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CHATGPT IN GEOGRAPHY EDUCATION: A REVIEW OF ITS POTENTIAL FOR DEVELOPING ARGUMENTATION AND ANALYTICAL THINKING

Annotation. The rapid spread of ChatGPT has turned generative artificial intelligence into a practical issue for school teaching rather than a distant technological prospect. In geography education, this shift is especially important because geography requires students to interpret spatial patterns, compare scales, evaluate evidence, and justify claims about environmental and social processes. This review article synthesizes recent studies on ChatGPT, critical thinking, argumentation, and geography education to propose a methodology for classroom use aimed at developing students' argumentation and analytical thinking. The reviewed literature suggests that ChatGPT can support learning performance, engagement, and some dimensions of higher-order thinking when it is used within structured, inquiry-based instruction. At the same time, the literature also points to clear risks, including hallucinated content, inaccurate local knowledge, weak source evaluation, and overreliance on fluent but analytically shallow responses. Based on this synthesis, the article proposes a six-stage methodology for geography lessons: problem framing, contextual prompting, evidence verification, multi-perspective comparison, argument construction with rebuttal, and reflective revision. It is argued that ChatGPT should not function as a substitute for disciplinary reasoning, but rather as a scaffold for critique, comparison, and evidence-based discussion in geography classrooms.

Keywords: ChatGPT, geography education, argumentation, analytical thinking, generative artificial intelligence, critical thinking.

Introduction

In a very short time, ChatGPT has shifted from being a technological novelty to becoming a practical classroom issue. For teachers, the main question is no longer whether students can use generative AI, but how this use changes learning tasks, classroom interaction, and assessment. Early discussions focused mostly on academic integrity and the risk of replacing students' own work with automatically generated text. Later studies, however, began to show a more complex picture. ChatGPT may support learning in some contexts, but its educational value depends heavily on the way it is integrated into teaching rather than on the tool itself [1-3].

Recent reviews and meta-analyses suggest that ChatGPT can improve learning performance, engagement, and some aspects of higher-order thinking, especially when it is used in structured learning environments [4-6]. At the same time, these benefits should not be



overstated. The same studies also show that the effects of ChatGPT vary across disciplines, task formats, and instructional settings. When students use it only to save time or generate ready-made answers, the result may be superficial task completion rather than genuine intellectual work. By contrast, when learners are asked to evaluate, challenge, verify, and revise AI-generated responses, the tool can become part of a more demanding learning process [7-9].

This distinction is especially important in geography education. Geography is not simply about recalling facts about countries, regions, or natural processes. It requires students to interpret maps, compare places and scales, connect environmental and social evidence, and explain why geographical differences and patterns emerge. In many classroom topics, students are also expected to justify positions on complex issues such as urban growth, water use, climate adaptation, regional development, or environmental risk. For that reason, geography lessons provide a particularly relevant setting for examining whether ChatGPT supports or weakens students' argumentation and analytical thinking.

Recent geography-related studies suggest that generative AI has real pedagogical potential, but they also show that the discipline has its own specific risks. ChatGPT may help students generate ideas, compare perspectives, and organize arguments. Yet geography is highly sensitive to contextual accuracy. A response may sound persuasive while still containing weak spatial logic, missing scale distinctions, or inaccurate place-based information. This problem becomes more visible when students work with regional examples or local case studies, where AI-generated content may be fluent but insufficiently grounded [10, 11]. Recent work in geographical and environmental education has therefore emphasized the need for critical spatial literacy, careful source verification, and more thoughtful assessment design in AI-mediated learning [12-14].

Although the broader literature on ChatGPT in education is growing quickly, the question of how it should be used specifically in geography lessons remains underdeveloped. Much of the current research discusses general opportunities and risks of generative AI, whereas fewer studies offer a classroom-oriented methodology for using ChatGPT to strengthen geography-specific reasoning. This is an important gap because argumentation and analytical thinking are central to geography as a school subject. Students are expected not only to describe geographical phenomena, but also to weigh evidence, compare interpretations, identify causal relationships, and defend reasoned judgments.

Against this background, this review article examines recent literature on ChatGPT, argumentation, analytical thinking, and geography education in order to propose a structured methodology for classroom use. The central argument of the article is that ChatGPT is most useful in geography not when it replaces student thinking, but when it is used to provoke comparison, critique, evidence checking, and reflective revision [15-17].

