes: earlier stages lay the foundation for subsequent ones, while later stages provide feedback to improve earlier phases. The six-stage model offers a theoretical and practical framework for student-centered, immersive, and innovative talent cultivation (see Fig. 1).

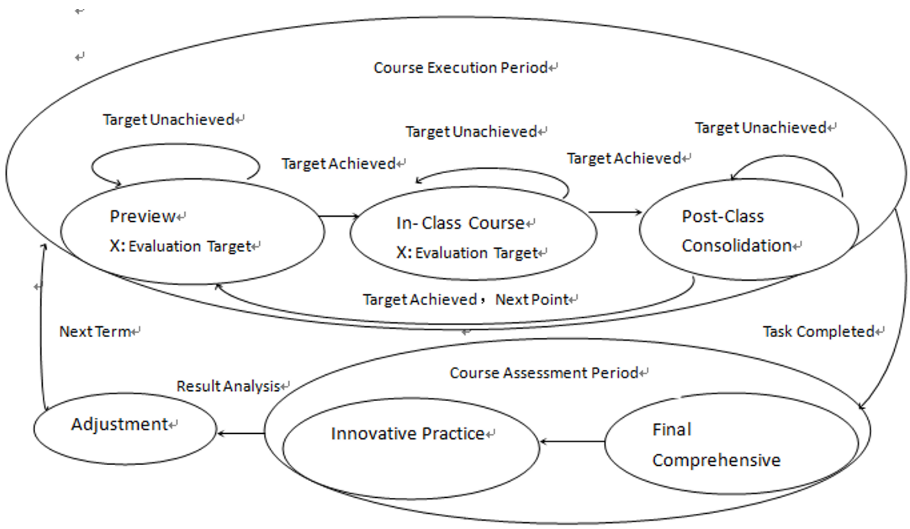

Fig. 1. Thesix-stage teaching process model

The model illustrates the composition, inherent relationships, and operation of process-oriented teaching. Current smart education platforms only provide partial support, and fully aligned platforms are still under development.

3 Theme -Based Curriculum Design

In the "AI +" era, innovation ability is central to talent cultivation. Only with innovation can individuals develop and master new AI technologies and remain competitive. Innovation stems from practice, and students' innovation cultivation relies on their embodied engagement. AGI, as a super knowledge entity, has transformed knowledge production and transmission, enabling the shift from passive indoctrination to active learning. This facilitates the implementation of human-machine collaborative talent cultivation mode, enhancing students' innovation ability. In research projects, students collaborate together with AGI to design experiments—AGI handles literature retrieval and data modeling, while students focus on hypothesis formulation and logical verification, significantly improving research efficiency. In learning, AGI searches for theme-related content, and students refine, supplement, and optimize results based on specific fields, activating initiative and innovative thinking.

To adapt to students' changing roles and innovation cultivation, teachers must transition from knowledge transmitters to guides, supervisors, and monitors of learning and innovation. Based on cultivation objectives, teachers refine curriculum content, design themes, construct theme-based curriculum systems, and optimize implementation phases. Students collaborate with AGI for autonomous, time-and-space-independent learning.

3.1 Differences between Theme-Based and Traditional Curricula

Theme-based curricula differ fundamentally from traditional ones in organization, goals, and implementers. Traditional curricula are task-centered, structured around knowledge points for teaching convenience. Theme-based curricula are student-centered, designed to facilitate autonomous learning and innovation cultivation, with themes as core modules. Key differences are summarized in Table 1.

Table 1. Comparison between traditional and theme – based curricula.

