

RESEARCH ARTICLE

From Colonial Legacies to Linguistic Inclusion: A BERTopic Enhanced Bibliometric Insight Into Global South Higher Education

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ABSTRACT The present study is a comprehensive three-tiered empirical framework that investigates the processes of linguistic diversity and decolonization within the higher education systems of the Global South. It provides a novel complementary application of ARM for Topic Recommender Systems and explores the evolving landscape of scholarly discourse on language justice and educational reform by mapping the findings from Bibliometric Co-occurrence Analysis with LDA and BERTopic modelling respectively. Bibliometric Co-occurrence Analysis was employed to produce seminal relationships between key terms from the extant scholarly literature that subsequently leads to a detailed thematic review. Successive applications of LDA and BERTopic modelling generated a comprehensive thematic analysis that detailed the trends in academic discourse on inclusivity, multilingualism, translanguaging and decolonization of higher education curriculum. Furthermore, by the innovative use of ARM based on author keywords, this study revealed more intricate associations and patterns among research topics, giving important insights into future avenues of research. The analysis was based on data entirely retrieved from the Scopus database. It shows the consensus around the need for reform of language policies in higher education, as well as the transformative potential for advanced computational techniques in analyzing academic narratives. The findings from our methodological exploration, demonstrate the necessity of policy reform in higher education concerning linguistic pluralism and dismantling colonial legacies. This study extends the conversation around the complexities of decolonisation, linguistic equity and justice in higher education in the Global South and beyond.

INDEX TERMS BERTopic modelling, educational technology, global south, higher education policy, linguistic decolonization, multilingualism.

I. INTRODUCTION

United Nations 2030 Agenda sets quality education as one of its key goals for the realization of sustainable development worldwide. The UN insists that quality education is inclusive and equitable given that it provides the right to lifelong learning [1], [2]. Quality higher education (henceforth referred to as HE) is hindered by several factors. Literature suggests that this form of assuring quality education in an egalitarian way, especially within the setting of a post-pandemic and

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post-conflict, would entail dealing with a host of factors ranging from infrastructures to teaching personnel's training and societal support [3], [4].

The core factor that overburdens quality higher education in the post-colonial societies depends highly on the overdependence of the Western education models and medium of instruction [5]. The impact of historical colonialism on the contemporary state of HE in post-colonial societies—like the Indian and African continents—is emerging as a growing cause of concern [6], [7]. This helps to provide a greater insight into postcolonial challenges with educational ideologies through the inspection of ideological influences such

as gender on HE. A major contribution to these restrictions is colonial language dependence and vernacular language ignorance. Furthermore, higher education's decolonizing discourse, especially in its curriculum focus, shares some of the cultural and material implications with relation to the colonialism and empire, in close relations to the need to decolonize the material aspects of colonization and decolonisation in higher education institutions [6].

The dominance of English in higher education (HE) in postcolonial societies in the Global South is the outcome of a powerful legacy of colonialism and contemporary global control over the English language [8]. South Africa serves as a prime example of the "colonial wound" caused by the dominance of English in HE, which leads to feelings of linguistic and social inferiority among students [1], [9]. Calls have been made to intellectualize and internationalize African languages at African universities in the global context as a way forward for addressing the issues of equity and development [10], [11]. The history of Indian HE, along with the influence of political policies, has traced an alternative internationalization trajectory [12], [13]. The use of English in East Asian HE has also been examined to reveal wider geopolitics relating to language dominance. This illustrates the association of sociopolitical and historical forces at play within postcolonial societies.

The significance of language justice in HE in the Global South has been studied extensively. Docrat and Kaschula [14], for example, explored the links between language transformation and decolonisation within the HE and legal systems of South Africa. They advocate the use of native African tongues in the judiciary of the country. In his work Rajendram [15] studied the hurdles faced by international students (especially from the Global South) who migrate to Canadian universities for higher studies. He speaks about biased institutional language policies and contends for translanguaging as a basic criterion that Western universities must ensure before onboarding international students. Tarisayi [16] speaks about the need to develop AI-based tools for language acquisition, which are relevant to the target users' culture in the Global South. Decolonising HE in the Global South is urgent and should focus on the dissociation of institutions from remnant colonial practices. This can take place through pedagogical transformations and strong institute-community connect [1]. Indigenous languages of the African continent face serious challenges in HE and research settings due to the overt dominance of colonial languages, thus making the continuous marginalisation of native languages indefensible [16], [17]. The aforementioned studies point out the essentiality of language justice and decolonisation efforts in Global South HE. They also give useful recommendations that serve as useful indicators in the pursuit of linguistic equality and inclusivity.

Language justice in HE needs addressing from varying perspectives such as linguistic inequalities, stakeholder participation, and overcoming colonial language hangover [18].

Adejumobi [19], for instance, has proposed linguistic translation as a means to counter language injustice. He points out that it can facilitate an environment that fosters diversity, both linguistic and socio-economic. Diversity and inclusion can be enhanced by participatory design. It is necessary, therefore, that HE systems in postcolonial societies be grounded in language justice, and an equitable environment, in which one has access to formal knowledge in one's vernacular [20], [21], [22].

In Africa, the process of decolonisation of HE is complicated and involves uprooting Eurocentric values entrenched in the academia [1]. Since the official end of apartheid in 1994, the knowledge systems and curriculum in the universities across South Africa are still steeped in colonial worldviews [5]. The current Eurocentric curricula is in urgent need of a total rethinking, reframing, and reconstitution to position South Africa and Africa at the core of teaching, learning, and research. Academics have drawn attention to the need to reconsider the decolonisation of higher education within broader societal shifts, such as the COVID-19 pandemic [14], with Naicker [23] underscores the pandemic's potential to "sustain an important plank from which to re-imagine the decolonisation of higher education in South Africa" as it proves to reflect the continuing resonance and adaptability of the decolonisation discourse. This signals a more nuanced and fuller understanding of the process of decolonisation, extending beyond the curriculum to rethink the epistemological and theoretical bases for HE in Africa [24].

Decolonising HE naturally involves the inclusion of vernacular as a fundamental constituent of its efforts in the Global South. Decolonisation of HE curricula and the inclusion of native languages or knowledge systems is complicit with various complexities [6]. Studies on multilingual practices in HE, such as LaDousa et al. [25] discussion of the 'languageedness', reveal the possibility of including indigenous languages in academics. Also, within postcolonial societies newer strategies of including vernaculars in HE ought to be implemented [26], [27]. In Africa, for example, processes like translanguaging and multilingualism are aimed to build linguistic diversity and equity in HE [28], [29]. Multilingualism allows for better student comprehension by reflecting a nation's linguistic and cultural [30], [31]. As a policy instrument translanguaging and multilingualism provides agency to both teachers and learners, eliminates socio-ethnic-linguistic discrimination, and promotes inclusivity [32], [33], [28].

The existing research has extensively explored the dimensions of inclusivity and quality in African HE, revealing critical insights and laying the groundwork for future exploration. Different approaches emphasizing cultural relevance, a capabilities approach, and rethinking the curriculum have been made by the aforementioned authors. Moving forward, the focus should shift toward designing practical strategies for inclusivity, researching the impact of digital education, and

TABLE 1. Bibliographic data retrieval process.

Stage	Filtering Criteria	Eliminated	Accepted
1	Initial search result (on search term)	–	3501
2	Subject filter (Social Sciences, Arts and Humanities)	1163	2338
3	Article – type documents	892	1446
4	Duplicate removal	38	1408
5	Language filter (English)	342	1066
6	Screening (based on content)	74	992

further destabilizing colonial legacies within curricula. The evolving African HE landscapes demands continued research to deal with dynamic challenges and opportunities.

