

GSE GenAI Research Repo Content Analysis

Last Updated: 2024-02-04

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Introduction:

As part of this project, I scraped the GSE GenAI Hub’s Research Repo to identify articles related to *Teaching - Instructional Materials in K12* and *Impact - Randomized Controlled Trials in secondary education* and analyze the keywords frequently used within them. For the keyword analysis, I relied on article’s titles and abstracts as I deemed those most appropriate for identifying high-level language, as well as more nuanced language regarding methodologies, results and impact.

A quick summary of my findings and a table summarizing the included papers can be found below. The paper abstracts are not included here for brevity, but can be found in the scraped data file `gse_genai_articles.csv`.

Summary of Findings:

My analysis looked at top individual words and top bi-grams (i.e. word pairings) used in the text. Top words shown in **figure 1** included “AI”, “learning”, “education”, “students” and “ChatGPT” – reflecting the topic’s focus on AI within education while highlighting one of the field’s most highly used tools, ChatGPT. Top word pairs shown in **figure 2** included “artificial intelligence”, “generative AI”, “AI education”, “intelligence AI”, and “AI literacy”, again relatively unsurprising with the exception of “AI literacy”, which may reflect an urge to educate students and teachers in ways to work with AI.

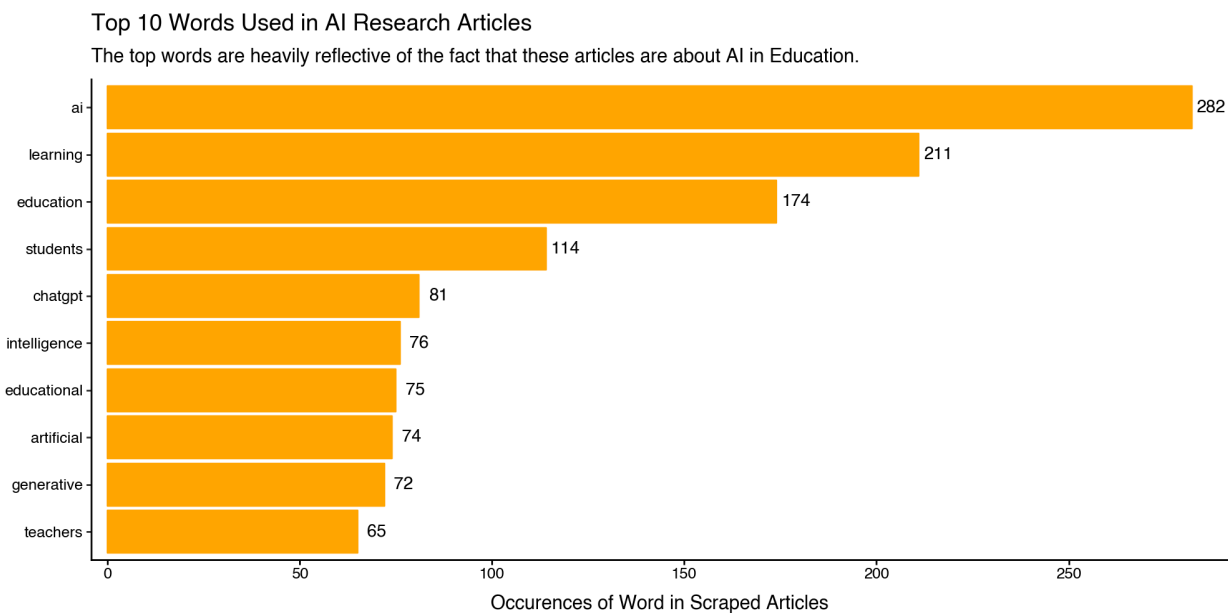


Figure 1.

Top 10 Phrases Used in AI Research Articles

Top bi-grams (i.e. word pairs) reflect the community's interest in AI broadly, as well as its associated tools and methods.

