Augmented Debate-Centered Instruction: A Novel Research Agenda for Responsible AI Integration in Education

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Abstract

This paper introduces a novel research agenda, Augmented Debate-Centered Instruction (ADCI), aiming to bridge a significant gap in the responsible integration of AI within educational frameworks. With the emergence of advanced language models, traditional individual writing assessments are becoming increasingly unreliable, shifting the focus towards detecting AI-assisted cheating rather than pedagogical innovation. This oversight neglects the potential for generative AI to enhance instructional practices and offer alternative assessment modes, crucial for fostering essential cognitive skills and durable competencies.

Keywords: Debate, Education, Artificial Intelligence, Pedagogy, Assessment

1. Introduction

The advent of Augmented Debate-Centered Instruction (ADCI) marks a pivotal shift in educational paradigms, addressing the urgent need for a responsible integration of AI in education. The rapid proliferation of language models challenges the reliability of conventional assessments, prompting a reevaluation of instructional and evaluative methodologies. Augmented Debate-Centered Instruction emerges as a promising solution, leveraging AI to enrich debate-centered learning, thereby cultivating critical thinking, persuasive communication, and durable skills essential in the 21st century.

Augmented Debate-Centered Instruction offers a promising tool for navigating the rapidly shifting educational and pedagogical contexts. Structured debates already require demonstrative reasoning and metacognitive skills beyond the current capabilities of generative large language models. Augmenting structured debates with AI assistance tailored to individual students' needs holds potential to strengthen the critical analysis, persuasive communication, evidence evaluation, and creative thinking development that structured debates offer to students. However, techniques for effective and ethical integration of AI to enrich debate-centered instruction remain underexplored, presenting concerning implications for equity and learning integrity.

This paper announces a research agenda investigating Augmented Debate-Centered Instruction, including its impacts on higher-order thinking and academic outcomes. We propose an online platform called DebaterHub to facilitate this agenda through pedagogical and technical innovation. If empirical findings confirm ADCI's potential, this methodology

could provide an ethical template for AI integration that enhances inquiry-driven learning experiences for all students. We invite collaborators across the AI ecosystem to advance this agenda, focusing squarely on human development and agency.

2. The Challenge of AI in Education

2.1. Current Educational Challenges and AI's Impact

The educational landscape faces myriad challenges, including the struggle to keep students engaged at school Defuria (2023), teacher burnout Kush et al. (2022), teacher shortages Nguyen et al. (2022), and school funding challenges Lionas (2023); Sprunt (2023) which are magnified by decentralization pressures Young (2023) that shift dollars away from public schools, in addition to day-to-day societal challenges that impact schools Santucci (2023).

Rapid developments in artificial intelligence and associated technologies exacerbate all of these challenges. Generative AI collides with the integrity of written assessments Theo and Ben (2023); Edwards (2023), and students rely on bots to complete their work, undermining a learning process still grounded in traditional assignments Islam and Islam (2023). Schools that move towards more performative and project-based assessments face growing demands for training and resources Luckin (2018). Adapting to AI raises pressure on schools to purchase bots to support instruction Lorentz (2023) and develop AI literacy programs Rosenbaum (2023), all accelerating their need for training and decision-making time.

2.2. The Need for Durable Skills Development

Preparing students for a rapidly evolving job market demands the development of "soft" or "durable" skills Goodin (2023), such as critical thinking, communication, and creativity Roslansky (2023), which are not easily measured by conventional tests. Additionally, schools are charged with preparing students for a world of work already complicated by the accelerating loss of many jobs in the near term Ermey (2023), even as new jobs are created in the long term McKerndrick (2023). As AI models gain the ability to reason and plan over the next few years Patel (2023) (quoting Hassabis), or sooner, as Victor and Efrati (2023) (2023) predict, more and more job functions could be replaced Sutskever (2023). In such scenarios, students must be prepared for a rapidly changing job market that requires perpetual learning and reinvention by future workers seeking gainful employment Litan (2020).

2.3. Debate as a Pedagogical Tool

Debate-centered learning offers a robust framework for the development of these skills. Structured debates require students to engage in higher-order thinking, argumentation, and evidence-based reasoning, augmenting and even going beyond what current AI models can achieve. However, effectively integrating debate into education requires innovative approaches, particularly in leveraging AI to support and enhance these activities.

