

# Research and Reflection on AI Empowering Lesson Preparation Stage of Junior Middle School Geography: A Case Study of the First Lesson of *Japan* in People's Education Press Edition

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**Abstract** With the rapid development of artificial intelligence technology, the education sector is gradually exploring how AI tools to empower subject teaching. In this paper, the first lesson of *Japan* published by People's Education Press in the second semester of seventh grade is taken as an example, focusing on the feasibility of using AI tools for lesson preparation. Through the Meta Sota AI special topic, Kimi, deepseek, and Baidu AI images, lesson preparation is completed. Using Coze intelligent agents, interactive learning scenarios are developed to complete teaching design. Research has shown that AI technology can effectively improve the efficiency and quality of lesson preparation, and can assist in the implementation of core competencies in geography. This paper can provide a reference for the operability of AI empowering educational and teaching activities.

**Key words** Junior middle school geography; AI tools; Lesson preparation stage

**DOI** 10.19547/j.issn2152 – 3940.2025.06.009

Based on the requirements of "deep integration of information technology and geography teaching" clearly stated in the *Geography Curriculum Standards for Compulsory Education* (2022 version), with its ease of operation and intelligence, AI technology has a wide range of applications in teaching processes such as lesson preparation, teaching, and teaching evaluation. For example, AI can simplify the image processing process and make images appear clearer; AI can generate exercises based on images and generate personalized evaluations based on evaluation criteria; AI can generate teaching processes based on curriculum standards and other materials to provide a basis for teaching. These applications can quickly construct teaching processes, efficiently implement classroom teaching reforms, cultivate core competencies, and greatly help improve teaching quality.

In the early days of the AI era, students' thinking patterns are gradually diversifying, and their knowledge construction abilities are rapidly improving. Traditional teaching media resources are unable to meet students' needs. Meanwhile, the information gap between teachers and students is gradually decreasing. In this era, the role of teachers has undergone significant changes. At the level of classroom teaching, the role of teachers has shifted from a leader to a guide and observer, and the task of teachers has shifted to providing students with learning guidance and personalized teaching resources. Therefore, students should possess digital literacy and skills beyond the pre AI era when facing the social development trend of human – machine collaboration. Teachers should master the basic skills of artificial intelligence assisted teaching during the teaching process<sup>[1]</sup>.

The current research on AI empowering geography teaching mainly focuses on several perspectives: firstly, personalized learning and precision teaching<sup>[2–3]</sup>; secondly, AI empowering interdisciplinary thematic learning and project-based learning<sup>[4]</sup>; thirdly, integrating VR/AR/MR technology to create immersive learning spaces<sup>[5–6]</sup>; fourthly, the optimization of subject specific models, focusing on the construction of AIGIS tools<sup>[7]</sup>. Previous literature research has focused more on classroom application theory and student development, and often relies on fee based platforms for practical operation. In conventional classroom construction, there may be issues such as insufficient funding and high technical difficulty. Some frontline teachers are facing the contradiction between heavy teaching tasks and limited preparation time. How to use AI tools to efficiently build high-quality classrooms on the basis of existing time has become a pain point for AI applications. Based on the demand for normalized teaching, taking the regional geography teaching in the second semester of seventh grade in People's Education Press version as an example, the practical application of AI technology in teaching is explored, and the application of commonly used AI tools in routine teaching activities is followed closely, providing feasible ideas for promoting AI empowered integrated intelligence classrooms.

## 1 AI empowering lesson preparation stage

**1.1 AI empowering curriculum standards, textbooks, and learning situation analysis** When using AI tools to assist in analyzing curriculum standards, textbooks, and learning situations, the main tools used are Meta Sota AI special topic search, deepseek, etc. Taking the first lesson of *Japan* published by People's Education Press as an example, the specific operation is shown as Table 1.

