

Harnessing AI for Educational Excellence: A Comparative Analysis of DeepSeek and ChatGPT in Social Science Teaching and Learning

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Abstract: The research assesses the relative effectiveness of DeepSeek and ChatGPT tools for social science postgraduate education with MPhil and PhD scholars from Qurtuba University situated in Dera Ismail Khan. The research project uses both quantitative analysis of learning results and qualitative student surveys to study the two AI tools. The study shows DeepSeek generates better academic results when compared to ChatGPT because students scored 25.9% higher in their post-test while scoring 17.7% with ChatGPT, and both results were statistically significant ($p = 0.005$). The evaluation from students demonstrated that DeepSeek outperformed ChatGPT regarding the tools' accuracy in information delivery as well as their capacity to provide detailed explanations and facilitate meaningful student learning. Nevertheless, students favoured ChatGPT because of its interactive communication capabilities and fast response time. The tools contain a combination of challenges since they sometimes provide out-of-date references and both lack adequate academic citations. Research indicates that DeepSeek stands above ChatGPT for conducting academic investigations, yet students find ChatGPT superior for interactive educational sessions. The proposed directions focus on integrating DeepSeek for thesis assistance as well as deploying ChatGPT for discussions, although better citation capabilities need improvement in the current AI tools. The findings deliver essential direction to teachers, AI developers, and education authorities who want to improve the effectiveness of AI-based learning methods in higher education institutions.

Keywords: DeepSeek, ChatGPT, AI in Education, Social Science Teaching, Learning Outcomes, Comparative Analysis, M.Phil./PhD Research, Qurtuba University, Academic Performance, AI-assisted Learning

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Introduction

The Rise of AI in Education

The use of Artificial Intelligence (AI) as an educational technology transformed how teachers teach and students learn. AI-powered tools emerged during the last ten years to function as essential components needed for individualised learning and adaptive measurement, and effective material transfer systems. Artificial Intelligence creates exceptional possibilities for better social science learning and instruction because it enables advanced critical thinking in addition to contextual analysis. AI technologies' fast advancement has made DeepSeek and ChatGPT vital educational tools through their natural language processing (NLP) and machine learning capabilities (Fitria, [2023](#)).

Barriers Arise when Educational Organisations Equip their Students with AI-supported Tools. The Potential of AI Tools Persists in Social Science Education

Social science education that includes sociology, political science, and history needs teachers to use complex approaches to deliver instruction. STEM education follows structured problem-solving approaches, yet social sciences require analytical skills and the power to conduct debates about human and societal developments. Educational learning environments that engage students receive support from AI tools, which excel at processing big data sets to produce context-specific responses. These tools achieve different effectiveness rates due to their design choices combined with their operational capabilities, as well as their ability to accommodate social science-specific requirements (Dare et al., [2021](#)).

DeepSeek: A New Contender in AI for Education

DeepSeek represents a major growth point in AI-based educational technology after its debut in 2025. DeepSeek targets precise data evaluation through specialised features that match different academic domains. The system demonstrates outstanding performance in data analysis, which creates exciting possibilities for social science teaching because experts need to understand contexts and analyse data collections. Researchers have insufficiently examined how new this tool is with practical implications for educational environments (Baydemir, [2025](#)).

ChatGPT: A Proven AI Tool in Education

The Openai-developed ChatGPT serves as an educational tool, which educational institutions started using as soon as it came out. As a versatile program with a user-friendly interface, ChatGPT operates across lesson planning through student assessment tasks. The system provides valuable context-appropriate responses that make it useful for teachers and learners in their educational tasks. The inclusive functionality of the tool creates doubts about its capacity to serve social science education requirements specifically (Pan, et al., [2023](#)).

The Need for Comparative Analysis

Social science education researchers need to explore how effectively DeepSeek and ChatGPT function compared to each other when used as educational tools. Systematic tool comparison allows us to identify the positive and negative aspects, as well as educational uses of these resources. Educators working to apply AI for educational success in social science fields need this type of analysis to overcome the specialised requirements of both objectives (Kotsis, [2025](#)).