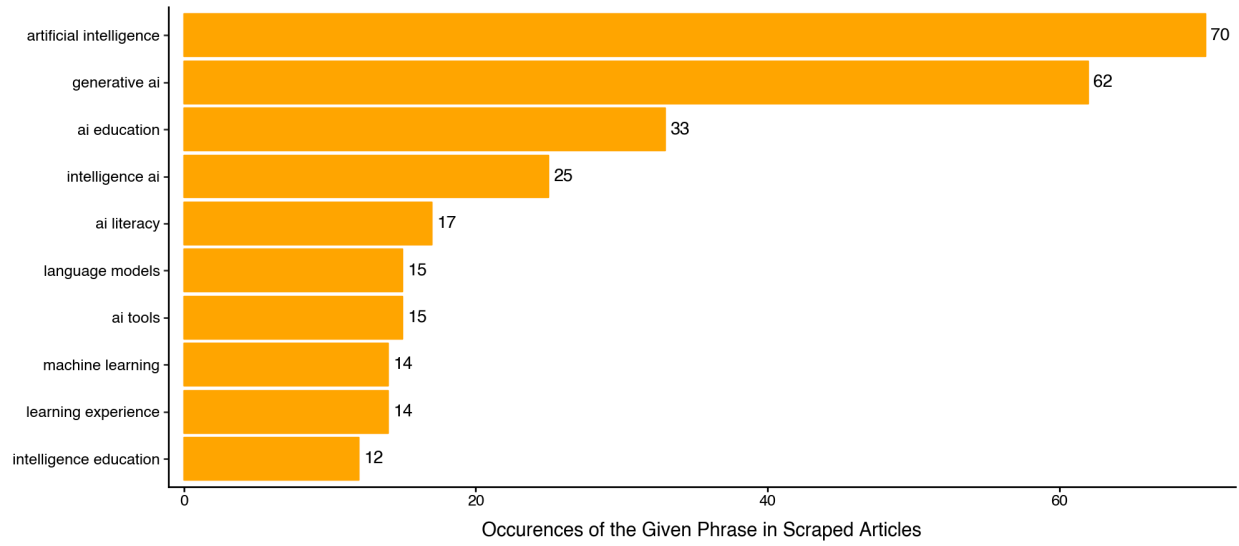


Figure 2.

Title	Authors	Date	Publisher	Link	What is the application?	Who is the user?	What age?	Why use AI?	Study design
A Comprehensive Review on Generative AI for Education	Uday Mittal, Siva Sai, Vinay Chamola, Devika Sangwan	09/2024	IEEE	https://ieeexplore.ieee.org/document/10695056	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Organizing, Analyzing	Student, Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Literacy, Outcomes – Numeracy, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills, Reimagined Schooling	Systematic Review
A Digital Recommendation System for Personalized Learning to Enhance Online Education: A Review	Dhananjaya. G. M., R. H. Goudar, Anjanabhargavi A. Kulkarni, Vijayalaxmi N. Rathod, Geetabai S. Hukkeri	02/2024	IEEE	https://ieeexplore.ieee.org/document/10445145	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support, Analyzing	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Differentiation	Systematic Review
A Framework for Responsible AI Education: A Working Paper	Caitlin Bentley, Christine Aicardi, Sammia Poveda, Leonardo Magela Cunha, David Kohan Marzagao, Richard Glover, Eryn Rigley, Simon Walker, Martin Compton, Oguz A Acar	08/2023	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4544010	Teaching – Instructional Materials, Teaching – Professional Learning, Learning – Student Support, Analyzing	Student, Educator, School Leader	High School (9-12), Post-Secondary	Outcomes – Differentiation, Outcomes – Durable Skills, Reimagined Schooling, Other	Descriptive – Implementation and Use, Systematic Review
A Human-Centered Learning and Teaching Framework Using Generative Artificial Intelligence for Self-Regulated Learning Development Through Domain Knowledge Learning in K–12 Settings	Siu-Cheung Kong, Yin Yang	04/2024	IEEE	https://ieeexplore.ieee.org/document/10507034	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support	Educator	Elementary (PK5), Middle School (6-8), High School (9-12)	Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills, Reimagined Schooling	Descriptive – Implementation and Use, Impact – Quasi-experimental
A Perspective on K-12 AI Education	Nathan Wang, Paul Tonko, Nikil Ragav, Michael Chungyou, Jonathan Plucker	01/2023	arXiv	https://arxiv.org/abs/2206.03217	Teaching – Instructional Materials, Teaching – Professional Learning	Educator, School Leader	High School (9-12)	Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Durable Skills, Reimagined Schooling	Descriptive – Product Development
A Review of Artificial Intelligence (AI) in Education during the Digital Era	Pongsakorn Limna, Somporn Jakwatanatham, Sutitthep Siripattanakul, Pichart Kaewpuang, Patcharavadee Sriboonruang	07/2022	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4160798	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support	Student, Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Systematic Review
A Systematic Assessment of OpenAI o1-Preview for Higher Order Thinking in Education	Ehsan Latif, Yifan Zhou, Shuchen Guo, Yizhu Gao, Lehong Shi, Matthew Nayaaba, Gyeonggeon Lee, Liang Zhang, Arne Bewersdorff, Luyang Fang, Xiantong Yang, Huaqin Zhao, Hanqi Jiang, Haoran Lu, Jiayi Li, Jichao Yu, Weihang You, Zhengliang Liu, (eta.)	10/2024	arXiv	https://arxiv.org/abs/2410.21287	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary	Outcomes – Other Academic, Outcomes – Durable Skills	Systematic Review

