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AN EMPIRICAL ANALYSIS OF EDUCATIONAL RESEARCH BASED ON CRITICAL DISCOURSE ANALYSIS

Bushra Ni'ma RASHID [1]

Asst. Prof. Dr., Ibn Rushd for Human Sciences, Iraq

Abstract

Critical discourse analysis in educational research has improved our collective knowledge of educational research, teaching, and learning processes, as well as the historical, social, and political aspects that affect those processes. Critical Discourse Analysis (CDA) is a theory that studies spoken and written texts to uncover the discursive origins of power, dominance inequity, and bias in an empirical analysis of education research. It assesses critically the preservation and replication of these discursive sources within certain social, political, and historical settings. The conventional technique in educational research has many problems with empirical analysis. In this paper, we suggested using a Multimodal Discourse Analysis (MDA) approach for efficient empirical analysis in the field of education. The K-means clustering algorithm is used to preprocess the educational data. The findings are presented in the following order: the many definitions of MDA, theories of education included in MDA frameworks, the link between MDA and context, the issue of methodologies, and reflexivity-related concerns. The results show how MDA frameworks are being reshaped as a result of educational researchers using them in educational research.

Key words: *Critical Discourse Analysis, Educational Research, Empirical Analysis, Multimodal Discourse Analysis, K-Means Clustering Algorithm.*

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[1] Bushra.nima@ircoedu.uobaghdad.edu.iq, https://orcid.org/0000-0003-2358-4849

I. INTRODUCTION

Critical discourse analysis (CDA), a pioneering work theory is used to analyze a study on educational research. To perform educational research, criticality in many domains is used as a theoretical lens to study and evaluate higher education research as well as the change of institutions and liberation of individuals. According to the paradigm, knowledge is made up of socially produced units that are influenced by a variety of factors, including social, political, historical, cultural, and economic factors **(Eryong et al. (2021))**. Discourse analysis is a comprehensive term that describes the process of discovering how education is utilized in various texts and circumstances, as well as in texts that either define or accompany discourse. The phrase discourse analysis has gained popularity in academics. The term "discourse" refers to the broad notion that education is organized by various patterns that people's education follows as they participate in different spheres of social life; well-known examples are "education discourse" **(Mirgiyazova (2021))**.

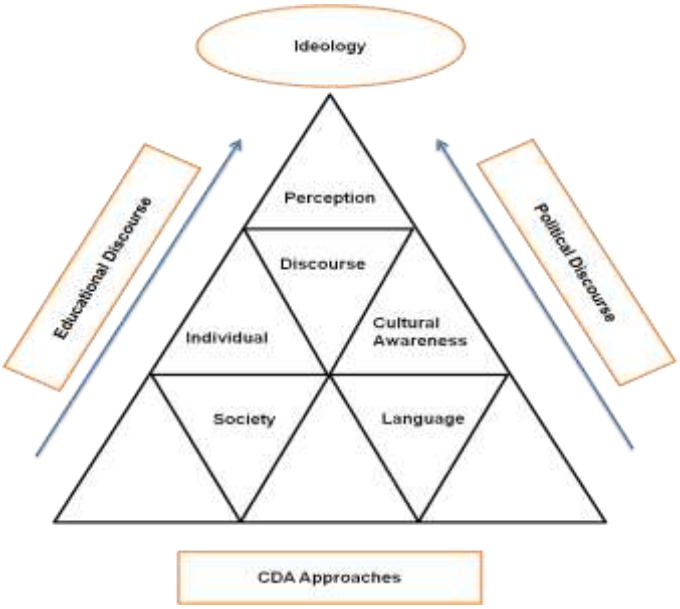

Figure: 1 Critical Discourse analysis in educational research

To do research, teach, and learn in any subject, including education, critical discourse is a critical requirement. Many academics in the field of critical discourse studies employ many techniques under the general heading of "discourse analysis" to comprehend the dynamics of involvement and occasionally how teaching occurs in education. Critical Discourse analysis provides numerous analytical techniques that researchers in scientific education frequently use to investigate the teaching and learning process in the field of education research. The figure 1 depicts the Critical Discourse analysis in educational research **(Tang et al. (2021))**. CDA is an integrative method for examining discourse as a tool for social education. Key presumptions are that discourse is constitutive and helps to create social identity, subjects, social interactions, and systems of knowledge and ideas **(Freire et**

al. (2021)). Critical discourse analysis (CDA) is fundamentally a method of deconstructing reading that is explanatory, interpretative, and descriptive. The CDA highlights how education is entangled with issues like moral and ideas, which affect how communication is used, its impact, and how it reflects, supports, and improve the interests, attitudes, perspectives, and values of people in moral. CDA is discipline and perspective **(Munro and Beck (2021)).**

The remaining sections in the paper are structured as follows. The associated literature and the problem statement are presented in Section II. The explanations of the proposed work are provided in Section III. Section IV has results and discussions. The proposed paper's conclusion is presented in section V.