This research has reviewed related literature in an attempt to offer a research terrain within the domain of Equity and Language Justice in Higher Education with special on African HE. As the research progresses, the authors argue that the bibliometric analysis and topic modelling serve to achieve the following research objectives:

1. Chart the trends of research in the field of Equity, Justice, and Language Justice in Higher Education.
2. Uncover the unique underlying themes of current research trends on Equity, Justice, and Language Justice in Higher Education by way of bibliometric mapping and topic modelling using large language models (LLM).
3. Use the Topic Recommender Systems to suggest directions and topics of future research in Equity, Justice, and Language Justice in Higher Education.

II. DATA AND METHODOLOGY

This research methodology is a major departure from the past methodologies [34], [35] in HE, social justice, decolonisation etc. This research advances the use of bibliometric analysis in the incorporation of the cutting-edge transformer-based large pre-trained language models [36], [37]. We utilized the Scopus database as it offers the largest collection of abstract and citation database of peer-reviewed literature. We entered search terms like “equity,” “social justice,” “inclusion,” “belonging,” “translanguaging,” “co-creation,” “decolonisation,” “decolonisation” and “postcoloni*” in combination with two group of keywords: first set of education (“higher education,” “university,” “university education,” “college education” and “tertiary education”) and second set of geography (“india,” “south africa,” “africa,” “south asia,” “south east asia” and “asia”), to access bibliometric data using ‘TITLE-ABS-KEY’ search function in Scopus database. This was done to limit the responses to countries belonging to the Global South [1], and also those that were erstwhile imperial colonies; now postcolonial societies, such as the Indian subcontinent and several nations from Africa [6].

Using established bibliometric procedures, 1408 articles were stratified and assessed to satisfy the selection criteria needed to yield 992 articles included in the study. The review was conducted following the PRISMA protocol (Table 1) which provides a comprehensive guideline for conducting systematic reviews and meta-analyses in a transparent, reproducible, and comprehensive process [38], [39] [40]. The search yielded a total of 1408 pieces of literature. The search strategy followed multiple inclusion and exclusion criteria. After filtering through articles in English, the collection was narrowed down to 1066 articles. Through further manual checking for relevancy, we identified 992 key articles that became the focal point of our study. The analysis spanned content topics, including basic bibliometrics, topic modelling, and topic recommendation, covering literature from the period of 1996 to January 2024. The analysis methods like bibliometric co-occurrence analysis, LDA topic modelling (topicmodels package in R v0.2.14), BERTopic (v0.16.0) modelling (using Python in Google Colab), and topic recommender system using association rule mining (arules package in R v1.7-6).

In basic bibliometric analysis from Table 2 using R programming v4.3.3 (RStudio GUI), we have found a total of 992 documents to be part of this paper from 562 sources. A total of 1929 authors are involved, including 464 single-authored documents, with an average citation rate of 9.277 per document. From the annual scientific production chart (Fig. 1), we can see a steep growth in the number of publications in luxury fashion marketing in recent years.

A. EMPIRICAL DESIGN

This flowchart illustrates the process of topic extraction and recommendation from bibliometric data, specifically sourced from Scopus. The flowchart is organized into several key steps and analytical processes to derive insights and themes from the data.

This flowchart in Fig. 2 unpacks the process of how bibliometric data collected from Scopus becomes topic insight suggestions about important areas of the new technology space. It maps out each step and the analytical procedures that were followed to uncover the insights and themes from the data that was gathered.

TABLE 2. Descriptive analytics of bibliometric data.

Description	Results
Timespan	1996:2024
Sources (Journals, Books, etc)	562
Documents	992
Annual Growth Rate %	9.59
Document Average Age	6.34
Average citations per doc	9,277
Authors	1929
Authors of single-authored docs	440
Single-authored docs	464
Co-Authors per Doc	2.1
Article count	992

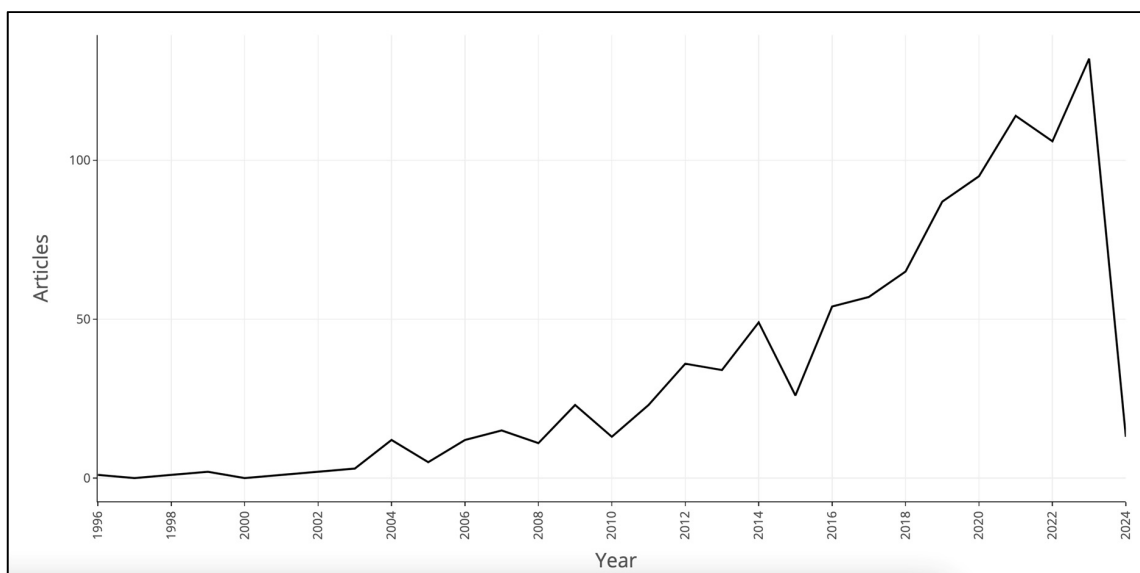


FIGURE 1. Annual scientific production.

1. *Data Source – Scopus Bibliometric:* The process starts with the 992 bibliometric records’ bibliometric data collected from Scopus. This is considered the foundational dataset for the analysis that follows. A standard cleaning procedure was further followed which included: tokenization, filtering out stopwords and special stopwords, filtering out punctuations, lower casing, removing all specialty punctuation outside of default ones *etc.* This was performed on the source datasets of both LDA and BERTopic models.
2. *Data Segregation:* The bibliometric data is then segregated into two main pathways for analysis:
 - a. *Author Keywords:* This pathway focuses on analysing the keywords provided by the authors of the bibliometric data.
 - b. *Untokenised Abstracts:* This pathway deals with the raw, untokenised abstracts from the bibliometric data.
3. *Analysis Pathways:*
 - a. *From Author Keywords:*
 - i. *Association Rule Mining:* This step involves applying association rule mining techniques [39] to the author keywords to identify patterns or co-occurrences among the terms. After filtering out redundant rules and statistically non-significant rules using Fisher’s exact test, significant rules were checked against domain knowledge to report only relevant rules.
 - ii. *Patterns / Co-occurrences:* The outcome of the association rule mining, highlight the significant