**Table 1** Examples of common AI tools

Tool	Activity purpose		Materials to be provided	Prompt
Meta Sota AI special topic search	Analysis of curriculum standards and educational concepts		Curriculum standards, original textbooks, and papers related to integrated intelligence classrooms	You are a junior middle school geography teacher and would like to analyze the curriculum standards for the lesson of Japan in the second semester of the seventh grade based on the textbook and curriculum standards, and explain how the curriculum standards are reflected in classroom activities
Meta Sota AI special topic search	Textbook analysis and problem chain generation		Curriculum analysis materials, textbooks, and teaching materials	You are a junior middle school geography teacher, and now you are going to teach the lesson of Japan. You need to integrate the lesson content of Japan in the second semester of the seventh grade, and form a problem chain. It requires the answer to the previous question as the basic knowledge for solving the next question, and highlights the correlation of geographical knowledge between each question. There are no more than 6 questions in the problem chain
Deepseek	Learning situation analysis		Student classroom performance record spreadsheet and student homework completion spreadsheet	I am a junior middle school geography teacher. My students are in the second semester of Grade 7. This is their classroom performance and homework completion in the previous class. Based on this, I have selected the list of students that should be focused on in this class and the list of students that should be supervised when grading homework
Deepseek	Knowledge point text organization and improvement		The text generated in the above steps	You are a junior middle school geography teacher teaching the lesson of Japan in the second semester of the seventh grade. Based on the existing problem chain and curriculum analysis, the questions and answers that students need to know for this lesson are output in csv format separated by ", ". And a mind map in markdown format is output

In the process of interacting with AI, AI could closely follow the curriculum standards and generate multiple implementation paths with the provided educational theories. Moreover, the sources of generation could be labeled, which is beneficial for teachers to distinguish the generated results. Teachers should start from the learning situation and teaching content focus when constructing prompt words, and provide modification suggestions for the teaching design provided by AI. This process helps broaden the boundaries of teachers' thinking, increase their focus on core competencies, and improve their learning and practical efficiency. In addition, the entire process is free and only requires language interaction to achieve lesson preparation goals, with low difficulty and strong operability.

**1.2 AI empowering teaching design** In the process of using AI tools to assist in completing lesson plans and multimedia courseware, AI technology can provide rich multimedia materials. Recommended AI tools for this process include: Kimi, Zhipu Qingyan and other PPT generation assistants for large models (where Kimi needs to run in the web version, and the PPT generated by large models generally cannot fully match our teaching needs and needs to be modified later); IvePPT can complete the initial version of PPT; as a teaching multimedia software, Seewo Whiteboard 5 has a rich online database and various subject tools. Clicking on the courseware library module of Seewo Whiteboard 5 software, the AI lesson preparation button could appear. Then, clicking to jump to the webpage, after inputting the topic by using the AI lesson preparation function, the editable teaching objectives could automatically pop up. Moreover, an editable teaching outline could be generated based on the teaching objectives, and the courseware could be generated based on the outline. The courseware includes interactive games. Due to the built-in massive

teaching database of Seewo Whiteboard, the rationality of courseware design has been strengthened. The program currently has ten free opportunities, and if there is no limit on the times, payment will be required. However, compared to other AI tools, the cost-effectiveness is relatively high.

In the process of using AI tools to assist in generating mind maps and knowledge quizzes, it is recommended to use Markdown, a lightweight markup language format that can better maintain the original format of information when switching tools. It is suitable for converting information generated by large models into a format that can be used in the classroom. The specific operation is as follows: in the deepseek teaching design generation interface, it enters "generate a mind map in markdown format based on the above instructional design", and then copies the text to the markdown map website. The website could generate an editable mind map based on the language. The mind map is saved in svg format, and the combination is canceled in higher versions of PowerPoint. Each block of the mind map can be edited, making it easy to flexibly apply in classroom teaching. When entering "generate knowledge Q&A in csv format based on the above teaching design" in the deepseek teaching design generation interface, the generated text is download, and the extension name is renamed as. csv. When opening Excel - data - import from text/csv, knowledge Q&A in Excel format can be generated for easy interaction with web pages or intelligent agents in the future. Making process of mind map is shown as Fig. 1.

In the process of using AI tools to assist in image search and courseware beautification, it is recommended to use Meta Sota AI search and ima. With the help of Meta Sota AI, a map themed collection can be established; the approved themed maps, different versions of electronic textbooks and geographic atlases can be

imported into it. After inputting the required content for the topic, the textbooks and the original maps of atlases that match the requirements can be returned. Meta Sota AI search engine can be used to search for landscape images, which has higher accuracy and a wider range of data sources, saving time in material collection. At the same time, after searching for images, the search engine can display the source of the images, making it easier to determine their authenticity. During the teaching of world regional geography, it is possible to search for foreign language images. At this time, the Doubao browser plugin can be used to translate the text on the images and understand the information in the images.