AI Agents and Education: Simulated Practice at Scale	Ethan Mollick, Lilach Mollick, Natalie Bach, LJ Ciccarelli, Ben Przystanski, Daniel Ravipinto	06/2024	arXiv	https://arxiv.org/abs/2407.12796	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning	Student, Educator	High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Differentiation, Reimagined Schooling	Descriptive – Product Development
AI and personalized learning: Bridging the gap with modern educational goals	Kristjan-Julius Laak, Jaan Aru	04/2024	arXiv	https://arxiv.org/abs/2404.02798	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools	Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Social Emotional, Outcomes – Durable Skills	Systematic Review
AI literacy in K-12: a systematic literature review	Casal-Otero, Catala, Fernandez-Morante, Taboada, Cebreiro, Barro	04/2023	SpringerOpen	https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-023-00418-7	Teaching – Instructional Materials, Teaching – Professional Learning, Analyzing	Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12)	Outcomes – Other Academic, Outcomes – Durable Skills, Reimagined Schooling	Systematic Review
AI-Based Learning Style Prediction in Online Learning for Primary Education	Bens Pardamean, Teddy Suparyanto, Tjeng Wawan Cenggoro, Digdo Sudigyo, Andri Anugrahana	03/2022	IEEE	https://ieeexplore.ieee.org/document/9737111	Teaching – Instructional Materials, Learning – Student Support	Educator	Elementary (PK5)	Efficiency, Outcomes – Differentiation, Reimagined Schooling	Descriptive – Implementation and Use
ActiveAI: Enabling K-12 AI Literacy Education & Analytics at Scale	Ruiwei Xiao, Ying-Jui Tseng, Hanqi Li, Hsuan Nieu, Guanze Liao, John Stamper, Kenneth R. Koedinger	12/2024	arXiv	https://arxiv.org/abs/2412.14200	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Analyzing	Others	High School (9-12)	Outcomes – Other Academic, Reimagined Schooling	Descriptive – Implementation and Use, Descriptive – Product Development
App Planner: Utilizing Generative AI in K-12 Mobile App Development Education	David Kim, Prerna Ravi, Randi Williams, Daeun Yoo	04/2024	arXiv	https://arxiv.org/abs/2401.15182	Teaching – Instructional Materials, Learning – Student Support	Student	High School (9-12)	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Durable Skills	Descriptive – Product Development, Impact – Quasi-experimental
Applications, challenges and ethical issues of AI and ChatGPT in education	Dimitrios Sidiropoulos, Christos-Nikolaos Anagnostopoulos	01/2024	arXiv	https://arxiv.org/abs/2402.07907	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Analyzing	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Durable Skills	Systematic Review
Applying IRT to Distinguish Between Human and Generative AI Responses to Multiple-Choice Assessments	Alona Strugatski, Giora Alexandron	11/2024	arXiv	https://arxiv.org/abs/2412.02713	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Systematic Review
Are Lesson Plans Created by ChatGPT More Effective? An Experimental Study	Muhammet Remzi Karaman, Idris Göksu	02/2024	Research Gate	https://www.researchgate.net/publication/377964050_Are_Lesson_Plans_Created_by_ChatGPT_More_Effective_An_Experimental_Study	Teaching – Instructional Materials	Educator	Elementary (PK5)	Efficiency, Outcomes – Numeracy	Impact – Quasi-experimental