II. LITERATURE SURVEY

(Deuel (2021)) aimed at a Foucauldian Critical Discourse Analysis to investigate discourses on prejudice in educational research. Based on the theories, foucauldian discourse analysis is a type of discourse analysis that focuses on how power connections in society are manifested via education and research. The analyses' validity and reliability cannot be determined precisely in the same manner as they can in quantitative methods. **(Soysal (2021))** suggested that the argumentative discourse analysis in educational research was carried out in two stages: systemic observation and efficient analysis to improve educational research. Argumentative discourse entails "verbal, social, and intellectual action intended at persuading a reasonable critic of the acceptability of a stance by advancing a constellation of assertions validating or disputing the notion conveyed in the perspective." It might take a lot of time and effort to analyze an argumentative conversation. **(Dowell and Kovanovic (2022))** outlines the state-of-the-art natural language processing (NLP) tools and methods that are available to researchers and practitioners to computationally identify patterns in massive amounts of text-based discussions that take place across a range of educational technology platforms. It is difficult to comprehend the laws that govern the communication of data using natural languages. **(Alek et al. (2021))** developed the critical discourse analysis by using Norman Fairclough discourse analysis, contributes to defending this technique based on the findings of educational research. By utilizing the power dimensions or three levels analysis, the Fairclough model may completely expose meaning in a communication. Because a three-dimensional technique was adopted, it is fairly complicated. **(Duran et al. (2021))** utilized Habermasian theory to analyze educational studies critically. The fact that the paradigm of education has methodological benefits over the paradigm of education is one reason why Habermas adopted the linguistic shift. However, the relevance of the study of education and communication goes beyond technique; it is substantive as well. Reformulating the core ideas of educational research requires a complex theoretical approach. **(Talib (2021))** explores the meritocracy framework and how its highly diversified educational system may coexist with claims of equal opportunity within educational research. It focuses on a link between Critical Discourse Analysis (CDA), the philosophical study of value, and political economics. According to education studies, the meritocracy system has failed to satisfy the demands of the shifting

political economy. **(Simmie et al. (2021))** analyzes "The Pied Piper of Neoliberalism". The Pied Pipers Neoliberal method increasingly harmonizes with neoconservative elites for a dictatorship of education research performativity, according to theoretical viewpoints from critical pedagogy. It reified perspective that limits reality to what can be described and explained via education research.

We proposed the Multimodal discourse Analysis for addressing the numerous issues in existing research and for effective empirical analysis in educational research.

Problem Statement

As a result of society's rapid growth and the need for more economic globalization, analysis of educational research is presently under strain and dealing with issues that have never before appeared. Enhancing research methodologies, research difficulties, and other activities that are essential in an empirical analysis of educational research form the basis of an analysis of educational research practice. To successfully analyze educational research and handle the many challenges in the field, this paper proposed a multimodal discourse analysis.

III. PROPOSED METHODOLOGY

With the help of the suggested multimodal discourse analysis, this paper aims to improve the efficiency of the analysis of educational research and enable researchers to make informed choices on important studies. The dataset is initially gathered based on the educational information from schools and universities. The K-means clustering algorithm is used to preprocess the educational data. A comprehensive description is given in this section, and figure 2 shows the flow of the proposed method.