With the widespread proliferation of general AI tools such as ChatGPT and specialized writing assistants, coupled with the general failure of AI writing detection tools Bauschard (2023) and applications that help students pass off AI writing as their own, instructors

need to develop instructional methods and assessments beyond essays and papers to measure student progress. Debate as a means of "performance-based" assessment, or iterative Project Based Learning (PBL), can play a critical role Litan (2020)(Litan, 2020). Debates provide a robust assessment of student work beyond Al's reach, requiring students to demonstrate content knowledge through questioning, argument selection, and persuasive articulation. Advanced texts used as evidence in debates further push students to develop comparative evidence assessment skills and identify weaknesses in opponents' arguments. Skill development in debates includes taking ownership of learning, refuting texts under pressure, managing time effectively, and cooperating in a competitive environment Schueler and Larned (2023). These skills, vital in today's AI-influenced academic and professional landscapes, highlight the importance of positioning debates as both strong pedagogy and authentic learning assessments.

The interactive qualities of debates make them uniquely effective environments for developing critical thinking dispositions and skills amid expanding information technologies Carter (2020); Iman (2017). Participating in debates enhances students' communication skills by requiring thorough research, clear argument development, effective listening, and dynamic adaptation to opponents' perspectives. The process involves coordinating with partners, preparing rebuttals, and developing delivery skills. Debate integrates critical thinking and analysis, proving more effective than traditional classroom experiences in building communication skills across disciplines Medina (2020); Bellon (2000); Afri et al. (2021); Snider and Schnurer (2002); Stuetzle (2015); Ang et al. (2019); Martini et al. (2021); Rao (2019). Debate's interactive nature also fosters active listening, which is essential for effective communication and learning Snider and Schnurer (2002). These skills, valuable in various professional contexts, are honed through the dynamic, high-pressure environment of debates Rodger and Stewart-Lord (2020); Carinanos-Ayala et al. (2021).

Research on learning and the brain reveals that learning occurs when people "build and organize skills to attain goals" and that "even the most discreet skill ... has to account for the embodied person learning that skill" Cantor et al. (2021) meaning that environment, context, and interaction are necessary to the dynamic development of the brain. Situating skills development and mastery of standards in shared, interactive debate experiences better aligns our pedagogical practices with what we know about how people learn.

Implementing debate in classrooms offers significant educational benefits but also faces challenges. For example, designing relevant topics and coaching debates is time-consuming for teachers, limiting engagement to a few students. Fortunately, classroom debates can significantly enhance social, cultural, and political discourse and promote equity Baines et al. (2023); Davis et al. (2016). Additionally, facilitating an ACDI model in PK-16 education can transform teachers into facilitators, allowing all students to simultaneously participate in debates in various forms, making debate-centered teaching methods more practical.

As learning bots integrate into education, they offer benefits like reduced costs and personalized learning Devi et al. (2022). However, concerns arise about their impact on vital skills like communication and empathy Jaiswal et al. (2022); Singh (2023); Yu et al. (2023). Interpersonal interactions, crucial for developing social, emotional, and cognitive abilities Müller et al. (2021), are at risk as bot interactions increase. Technology-centric education, by itself, often diminishes soft skills such as teamwork and communication Anderson

(2017), emphasizing the importance of human engagement in learning Chen et al. (2023). Both technical and soft skills are essential for the workforce Majid et al. (2019) and must be integrated into educational content Vogler et al. (2018); Kioupi and Voulvoulis (2019). Classroom debates, fostering student to student and teacher to student interactions, effectively develop these human-centric skills, aligning with 21st-century career requirements and enhancing professional readiness O'Donnell (2010).

One application of an ADCI model could resemble a 'flipped' classroom, with the introduction and engagement of content happening outside of class and discussion and debate in class. While earlier iterations of the flipped classroom relied on readings and multimedia produced for broader audiences, such as an entire class, AI tools can provide personalized instruction for students outside of class, providing active engagement in the classroom Mollick (2023). Currently, implementing flipped classroom concepts is limited due to structural constraints. Specifically, instructors face challenges in preparing materials and developing active in-class learning strategies Diwanji et al. (2018); Gonçalves et al. (2022). Additionally, using AI in a flipped classroom requires careful planning and implementation to ensure that it is effective and beneficial for students Graves (2019). Ouyang and Jiao (2021) (2021) outline three paradigms for human-AI interaction in education: AI-directed learning, where AI takes an instructional role tailored to individual needs du Boulay (2019); Skinner (1958), AI-supported learning fostering human-AI collaboration and communication skill development Lecunn (2023); Wiggers (2023), and AI-empowered learning focused on student agency and leadership, with humans and AI working interdependently as "colleagues" and "co-creators" in a mixed-initiative system Mollick and Mollick (2023); Grabe (2022); Guzdial and Riedl (2019); Hwang et al., 2020; Novick and Sutton, 1997). Our proposed system aims to explore the AI-empowered model while recognizing all three paradigms facilitate personalized learning across developmental stages. Testing varying levels of human-AI interaction will elucidate what balances optimize educational outcomes and skill gains.