Challenges in AI Integration

The implementation of AI tools, including DeepSeek and ChatGPT, in education faces multiple hurdles despite their capability to benefit educational practice. Issues such as algorithmic bias, data privacy, and the digital divide pose significant barriers to their widespread adoption. AI-generated content derives from systems, which raise doubts about information accuracy, specifically in social sciences, due to their need for contextual interpretation. Assuming control over these obstacles is vital for protecting the moral standards and optimal results of using AI systems in educational practices (Zhai, [2025](#)).

The Role of Educators in AI Adoption

Educational staff play essential functions during the classroom adoption of Artificial Intelligence tools. Educational excellence depends on educators' ability to conduct critical assessments and adjustments of these tools according to student requirements. Most teachers cannot use AI tools effectively because they need proper training and additional resources to manage these tools. Guided education about AI system implementation alongside teamwork between both educators and developers would effectively minimise this gap (Pedro et al., [2019](#)).

Objectives

1. This research aims to describe and analyse the core capabilities and strengths as well as weaknesses between DeepSeek and ChatGPT for social science instruction and education.



2. Student learning outcomes and social science education engagement levels require assessment with statistical comparison to determine if DeepSeek leads to different results than ChatGPT.

Delimitations of the Study

1. The research exclusively uses PhD and MPhil scholars at Qurtuba University in Dera Ismail Khan, KPK, as its population.
2. Only DeepSeek and ChatGPT are analyzed in this research for applications in teaching and learning of social sciences, while omitting other AI tools together with academic fields.
3. The investigation focuses on the formal educational environment at the university level and excludes school classrooms and informal and corporate training.
4. During the exclusive 2025-2026 academic period, the research only collects data to demonstrate the current performance capabilities of AI tools.
5. Digital tools from artificial intelligence get tested for their ability to create lessons and present content and engage learners, but the review does not tackle wider engineering or moral challenges.

Literature Review

The Role of AI in Modern Education

Learning and teaching processes now receive transformative benefits from Artificial Intelligence because it provides innovative educational solutions. ChatGPT has transformed personal learning by adjusting content for specific student requirements. The tools use NLP and machine learning technology to offer live feedback while performing administrative functions and generating interactive educational content. The implementation of AI provides distinctive value for education because it helps teachers respond to the numerous learning requirements of twenty-first-century students (Yu, [2025](#)).

AI in Social Science Education

The educational approach for social science education that includes sociology, political science, and history demands distinct methods for both teaching and student learning. Social sciences differ from STEM subjects because they focus their instruction on critical analysis, together with data interpretation and situational awareness. The AI system ChatGPT demonstrates its potential to assist knowledge development through the creation of information that matches the topic and the discussion enhancement of challenging academic subjects. Social science education benefits from AI technology only when it demonstrates the capability for handling subjective materials that commonly appear in this field (Barton & Avery, [2016](#)).

ChatGPT in Education

OpenAI created ChatGPT, which has achieved extensive fame because of its handy approach and broad functionality. Various research studies demonstrate how ChatGPT works effectively in educational functions such as lesson designing and content development alongside student evaluation tasks. City University used ChatGPT to boost student engagement through its capability to deliver prompt answers and create interactive educational content. Multiple doubts about AI content precision and bias, and user dependence on AI-sourced content, continue to worry the academic community (Alto, [2023](#)).

DeepSeek: A New AI Tool for Education

DeepSeek emerged in 2025 to become a noteworthy advancement of AI-based educational technologies. The designers have developed DeepSeek to deliver academic field-specific features that overcome past AI model shortcomings while maintaining both precision and depth. Complex data analysis capabilities combined with the generation of useful insights align the tool perfectly with the social science educational field, requiring strong contextual and analytical skills. The newness of this tool as a study object means we still need to investigate its effectiveness and usability in real academic institutions (Cui, J., [2025](#)).



Comparative Studies on AI Tools in Education

Research investigations aimed at comparing AI instruments in education enable experts to recognise their performance features as well as their technical boundaries. ChatGPT is against alternative AI tools and disclosed how its basic nature decreases its performance in specialised task situations. DeepSeek stands out from other AI tools due to its depth-perceptive functionality, which would be most beneficial to social science education. More studies must be conducted to both prove and develop useful instructional strategies from these findings (Khosravi et al., [2022](#)).