Materials and methods of research

This study was conducted as a narrative review article with conceptual synthesis. It did not follow a full PRISMA protocol because the purpose was not to perform a narrowly bounded quantitative aggregation of intervention effects, but to integrate recent findings from several related domains into a pedagogically applicable framework for geography education.

The review focused primarily on peer-reviewed journal publications published between 2023 and 2026. The literature was selected around five interrelated thematic areas:

- (1) ChatGPT and generative AI in education;
- (2) ChatGPT and higher-order thinking;
- (3) AI-supported argumentation, critique, and analytical reasoning;



- (4) AI and assessment redesign; and
- (5) geography-specific uses of generative AI.

Priority was given to recent meta-analyses, systematic reviews, and disciplinary studies because these sources offer both broad empirical trends and field-specific implications. The selected literature was examined comparatively in order to identify recurring educational benefits, persistent pedagogical risks, and instructional conditions under which ChatGPT may support rather than weaken reasoning-intensive learning.

The analysis proceeded in three stages. First, the reviewed studies were examined to determine what forms of learning gain are most consistently associated with ChatGPT use. Second, the literature was analyzed for risks relevant to geography education, particularly hallucination, weak source criticism, and context-poor place knowledge. Third, the educational implications of these findings were synthesized into a lesson methodology aimed at strengthening argumentation and analytical thinking. As a result, the review moves beyond a general discussion of AI in education and toward a discipline-sensitive pedagogical framework.

Results and Discussion

The review yielded three principal findings.

First, the literature consistently suggests that ChatGPT has conditional educational value. Meta-analytic and review-based evidence indicates that ChatGPT can improve students' academic performance, engagement, and some dimensions of higher-order thinking. However, these effects depend heavily on how the tool is used. Positive outcomes are more likely when ChatGPT functions within a structured learning design and when students are expected to actively process, compare, and critique AI-generated content rather than passively receive answers [18, 19].

Second, the reviewed studies show that ChatGPT is not inherently conducive to analytical or critical thinking. In some contexts, it may reduce cognitive effort and encourage superficial completion strategies. In others, it may stimulate reflection, idea generation, and counterargumentation. The decisive factor appears to be whether the learning task requires verification, explanation, and revision. When students are expected to challenge AI output, identify unsupported claims, and refine their own judgments, ChatGPT can become a productive scaffold. When such demands are absent, it may instead encourage cognitive offloading and reliance on plausibly written but weakly grounded responses.

Third, geography-specific literature demonstrates that the educational use of generative AI in geography is both promising and discipline-sensitive. Recent studies indicate that generative AI may influence geographical curriculum, teaching methods, assessment, and even field-based learning. Yet geography also exposes the limitations of generative AI very clearly. Since geographical understanding depends on scale, context, place specificity, and evidence, inaccuracies in local knowledge or oversimplified territorial explanations can seriously distort learning. This makes geography one of the disciplines in which source verification and critical interpretation are especially important.

On the basis of these findings, a six-stage methodology for geography lessons is proposed.

Stage 1: Geographical problem framing.

The lesson should begin with a problem that requires interpretation and judgment rather than recall. Suitable tasks include questions related to urban development, environmental management, climate adaptation, migration, land use conflict, or regional



inequality. Such issues create a natural context for argumentation because they require students to weigh evidence and justify positions.

Stage 2: Contextual prompting.

Students should learn to formulate prompts that specify region, scale, stakeholder perspective, and analytical purpose. Instead of broad requests, they should use discipline-sensitive prompts that frame a clear geographical problem. This practice reduces generic AI responses and encourages more precise reasoning.

Stage 3: Evidence verification.

Students should compare ChatGPT-generated content with maps, datasets, textbooks, atlases, scientific sources, or teacher-provided materials. They should identify unsupported claims, spatial inaccuracies, vague causal links, and missing evidence. This stage is essential for preventing the uncritical acceptance of fluent but unreliable outputs.

Stage 4: Multi-perspective comparison.

Students should use ChatGPT to generate contrasting perspectives across social groups, institutions, regions, or scales. For example, they may compare local community, governmental, economic, and environmental viewpoints. This process helps students recognize complexity, trade-offs, and competing interpretations.