3. Augmented Debate-Centered Instruction: DebaterHub's Role

3.1. DebaterHub's Role in Promoting Social Learning

DebaterHub, an AI-powered online platform, is at the forefront of ADCI. It is designed to simulate the dynamic and interactive environment of traditional debates. By integrating AI assistants that provide real-time feedback and support, DebaterHub facilitates a learning experience that fosters cognitive skills and social and emotional competencies. These AI assistants are programmed to encourage empathy, active listening, and constructive feedback, essential components of social-emotional learning, thereby ensuring that the online platform enhances rather than hinders the development of social learning.

DebaterHub creates social learning environments optimized for strengthening sophisticated reasoning through debate cycles with an ecosystem of peers and AI tutors. The conversational AI assistants will leverage state-of-the-art natural language processing, neural networks, and reinforcement learning tailored to debate. This allows adaptive scaffolding based on individual students' competency levels, misconceptions, and evolving needs. Key capabilities include sourcing verified evidence, identifying logical fallacies, explaining concepts, providing personalized feedback, and simulating guidance from an expert human tutor. Our approach to Augmented Debate-Centered Instruction aims to enhance

the traditional English Language Arts curriculum by creating an engaging social learning environment for co-constructing knowledge and honing higher-order reasoning skills while collaborating with an ecosystem of human and AI peers.

3.2. Integration of ADCI for Assessment Purposes

ADCI represents a paradigm shift towards performance-based assessment, addressing the limitations of traditional writing assessments in the era of generative AI. DebaterHub enables a comprehensive evaluation of students' debate performances, focusing on the quality of their arguments, the use of evidence, and their engagement with opposing viewpoints. This approach offers a more authentic and reliable measure of students' critical thinking and communication skills, aligning with the demands of 21st-century education.

4. Research Methodology and Data Analysis

4.1. Methodology for Investigating ADCI

This study employs a mixed-methods approach to comprehensively evaluate the effectiveness of ADCI through DebaterHub. The research design incorporates both qualitative and quantitative methods to capture a holistic view of the impact of debate-centered learning augmented by AI on student outcomes.

We will begin with a small-scale, exploratory, iterative process of collaborative construction and testing of DebaterHub in partnership with the National Association of Urban Debate Leagues (NAUDL) and The Delores Taylor Arthur School (The Taylor School) in New Orleans. Following initial development and focused testing, a large-scale randomized controlled trial across diverse schools will rigorously assess DebaterHub's efficacy on learning indicators, including critical thinking, perspective taking, collaboration, career interests, college readiness, communication skills, content knowledge, and cognitive abilities, the durable skills vital for the 21st century. This study will utilize a mixed methods approach incorporating validated instruments, discourse analysis, data analytics, surveys, and interviews.

4.2. DebaterHub Use Cases and Data Analysis Methodology

The data analysis will leverage validated instruments for measuring cognitive and social-emotional skills, discourse analysis to assess the quality of student arguments, and data analytics for tracking engagement and learning progression on DebaterHub. Surveys and interviews will provide insights into the perceptions of students and teachers regarding the platform's impact. Each method will be underpinned by relevant theoretical frameworks, such as constructivism for discourse analysis, ensuring a nuanced understanding of the data collected.

Our research will explore best practices for deploying automated AI solutions that facilitate the seamless translation of human tasks into machine tasks in traditionally under resourced classrooms. This synergy enables us to glean insights into human techniques and strategies using reinforcement learning through human feedback (RLHF). We aim to develop an intuitively navigable system for humans and machines. By encouraging human

users to employ strategic thinking in their use of the system, we can effectively transfer this knowledge to AI agents. This cooperative dynamic ensures that human ingenuity and machine learning complement each other, enhancing the system's overall efficacy.