Key Indicators	Traditional Curriculum Design	Theme-Based Curriculum Design
Design Philosophy	Task-centered	Student-centered
Purpose	Facilitate knowledge transmission	Facilitate autonomous learning
Goal	Knowledge imparting	Competence development
Core Modules	Knowledge points	Themes
Designer	Teachers	Teacher-student-machine collaboration
Implementer	Teachers	Students (supported by teacher-student-machine collaboration)
Main Methods	Indoctrination	AGI-assisted autonomous learning + teacher-student-machine collaboration
Teaching Mode	Teacher lecturing	Teacher-student-machine collaboration
Student Role	Passive learner	Active learner

3.2 Theme-Based Curriculum System

AGI excels at generating content based on themes but struggles with vague, imprecise, or incomplete prompts. Curriculum theme systems must fully reflect course content to enable students to design proper prompts for AI searching. Thus, theme design should follow a top-down refinement process from course to clear themes: decompose curriculum to sub-contents, decompose sub-contents to next level sub-contents, and extract clear themes. Sub-contents are decomposed multiple times as needed until the clear themes are identified (see Fig. 2). The theme must be clear, precise, and include appropriate workload, able to serve as an independent topic, suitable for students to explore, cultivate their research and innovation abilities.

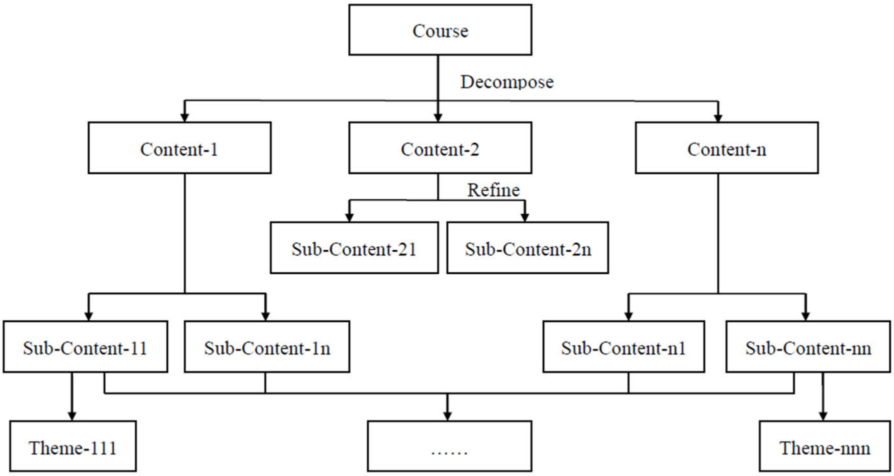

Fig. 2. Theme design and theme based curriculum system.

4 Process- Constrained Daily Performance Assessment

Process-oriented teaching features phase correlations: The execution effect of the previous stage affects the execution result of the later stages, and the feedback of the later stages can help improve the execution of the previous stages. To enhance students' deep engagement, a process-constrained daily assessment model is designed based on inherent phase relationships (see Fig. 3), ensuring effective implementation of all stages.

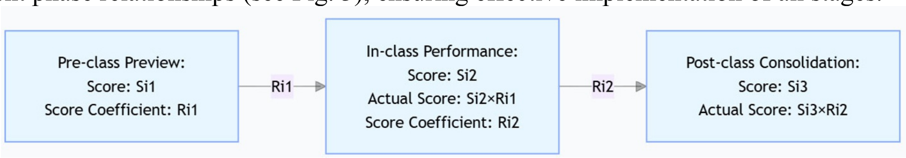

Fig. 3. Process-constrained daily performance assessment model.

Daily performance includes pre-class preview (Si1), in-class performance (Si2), and post-class consolidation (Si3). Performance coefficients (Rix) are calculated using either Formula (1) (based on scores/100) or Formula (2) (based on scores relative to the highest score Sim). They can also be determined through teacher-student negotiation.

$$R_{ix} = {}^{S_{ix}}/_{100} \tag{1}$$

$$R_{ix} = {}^{S_{ix}}/_{S_{im}} \tag{2}$$

Total daily performance S_C is calculated using Formula (3), where N is the number of assessments:

$$Sc = \sum_{i=1}^{N}(S_{i1} + S_{i2} \times R_{i1} + S_{i3} \times R_{i2}) \tag{3}$$