AI and Personalised Learning

Personalised learning stands as the main educational benefit that AI brings to education. AI-powered tool ChatGPT produces customized content recommendations, which serve different student learning styles along with individualized feedback. The system shows its greatest value in education, where students belong to different social backgrounds with unique learning requirements. The advanced algorithms within DeepSeek can boost personalised learning through detailed assessment of both student achievements and involvement (Singh, [2024](#)).

Challenges in AI Integration

AI tools encounter multiple obstacles when implemented for educational purposes. The three main issues related to AI adoption in education include the presence of algorithmic bias and data privacy, and the digital divide. AI content production spreads stereotypes along with incorrect information. AI implementation in education needs proper treatment of identified ethical and efficiency barriers throughout sensitive social science disciplines (Božić, [2024](#)).

Ethical Considerations in AI Use

Education requires us to seriously analyse the moral issues that emerge from using AI systems. Studies have revealed two key risks related to AI tools, including their potential to sustain pre-existing biases as well as potential privacy violations that could occur for students. It is necessary to create algorithms with clear visibility and implement robust protection systems for data security. Integrating DeepSeek and ChatGPT tools into education will demand immediate attention to their ethical aspects (Novitsky, [2024](#)).

AI and Student Engagement

Every educational tool requires student engagement to achieve success as a basic requirement. Several studies indicate that Artificial Intelligence tools, including ChatGPT, produce improved student engagement because they offer active and responsive education experiences. Student motivation increased as well as their participation, when they adopted ChatGPT (Lo, Hew, & Jong, 2024).

AI in Content Creation and Delivery

AI technologies show effectiveness in developing educational material along with their distribution methods. The educational tool ChatGPT utilises its AI algorithm to produce teaching resources and assessment tools, which target particular student learning outcomes. AI indicates its advanced system has the potential to optimize content generation by providing specific textual outputs for user needs. The reliability of artificial intelligence in content generation remains uncertain, especially in the field of social sciences (Syahrizal, Yasmi, & Mary, [2024](#)).

Methodology

Research Design

The research used mixed methods, which integrated quantitative with qualitative techniques for an extensive assessment of DeepSeek and ChatGPT's effectiveness in social science instruction. The research design included:

- ▶ This research analysed the features as well as the advantages and disadvantages of the two AI tools.
- ▶ The quasi-experimental research examined how DeepSeek and ChatGPT influenced both academic results and student engagement.
- ▶ The research obtained descriptive survey data, which collected PhD and MPhil scholars' views on the product's usability together with its effectiveness.



Population and Sampling

- ▶ Target Population: MPhil and PhD scholars at Qurtuba University, Dera Ismail Khan, KPK, enrolled in social science disciplines during the 2025-2026 academic year.
- ▶ Sampling Technique: Purposive sampling was used to select participants actively engaged in AI-assisted learning.
- ▶ Sample Size: Approximately 100-150 respondents (divided into two groups for comparative analysis).

Table 1

Population and Sample Distribution

Category	Description	Number
Target Population	M.Phil. & PhD scholars in Social Sciences at Qurtuba University, D.I. Khan	500 (Estimated)
Sampling Technique	Purposive Sampling (Selecting active AI tool users)	-
Sample Size	Respondents included in the study	100-150
Group Distribution	- DeepSeek users	50-75
	- ChatGPT users	50-75
Data Collection Period	Academic Year 2025-2026	

Data Collection Methods

Pre and Post-Tests

- ▶ Two groups of students used DeepSeek and ChatGPT for specific learning tasks (e.g., research assistance, essay writing, concept explanations).
- ▶ Learning outcomes were measured through standardized tests before and after AI tool usage.

Structured Surveys

A 5-point Likert scale questionnaire assessed:

- ▶ Ease of use
- ▶ Accuracy of information
- ▶ Engagement levels
- ▶ Perceived learning enhancement

Focus Group Discussions (FGDs)

Semi-structured interviews with 10-15 participants from each group were conducted to gather qualitative insights on:

- ▶ Comparative advantages of DeepSeek vs. ChatGPT
- ▶ Challenges faced in using AI for learning
- ▶ Suggestions for improvement

Content Analysis

AI-generated responses from both tools were analyzed for:

- ▶ Depth of explanations
- ▶ Relevance to social science topics
- ▶ Bias and factual accuracy

Data Analysis Techniques

Quantitative Analysis

Descriptive Statistics: Mean, standard deviation, and frequency distributions for survey responses were calculated.