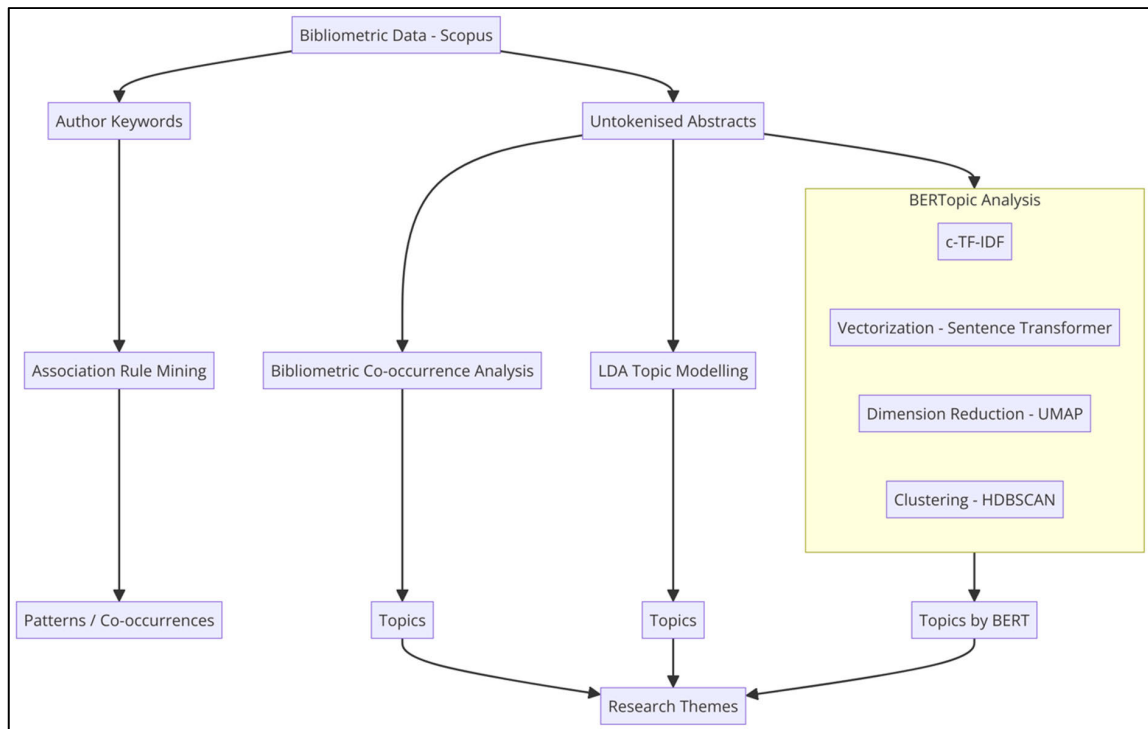


FIGURE 2. Empirical design.

patterns or co-occurrences within the author keywords. The recommended topics co-occurring with a selected topic gives an insight that how topics are correlated to each other. This is a unique way of understating co-occurrence of keywords (or research topics) with each other to give researchers an idea about possible research connections between keywords.

b. Topic Modelling:

- i. Bibliometric Co-occurrence Analysis: This analysis [41] identifies co-occurring terms within the bibliometric data to understand the relationships between different topics.
- ii. LDA Topic Modelling: Latent Dirichlet Allocation (LDA) is used for topic modelling [42], extracting themes or topics from the untokenised abstracts. It was further tuned using K-fold Cross Validation for different number of topics (2 to 20) for selection of optimal number of topics using Elbow method as well as coherence score (highest value).
- iii. BERTopic Topic Modelling: BERTopic is a topic modelling algorithm that uses BERT (Bidirectional Encoder Representations from Transformers) embeddings to represent text documents [43]. BERTopic is known for showing superior performance over other traditional and deep learning-based topic modelling methods. It uses HDBSCAN clustering approach to group

similar documents into topics based on their BERT embeddings. In post-processing, several steps are performed to improve the quality and relevance of the topics identified by BERTopic. Apart from refinement step to remove noisy documents, similar topics were consolidated based on coherence and exclusivity measures. The processing includes following sub-steps:

1. c-TF-IDF: A custom Term Frequency-Inverse Document Frequency analysis tailored for topic modelling [44].
2. Vectorization by Sentence Transformer: Converts text data into numerical vectors using sentence transformers [45] for better semantic understanding.
3. Dimension Reduction – UMAP: Applies the Uniform Manifold Approximation and Projection (UMAP) [46] technique for dimension reduction, also aiding in the visualization and clustering of topics.
4. Clustering – HDBSCAN: Hierarchical Density-Based Spatial Clustering of Applications with Noise (HDBSCAN) was then used to perform clustering on the reduced-dimensional data, which was successful in identifying distinct topics [47].
5. Tuning: The BERTopic was tuned on default values for UMAP and HDBSCAN. An iterative tuning approach was taken for adjusting parameters

by observing impact on results. However, given the sample size, tuning set of parameters were restricted to limited options.

4. Theme Mapping:
 - a. The topics generated by Bibliometric Co-occurrence Analysis and LDA Topic Modelling are mapped against each other for identification of common and exclusive topics.
 - b. The final BERTopic Analysis yields “Topics by BERT” which were mapped against identified topics from co-occurrence analysis and LDA topic modelling.
5. Research Themes:
 - a. In the final block, topics generated by BERTopic, and their clustering helped in identifying six research themes. These themes were named with the help of the domain experts. This section provides a comprehensive overview of the main themes and insights derived from the entire analysis process which presents potential areas of interest for research within the domain.

The flowchart acts like a step-by-step process to extract topics and insights from bibliometric data. Furthermore, the results from analysis present the themes of research and potential research topic recommendations. This includes using both old bibliometric analysis and new text mining ways to learn from hidden patterns in bibliometric data from Scopus to get meaningful insights.

III. RESULTS

In our analysis 6 topics were extracted using Bibliometric Co-occurrence analysis (Fig. 3), 10 using LDA topic modelling and 36 using BERTopic modelling (Fig. 5). LDA optimal topic selection is decided using Elbow method as shown in Fig. 4. Fig. 5 visualizes an inter-topic distance map, revealing six distinct clusters of topics given the distance between data points [48]. This visualization reinforces the clarity and separateness of these themes in form of group of topics. Quality check helps to identify the validity and reliability of topics generated from topic modelling algorithms such as Latent Dirichlet Allocation (LDA) and BERTopic. Coherence scores provide a method for quantifying the quality of topics that are produced by algorithms by indicating to what degree the words in each topic co-occur in a meaningful way [49]. As such, they allow us to determine the performance of LDA as well as BERTopic. Using a fixed choice of 10 topics, the LDA model returns a coherence score of 0.094, whereas the BERTopic model is able to achieve a significantly superior coherence score of 0.496. A higher coherence score signifies that the model is more effective in identifying cohesive and interpretable topics. This comparison underscores the BERTopic model’s enhanced effectiveness in creating more meaningful and coherent topic clusters compared to the traditional LDA model.

A. RESEARCH THEMES

As is evident from Table 3, the topics generated by LDA topic modelling are greater in number than those generated by Bibliometric Co-occurrence Analysis. LDA topic modelling was able to produce more precise topics. Consequently, the topics generated by BERTopic are still greater in number than those produced by LDA and Co-occurrence Analysis. BERTopic was able to give topics with greater precision and accuracy. If we compare the topics between LDA (e.g. “Decolonisation & African Studies”) and BERTopic, we see that BERTopic gives us multiple topics within the topic given by LDA. This enhances the perspective of the researcher and presents an opportunity to study individually essential fields within a larger domain. Thus, BERTopics remains the most potent tool for extracting significant topics from extant research. Using BERTopics, we proposed broad research themes in Table 4 which we discussed in detail.