Artificial Intelligence Applications in K-12 Education: A Systematic Literature Review	Mostafa Zafari, Jalal Safari Bazargani, Abolghasem Sadeghi-Niaraki, Soo-Mi Choi	05/2022	IEEE	https://ieeexplore.ieee.org/document/9785805	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Analyzing	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12)	Efficiency, Outcomes – Literacy, Outcomes – Numeracy, Outcomes – Other Academic, Outcomes – Differentiation	Systematic Review
Artificial Intelligence Policy Framework for Institutions	William Franz Lamberti	12/2024	arXiv	https://arxiv.org/abs/2412.02834	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Organizing, Analyzing	Educator, School Leader, Others	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills	Descriptive – Implementation and Use
Artificial Intelligence in Education - From a Teacher and a Student Perspective	Indira Sangapu	12/2018	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3372914	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Analyzing	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Impact – Quasi-experimental
Artificial Intelligence in Education: A Review	Lijia Chen, Pingping Chen, Zhijian Lin	04/2020	IEEE	https://ieeexplore.ieee.org/document/9069875	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Organizing, Analyzing	Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Reimagined Schooling	Systematic Review
Artificial Intelligence, Teacher Tasks and Individualized Pedagogy	Bruno Ferman, Lima Lycia, Riva Flavio	02/2021	IDEAS	https://ideas.repec.org/p/osf/socarx/qw249.html	Teaching – Assessment and Feedback, Teaching – Professional Learning	Educator	High School (9-12)	Efficiency, Outcomes – Literacy, Outcomes – Differentiation	Impact – Randomized Controlled Trial
Assigning AI: Seven Approaches for Students, with Prompts	Ethan R. Mollick, Lilach Mollick	09/2023	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4475995	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools	Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary	Outcomes – Differentiation, Outcomes – Durable Skills, Reimagined Schooling	Descriptive – Implementation and Use
Backwards Planning with Generative AI: Case Study Evidence from US K12 Teachers	Samantha Keppler, Wichinpong Park Sinchaisri, Clare Snyder	08/2024	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4924786	Teaching – Instructional Materials, Teaching – Professional Learning	Educator	Elementary (PK5), Middle School (6-8), High School (9-12)	Efficiency, Outcomes – Other Academic	Impact – Quasi-experimental
Bringing Generative AI to Adaptive Learning in Education	Hang Li, Tianlong Xu, Chaoli Zhang, Eason Chen, Jing Liang, Xing Fan, Haoyang Li, Jiliang Tang, Qingsong Wen	06/2024	arXiv	https://arxiv.org/abs/2402.14601	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Reimagined Schooling	Systematic Review
Building Bridges: AI Custom Chatbots as Mediators between Mathematics and Physics	Julia Lademann, Jannik Henze, Sebastian Becker-Genschow	12/2024	arXiv	https://arxiv.org/abs/2412.15747	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	Middle School (6-8)	Outcomes – Numeracy, Outcomes – Other Academic, Outcomes – Differentiation	Impact – Randomized Controlled Trial

ChatGPT for Education and Research: A Review of Benefits and Risks	Sarin Sok, Kimkong Heng	03/2023	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4378735	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Organizing, Analyzing	Others	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Systematic Review
ChatGPT in Education: Exploring Opportunities for Emerging Economies to Improve Education with ChatGPT	David Mhlanga	03/2023	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4355758	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Literacy, Outcomes – Other Academic, Outcomes – Durable Skills	Systematic Review
ChatGPT-generated help produces learning gains equivalent to human tutor-authored help on mathematics skills	Zachary A. Pardos, Shreya Bhandari	05/2024	PLOS ONE	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0304013	Learning – Student Support	Student	High School (9-12), Post-Secondary	Efficiency, Outcomes – Numeracy	Impact – Randomized Controlled Trial
ChatGPT: Revolutionizing student achievement in the electronic magnetism unit for eleventh-grade students in Emirates schools	Saif Alneyadi, Yousef Wardat	06/2023	CedTech	https://www.cedtech.net/download/chatgpt-revolutionizing-student-achievement-in-the-electronic-magnetism-unit-for-eleventh-grade-13417.pdf	Teaching – Instructional Materials, Teaching – Assessment and Feedback	Student, Educator	High School (9-12)	Outcomes – Other Academic, Outcomes – Differentiation	Impact – Quasi-experimental
Chatbot dialogic reading boosts comprehension for Chinese kindergarteners with higher language skills	Xi Cheng, Li Yin, Chaochao Lin, Zhaoning Shi, Hanxiao Zheng, Leqi Zhu, Xiabi Liu, Keran Chen, Rui Dong	04/2024	ScienceDirect	https://www.sciencedirect.com/science/article/abs/pii/S0022096523002187	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Educator	Elementary (PK5)	Outcomes – Numeracy, Outcomes – Differentiation	Impact – Randomized Controlled Trial
Data-Driven Artificial Intelligence in Education: A Comprehensive Review	Kashif Ahmad, Waleed Iqbal, Ammar El-Hassan, Junaid Qadir, Driss Benhaddou, Moussa Ayyash	09/2023	IEEE	https://ieeexplore.ieee.org/document/10247566	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Organizing, Analyzing	Educator, School Leader, Others	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills	Systematic Review
Decision-Making Framework for the Utilization of Generative Artificial Intelligence in Education: A Case Study of ChatGPT	Umar Ali Bakar, Md. Shohel Sayeed, Siti Fatimah Abdul Razak, Sumendra Yogarayan, Radhwan Sneesi	07/2024	IEEE	https://ieeexplore.ieee.org/document/10589404	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Analyzing	Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Systematic Review
Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in Promoting Teaching and Learning	David Baidoo-Anu, Leticia Owusu Ansah	01/2025	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4337484	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Systematic Review