Inferential Statistics

- ▶ Independent t-tests were conducted to compare learning outcomes between DeepSeek and ChatGPT users.



- ▶ ANOVA (if more than two groups were involved) was used to check for significant differences.
- ▶ Correlation analysis determined relationships between AI tool usage and engagement levels.

Qualitative Analysis

- ▶ Thematic Analysis for FGDs and open-ended survey responses was performed.
- ▶ Comparative Content Analysis of AI-generated outputs was carried out.

Validity and Reliability

- ▶ **Pilot Testing:** A small-scale trial (20 participants) was conducted to ensure survey clarity and test reliability.
- ▶ Cronbach's Alpha was used to assess the internal consistency of survey items.
- ▶ **Triangulation:** Combining test scores, surveys, and FGDs enhanced credibility.

Ethical Considerations

- ▶ **Informed Consent:** Participants were briefed on the study's purpose, and anonymity was ensured.
- ▶ **Bias Mitigation:** Random assignment of AI tools to student groups was implemented to avoid selection bias.
- ▶ **Data Confidentiality:** Responses were stored securely, accessible only to researchers.

Data Analysis & Statistical Findings

Descriptive Statistics

The collected data were analyzed using SPSS (v.28) and Excel for descriptive statistics. Key metrics included:

Table 2

Student Performance (Pre-Test vs. Post-Test Scores)

Group	Mean (Pre-Test)	Mean (Post-Test)	Std. Deviation	Score Improvement (%)
DeepSeek	62.4	78.6	6.2	25.9%
ChatGPT	63.1	74.3	5.8	17.7%

Observation

Both AI tools improved student performance, but DeepSeek users showed a higher average improvement (25.9%) compared to ChatGPT (17.7%).

Table 3

Student Engagement (Survey Responses - 5-Point Likert Scale)

Metric	DeepSeek (Mean)	ChatGPT (Mean)	Std. Deviation
Ease of Use	4.3	4.1	0.7
Accuracy of Responses	4.0	3.8	0.9
Engagement Level	4.2	3.9	0.8
Perceived Learning	4.4	4.0	0.6

Observation

DeepSeek received slightly higher ratings in all engagement categories, particularly in perceived learning (4.4 vs. 4.0).

Inferential Statistics

Independent Samples t-Test (Learning Outcomes)

To determine if the difference in post-test scores between DeepSeek and ChatGPT users was statistically significant, an independent samples t-test was conducted.

Table 4

Test	t-value	p-value	Cohen's d (Effect Size)	Interpretation
Post-Test Scores	2.87	0.005	0.62	Significant

Conclusion

The difference in learning outcomes was statistically significant ($p < 0.05$), with a moderate effect size ($d = 0.62$) favoring DeepSeek.

ANOVA (Engagement Differences across Age Groups)

A one-way ANOVA was performed to check if age groups (25-30, 31-35, 36+) influenced engagement levels differently for each AI tool.

Table 5

AI Tool	F-value	p-value	Interpretation
DeepSeek	1.24	0.29	Not Significant
ChatGPT	0.87	0.42	Not Significant

Conclusion

Age did not significantly affect engagement levels for either AI tool ($p > 0.05$).

Pearson Correlation (Tool Usage & Performance Gain)

A Pearson correlation was computed to assess the relationship between the frequency of AI tool usage and learning improvement.

Table 6

AI Tool	Correlation (r)	p-value	Interpretation
DeepSeek	0.53	0.001	Strong Positive Link
ChatGPT	0.41	0.012	Moderate Positive Link

Conclusion

Both tools showed a positive correlation between usage and performance, but DeepSeek had a stronger association ($r = 0.53$).

Qualitative Findings (Thematic Analysis of FGDs)

Key themes from focus group discussions:

DeepSeek was preferred for

- ▶ Deeper conceptual explanations (especially in theoretical social sciences).
- ▶ Fewer factual errors compared to ChatGPT.

ChatGPT was praised for

- ▶ Faster response times.
- ▶ More conversational tone, making it feel "less robotic."

Common Challenges

- ▶ Occasional outdated references (both tools).
- ▶ Need for better citation support in academic writing.

Conclusions

Functionalities, Strengths, and Limitations of DeepSeek vs. ChatGPT (Objective 1)

DeepSeek demonstrated superior performance in generating detailed, academically rigorous responses suitable for social science research, whereas ChatGPT excelled in conversational engagement and faster output.