B. THEME 1: TRANSFORMATIVE EDUCATION IN THE GLOBAL SOUTH

Based on our analysis, the prominent keywords that came up are decolonisation, curriculum, South African, teacher education and pedagogical strategies etc. An important issue in the Global South is the concept of transformative educational paradigms. In the process of decolonizing educational curricula [50], observed that South African activism and social movements have emerged as an important terrain through which educational narratives are re-constructed globally. This is important given that in the Global South, higher education is faced with numerous challenges and opportunities, among them the invention of multilingual and translingual pedagogical practices [51] which in turn empower the privileged place of creative expression and student creativity within a decolonized education system, offering new frontiers for the discussion of African higher education [35]. This theme asks us to consider these as inseparable in the context of how educational systems shape social structures and the call for educational research to interrupt, disrupt, and reconfigure social and educational structures so that students’ lives are worth writing and reading about. Topics like nurturing a critical feminist praxis that is inclusive, exploring queer pedagogies, and a decolonial critique of development in relation to higher education and society thread gender, race, and social justice in such a way that it is not erased but rather addresses issues from outside the norms of higher education and equity policies [1]. A call is made for teacher education that includes a reconfiguration of the pedagogical to accommodate the diverse needs of students and ensure equitable access to quality education for all [10]. This is part of an even wider epistemological transformation and speaks to re-imagining world views, exchanging linear and Eurocentric views for those centered on decolonisation, inclusivity, and social justice as the agenda for education in the Global South [6].

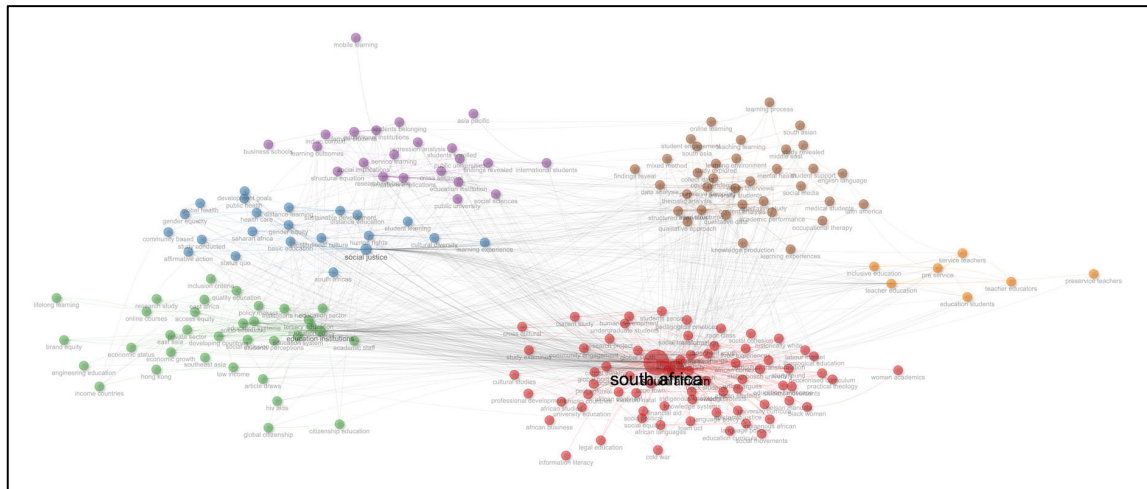


FIGURE 3. Bibliometric co-occurrence analysis.

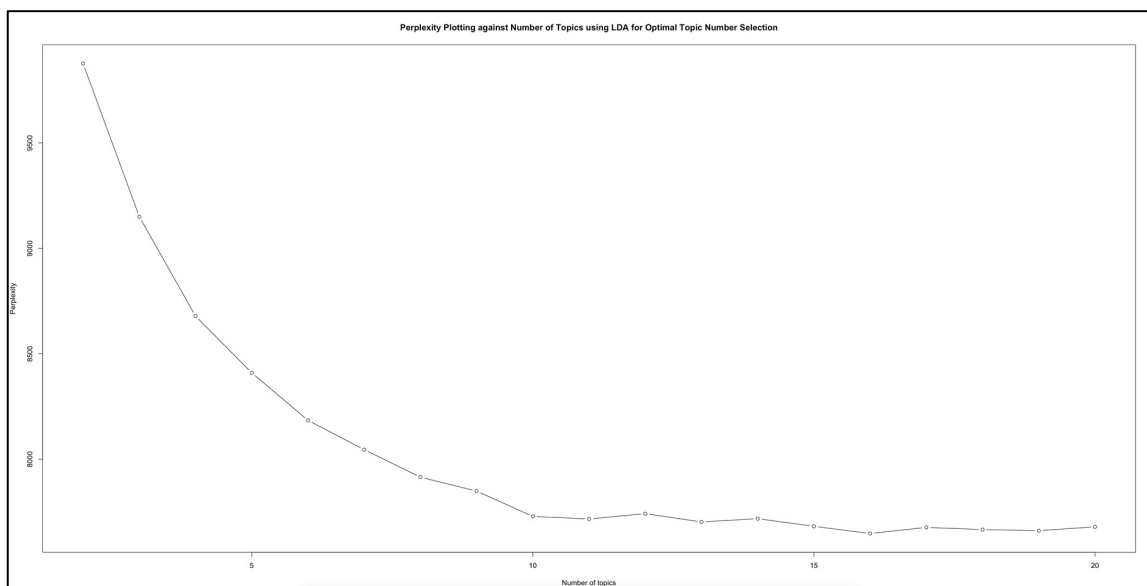


FIGURE 4. Latent Dirichlet Allocation (LDA) optimal topics selection using elbow method.

C. THEME 2: DECOLONISATION, EDUCATION, AND CULTURAL TRANSFORMATION IN AFRICA

Reimagining higher education in Africa as a vehicle for decolonisation and African cultural transformation is pivotal within this research theme. Major keywords appearing under this theme include decolonisation, African film studies, African colonial studies, French influence, Ubuntu philosophy, African education, Epistemic knowledge in Africa, theology, and religious education insights amongst others. Within the landscape of Africa, HE decolonisation, education, and African cultural transformation are significant topics of exploration [50]. Such as, African film studies as a lens to understand the broader cultural narrative and the persistent colonial legacy, with a specific emphasis on the French influence on African colonial studies [52].

Ubuntu philosophy, which accentuates communal values and interconnectedness as counter-narratives to the legacy of coloniality [53]. Decolonisation of HE in Africa is one that compels the reclaiming of epistemic knowledge in Africa, challenging western epistemic hegemony and arguing for an educational curriculum that speaks to the reality and knowledge systems of Africa [35]. So too, does it provide into theological and religious HE and their contribution to the decolonisation project and cultural transformation in Africa [54]. The decolonisation of African studies and HE commands both the cultivation of vernacular research and student engagement as major drivers of transformative change. The research theme marked in our analysis elucidates the critical import of a reimagining of HE in Africa as the vehicle for decolonizing and cultural transformation. It is