If each assessment has a different significant difficulty, it is multiplied by a difficulty coefficient $D_i$using Formulas (4) and (5):

$$Sc = \sum_{i=1}^{N} D_i \times (S_{i1} + S_{i2} \times R_{i1} + S_{i3} \times R_{i2}) \quad (4)$$

$$\sum_{i=1}^{N} D_i = 1 \quad (5)$$

In order to encourage students to effectively participate in the classroom, Adding and subtracting practical methods are suggested for calculating in-class performance grade. A base score is allocated at the start of the course, with points added or deducted based on assessments. Scores range from 0 to the maximum allocated for in-class performance. Results are visualized and announced promptly to enhance students' autonomous learning awareness and engagement. In-class performance is evaluated based on participation and attention. For feasibility, a small number of low and high scores are determined first, with most scores referenced accordingly.

Table 2 shows one practice model for daily performance assessment and Algorithm 1 is designed for daily performance computation.

Table 2. Composition of daily performance.

Pre – Class Performance		Post – Class Performance	In – Class Performance
Course Preview-Completion	Course Preview Assignment Score	Post – Class Assignment Score	In – Class Performance
Completion Rate	Course Preview Assignment Score = Course Preview Completion Rate * Course Preview Assignment Score	Post – Class Assignment Score = Course Preview Assignment Score/100 * Post – Class Assignment Score	Give Half Score to Each Student first, and Add or Subtract Points based on their participation and attention in class

Algorithm 1. Daily Performance Assessment

Input:

Number of knowledge points: KN

Number of students: SN

Pre-class scoreS_{i1k} , in-class scores S_{i2k} , post-class scores S_{i3k} fo5r each student k and knowledge point i.

Output:

Total daily performance score $sc_k$for each student.

1: for each student k do

2: Initializesc_k =0

end for
for knowledge point i=1 to KN do
  for phase j=1 to 2 do // j=1: pre-class, j=2: in-class
  Find the maximum score in phase j: $sm_j \leftarrow max_k(s_{ijk})$
    for each student k do
      Compute performance coefficient: $r_{jk} \leftarrow s_{ijk}/sm_j$
    end for
  end for
  for each student k do
    $sc_k \leftarrow sc_k + s_{i1k}$ // Add pre-class score
    $sc_k \leftarrow sc_k + s_{i2k} \times r_{1k}$ // Add weighted in-class score
    $sc_k \leftarrow sc_k + s_{i3k} \times r_{2k}$ // Add weighted post-class score
  end for
end for

5 Practice and Construction of Smart Teaching Platform

5.1 Teacher-Student-Machine Collaboration Based on Smart Platforms

Process-oriented and theme-based curriculum design creates numerous active learning opportunities for students. Modern smart teaching platforms support teacher-student-machine collaboration. Teachers define curriculum goals, decompose content, design themes, construct theme systems, release themes on platforms, develop intelligent agents, grade assignments, analyze feedback, and deliver targeted instruction—shifting roles to guides and supervisors. Students use AGI to search for themes, analyze and summarize materials, complete tasks, and submit work/feedback via platforms. Smart platforms train agents to assist with grading and learning analytics, providing data support for assessment and targeted teaching. This collaboration breaks time-space barriers, transforms traditional indoctrination, and improves learning initiative and course quality.

5.2 Development of Student-Centered Smart Teaching Platform

Current smart teaching platforms have independent, weakly correlated functions, failing to reflect the inherent logic of process-oriented teaching or guarantee the student-centered philosophy. Essentially, they are alternative implementations of traditional teaching, limiting student initiative.

Future smart teaching systems should prioritize students, supporting their full participation and initiative. Guided by AI development and the student-centered philosophy, platform development should follow these principles:

Fully Embody the Student-Centered Educational Philosophy to Foster Initiative and Innovative Talent: The effective implementation of the student-centered teaching philosophy can fully unleash students' initiative, facilitate in-depth practice, cultivate innovative talents that meet societal needs, and promote the development of new-quality productive forces in education. The development of smart teaching platforms should revolve around the student-centered concept, providing a platform for immersive learning.