Stage 5: Argument construction with rebuttal.

Students should write their own response using a claim-evidence-reasoning structure. After drafting, they should ask ChatGPT to generate objections, counterarguments, or additional demands for evidence. The purpose is not to let AI write the final response, but to test the strength of students' own arguments.

Stage 6: Reflective revision.

At the end of the task, students should reflect on which AI-generated elements were useful, which were inaccurate or misleading, and how their final argument changed after verification and revision. This stage develops metacognitive awareness and helps prevent passive dependency on AI tools. Taken together, these stages suggest that the most educationally meaningful use of ChatGPT in geography is dialogic, evidence-based, and revision-oriented.

The findings of this review indicate that ChatGPT may support geography learning only when it is embedded in a pedagogy of inquiry, evaluation, and disciplinary accountability. This conclusion is significant because it shifts the conversation from whether ChatGPT should be used in education to how it should be used in a way that strengthens reasoning rather than substitutes for it.

From a disciplinary perspective, geography requires more than textual fluency. Students must analyze spatial relationships, compare scales, interpret multiple forms of evidence, and defend conclusions in relation to environmental and social realities. ChatGPT can contribute to these processes by generating alternative viewpoints, prompting comparison, exposing weak assumptions, and helping students test the coherence of their arguments. In this sense, it may function as a scaffold for analytical dialogue.

At the same time, the literature reviewed here makes it clear that generative AI can also undermine these very same aims. Because ChatGPT often produces smooth, plausible, and confident prose, students may confuse coherence with accuracy. This problem becomes especially serious in geography, where local specificity, regional context, and territorial nuance matter. A response that appears reasonable on a linguistic level may still contain geographical distortions, omitted evidence, or misleading generalizations. Therefore, any



pedagogical methodology for ChatGPT in geography must include explicit source verification and critical examination of AI-generated content.

Another major implication concerns assessment. Conventional assignments based on summary and reproduction are easily displaced by AI tools. By contrast, tasks that require students to compare perspectives, justify claims with evidence, identify weak assumptions, and formulate rebuttals are more resistant to superficial AI substitution and more consistent with the educational goals of geography. Accordingly, the proposed methodology is closely connected with current calls for AI-resilient assessment design.

This review also has limitations. It is narrative rather than fully systematic, and the empirical base specifically focused on school geography remains more limited than the broader literature on ChatGPT in education. Nevertheless, the convergence of recent meta-analyses and geography-specific studies provides a sufficiently strong basis for proposing a pedagogical framework. Future empirical studies should test this six-stage methodology in actual secondary geography classrooms and examine its effects on students' argumentative writing, spatial reasoning, and analytical performance.

Conclusions

This review article has shown that ChatGPT has meaningful but conditional pedagogical potential in geography education. Recent studies suggest that it may support learning performance, engagement, and higher-order thinking, but these benefits depend on the extent to which students are required to verify information, compare perspectives, construct evidence-based arguments, and revise their reasoning.

For geography lessons, the central value of ChatGPT lies not in automating student responses, but in stimulating structured analytical dialogue. When used through problem framing, contextual prompting, evidence verification, multi-perspective comparison, rebuttal, and reflective revision, ChatGPT may function as a scaffold for argumentation and analytical thinking. When used without these safeguards, it may instead encourage superficial reasoning and uncritical dependence.

Therefore, the pedagogically responsible integration of ChatGPT into geography education should focus on strengthening disciplinary thinking rather than reducing intellectual effort. In this respect, geography offers a particularly important field for AI-informed pedagogy, because it requires students to connect evidence, place, scale, and judgment in ways that cannot be replaced by fluent text generation alone.