DebaterHub leverages the latest progress in NLP, which has enabled significant advancement in converting language into mathematical representations that can be expressed in a latent space. Our vision for a new paradigm of symbiotic bi-directional research is rooted in the belief that machine learning is not being adequately leveraged in research and, when utilized, does not correctly reflect the diversity of paradigms and thinking that goes into embedding models. Research retrieval processes could benefit from a robust and sophisticated network of relating texts to one another via several different embedding models.

Our research retrieval paradigm involves a multi-dimensional embedding model (e.g. a model that leverages several different embedding models to build a coordinate system for locating a particular text in relation to other texts). Our primary objective is to innovatively cluster information, making it easily accessible and understandable for end users, thereby placing the concept of 'clustering' at the forefront of our approach. In other words, we hope to define a text as it relates to other texts utilizing many different expert models, each with its own fine-tuned focus on a particular objective of interpreting language (e.g., entailment, causality, argument mining, fine-tuned domain expertise).

Currently, Debaterhub utilizes a graphql dynamo db database to store and organize beliefs, documents, trees, clusters, and passages.

Tree A set of Clusters often defined by a research domain or a user query.

Cluster A defined center via k-means clustering that leverages a particular model's embedding. (Note there is a many-to-many relationship here with documents)

Document A particular data point (often a text corpus) and associated uses, beliefs, and clusters. The term "document" here is used loosely and can refer to various data types.

Passage A document subset that can be encoded to identify sentences or statements related to a user's query.

This schema encodes a set of embedding coordinates for each document and passage, which are then used to create relationship clusters. Clusters, documents, and passages may be organized using several embedding techniques like entailment, contradiction, argument mining, named entity recognition, and more.

We embrace a "mixture of experts" approach to large language models and believe that experts should be trained on particular domains of knowledge and objectives (in a game theoretic sense). Consider the following roles and their corresponding aspects of ideation in human beings (as expressed by thinkers like Hegel).

Advocate: The advocate takes a resolution and proposes and defends a set of beliefs reinforcing that resolution.

Critic: The critic takes a resolution and argues against it by creating disadvantages for the advocate and advantages for the critic.

Judge: The judge is blind to the role of any particular agent but must balance each belief independently according to the various arguments made by either side (but still coherently

- e.g., supporting self-consistency). Notably, the judge learns through human comparison (RLHF). The development of this decision framework is based on two factors:

Chain of reasoning and guided deliberation. Using principles of rhetoric and debate thinking and reasoning, we iteratively develop a process of reasoning for agents to follow to make solid and compelling arguments. Reinforcement learning through human feedback (RLHF): AI agents are optimized to not be in minority decisions on human/AI judge panels.

Debaterhub users will compete on teams with other students and AI partners against other teams. This is done via a combination of brief exchanges and classroom debates and discussions. Debaters will also serve as jurors to evaluate persuasive and judgment skills in this model. Instructors evaluate the presentation of ideas in the debate context and the methods and reasons behind juror decisions. Jurors must present an RFD (Reason for decision) and explain how the arguments were effective or ineffective in influencing beliefs.

5. Conclusion

This paper presents a timely research agenda focused on Augmented Debate-Centered Instruction (ADCI) leveraging academic debate paired with conversational AI to address critical challenges introduced by generative language models in education. Our proposed platform, DebaterHub, will facilitate empirical investigations of best practices for responsible AI integration to augment assessment rigor and cognitive skill development for underserved learners.

As we validate ADCI's effectiveness, we will also develop a more useful connection between the technology of debating and the pedagogy of debate-centered instruction in the context of the growing ubiquity of artificial intelligence. Developing this connection could profoundly impact the future of AI in education. Prioritizing durable critical thinking skills and active metacognitive assessments, ADCI offers a promising template for ethical, human-centric innovation as demand for augmented learning systems grows globally. Of course, widespread implementation will also introduce complex regulatory implications regarding academic integrity protections, equitable access, and upholding human agency amidst anticipated economic disruption.

Grounding educational transformation in rigorous scholastic traditions while centering learner needs represents a high road for our AI-augmented future. ADCI can potentially enhance teacher instruction and learning outcomes if scaled responsibly. We invite cross-disciplinary partners to advance this agenda, investigating both the practical efficacy and more profound societal impacts of ADCI. Human-centered AI collaboration in education can help shape an AI-integrated world where all students retain opportunities to flourish.

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