Encouraging Responsible Use of Generative AI in Education: A Reward-Based Learning Approach	Aditi Singh, Abul Ehtesham, Saket Kumar, Gaurav Kumar Gupta, Tala Talaei Khoei	06/2024	arXiv	https://arxiv.org/abs/2407.15022	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary	Outcomes – Numeracy, Outcomes – Differentiation	Descriptive – Product Development, Impact – Quasi-experimental
Experimental Evidence on Artificial Intelligence in the Classroom	Bruno Ferman, Lycia Lima, Flavio Riva	11/2020	RePEc	https://ideas.repec.org/p/pra/mprapa/103934.html	Teaching – Assessment and Feedback	Educator	High School (9-12)	Efficiency, Outcomes – Literacy	Impact – Randomized Controlled Trial
Exploring User Perspectives on ChatGPT: Applications, Perceptions, and Implications for AI-Integrated Education	Reza Hadi Mogavi, Chao Deng, Justin Juho Kim, Pengyuan Zhou, Young D. Kwon, Ahmed Hosny Saleh Metwally, Ahmed Tlili, Simone Bassanelli, Antonio Bucchiarone, Sujit Gujar, Lennart E. Nacke, Pan Hui	11/2023	arXiv	https://arxiv.org/abs/2305.13114	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Organizing, Analyzing	Student, Parent/Caregiver, Educator, Others	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Literacy, Outcomes – Numeracy, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills, Other	Impact – Quasi-experimental
FairAIED: Navigating Fairness, Bias, and Ethics in Educational AI Applications	Sribala Vidyadhari Chinta, Zichong Wang, Zhipeng Yin, Nhat Hoang, Matthew Gonzalez, Tai Le Quy, Wenbin Zhang	07/2024	arXiv	https://arxiv.org/abs/2407.18745	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Analyzing	Student, Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Reimagined Schooling	Systematic Review
From Unseen Needs to Classroom Solutions: Exploring AI Literacy Challenges & Opportunities with Project-Based Learning Toolkit in K-12 Education	Hanqi Li, Ruiwei Xiao, Hsuan Nieu, Ying-Jui Tseng, Guanze Liao	12/2024	arXiv	https://arxiv.org/abs/2412.17243	Teaching – Instructional Materials, Teaching – Professional Learning	Educator	Middle School (6-8), High School (9-12)	Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Durable Skills	Descriptive – Implementation and Use, Descriptive – Product Development, Impact – Quasi-experimental
Generative AI Can Harm Learning	Hamsa Bastani, Osbert Bastani, Alp Sungu, Haosen Ge, Özge Kabakcı, Rei Mariman	07/2024	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4895486	Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	High School (9-12)	Outcomes – Numeracy, Outcomes – Durable Skills	Impact – Randomized Controlled Trial
Generative AI and Its Educational Implications	Kacper Łodzikowski, Peter W. Foltz, John T. Behrens	01/2024	arXiv	https://arxiv.org/abs/2401.08659	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Analyzing	Student, Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Literacy, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills, Reimagined Schooling	Systematic Review
Generative AI for Education (GAIED): Advances, Opportunities, and Challenges	Paul Denny, Sumit Gulwani, Neil T. Heffernan, Tanja Käser, Steven Moore, Anna N. Rafferty, Adish Singla	02/2024	arXiv	https://arxiv.org/abs/2402.01580	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary	Efficiency, Outcomes – Literacy, Outcomes – Numeracy, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills, Reimagined Schooling	Descriptive – Implementation and Use, Descriptive – Product Development
Generative AI for Enhancing Active Learning in Education: A Comparative Study of GPT-3.5 and GPT-4 in Crafting Customized Test Questions	Hamdireza Rouzegar, Masoud Makrehchi	06/2024	arXiv	https://arxiv.org/abs/2406.13903	Teaching – Instructional Materials, Teaching – Assessment and Feedback	School Leader	Middle School (6-8)	Outcomes – Numeracy, Outcomes – Differentiation	Impact – Quasi-experimental