Facilitated to Organize Content Based on Themes: As a super knowledge entity, AGI has become a primary helper for students' learning. To facilitate students' immersive learning, smart teaching platforms should support organizing a theme-based system covering curriculum content by themes, enabling students to interact with AGI through themes for active learning.

Enhance the Intelligence of Teaching System: In the "AI+" era, AI applications continue to expand and upgrade industry. AI's impact on education is "profound and long-lasting", requiring close tracking of AI technology development, pilot implementations in education, and enhancement of teaching systems' intelligence.

Support Process-Oriented Talent Cultivation: Talent cultivation is process-oriented endeavor. Teaching systems must reflect the process nature of education, facilitate logical constraints between phases, and ensure the controllability of the talent cultivation process and the quality of talent cultivation.

Support Efficient Flow of System Resources: Education is the foundation of social and national economic development. Efficient flow of educational resources such as high-quality courses, educational datasets, and educational agents can facilitate resource sharing among different teaching systems, reduce development costs, and enhance effective resource utilization, exert the educational value of high-quality resources, and improve educational equity and quality.

5.3 Experiment and Analysis

The student-centered intelligent teaching and practice has been carried out for more than two years, and the methods have gradually matured with continuous effectiveness. The following are relevant results and comparisons. The results of the 2025 fall course implementation are still under statistical analysis, as shown in Table 3.

Table 3. Comparison of course implementation methods and effects.

Course Name/Term/Student Number /Process related	Pre - Class Preview Rate/ Preview Questions by Student/ preview assignment	In - Class Chapter Test/ Even Interaction Per Class	Post - Class Assignment Rate/Score	Exam Score	Innovation Practice (Participation Rate/Score)
AI/Spring Semester 2025/94	94.68%/185/N	N/15	92%/86	75.91	90.43%/73.8
AI/Spring Semester 2025/67	98.51%/91/N	N/9	93%/90	73.89	N/N
AI/Fall Semester 2024/31	N/N/N	N/6	N/N	63.89	N/N
AI/Fall Semester 2024/25	N/N/N	N/6	N/N	69.23	N/N

AI/Spring Semester 2024/93/Y	N/ N/N	Y/13	100%/88.34	76.16	100%/85.01
AI/Spring Semester 2024/94/Y	N/ N/N	Y/9	100%/80.08	74.68	100%/88.67
AI/Fall Semester 2023/40	N/N/N	N/6	97.7/83.67	74.37	N/N
AI/Fall Semester 2023/37	N/N/N	N/6	100%/81.43	67.32	N/N
AI/Spring Semester 2023/91	N/N/N	N/5	100/91.16	72.74	N/N
AI/Spring Semester 2023/85	N/N/N	N/4	100%/88.61	68.67	N/N

The comparison shows that strict process control can effectively improve students' comprehensive grades. In Spring Semester 2024, Testing follows each knowledge point, and innovative practices are also conducted before the final exam, effectively increasing students' opportunities for immersive learning and improving their grades. In Spring Semester 2025, the course content was restructured based on theme, incorporating immersive learning components such as pre-class preparation, proposal of preparatory questions, and post-class assignments, achieving excellent results. And the innovative practice project was adjusted to be conducted after the final exams, providing students with ample time for practice and effectively enhancing the cultivation of their innovative abilities.

6 Conclusions

The student-centered teaching philosophy embodies the essence of student-centered education. The development of AI not only poses challenges to education, but also brings opportunities for educational reform. The paper proposes to reconstruct the course content based on theme, so that students can use AGI for research-based learning and improve their innovation ability. The design of relational restrictive learning processes provides students with more immersive learning opportunities, which can effectively cultivate their self-directed learning and sense of social responsibility. Of course, the excessive application and dependence on AGI are also one of the hot topics in society. Theme based curricula encourage students to conduct research projects, make them to construct the architectures of the projects, guide them to design prompts to search materials, effectively cultivate their innovative thinking ability, material analysis ability, and organizational ability, and master the application of AGI. In addition, AI repetition rate detection, AI generated watermark labels, and project defense can also to some extent prevent students from overly relying on AGI. In order to better support teaching methods based on theme and process constraint control, suggestions for further construction of smart teaching platforms have also been proposed.