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Ракишева М.Д., Гайсин И.Т., Жанаева М.Б., Құмарбекұлы С.
ГЕОГРАФИЯЛЫҚ БІЛІМ БЕРУІНДЕГІ CHATGPT: АРГУМЕНТАЦИЯ МЕН
АНАЛИТИКАЛЫҚ ОЙЛАУДЫ ДАМУЫ ӨЛЕУЕТІНЕ ШОЛУ

Андатпа. ChatGPT-тің жылдам таралуы генеративті жасанды интеллектіні алыстағы технологиялық мүмкіндік емес, мектептегі оқыту практикасының нақты мәселесіне айналдырды. География білім беруінде бұл өзгеріс ерекше маңызды, өйткені география пәні оқушылардан кеңістіктік заңдылықтарды түсіндіруді, әртүрлі масштабтарды салыстыруды, дәлелдерді бағалауды және табиғи-әлеуметтік үдерістер туралы тұжырымдарды негіздеуді талап етеді. Бұл шолу мақаласында ChatGPT, сыни ойлау, аргументация және географияны оқыту мәселелері бойынша соңғы зерттеулер талданып, оқушылардың аргументациялық және аналитикалық ойлауын дамытуға бағытталған сыныпта қолдану әдістемесі ұсынылады. Қарастырылған әдебиеттер ChatGPT-тің құрылымдалған, зерттеуге негізделген оқыту жағдайында қолданылған кезде оқу нәтижелерін, оқушылардың белсенділігін және жоғары деңгейлі ойлаудың кейбір қырларын қолдай алатынын көрсетеді. Сонымен қатар, зерттеулерде бірқатар тәуекелдер де анықталған: жалған немесе ойдан шығарылған ақпарат (hallucination), жергілікті контекст туралы дәлсіз мәліметтер, дереккөздерді бағалаудың әлсіздігі және мазмұны үстірт, бірақ тілдік жағынан сенімді жауаптарға шамадан тыс сүйену. Осы талдаулар негізінде мақалада география сабағына арналған алты кезеңнен тұратын әдістеме ұсынылады: мәселені анықтау, контекстік сұрау құру, дәлелдерді тексеру, түрлі көзқарастарды салыстыру, қарсы дәлелдері бар аргумент құрастыру және рефлексивті қайта қарау. Автордың пайымдауынша, ChatGPT пәндік ойлаудың орнын басатын құрал емес, керісінше география сабағында сын тұрғысынан талдау, салыстыру және дәлелге негізделген пікірталасты дамытуға арналған қолдау құралы болуы тиіс.

Кілт сөздер: ChatGPT, географияны оқыту, аргументация, аналитикалық ойлау, генеративті жасанды интеллект, сыни ойлау.

Ракишева М.Д., Гайсин И.Т., Жанаева М.Б., Құмарбекұлы С.
CHATGPT В ГЕОГРАФИЧЕСКОМ ОБРАЗОВАНИИ: ОБЗОР ПОТЕНЦИАЛА ДЛЯ
РАЗВИТИЯ АРГУМЕНТАЦИИ И АНАЛИТИЧЕСКОГО МЫШЛЕНИЯ

Аннотация. Быстрое распространение ChatGPT превратило генеративный искусственный интеллект из отдалённой технологической перспективы в практический вопрос школьного обучения. В географическом образовании этот сдвиг особенно важен, поскольку изучение географии требует от учащихся интерпретации пространственных закономерностей, сравнения различных масштабов, оценки доказательств и обоснования утверждений о природных и социально-экологических процессах. Данная обзорная статья обобщает современные исследования, посвящённые ChatGPT, критическому мышлению, аргументации и преподаванию географии, и предлагает методологию использования данного инструмента в учебном процессе, направленную на развитие аргументационного и аналитического мышления учащихся. Анализ литературы показывает, что ChatGPT может способствовать повышению учебных результатов, вовлечённости учащихся и развитию некоторых аспектов мышления высокого уровня, особенно при его использовании в рамках структурированного исследовательского обучения. В то же время исследования указывают на ряд существенных рисков, включая генерацию недостоверной информации (hallucinations), неточности в



локальных знаниях, слабую оценку источников и чрезмерную зависимость от стилистически убедительных, но аналитически поверхностных ответов. На основе проведённого анализа в статье предлагается шестиступенчатая методика проведения уроков географии: формулирование проблемы, контекстуальное формирование запроса, проверка доказательств, сопоставление различных точек зрения, построение аргумента с учётом контраргументов и рефлексивное пересмотрение выводов. Подчёркивается, что ChatGPT не должен выступать заменой дисциплинарного мышления, а должен использоваться как инструмент поддержки критического анализа, сравнения и обсуждения, основанного на доказательствах, в процессе обучения географии.

Ключевые слова: ChatGPT, географическое образование, аргументация, аналитическое мышление, генеративный искусственный интеллект, критическое мышление.