Home-Tutoring Services Assisted with Technology: Investigating the Role of Artificial Intelligence Using a Randomized Field Experiment	Jun Hyung Kim, Minki Kim, Do Won Kwak, Sol Lee	09/2021	Journal of Marketing Research	https://journals.sagepub.com/doi/full/10.1177/00222437211050351	Teaching – Assessment and Feedback, Learning – Student Support	Educator	Elementary (PK5), Middle School (6-8)	Efficiency, Outcomes – Numeracy, Outcomes – Differentiation	Impact – Randomized Controlled Trial
Improving Teachers' Questioning Quality through Automated Feedback: A Mixed-Methods Randomized Controlled Trial in Brick-and-Mortar Classrooms	Dorottya Demszky, Jing Liu, Heather C. Hill, Shyamoli Sanghi, Ariel Chung	11/2023	EdWorkingPapers.com	https://files.eric.ed.gov/fulltext/ED638993.pdf	Teaching – Assessment and Feedback, Teaching – Professional Learning	Educator	Elementary (PK5), Middle School (6-8), High School (9-12)	Efficiency, Outcomes – Other Academic, Reimagined Schooling	Impact – Randomized Controlled Trial, Impact – Quasi-experimental
Improving Teaching at Scale: Can AI Be Incorporated Into Professional Development to Create Interactive, Personalized Learning for Teachers?	Yasemin Copur-Gencurk, Jingxian Li, Sebnem Atabas	05/2024	American Educational Research Journal	https://journals.sagepub.com/doi/full/10.3102/00028312241248514	Teaching – Professional Learning	Educator	Middle School (6-8)	Outcomes – Numeracy, Outcomes – Differentiation	Impact – Randomized Controlled Trial
Instructors as Innovators: a Future-focused Approach to New AI Learning Opportunities, With Prompts	Ethan R. Mollick, Lilach Mollick	04/2024	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4802463	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools	Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary	Outcomes – Differentiation, Outcomes – Durable Skills	Descriptive – Implementation and Use, Descriptive – Product Development
Interaction With a Television Character Powered by Artificial Intelligence Promotes Children's Science Learning	Ying Xu, Julian Levine, Valery Vigil, Daniel Ritchie, Shan Zhang, Trisha Thomas, Carlos Barrera, Michelle Meza, Andres Sebastian Bustamante, Mark Warschauer	04/2023	EdArXiv	https://osf.io/preprints/edarxiv/m3ej9	Teaching – Instructional Materials, Teaching – Assessment and Feedback	Educator	Elementary (PK5)	Outcomes – Other Academic, Outcomes – Differentiation	Impact – Randomized Controlled Trial
Is ChatGPT Massively Used by Students Nowadays? A Survey on the Use of Large Language Models such as ChatGPT in Educational Settings	Jérémie Sublime, Ilaria Renna	12/2024	arXiv	https://arxiv.org/abs/2412.17486	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student	Middle School (6-8), High School (9-12), Post-Secondary	Efficiency, Outcomes – Literacy, Outcomes – Other Academic	Descriptive – Implementation and Use
LearnLM: Improving Gemini for Learning	LearnLM Team, Google	12/2024	arXiv	https://arxiv.org/abs/2412.16429	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Outcomes – Other Academic, Outcomes – Differentiation	Descriptive – Product Development, Impact – Quasi-experimental
Learning to Give Useful Hints: Assistance Action Evaluation and Policy Improvements	Robin Schmucker, Nimish Pachapurkar, Shanmuga Bala, Miral Shah, Tom Mitchell	08/2023	Responsive and Sustainable Educational Futures	https://link.springer.com/chapter/10.1007/978-3-031-42682-7_26	Teaching – Instructional Materials, Learning – Student Support	Student	High School (9-12)	Efficiency	Impact – Randomized Controlled Trial
M-Powering Teachers: Natural Language Processing Powered Feedback Improves 1:1 Instruction and Student Outcomes	Dorottya Demszky, Jing Liu	07/2023	EdWorkingPapers.com	https://edworkingpapers.com/sites/default/files/ai23-759-v2.pdf	Teaching – Assessment and Feedback, Teaching – Professional Learning	Educator	High School (9-12), Post-Secondary	Efficiency, Outcomes – Other Academic	Impact – Randomized Controlled Trial

