Faculty Research in Partnership with RIDIL

Perceptions of STEM Education and Artificial Intelligence: A Twitter (X) Sentiment Analysis

This white paper provides a summary of the work from:

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Overview

Artificial intelligence (AI) is increasingly prevalent in science, technology, engineering, and mathematics (STEM) education, and it has a significant potential to enhance the design and implementation of quality STEM education (STEM ED). Nonetheless, there exists a lack of research grounded in social media data that examines the varied perceptions of AI within STEM ED, the factors that influence these perceptions, or the evolution of such perceptions over time among public audiences.

Purpose of the Research

The purpose of this study was to examine public perceptions of AI in STEM ED by analyzing X posts (Tweets) between 04/28/2020 and 04/27/2023. The study was guided by the following research questions.

RQ1. What are the public sentiments about artificial intelligence in STEM ED on X, formerly known as Twitter?
   A. Are public sentiments positive, neutral, or negative?
   B. What specific emotions are most frequently expressed?

RQ2. How have the public sentiments of artificial intelligence in STEM ED evolved over time?

RQ3. What are the prevalent topics influencing public sentiment toward AI in STEM ED?

Method

We utilized a machine learning-based sentiment analysis to examine the public's perception of AI and the factors influencing it.

Findings and Discussion

RQ1. What are the public sentiments about artificial intelligence in STEM ED on X, formerly known as Twitter?

A. Are public sentiments positive, neutral, or negative?

The sentiment analysis revealed that 56.1% of the sentiments expressed were neutral, 40.6% were positive, and the remaining 3.3% were negative (Figure 1). This indicates that the public has an overall neutral attitude towards AI in STEM ED, with a significant portion expressing a positive sentiment. In contrast, the percentage of negative sentiments is minimal.
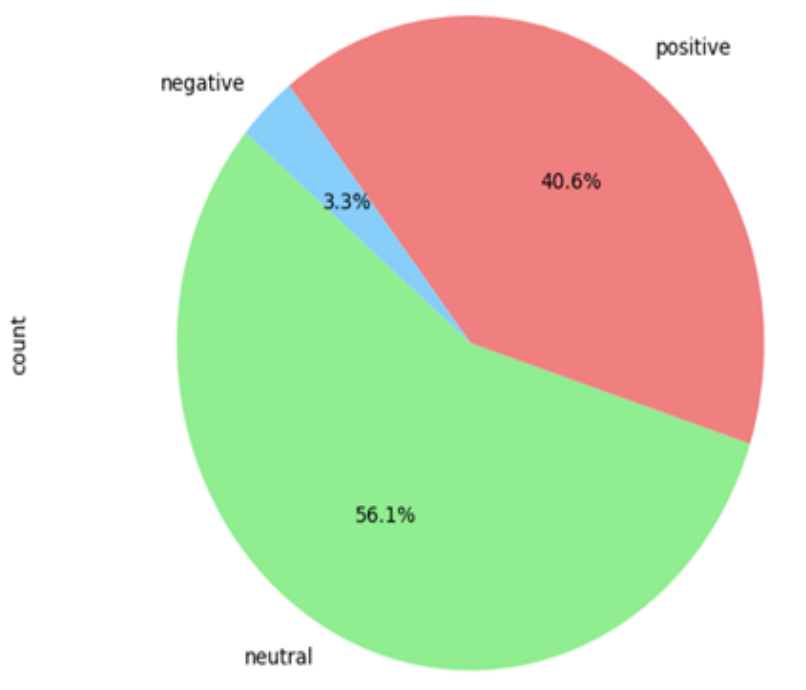

Figure 1. Public Sentiments (from Smith-Mutegi et al., 2025)

B. What specific emotions are most frequently expressed?

An analysis of public sentiment shows a wide range of feelings about AI in STEM education. The most common emotions are anticipation, trust, and joy, which have 4207, 3249, and 2892 mentions respectively. These positive feelings indicate a hopeful perspective on the integration of AI into STEM education. However, fear is also significant, with 758 occurrences, and anger appears 335 times, reflecting some public concerns and hesitations. Additionally, the 882 instances of surprise demonstrate a mixed sentiment, capturing both positive and negative responses. Although disgust (148 occurrences) and sadness (290 occurrences) are less prevalent, they still reveal some negative feelings.

These findings indicate that although the public generally views AI positively in STEM education, there remains uncertainty about its possible applications. This uncertainty may stem from a limited

understanding of AI's functionalities and full capabilities. Additionally, there are concerns regarding the misuse of AI, particularly in terms of fostering bias or facilitating widespread surveillance. As AI technologies are adopted across institutions and industries, the uncertainty can be addressed with targeted professional development and support.

RQ2. How have the public sentiments of artificial intelligence in STEM ED evolved over time?