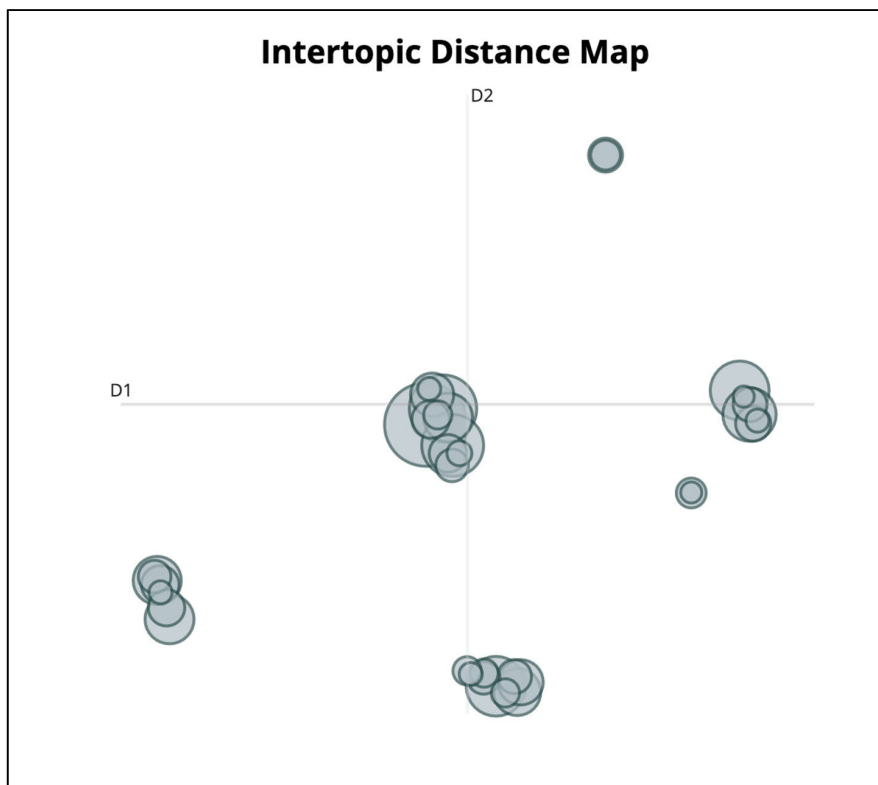


FIGURE 5. BERTopic mapping of topics.

advocacy for an educational paradigm deeply engaged with African epistemologies, philosophies, and realities, aiming for a future grounded in cultural sovereignty, social justice, and sustainable development.

D. THEME 3: INCLUSIVITY AND SOCIAL JUSTICE IN EDUCATION IN ASIA

The primary keywords identified under this theme included HE in India, migrant and refugee experiences, multiculturalism and diasporic identities, Asian histories and international relations, gender studies in HE, social implications, LGBTQ+ studies and rights, and more. Significant discussion in the Asian context — with its postcolonial societies — includes inclusion and social justice [6] and how the experiences of migrants and refugees, for instance, have transformed the educational landscape for new generations in Asia, and the attendant complexities of contemporary multiculturalism and diasporic identities [55] and its intersections with educational practices and policies with wide-ranging impacts on student experiences across the continent.

Inclusivity in HE is also salient in the context of gender, and how it offers key insights into how institutions and individuals can understand and address gender disparities within HE [1], even as we consider the struggles and successes for Muslim women's higher education across India — an example of how sometimes overlooked female bodies may defend their rights to higher education and living in the Asian

postcolonial space [6], and where the LGBTQ+ community adds another, unique dimension to the conversation [56]. Although not an obvious domain of the inclusion and social justice movement, Asian politics and international relations offers more than enough evidence of the close alignment between political dynamics and educational reform, and any critical analysis of the inclusion of learners within the HE sector should also incorporate dominant formations of gender, race, and social justice at the HE level in an Asian utopia [56]. This theme thus maps an international terrain as well as a cross-disciplinary one where we can re-imagine an equality-driven, culturally emergent, and critically distinctive HE galaxy.

E. THEME 4: TRANSFORMING HIGHER EDUCATION

Our analysis unveiled two major keywords under this theme, viz., privatization and education trends in Kerala, and quality in HE. This theme extends the discussion from Theme 3 and consolidates the focus to the state of HE in the Indian subcontinent. HE in India continues to cope with the colonial linguistic legacy dominated by English [6]. The narrative of transformation of the system of Indian HE has largely been one of privatization. For example, privatization and HE trend in Kerala, India, serve as a case study to understand the implications of privatization in HE globally. The trend towards privatization of HE in India presents both challenges and opportunities for ensuring quality in higher education,

TABLE 3. Topics generated by bibliometric co-occurrence analysis, LDA topic modelling and bertopic modelling.

BERTopic Topics	LDA Topics	Bibliometric Co-occurrence Analysis Topics
Decolonisation and Curriculum in the South	Decolonisation & African Studies	African Education and Decolonisation
South African Activism and Movements		
Decolonising Curriculum and Lecturer Perspectives in the South		
Community Engagement and Partnership	Education Systems & Social Impact	Pedagogical trends
		Higher Education and Social Impact
Teacher Education and Pedagogical Strategies	Educational Research & Student Engagement	Higher Education & Student Engagement
Mathematical Education and Calculus Studies		
Social Justice and Social Work	Gender, Race, and Social Justice	Gender & social justice
Southern High Education Dynamics	Higher Education & Equity Policies	Inclusive teacher education
Multilingual and Translingual Language Studies	Linguistics, Law, and Legal Studies	
Legal Education and Law Practice		
Artistic Expression and Student Creativity	Scholarly Communication & Creative Arts	
African Film Translation and Studies		
African Colonial Studies and French Influence	Decolonisation & African Studies	African Education and Decolonisation
Ubuntu Philosophy in African Education		
Decolonisation and Epistemic Knowledge in Africa		
Theology and Religious Education Insights	Educational Research & Student Engagement	Higher Education & Student Engagement
Conservation and Spatial Geography	Urban Development & Youth Culture	
Migrant and Refugee Experiences in a New Generation		
Multiculturalism and Diasporic Identities		
Asian Histories and International Relations	Asian Politics & International Relations	
Gender Studies in Higher Education	Gender, Race, and Social Justice	Gender & social justice
Social Implications of Caste and Reservation		
Studies on Women of Color and Asian Descent		
LGBTQ+ Studies and Rights		
Education for Muslim Girls and Women		

TABLE 3. (Continued.) Topics generated by bibliometric co-occurrence analysis, LDA topic modelling and bertopic modelling.

High Education Trends in India	Higher Education & Equity Policies	Inclusive teacher education
Privatisation and Education Trends in Kerala	Education Systems & Social Impact	Pedagogical trends
		Higher Education and Social Impact
Quality in Higher Education	Higher Education & Equity Policies	Inclusive teacher education
Brand Equity and Consumer Satisfaction		
The COVID Pandemic's Impact on Sense of Belonging		
Library Learning and Student Studies	Educational Research & Student Engagement	Higher Education & Student Engagement
Digital Literacy and Online Learning		
Performance, Stress, and Anxiety in Academia		
Clinical and Medical Health Studies	Healthcare Research & Medical Innovations	
Education for Students with Disabilities		
Inclusive Education Practices	Educational Research & Student Engagement	Higher Education & Student Engagement

which is crucial for stakeholders in the education sector [57]. Privatisation of HE also has social ramifications, in fostering social equity and justice. It can help in identifying effective strategies and frameworks to promote inclusivity and fairness in educational access and outcomes [56]. Privatisation can further the process of inclusive teacher education which is fundamental in creating environments conducive to learning for all students, regardless of their socio-economic, cultural, or personal backgrounds. This may lead to the holistic transformation of HE institutions. This transformation should aim not only to achieve academic excellence and operational efficiency but also to promote social justice, equity, and inclusivity [58].