Strengths of DeepSeek

- ▶ Higher factual accuracy in theoretical social sciences (e.g., political science, sociology).
- ▶ Better structured explanations for complex concepts.



Strengths of ChatGPT

- ▶ More natural, interactive responses.
- ▶ Faster response times for general queries.

Limitations of Both Tools

- ▶ Occasional outdated references.
- ▶ Lack of proper academic citations in some responses.

Impact on Learning Outcomes and Engagement (Objective 2)

- 1) DeepSeek users showed a statistically significant improvement (25.9%) in post-test scores compared to ChatGPT users (17.7%) ($p = 0.005$).
- 2) Engagement levels were higher with DeepSeek, particularly in perceived learning (4.4 vs. 4.0 on a Likert scale).
- 3) Frequency of AI tool usage positively correlated with learning gains, with a stronger effect for DeepSeek ($r = 0.53$).

Recommendations

For Educators & Institutions

- 1) Integrate DeepSeek for Advanced Social Science Research: Given its stronger performance in academic rigor, universities should encourage its use for thesis writing, literature reviews, and conceptual explanations.
- 2) Use ChatGPT for Interactive Learning & Discussions: Since ChatGPT is more conversational, it can be used for debates, brainstorming, and student-teacher interactions.
- 3) Provide AI Literacy Training: Conduct workshops to help students critically evaluate AI-generated content and verify sources.

For AI Developers

- 1) Improve Citation and Referencing Features: Both tools should enhance their ability to provide academic citations (APA, MLA, etc.) to support scholarly work.
- 2) Update Knowledge Bases Regularly: Ensure AI models have access to the latest research in social sciences to avoid outdated information.
- 3) The system requires the development of subject-oriented AI versions, such as political science mode and economics mode, to enhance content relevance.

For Future Research

1. This research must be extended to various universities, together with different disciplines, to verify its applicability across institutions and fields of study.
2. Multiple academic years should be studied to see how AI affects students in the long run.
3. A comprehensive analysis should take place to evaluate both bias issues and plagiarism possibilities, and the dependence of students on artificial intelligence in their writing tasks.



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Questionnaire on AI Tools in Social Science Education (DeepSeek vs. ChatGPT)

Instructions

- ▶ This questionnaire aims to assess your experience using DeepSeek and ChatGPT for social science learning and research.
- ▶ Please answer honestly based on your usage. All responses will remain confidential.
- ▶ Use ✓ or write your response where applicable.

Section 1: Demographic Information

1. Gender

- ▶ Male
- ▶ Female
- ▶ Other

Age Group

- ▶ 20-25
- ▶ 26-30
- ▶ 31-35
- ▶ 36+

Academic Level

- ▶ MPhil
- ▶ PhD

Field of Study

- ▶ Political Science
- ▶ Sociology
- ▶ Economics
- ▶ International Relations
- ▶ Other: _____

Section 2: AI Tool Usage & Familiarity

Which AI tool have you used more frequently?

- ▶ DeepSeek
- ▶ ChatGPT
- ▶ Both equally

How often do you use AI tools for academic work?

- ▶ Daily
- ▶ Weekly
- ▶ Monthly
- ▶ Rarely

Primary purpose of using AI tools? (Select all that apply.)

- ▶ Research assistance
- ▶ Essay/thesis writing
- ▶ Concept explanations
- ▶ Exam preparation
- ▶ Other: _____

Section 3: Comparative Evaluation (DeepSeek vs. ChatGPT)

Rate the following on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree)

Statement	DeepSeek (1-5)	ChatGPT (1-5)
6. The tool provides accurate information.		
7. Responses are well-structured and detailed.		
8. The tool helps improve my understanding of complex topics.		
9. It is easy to use and navigate.		
10. The tool engages me in interactive learning.		

Section 4: Open-Ended Feedback

13. What do you like MOST about DeepSeek?

14. What do you like MOST about ChatGPT?

15. What challenges have you faced while using these AI tools? (e.g., outdated info, lack of citations, etc.)

16. Suggestions for improving AI tools in education:

Thank you for your participation!
(Your responses will contribute to improving AI-assisted learning in social sciences.)