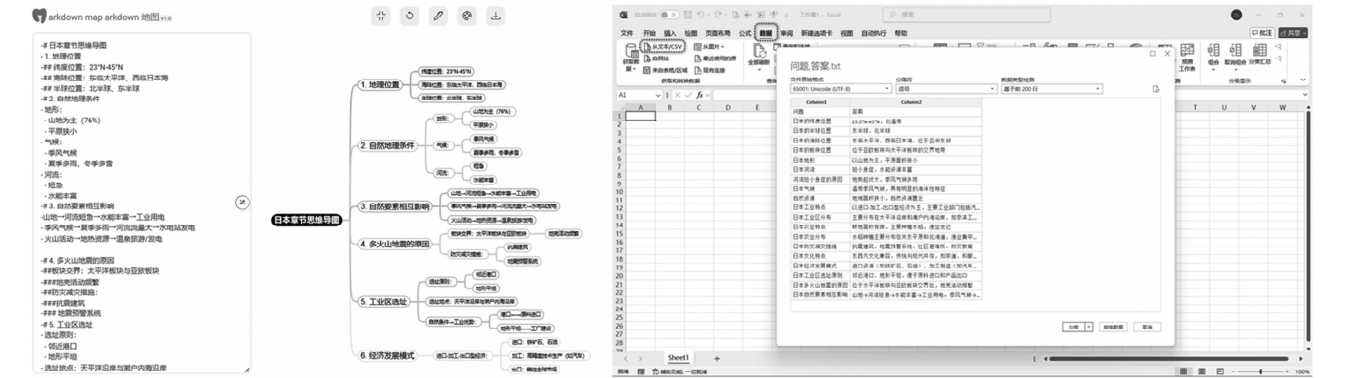


Fig. 1 Making process of mind map

In the process of using AI tools to assist in designing classroom teaching activities, it is recommended to use deepseek. With the powerful programming capabilities of deepseek, it can assist in generating various classroom teaching mini programs. The design of ‘soil erosion simulation experiment’ is taken as an example; when inputting “task: help me create an interactive webpage for soil erosion simulation experiment, presented in html format. The title is, a rectangle with adjustable tilt is displayed in the middle area as soil, with three types of soil: sandy soil, loam soil, and clay. When there is precipitation, different erosion effects are present, and the erosion effect is weakened when vegetation elements are added; on the left side, there are interactive buttons for three types of soil textures and whether to open vegetation; setting two forms of rainfall: rainstorm and light rain, and requiring that the rain only falls down, the soil shape can change when the rain falls on the soil; the greater the slope, the greater the rain, the

Baidu AI image assistant can assist in adjusting image information, such as increasing image clarity, extracting contour images, quickly erasing, and converting textbook images into dynamic images. The plugins such as Isliand and Motion Go are used to beautify PPT; Isliand is mainly used for PPT layout, organizing commonly used tools into side toolbars and designing reference line functions for easy operation; Motion Go can be used to create complex path animations with just one click, and has various forms of expression such as flash animations, Monkey text, and Mg animations, which can greatly enhance the aesthetics and attractiveness of courseware.

stronger the erosion capacity, and the rainstorm should reflect the change of soil shape within 10 s", deepseek can generate the corresponding code. When clicking run, the results can be viewed. When clicking download, it is saved as a webpage, and the website is inserted into the courseware in the form of hyperlink to use. Interactive web pages are easy to operate and can generate various forms such as roll call, simulation experiments, knowledge quizzes, and group bonus points according to usage needs. They have strong flexibility and need to be continuously adjusted during the generation process to adapt to classroom needs.

2 Presentation of teaching design results empowered by AI in lesson preparation

Example of teaching design for the first lesson of Japan is shown as Table 2.

Table 2 Example of teaching design for the first lesson of Japan

Link	Time min	Teacher activities	Student activities	Design intent	Core literacy embodiment	AI application	Activity evaluation criteria
Situational introduction	2	1. Display the parent-child education official account such as "Gaia Natural Education", introduce the industry of natural education planner, and explain that this is the employment direction of geography related majors. 2. Build a scenario: acting as a nature education planner and complete a parent-child travel itinerary design to Japan	1. Watch videos to understand career positioning. 2. Clearly define the role objectives	Inspire interest through career immersion and establish real learning scenarios	Geographical practical ability, regional cognition	No	-

(Continued)