F. THEME 5: INNOVATIONS AND CHALLENGES IN EDUCATION

Theme 5 has the following keywords as per our analysis, the COVID pandemic’s impact on sense of belonging, library learning and student studies, digital literacy and online learning, performance, stress, and anxiety in academia, and clinical and medical health studies. The Pandemic impacted students’ sense of belonging; the shift from offline to online learning HE environments challenged and restructured student engagement and community-building dynamics in a significant manner [14]. In wake of the digital literacy and online learning has become important. Innovative pedagogical strategies could enhance digital competencies among

students and educators. Key among them is the proliferation of digital libraries run by specific AI apps and websites [59]. Digital libraries increase the width of learning capabilities in response to the challenge of the Pandemic. COVID 19 severely affected teacher-student performance, especially in HE settings, leading to stress, and anxiety in academia [14]. Innovative educational practices can mitigate these issues, thereby improving academic outcomes and student well-being [16]. Also, in the post-Pandemic scenario integrating healthcare research and medical innovations into HE curricula has become essential, to equip students with the skills and knowledge required to address contemporary health challenges [60].

The present research themes underscore the significance of educational research and student engagement in driving innovation within HE, especially in creating environments that encourage active participation and critical thinking.

G. THEME 6: INCLUSIVE AND ENGAGING EDUCATIONAL PRACTICES

Based on our analysis the principal keywords that emerged under this research theme are Education for Students with Disabilities, and Inclusive Education Practices. A key component of inclusion among HE institutions, especially in the Global South, is the education of students with disabilities. There is an urgent need to explore innovative strategies and interventions designed to dismantle barriers to learning and

TABLE 4. Themes generated by clustering of topics extracted using BERTopic.

Theme Name (Author Generated)	Topics generated by BERTopic
Transformative Education in the Global South	Decolonisation and Curriculum in the South
	South African Activism and Movements
	Decolonising Curriculum and Lecturer Perspectives in the South
	Community Engagement and Partnership
	Teacher Education and Pedagogical Strategies
	Mathematical Education and Calculus Studies
	Social Justice and Social Work
	Southern High Education Dynamics
	Multilingual and Translingual Language Studies
	Legal Education and Law Practice
	Artistic Expression and Student Creativity
Decolonisation, Education, and Cultural Transformation in Africa	African Film Translation and Studies
	African Colonial Studies and French Influence
	Ubuntu Philosophy in African Education
	Decolonisation and Epistemic Knowledge in Africa
	Theology and Religious Education Insights
	Conservation and Spatial Geography
Inclusivity and Social Justice in Education in Asia	Migrant and Refugee Experiences in a New Generation
	Multiculturalism and Diasporic Identities
	Asian Histories and International Relations
	Gender Studies in Higher Education
	Social Implications of Caste and Reservation
	Studies on Women of Color and Asian Descent
	LGBTQ+ Studies and Rights
	Education for Muslim Girls and Women
	High Education Trends in India
Transforming Higher Education	Privatisation and Education Trends in Kerala
	Quality in Higher Education
	The COVID Pandemic's Impact on Sense of Belonging
	Library Learning and Student Studies
	Digital Literacy and Online Learning
	Performance, Stress, and Anxiety in Academia
	Clinical and Medical Health Studies
Innovations and Challenges in Education	The COVID Pandemic's Impact on Sense of Belonging
	Library Learning and Student Studies
	Digital Literacy and Online Learning

TABLE 4. (Continued.) Themes generated by clustering of topics extracted using BERTopic.

	Performance, Stress, and Anxiety in Academia
	Clinical and Medical Health Studies
Inclusive and Engaging Educational Practices	Education for Students with Disabilities
	Inclusive Education Practices

ensuring equitable access to educational opportunities for all students [61]. Inclusion practices in HE not only meets essential educational needs but also foster a sense of belonging and community among students. In addition to leading to an increased educational experience, the benefits and values of adopting inclusive educational pedagogies in HE should be viewed as a strategy for a more effective educational practice, student engagement, and engaged learning environment, with a view to enhancing academic success and personal development for the many students with diverse needs [35]. Universities and colleges are required to be responsive to a diverse population of students. The paper provided case studies and examples of HEIs that have incorporated inclusive teaching methodologies, resulting in the enhancement of academic practice and a more inclusive student experience [61].

In HE, as in education more broadly, there has been a call to action for the implementation of inclusive and engaging educational practices. This is a theme that evidences the importance of higher education's deep engagement with, and holistic adoption of inclusive practices in relation to HE. It calls for collective action in relation to the creation of learning environments that are accessible, fair, and engage all students, particularly those with disabilities. This adds more depth to the discussions on equity in education and calls for a paradigm shift in HE by embracing different languages, viewpoints and experiences.

H. TOPIC RECOMMENDER SYSTEMS

The association rules in Table 5 indicate some intriguing relationships between academic research topics, illustrating the utility of association rule mining (minimum support = 0.002, minimum confidence = 0.1) to uncover complex patterns within scholarly literature using author keywords. Each rule represents a directional relationship from the left-hand side (LHS) to the right-hand side (RHS), providing insight into the way certain topics are associated with each other conceptually.

The relevance of these rules goes beyond mere statistical association, shedding light on thematic continuities, interdisciplinary bridges, and evolving discourses within academia. These data offer a number of interesting insights into the way research themes are connected. This is suggestive of the potential for association rule mining to uncover significant patterns that are not necessarily immediately obvious, aiding the synthesis of literature and the identification of novel research directions. The varying levels of support,

confidence, and lift across rules indicate a rich web of relationships to be unpacked for those interested in these topics. As an example, the strong association between “colonialism, postcolonialism” and “neocolonialism” (lift = 496.500) implies a deeply entangled literature, perhaps reflective of a critical interrogation of both historical and contemporary colonialisms. In contrast, the rule “transformation” and “higher education” (lift = 2.486) underscores a relationship that might be more intuitive or broadly findable in the literature, symptomatic of ongoing debates about the role of education in social transformation.

I. THEMATIC CONTINUITIES

Rules which reflect the strong interrelations between “arts-based inquiry” and “methods of inquiry” and between “colonialism, postcolonialism” and “neocolonialism” respectively indicate thematic continuities within particular fields. These rules are characterized by relatively high confidence scores, which imply that a strong conceptual link remains between the discussion of one theme and another. This may be particularly useful in guiding researchers to explore the depth of these themes as it suggests a strong scholarly consensus and a greatly foundational relationship between the concepts.

J. INTERDISCIPLINARY BRIDGES

Several rules underscore the interdisciplinary nature of modern academic inquiry. For instance, the association of “central asia, gender” with “Tajikistan” and similarly, “central asia, higher education” with “Tajikistan,” reflect specific regional studies intersecting with broader thematic areas like gender studies and education [1]. These associations, supported by perfect confidence scores, may reveal regional case studies that are pivotal in the broader discourse of these thematic areas, suggesting fruitful areas for cross-disciplinary research. Yet another example can be the cross disciplinary association between “global south”, “social justice” and “global citizenship education.” The concept of decolonising HE in the Global South should, according to this rule, incorporate discussions on educating the demographic in the Global South about its extended international community [62].

K. EVOLVING DISCOURSES

The table also captures evolving discourses within the academia, particularly in rapidly developing fields. The

TABLE 5. Topic recommender system.