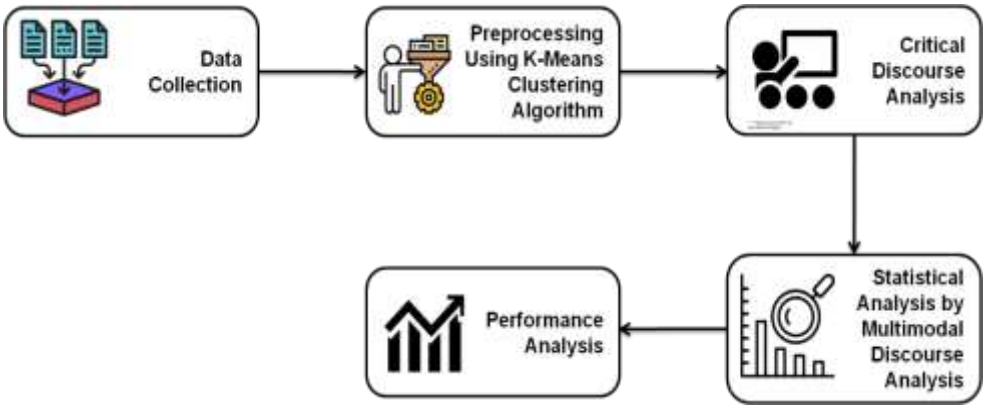

Figure: 2 Flow of the proposed method

A. Data set

Various organizations and governments, such as the provincial and federal governments, as well as private researchers, can provide data. 290 individuals, high school students, graduate students, and professors participated in the study. The high school pupils, who were generally 16 years old, attended nine urban and suburban schools. Graduate students and professors from several institutions' departments of physics, such as computational astrophysics, made up the group. Every scale demonstrated adequate dependability for the three groups **(Kubsch et al. (2021)).**

B. Preprocessing of data using K-means clustering algorithm

The processing of the K-means clustering algorithm depends entirely on the choice of the initial collocation point's data. K data points are chosen as the initial cores, and the Euclidean distance formula is used to compute the intervals between each data point. Data items are relocated to the proper group if they have a lower parameter than centroids. The procedure is carried on until groups stop experiencing changes. The fundamental K-mean clustering algorithm stages are shown in algorithm 1 below.

Algorithm 1: K-means clustering algorithm

Number of desired data objects, K
Choose k collected data at arbitrary from given data D to function as initial centers.

Repeat: Determine the separation between every data item di (2 = j= m) and every K clusters Di (2 = i= k) and assign data object di to the closest data point.

Recalculate the cluster center for one cluster i (2= i=K).

Up till now, cluster centers remained unchanged.

K-means time complexity clustering symbol is O (nKt).

C. Critical Discourse Analysis

An interdisciplinary method for studying discourse as a type of educational research is called critical discourse analysis (CDA). Discourse is a technique that gives the studies meaning, to put it more precisely. Discourse's defining component is knowledge. As a result, it is important to think about how knowledge and power interact. Ideological methods encourage us to consider the close consecutive and confessional ties that have been gradually forged between personal identities, society, and the modern country's economy. Education researchers have used a multimodal approach to enquiry to clarify the ways that discourse, morals, and intelligence are expressed in educational research. However, in examining the relationships between the education choices of a specific educational research study and educational growth, we proposed a Multimodal Discourse Analysis (MDA).

D. Statistical Analysis by Multimodal Discourse Analysis (MDA)

Our collective awareness of the procedures involved in educational research has been enhanced by the use of discourse analysis as a technique of inquiry. It compiles the scholarly

work that has impacted how educational research has aided educational advancement. It examines significant attention to the advancement of educational research, such as how interplay is formed and underlying social systems, how credentials are assembled in and through discussion, how communication and teaching relate in both formal and informal educational environments, and how the element, multimodality, and digital areas provide additional choices for educational sites, raising critical questions about what these new research methodologies imply in this educational research. Figure 3 depicts the Statistical Analysis by Multimodal Discourse Analysis (MDA).

Figure: 3 Statistical Analysis by Multimodal Discourse Analysis (MDA)

A multimodal discourse analysis approach offers a greater standpoint on the various ways that research takes place, and on the different ways that knowledge is expressed and evaluated. Various ways that students are evaluated and assessed, on the social relations that are visible in educational research. Both the multimodal design of in-research instruction and the multimodal extracurricular learning of students should be included in multimodal educational research. The term "multimodal discourse analysis planning" refers to the meticulous planning of educational materials and instructional strategies in educational research.

IV. RESULT AND DISCUSSION

In this paper, empirical analysis of educational research is analyzed using Multimodal Discourse Analysis (MDA) for the enhancement of educational growth in modern society. This section analyzes the performance of the proposed MDA ensuring the analysis of educational research. The existing methods are Analysis of Variance (ANOVA), Sentimental Analysis (SA), Quantitative Content Analysis (QCA), and Epistemic Network Analysis (ENA).