Mapping Artificial Intelligence Integration in Education: A Decade of Innovation and Impact (2013–2023)—A Bibliometric Analysis	Muhammad Afzaal, Xiao Shanshan, Dong Yan, Muhammad Younas	08/2024	IEEE	https://ieeexplore.ieee.org/document/10636217	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Analyzing	Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Systematic Review
Math Education with Large Language Models: Peril or Promise?	Harsh Kumar, David M. Rothschild, Daniel G. Goldstein, Jake M. Hofman	11/2023	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4641653	Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	High School (9-12)	Outcomes – Numeracy, Outcomes – Differentiation	Impact – Randomized Controlled Trial
MindScratch: A Visual Programming Support Tool for Classroom Learning Based on Multimodal Generative AI	Yunnong Chen, Shuhong Xiao, Yaxuan Song, Zejian Li, Lingyun Sun, Liuqing Chen	12/2024	arXiv	https://arxiv.org/abs/2412.09001	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	Elementary (PK5)	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Durable Skills	Impact – Randomized Controlled Trial, Impact – Quasi-experimental
New Modes of Learning Enabled by AI Chatbots: Three Methods and Assignments	Ethan R. Mollick, Lilach Mollick	12/2022	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4300783	Teaching – Instructional Materials, Teaching – Assessment and Feedback	Educator	High School (9-12), Post-Secondary	Outcomes – Differentiation, Outcomes – Durable Skills	Descriptive – Implementation and Use
Open AI in Education, the Responsible and Ethical Use of ChatGPT Towards Lifelong Learning	David Mhlanga	02/2023	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4354422	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Literacy, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Durable Skills	Systematic Review
Pros and Cons of Artificial Intelligence–ChatGPT Adoption in Education Settings: A Literature Review and Future Research Agendas	Idria Maita, Saide Saide, Afifah Meshia Putri, Didi Muwardi	04/2024	IEEE	https://ieeexplore.ieee.org/document/10510580	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Analyzing	Student, Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Literacy, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills	Systematic Review
Qualitative and quantitative analysis of student's perceptions in the use of generative AI in educational environments	Sergio Altares-López, José M. Bengochea-Guevara, Carlos Ranz, Héctor Montes, Angela Ribeiro	09/2024	arXiv	https://arxiv.org/abs/2405.13487	Teaching – Instructional Materials, Learning – Student Support	Student, Educator	High School (9-12)	Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional	Impact – Quasi-experimental
Questioning the Scope of AI Standardization in Learning, Education, and Training	Jon Mason, Bruce E. Peoples, Jaeho Lee	01/2020	IEEE	https://ieeexplore.ieee.org/document/10258062	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Differentiation, Outcomes – Durable Skills	Descriptive – Implementation and Use, Systematic Review
Realizing Visual Question Answering for Education: GPT-4V as a Multimodal AI	Gyeong-Geon Lee, Xiaoming Zhai	05/2024	arXiv	https://arxiv.org/abs/2405.07163	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Analyzing	Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Descriptive – Implementation and Use, Systematic Review
Rethinking the A in STEAM: Insights from and for AI Literacy Education	Pekka Mertala, JAnne Fagerlund, Tomi Slotte Dufva	05/2024	arXiv	https://arxiv.org/abs/2405.18179	Teaching – Instructional Materials, Teaching – Professional Learning, Communicating / Social Tools	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12)	Outcomes – Other Academic, Outcomes – Durable Skills, Reimagined Schooling	Systematic Review