In STEM ED on X, the public's perception of AI fluctuated (Figure 2). In 2020, the distribution of sentiments showed a higher count of positive sentiments (498), with neutral (223) and negative (32) sentiments considerably lower. By 2021, positive sentiments (1013) have more than doubled, neutral sentiments have jumped to 1182, and negative sentiments have increased slightly to 45. The year 2022 witnessed a dramatic rise in neutral sentiments, which peaked at 2064, despite a slight decline in positive sentiments to 943 and an increase in negative sentiments to 128. In 2023, we saw a noticeable reduction in all sentiment categories.
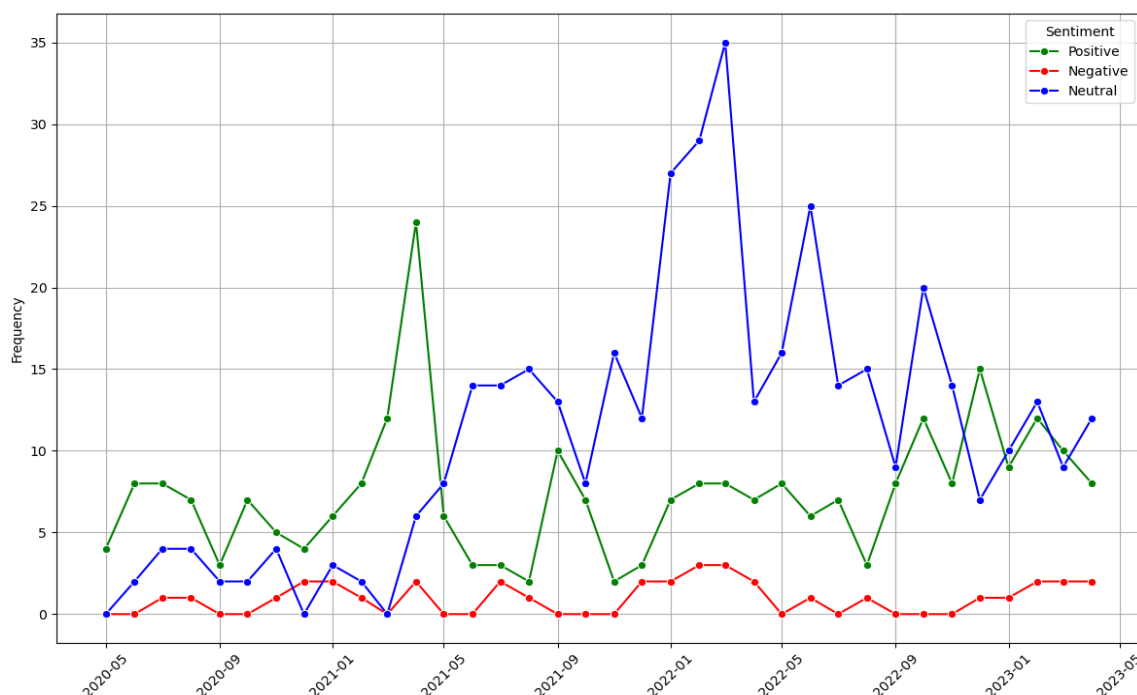

Figure 2. Frequency of Sentiment by Year and Month (from Smith-Mutegi et al., 2025)

RQ3. What are the prevalent topics influencing public sentiment toward AI in STEM ED?

The Coherence Score was used to evaluate different numbers of topics during our topic modeling exploration, as shown in Figure 3. Four topics with high Coherence Scores were identified as having meaningful and coherent content within our dataset. Data science topics such as machine learning and hashtag phrases such as #AI4ALL dominate the topic model analysis, accounting for 30.72% of the data. Future innovators account for 27.9% of the data. Teaching and education chat emerged as the third prevalent topic at 24.31%. Coding and physical computing accounted for 17.4%. Addressing these key topics with resources and further exploration is an opportunity to address issues.
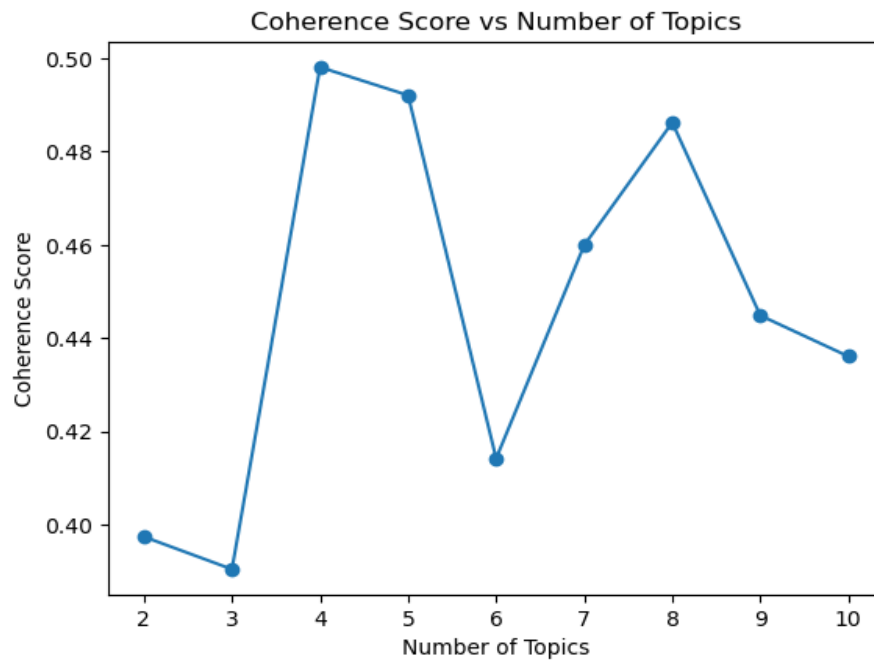
Figure 3. Coherence Score vs. Number of Topics (from Smith-Mutegi et al., 2025)

Conclusions

Existing research calls for a solid need to map diverse perceptions of AI in STEM education among the public and connect the construction of scholastic and social relationships centered around AI in STEM education (Fouad & Alkooheji, 2023; Yuen & Pickering, 2015). Our study aimed to understand public sentiments regarding AI in STEM education at a broad level. This approach allowed us to explore perceptions from a wide range of diverse stakeholder groups collectively. Most public X posts about AI in STEM education were neutral or positive, expressing emotions such as joy, anticipation, and trust. The findings of this study can provide a solid foundation for analyzing prevailing opinions and issues surrounding AI in STEM education or general education. Furthermore, the proposed directions for AI in STEM education outlined in this paper can establish a basis for developing essential curricula in the field and help cultivate talents equipped with AI literacy.

References

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