A. Accuracy

One aspect to take into account while analyzing education research is accuracy. The phrase "degree to which the outcome of a measurement agrees with the appropriate value or a standard" is used to define accuracy. The percentage of predictions that our technique correctly predicted is known as accuracy. Every technique that calls for data pre-processing has to do an accuracy evaluation. The accuracy of our technique is compared to other techniques. Figure 4 depicts the traditional model and the recommended model accuracy. The recommended approach to assessing education research is very accurate. The

ENA scored 55 percent, the QCA scored 68 percent, the SA scored 74 percent, the ANOVA scored 87 percent, and the recommended method scored 92 percent.

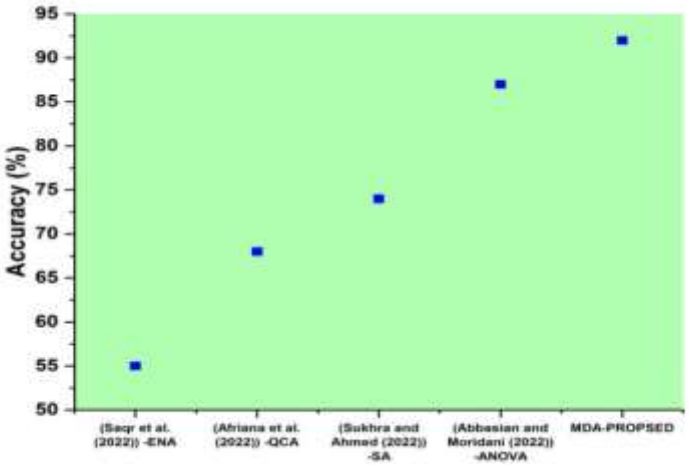

Figure 4: Accuracy for Proposed and Existing Methods

B. Precision

The ability of an empirical analysis model to assess the analytical method is known as precision. By dividing the entire proportion of actual data by the total proportion of actual data plus erroneous data, precision is determined.

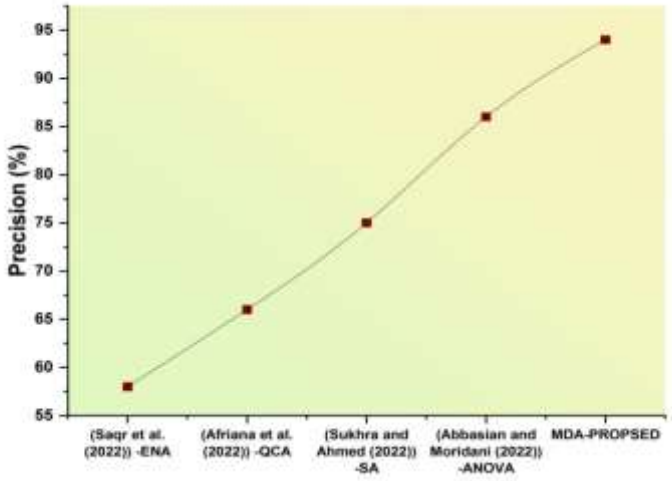

Figure 5: Precision for Proposed and Existing Methods

The precision of the MDA is visualized in Figure 5. As a result, the suggested model is more precise than the existing techniques. The ENA received 58 percent, the QCA received 66 percent, the SA received 75 percent, the ANOVA received 86 percent, and the recommended method scored 94 percent.

C. Prediction rate

The degree to which character states are stable within and limited to analysis in research determines their predictive usefulness. Previous research measured the prediction value using phonetic correlations, taxonomic congruence, parsimony, and taxonomy partitions. Figure 5 shows the MDA prediction rate. As a result, the suggested model has a higher prediction rate than the current approaches. The ENA gained 60 percent, the QCA gained 68 percent, the SA gained 77 percent, the ANOVA gained 88 percent, and the recommended method gained 95 percent.