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References

1. F. Xu, “What is a fourth-generation university?” China News Weekly, September. 2025. https://www.chinanews.com.cn/edu/2025/09-17/10483817.shtml.
2. Bianews, ”Bezos’ bold prediction: millions will live in space as AI advances,” October 2025. https://tech.ifeng.com/c/8nBSfF5aJ9s.
3. W.Zhou, Y. Q. He, “New productive forces: new momentum and pathways for Chinese modernization,” Research on Financial and Economic Issues, Vol. 4, pp.3-1, 2024.
4. H. P. Qiu, “Scientific connotation of the theory of new quality productive forces and its great innovation significance,” Research on Financial and Economic Issues, Vol. 5, pp. 3-14, 2024.
5. B. Xiao, Q. Y. Chen, “Understanding new productive forces from a worldview and methodological perspective,” Social Sciences in Chinese Universities, Vol. 4, pp.98-105, 2024.
6. S. Q. Liu,Z. Liu,H. M. Duan,Z. Su, X. Peng, “Research on educational multi-agent systems empowered by large language models—technical architecture, current status, practical pathways, and future prospects,” Journal of Distance Education, Vol. 1, pp. 33-45, 2025.
7. Y. F. Zheng,J. Y. Huang, H. G. Bao, “AI agent for education empowering science education: conceptual features, application value and implementation strategies,” Journal of Distance Education, Vol. 3, pp. 24-32, 2025.
8. T. Bu, L. D. Su, L. Zheng, “Exploring new productive forces in sports,” Journal of Tianjin University of Sport, Vol.39(3), pp.280-286, 2024.
9. T. Bu, L. D. Su,L. Zheng, “The connotation, value, and formation path of new productive forces in sports,” Journal of Beijing Sport University, Vol. 47(3), pp.1-12, 2024.
10. B. Q. Zhang, L. Zhang,Z. F. Song, “Research on new quality productive forces in education”, Open Journal of Social Sciences, Vol. 13, pp. 632-642, 2025. doi: 10.4236/jss.2025.139038.
11. K. Q. Chen, X. L. Han, Z. F. Zheng, X. L. Liu, X. S. Hu, “The analysis of construction and application mode of scenario construction in intelligent education from the perspective of human-machine cooperation — a review of domestic and international review on human-machine cooperative education in the past ten years,” Journal of Distance Education, Vol. 2, pp. 3-14, 2022.
12. L.M., Dai,S. Kong, “The triple difficulties and relief paths of human computer collaborative teaching from the perspective of life practice pedagogy,” China Education Technology, Vol.5, pp. 109-116, 2025. DOI: 10.3969/j.issn.1006-9860.2025.05.015
13. Y. F. Wang, W. L. Zou, M. J. Liu, “Generative AI-supported human-machine collaborative intelligent teaching and application exploration,” Chinese University Science & Technology, Vol.6, pp. 70-78, 2025.

14. W. M. Liu, X. D. Liu, Y. Lu, “Research on the construction of immersion practical teaching system under the background of new engineering,” China Modern Educational Equipment, Vol. 23, pp. 94-96, 2022.
15. Y. Hong, “An analysis of immersive teaching from the perspective of great ideological and political courses, “Leading Journal of Ideological & Theoretical Education, Vol. 22(9), pp. 123-129, 2022.
16. W. L. Bu,H. L Wang, “Embodied emotion: anew direction for embodied cognition,” Philosophy Study, Vol.10(8), 2022.
17. T. J. Kopcha, K. D. Valentine, C. Ocak, “Editorial: preface to the special issue on embodied cognition and technology for learning,” Educational Technology Research and Development, Vol.69, pp. 1881-1887, 2021.