Systematic review of research on artificial intelligence in K-12 education (2017–2022) - pre ChatGPT 3.5	Florence Martin, Min Zhuang, Darlene Schaefer	05/2023	ScienceDirect	https://www.sciencedirect.com/science/article/pii/S2666920X23000747	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support, Analyzing	Student, Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12)	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Reimagined Schooling	Systematic Review
Teachers' and Students' Perception Towards Integration of Artificial Intelligence in School Curriculum: a Survey	Rini Mandal, Dr Jayanta Mete	07/2023	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4544750	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	High School (9-12)	Outcomes – Other Academic, Outcomes – Differentiation	Descriptive – Implementation and Use
Teaching Machine Learning in K–12 Classroom: Pedagogical and Technological Trajectories for Artificial Intelligence Education	Matti Tedre, Tapani Toivonen, Juho Kahila, Henriikka Vartiainen, Teemu Valtonen, Ilkka Jormanainen	07/2021	IEEE	https://ieeexplore.ieee.org/document/9490241	Teaching – Instructional Materials, Teaching – Professional Learning	Educator	Elementary (PK5), Middle School (6-8), High School (9-12)	Outcomes – Other Academic, Outcomes – Durable Skills, Reimagined Schooling	Systematic Review
The Extent of AI Applications in EFL Learning and Teaching	Yousif A. Alshumaimeri, Abdulrahman K. Alshememry	10/2024	IEEE	https://ieeexplore.ieee.org/document/10272618	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	High School (9-12), Post-Secondary	Outcomes – Literacy, Outcomes – Other Academic, Outcomes – Differentiation	Systematic Review
The Impact of Artificial Intelligence on Students' Learning Experience	Potter Kaledio, Abill Robert, Louis Frank	02/2024	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4716747	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Analyzing	Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional	Systematic Review
The Impact of Large Language Models on Students: A Randomised Study of Socratic vs. Non-Socratic AI and the Role of Step-by-Step Reasoning	Andrea Blasco, Vicky Charisi	12/2024	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5040921	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student	Middle School (6-8), High School (9-12)	Outcomes – Other Academic, Outcomes – Durable Skills	Impact – Randomized Controlled Trial
Towards Educator-Driven Tutor Authoring: Generative AI Approaches for Creating Intelligent Tutor Interfaces	Tommaso Calo, Christopher J. MacLellan	05/2024	arXiv	https://arxiv.org/abs/2405.14713	Teaching – Instructional Materials	Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary	Efficiency, Reimagined Schooling	Descriptive – Product Development, Impact – Quasi-experimental
Towards Responsible Development of Generative AI for Education: An Evaluation-Driven Approach	Irina Jurenka, Markus Kunesch, Kevin R. McKee, Daniel Gillick, Shaojian Zhu, Sara Wiltberger, Shubham Milind Phal, Katherine Hermann, Daniel Kasenberg, Avishkar Bhoopchand, Ankit Anand, Miruna Pîslar, Stephanie Chan, Lisa Wang, Jennifer She, Parsa Mahmoud	07/2024	arXiv	https://arxiv.org/abs/2407.12687	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Descriptive – Product Development, Impact – Quasi-experimental

Trustworthy Artificial Intelligence in Education: Pitfalls and Pathways	Nathalie A. Smuha	12/2020	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3742421	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Teaching – Professional Learning, Learning – Student Support, Communicating / Social Tools, Analyzing	Student, Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation, Outcomes – Social Emotional, Outcomes – Durable Skills	Systematic Review
Tuning Music Education: AI-Powered Personalization in Learning Music	Mayank Sangneria, Rohan Gala	12/2024	arXiv	https://arxiv.org/abs/2412.13514	Teaching – Instructional Materials, Learning – Student Support	Student, Educator	High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Differentiation	Descriptive – Product Development
Tutor CoPilot: A Human-AI Approach for Scaling Real-Time Expertise	Rose E. Wang, Ana T. Ribeiro, Carly D. Robinson, Susanna Loeb, Dorottya Demszky	10/2024	EdWorkingPapers.com	https://edworkingpapers.com/ai24-1054	Teaching – Professional Learning, Learning – Student Support	Educator	Elementary (PK5), Middle School (6-8)	Efficiency, Outcomes – Other Academic	Impact – Randomized Controlled Trial
Use Scenarios & Practical Examples of AI Use in Education	Dara Cassidy, Yann-Aël Le Borgne, Francisco Bellas, Riina Vuorikari, Elise Rondin, Madhumalti Sharma, Jessica Niewint-Gori, Johanna Gröpler, Anne Gilleran, Lidija Kralj	07/2024	arXiv	https://arxiv.org/abs/2309.12320	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support	Student, Educator	Elementary (PK5), Middle School (6-8), High School (9-12)	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Descriptive – Implementation and Use
Use of Artificial Intelligence in Education	Ashok Panigrahi	05/2020	SSRN	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3606936	Teaching – Instructional Materials, Teaching – Assessment and Feedback, Learning – Student Support, Analyzing	Student, Educator, School Leader	Elementary (PK5), Middle School (6-8), High School (9-12), Post-Secondary, Adult	Efficiency, Outcomes – Other Academic, Outcomes – Differentiation	Descriptive – Implementation and Use
Using ChatGPT for Science Learning: A Study on Pre-service Teachers' Lesson Planning	Gyeong-Geon Lee, Xiaoming Zhai	05/2024	IEEE	https://ieeexplore.ieee.org/document/10531039	Teaching – Instructional Materials, Teaching – Professional Learning	Educator	Elementary (PK5)	Outcomes – Differentiation	Descriptive – Implementation and Use, Impact – Quasi-experimental