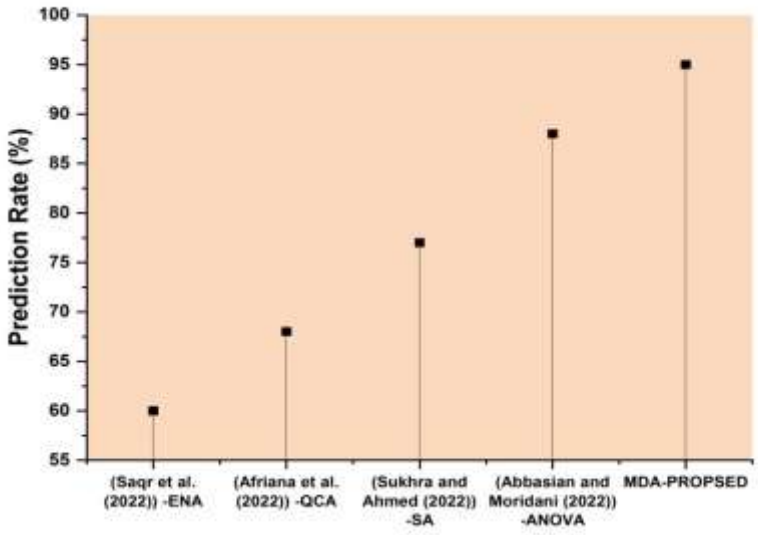

Figure 6: Prediction rate for Proposed and Existing Methods

D. Operational performance

Operational performance is the capacity to analyze research and give academics the best possible direction for educational research. This explanation for operational success emphasizes the interdependence of the two analytical methods used to generate educational progress. Figure 7 displays the operational efficacy of both the suggested tactics and the current methods. When compared to other strategies, the suggested method performance performs well. The ENA achieved 60 percent, the QCA achieved 72 percent, the SA achieved 79 percent, the ANOVA achieved 90 percent, and the recommended method achieved 97 percent.

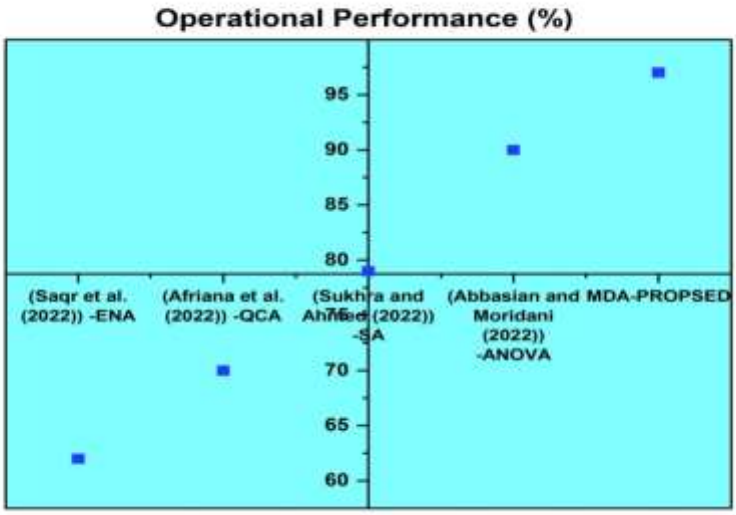

Figure 7: Operational performance for Proposed and Existing Methods

E. Operational Risk Management

Operational risk management is a continuous, repeatable process that entails risk analysis, risk decision-making, and the implementation of risk controls to accept, minimize, or avoid risk.

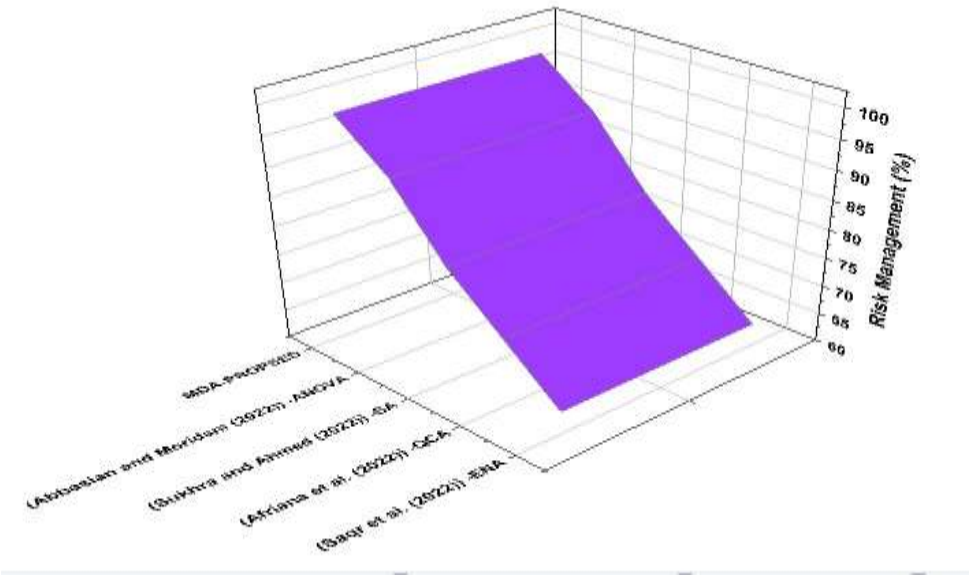

Figure 8: Operational Risk Management of Proposed and Existing Methods

Every educational research has occurrences or significant changes in its surroundings that might put that education at risk to varying degrees, from little inconveniences to a situation that could threaten the entire research procedure. The risk management of the suggested and current strategies is shown in figure 8. In educational research, our technique

manages high risk. The ENA received 64 percent, the QCA received 72 percent, the SA received 80 percent, the ANOVA received 91 percent, and the recommended method scored 98 percent.