LHS of Rule	RHS of Rule	Support	Confidence	Lift
arts-based inquiry	methods of inquiry	0.002	1.000	496.500
methods of inquiry	arts-based inquiry	0.002	1.000	496.500
colonialism, postcolonialism	neocolonialism	0.002	1.000	496.500
central asia, gender	tajikistan	0.002	1.000	496.500
central asia, higher education	tajikistan	0.002	1.000	496.500
narrative, social justice	performative text	0.002	1.000	496.500
tajikistan	central asia	0.002	1.000	331.000
central asia	tajikistan	0.002	0.667	331.000
performative text	narrative	0.002	1.000	331.000
narrative	performative text	0.002	0.667	331.000
affirmative action, india	merit	0.002	0.667	331.000
religion, university	theology	0.002	1.000	331.000
education, religion	theology	0.002	1.000	331.000
global south, social justice	global citizenship education	0.002	1.000	331.000
africa, religion	economy	0.002	1.000	331.000
swayam	moocs	0.002	1.000	248.250
moocs	swayam	0.002	0.500	248.250
media literacy	community	0.002	1.000	248.250
community	media literacy	0.002	0.500	248.250
gender, teaching	feminism	0.002	1.000	248.250
race, south africa	post-apartheid	0.003	0.500	62.062
learning	teaching	0.005	0.714	50.663
teaching	learning	0.005	0.357	50.663
multilingualism	translanguaging	0.004	0.500	33.100
translanguaging	multilingualism	0.004	0.267	33.100
exclusion	inclusion	0.004	0.667	22.067
inclusion	exclusion	0.004	0.133	22.067
equity, higher education	access	0.008	0.381	13.510
access	equity	0.016	0.571	11.580
equity	access	0.016	0.327	11.580
transformation	higher education	0.022	0.478	2.486
higher education	transformation	0.022	0.115	2.486

discussion of “narrative, social justice” and “performative text” with a high reach, as indicated by Müller [63], moves us to a fresh approach to social justice research, one which pays attention to narrative and performance in activism and scholarship. Narratives are powerful carriers of lived experience, tools that enable individuals and groups to give voice to their muted knowledge, and challenge ideologies of domination, including newer iterations of colonialism, for instance [6]. Performative text refers to any written or

spoken word or visual artifact through which meaning is conveyed and through which a specific message or positioning emerges [63]. Here, individuals and groups disrupt dominant narratives, contest oppressive norms, and catalyze communities in the construction of alternative narratives of and visions for more just and inclusive societies. In HE, narratives and performative texts represent immersive experiential learning opportunities that immerse students in the creation, representation, and interpretation of narratives through performative

acts, for instance, in English courses at the postsecondary level, as is attested by Giroux and Shannon [64] in their whirlwind tour of recent developments in this area. When narratives and performative texts are woven into the fabric of HE, educators create transformative experiences that cut across disciplines and develop the essential skills to deal with navigating an increasingly interconnected and diverse world.

L. METHODOLOGICAL INSIGHTS

This combination of concepts suggests methodological insights. A lift of 496.500 between the terms “arts-based inquiry” and “methods of inquiry”, for example, suggests the close association and likely underexplored or highly specific methodological approaches that might each rule a number of different research niches. Researchers further from the boundaries of a given field might trust this insight to identify under-utilized methodological approaches that could redefine their practice and thus the frontiers of their holistic contribution to knowledge.

The relationship is as fascinating as the possibilities for future use-cases. Arts-based inquiry is a challenging category. The underlying concepts describe an approach aligned to arts practice, as they are used to communicate and explore human experience [65]. This is somewhere after, but not entirely unlike, traditional methodologies. These too explore human phenomena and create knowledge. That includes the sensory and emotional dimension of scholarship that arts-based inquiry champions. This examination and interpretation of human phenomena, including the practices surrounding forcibly displaced peoples, would be further enriched by an exploration and interpretation of arts-based inquiry. It would not replace traditional methodologies, but package together their insights into a more comprehensive understanding of their subjects.

M. IMPLICATIONS FOR RESEARCH AND EDUCATION

Variables with lower lift scores are still significant but suggest more established or broadly acknowledged connections within the academic discourse, such as “learning” and “teaching.” These more intuitive associations, then, are well positioned to inform curriculum development, pedagogical strategies, and the broader educational discourse by highlighting areas of consensus or foundational knowledge that underpin academic disciplines.

In sum, the significance of these association rules is their ability to map the intellectual landscape of contemporary research, specifying the co-occurrence of topics as well as the depth of their interrelation. This provides a roadmap for navigating dialogues that are increasingly complex, identifying literature-laden poles from which scholars might proffer contributions in the form of knowledge and/or method, and suggesting new lines of flight for projects that creatively crosscut disciplines, methodologies, and thematic areas in an era of knowledge production that seems increasingly defined by such border crossings.

The results of the present study provide a detailed analysis of the aforementioned themes around decolonization, and language justice in Global South HE.

The analysis revealed an evolving literature emphasizing the urgency to decolonize HE within postcolonial societies and promote linguistic inclusion. These research trends align with a theoretical framework that suggests decolonization of HE and language justice as vital components for achieving academic equity. The growing attention on such themes indicates a positive shift towards addressing the colonial practices that still persist in various HE systems.

The unique themes identified through BERTopic modelling, underscore the intricate nature of the decolonization discourse. These identified themes suggest that achieving language justice in HE cannot be limited to changes in the curriculum but must also cover greater institutional and sociocultural dynamics. The theoretical underpinnings of postcoloniality that advocates for a wholesome approach of undoing entrenched colonial legacies is reflected in these findings.

Also, as mentioned earlier the topic recommender system and association rule mining provide vital insights into possible avenues for future research. For example, the strong correlation between “colonialism postcolonialism” and “neocolonialism” indicates the potential need to investigate current forms of colonial influence upon the HE systems of postcolonial societies. This aligns well with the theoretical insight that decolonization is a continual process which requires constant vigilance, attention and adaptation.

The findings when perceived through the lens of postcolonial theory and language equity in HE, divulge the interplay of historical inheritance and the modern academia. Additionally, the emphasis on multilingualism as a tool to accomplish the urgent inclusion of indigenous languages also aligns with the theoretical assertion that actual decolonization necessarily involves implementing linguistic equity and empowering marginalized voices.

This also highlights the crucial areas where HE systems in the Global South should focus their efforts to promote language equity, justice, and inclusion.

IV. DISCUSSION AND POLICY IMPLICATIONS

This study emphasizes the urgency of policy reform in Global South HE. It is necessary to eradicate colonial linguistic scars and ensure language justice, inclusivity and equity in the academia within postcolonial societies. The prevalence of colonial languages in their HE systems perpetuates socio-cultural exclusion of native speaking students. Thus, HE in these nations needs to be more inclusive, and policy makers need to deliberate several essential aspects.

Firstly, transforming HE requires immediate execution of decolonial practices within the curricula. This naturally necessitates dismantling Western hegemonic epistemologies and hermeneutics. Policy makers should consider transforming the HE curricula to officially include native languages and knowledge systems, in order to promote diversity within

academic discourse [1]. A total overhaul of the course content is required, along with major revisions of reading and reference materials, teaching methodologies and didactic approaches, to make certain of meeting the goals of decolonisation. Such policy measures would ensure academic democratisation. It would make HE more inclusive, accessible, and practical to students from various socio-linguistic environments [66]. Inclusivity can be increased greatly by propagating “vernacular” knowledge(s) within HE institutions, which could consequently become spaces for “the innumerable diversities of human thought and culture” [61].

Secondly, a major component of the language justice project is the promotion of multilingualism within HE. Multilingualism establishes the natural linguistic diversity of students as an asset. Therefore, policy makers should focus on creating a translanguaging environment, which augments the development of cognitive ability, student engagement and subsequent academic scores [67]. The multilingual approach is also beneficial towards enhancing socio-cultural collaboration among students. This could contribute to their psychological aptitude and well-being as well [15]. For this to happen policies should focus on developing modern academic infrastructure and should introduce extensive teacher training programmes.

Thirdly, a significant part of the infrastructure should include modern tools, AI and language technologies. The incorporation of such technologies, like language learning and translation apps, tools for creative etc., help in creating a multifaceted academic and research environment within HE institutions. Technology can effectively bridge the gap between students who have benefited from a foreign language exposure and those that have not [59]. Policy makers thus, need to incentivise and sponsor HE institutions to incorporate AI tools and language technologies within their pedagogy. The integration of modern educational technology has the potential to totally transform the HE landscapes in the Global South.