Link	Time min	Teacher activities	Student activities	Design intent	Core literacy embodiment	AI application	Activity evaluation criteria
Knowledge exploration	3	1. Guide question: "what aspects of knowledge should nature education event planners understand about Japan?" 2. Summarize exploration perspectives based on students' answers: location, terrain, climate, resources, and natural disasters	1. Ask the intelligent agent about the basic knowledge involved in planning natural education activities related to Japan 2. Summarize the natural environment of Japan through reading thematic maps, Q&A with intelligent agents, and present it in the form of a mind map	Systematically organize the regional natural geography knowledge framework through independent questioning and tool assistance	Integrated thinking and human – earth coordination perspective	AI Q&A (Doubao)	Explanation from the perspective of regional analysis (1 – 2) Ability to conduct regional analysis of Japan based on thematic maps (2 – 4)
Task practice 1	10	1. Guide question: "how to explain to customers the causes of natural phenomena in Japan and whether there are any interrelationships between various natural geographical elements?" 2. Demonstrate and explain the relationship between natural elements (such as "mountains → short and fast rivers → abundant water energy → industrial electricity generation")	1. Group discussion, Q&A with intelligent agents, derive the correlation of natural elements guided by intelligent agents. 2. Draw arrows in the mind map to explain the causes of phenomena. 3. Based on the previous analysis of regional cases, explain how various natural geographic elements interact with each other	Cultivate logical analysis ability and establish causal thinking of natural elements	Comprehensive thinking and geographical practical skills	Intelligent agent of "Japanese teaching assistant"	Ability to explain the mutual influence relationship between natural elements (1 – 2) Ability to interpret relationship between natural elements in conjunction with other regions (2 – 4)
Task practice 2	10	1. The group combines Japanese hot spring culture customs to analyze the causes of distinctive cultural landscapes. 2. The group introduces the relationship between the building structure of Gassho-zukuri and the natural environment based on the form of Gassho-zukuri	1. Independently explore and combine Japan's natural geographical environment to explain the relationship between Japan's hot spring culture and lightweight architecture with multiple volcanic earthquakes, and explain the reasons for Japan's multiple volcanic earthquakes. 2. Explain common disasters and disaster prevention measures in Japan	Transforming knowledge into practical solutions, enhancing application capabilities	Regional cognition and the concept of human-earth coordination	No	Ability to analyze the causes of multiple volcanic earthquakes in Japan (1 – 2) Measures taken by humans to respond to natural disasters (2 – 4)
Results presentation	10	1. Organize the team to write the official account and itinerary according to the official account cases provided. 2. Other groups rate the group's proposal and select the best one	1. Display and explain the design results. 2. Mutual evaluation and suggestions for optimization (such as "increasing earthquake experience hall activities")	Through presentation and mutual evaluation, deepen knowledge understanding and enhance communication skills	Integrated thinking, regional cognition	AI copywriting generation (Doubao) Agent evaluation	–
Summary and evaluation	5	Summarize the main theme of the classroom: "natural geographical features → mutual influence between natural elements → adaptation to human activities", and emphasize the importance of disaster prevention education	According to the teacher's guidance, tell the main line, submit the text written in class, and display it on the official account after class	Consolidate knowledge and extend learning	Human – earth coordination concept	No	–

### 3 Summary and reflection

In this paper, commonly used AI tools are used to assist in lesson preparation and generate teaching design. It is found that AI empowerment in routine teaching work can greatly improve teaching efficiency, enhance teaching quality, and have strong operability. Firstly, AI tools greatly shorten teachers' lesson preparation time through multimodal resource retrieval and automated processing (such as landscape image retrieval and mind map generation). Secondly, scenarios can be built based on AI tools, and AI is utilized to efficiently complete practical assignments in that sce-

nario, which effectively stimulates students' interest in exploration. Thirdly, the closed-loop function of intelligent agents in task agents (such as answering disaster prevention measures with Doubao intelligent agent and generating personalized comments with AI) can also achieve precision and differentiation in teaching evaluation. In addition, through the progressive design of "task – practice – display", students' core competencies such as geographical practice and comprehensive thinking have been significantly strengthened, and AI technology has demonstrated significant teaching empowerment potential.

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In addition, there are still the following problems in the practical process:

The complexity of AI tools: the generation quality of free AI tools depends on the design of prompt words, and some complex tasks (such as thematic maps) still require manual intervention. Moreover, multimodal output lacks professionalism and is difficult to completely replace teacher creativity.

Limitations of teacher technology: some teachers' understanding of AI technology still remains at the surface level of application, and their awareness of technology application is weak. It is necessary to strengthen the integration ability of "technology – literacy – application" through school-based training.

Data security: the development of intelligent agents involves the collection of student behavior data, and it is necessary to improve the confidentiality mechanism of campus data to avoid privacy leakage risks.

In future research, it will further explore multi-agent collaboration models (such as "lesson preparation – teaching – evaluation" chain agents) and develop lightweight AI – GIS tools to enhance the characteristics of geography. In addition, attention should be paid to the dynamic balance of teacher – student relationships under technological empowerment, in order to avoid the weakening of humanistic nature of education by excessive reliance on AI. The digital transformation of education is not only

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about tool innovation, but also requires the construction of a sustainable practical paradigm between "technological rationality" and "educational essence".

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