F. Computation Time

Computation time is a critical performance measure that researchers and experts use to evaluate analysis effectiveness in terms of execution time. Our suggested method requires less computing time than the current methods. The computation times for the suggested and current approaches are shown in figure 9.

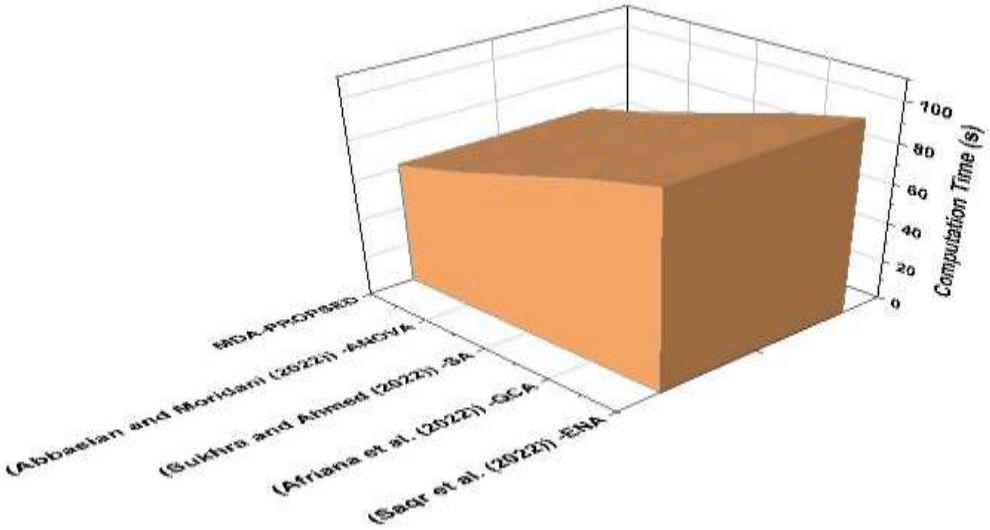

Figure 9: Computation Time for Proposed and Existing Methods

Discussion

(Abbasian and Moridani (2022)) demonstrated the Analysis of Variance (ANOVA) to analyze the educational research. Under rigorous knowledge constraints, ANOVA analysis is challenging. **(Sukhra and Ahmed (2022))** utilized the Sentimental Analysis (SA) algorithm to analyze educational research empirically. The categorical nature of a SA approach's concentration on research value—whether positive, negative, or neutral is a major drawback. This makes it more difficult to comprehend complex emotional states that are reflective of research experiences. **(Afriana et al. (2022))** employed the Quantitative Content Analysis (QCA) analytical approaches to look at the numerical distribution of the various educational studies. Particularly when an analysis is employed to get a greater degree of interpretation, it has increased inaccuracy. **(Saqr et al. (2022))** suggested using an Epistemic Network Analysis (ENA) to analyze educational research practically. This network study is too vast for multivariate research methods in education. Hence the proposed approach seems to be better than conventional techniques.

V. CONCLUSION

The area of educational research is quickly moving away from antiquated methods in favor of more contemporary ones that are open, unbiased, based on standards, and feedback-focused. Performance evaluations that are future-focused and put more of an emphasis on analysis, management, and growth are required by the research. Making educated decisions in career circumstances is analysis's most challenging problem. This paper suggests a significant and useful analysis technique as a consequence. To promote educational progress in contemporary culture, this paper suggests an empirical analysis of educational research that is evaluated utilizing multimodal discourse analysis (MDA). The K-means clustering technique is used for preprocessing the educational data. The results show that the recommended MDA methodology outperforms the traditional ANOVA, QCA, ENA, and SA methods in terms of accuracy, precision, prediction rate, operational performance, risk management, and computation time. It is necessary to conduct further studies to determine how these platforms affect undergraduate students' discourse, knowledge formation, and critical thinking. The factors in the ongoing educational research may also help with future computational studies of argumentation mining to evaluate the accuracy of computational feedback on interaction and knowledge production in educational research.

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