Fourthly, incorporating multilingualism within the HE ecosystem automatically requires teachers and facilitators who are adept at multilingual instruction. Policy makers must ensure and fund comprehensive teacher training programmes in order to create educators equipped with the necessary skills to handle a multilingual environment in their classrooms. Such programmes should include modules dealing with diversity and inclusivity training, translanguaging and multilingual practices [68]. Also, teaching-learning and additional reading materials should be made in various indigenous languages. Public-private partnerships and investment in these programmes can safeguard the academic needs of students in the long run, by developing inclusive, and diverse academic environments.

Furthermore, public policies should incentivise the development of multilingual policies. HE systems in postcolonial countries can develop pragmatic frameworks for the use of various languages within institutional administration, and

socio-cultural contexts [6]. This can be achieved by initiatives like multilingual documentation and archiving, vernacular support services, and campaigns for linguistic diversity within campuses. Policies such as these, if implemented pragmatically, could encourage multilingualism and inclusion in academic spaces [35].

Along with public policy initiatives the academia also needs to facilitate the process. Research and development on translanguaging, multilingualism in the classroom, pedagogical innovations, the efficacy of training programmes, among others, are essential to the overall improvement of HE systems. Research should necessarily be interdisciplinary and collaborative. It should facilitate easy exchange of ideas among multiple stakeholders in the academia and should also provide access to knowledge repositories [23]. Publicly or privately funded joint research and consultancy projects can shed light on any essential emergent phenomenon, best practices, and creative solutions. Collaborative research between academia and industry can also lead to the development of newer technologies customised to meet the specific linguistic needs of native students in HE setups. Transnational research can also advance the understanding the methods of meeting language justice in HE, by allowing a bird’s view perspective into multifarious translanguaging strategies being employed elsewhere [69]. It can lead to best practices in pedagogy, and training methods in HE. International research can also stimulate consensus on vernacular rights, diversity and inclusivity within academic spaces [70].

While the policy recommendations in the study are aimed at fostering linguistic equity in HE, it is nonetheless necessary to acknowledge the potential challenges that could hinder their implementation. Addressing such problems and offering relevant solutions will undoubtedly augment the operational effectiveness of the recommendations in the real-world.

A significant challenge is of course could be the lack of institutional willingness to adopt an overhauled format of academic instruction. This may be due to an indifference towards the problem or the dearth of resources to address it. An entirely revised curricula, and the inclusion of indigenous language systems requires substantial time, capital and effort.

Another obstacle could be incorporating a multilingualism framework within HE. In postcolonial societies the predominance of colonial languages such as English delimit the availability of instructional materials in native languages. Additionally, there is a significant probability of a scarcity of qualified multilingual educators.

Yet another vital challenge is posed by technology. Integrating state-of-the-art technologies, such as AI-based language learning into the Global South HE landscape will prove daunting. This may be due to hurdles concerning infrastructure, capital expenditure and digital literacy.

Overcoming such challenges would necessitate a multi-pronged approach in policymaking, stakeholder engagement, technological innovation and teacher training. Conducting training workshops to educate HE faculty and staff could

prove extremely beneficial. They must be made aware of the benefits of decolonized curricula. The policymakers should begin with pilot programmes that incorporate native indigenous knowledge systems and languages, and gradually spread out based on stakeholder feedback. In order to defeat the challenged HE institutions in the Global South must seek funding opportunities from governmental and non-governmental organizations. International collaboration and sharing best practices would also be beneficial. Along with this educational material must be developed in indigenous languages and educators should be trained in them.

By proactively addressing these potential challenges HE institutions in the Global South can rationally hope to achieve a more equitable, inclusive, and socio-culturally rooted educational system.

Overall, policymakers in the Global South have the opportunity to dismantle redundant colonial HE models and technologies and pave the way for a more socio-linguistically and socio-culturally nuanced, equitable, diverse and inclusive HE landscape. HE transformation and decolonisation in post-colonial societies are consistent with the UN SDGs and can contribute to a more just society.

V. CONCLUSION

The research presented here offers a significant addition to a growing body of work that is challenging the exclusionary forces that shape higher education, particularly in the Global South, through the lens of language justice. By illuminating the intricate ways in which linguistic diversity, educational policies, and colonial legacies intersect, it reminds us of the necessity of radically rethinking educational systems to embrace linguistic pluralism and foster truly inclusive spaces of learning [68]. Ultimately, in synthesising this discussion, this research argues for a reimagined project of higher education, one that places language justice at its core and seeks to nurture an educational system that values and builds from our many languages. The pursuit of such an educational endeavour will depend significantly on the commitment of scholars, educators, and policymakers working in unison to radically rethink educational policy and practice. The path ahead is long, and it is strewn with the legacy of colonial practices in education and the murky waters of a decolonial project. But as clear as the legacy of colonialism is in the current university systems it is indeed possible to envision a world of academia beyond the colonial [6]. Collaborative efforts that centre decolonial praxis in higher education may well produce a more inclusive and equitable academic world within which to marvel at and nurture the intellectual traditions of all of our languages.

It is important to acknowledge the limitations of this study. The use of specific bibliometric databases runs the risk of excluding a tradition of valuable non-English and grey literature research published in languages other than English and in non-academic domains, which could have widened the scope of discussion to include various perspectives from underrepresented regions. Additionally, while the

quantitative analyses involved in this research allowed for in-depth analyses of the bibliometric data, making it broadly representative of the academic literature, it is also clear that they do not necessarily reflect the complex lived experiences of linguistic minorities in higher education. Further qualitative and/or ethnographic research should be undertaken to flesh out these preliminary findings. The study limited its analysis to articles retrieved from the Scopus database alone, which might have left out similar significant research in the domain from other databases (Web of Science etc.). An important limitation is the linguistic similarity of the analyzed texts. Since the study mainly focuses on publications in English, it disregards potentially valuable research in other languages. This may have led to single dimensional perspective to capture educational practices and policies, eventually leading towards exclusion of different linguistic and cultural contexts. Also, the study presupposed that the trends and patterns identified by the analyses would remain stable over time, geographies and cultures. This assumption might inadvertently overlook the evolution of educational policies and practices, which may limit the universal applicability of the findings. The authors suggest expanding future research in this field by including more data sources that are diverse as well as multiple languages alongside more detailed qualitative analyses.

Future research can be expanded to include other (non-English) language-based literature as well as multiple bibliometric databases (Web of Science, Google Scholar etc.) to capture diverse perspectives as sole reliance on a single database (Scopus in this study) could introduce an unforeseen selection bias because of its unique coverage, indexing criteria, and geographic representation. This can help to gain more generalizability of the future findings. Qualitative methodologies can further provide additional exposure to experiences by linguistic minorities. Longitudinal as well as cross-cultural studies can put light onto a dynamic and comprehensive understanding of educational policies and colonial legacies. Additionally, exploring decolonial practices, integrating technology, and focusing on the unique challenges in the Global South will help create more inclusive and equitable educational systems.

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AUTHOR CONTRIBUTIONS

Aritra Pan and Soumyajyoti Banerjee: conceptualization, validation, formal analysis, data curation, writing—original draft preparation, and writing—review and editing; and Aritra Pan: methodology, software, and visualization. Soumyajyoti Banerjee and Aritra Pan have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work the author(s) used OpenAI's ChatGPT (v3.5) in order to do the English language editing and grammatical errors checking to improve the readability of the article. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication. The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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