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A Bibliometric Analysis Ethical Perspectives on SDGs Based Education Goals Using VOSViewer

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ABSTRACT

This study investigates the integration of ethical perspectives into the frameworks of Education for Sustainable Development (ESD) and Society 5.0, with a focus on their alignment with the Sustainable Development Goals (SDGs). Utilizing a bibliometric analysis, the research examines academic and professional literature published between 2010 and 2024. Data was collected from Google Scholar using keywords such as "Ethical Education," "Sustainable Development Goals and Education," and "Technology in Education." The analysis employed VOSviewer to map and visualize thematic connections and subject linkages within the literature.The findings indicate a notable increase in research on ethical education and the SDGs, with publication peaks in 2012 and 2023, alongside a slight decline in 2021, reflecting fluctuating scholarly attention. These results highlight the growing recognition of ethics as an essential element in educational strategies that advance sustainable development goals. The study emphasizes the importance of integrating ethical considerations into the development of inclusive, equitable, and sustainability-oriented educational objectives. The conclusions advocate for the establishment of ethically grounded educational frameworks that align with the objectives of Society 5.0, which aims to harmonize technological advancements with societal well-being. This research offers actionable insights for educators, policymakers, and researchers, providing strategies to strengthen the role of ethics in achieving educational and sustainable development objectives.

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1. INTRODUCTION

Education serves as a foundational pillar for shaping both individuals and societies. Its primary aim is to enhance individual potential by equipping people with the knowledge, skills, and values necessary for success in personal, professional, and social domains (Abulibdeh et al., 2024; Nguyen et al., 2023). Through education, individuals can develop their abilities, broaden their perspectives, and cultivate the character and personality required to build a civilized and cultured society. It also plays a critical role in driving economic, social, and political development by fostering intelligent and creative human resources. The rapid pace of globalization and technological advancement necessitates constant updates to educational objectives, ensuring their relevance and adaptability. These updates prepare students to address future challenges, including advancements in technology, societal transformations, and global complexities (Aydin, 2024; Malik, 2018; Rogers, 2023).

The concept of Society 5.0 positions technology not only as a tool for efficiency but also as a means to create a more inclusive and humane society. Education must therefore evolve beyond traditional teaching approaches to integrate technology while simultaneously fostering character development and moral values (Du Preez et al., 2022; Khudoykulov & Abdullaeva, 2021; Monteiro et al., 2019). This dual emphasis on technological and ethical education is essential for establishing inclusive, equitable, and sustainable learning environments. The Fourth Sustainable Development Goal (SDG 4), which advocates for inclusive and quality education for all, provides a critical framework for achieving this balance. In the context of Society 5.0, technology acts as a powerful tool for educational equity, enabling access to quality education regardless of socioeconomic or geographic disparities (Collén, 2019; Tharakan, 2022).

The integration of technology in education, however, raises significant ethical concerns. Challenges such as managing students' personal data, preventing bias in educational technologies, and ensuring equitable learning opportunities require urgent attention. Addressing these issues involves moving beyond the mechanical application of technology to actively incorporate ethical principles such as honesty, empathy, and respect for diversity (García-Parra et al., 2023; Tsamados, 2021). This integration of ethics is vital for fostering individual responsibility and building societies that are just, empathetic, and inclusive. Ethical and inclusive education forms the foundation for creating a technologically advanced yet morally resilient future society. These objectives align with SDG 4 and highlight the role of education as a catalyst for sustainable development within the framework of Society 5.0 (Kong et al., 2023; Zhanbayev et al., 2023).

The research gap in this area is evident, as existing studies primarily focus on the technological aspects of education, such as tools and platforms, with limited exploration of the ethical frameworks needed for equitable implementation. Discussions on ethical education often remain theoretical, lacking practical strategies for aligning ethics with technology-driven education in the Society 5.0 context. Another gap lies in addressing the dual role of technology in democratizing education while potentially exacerbating inequalities when ethical considerations are overlooked, particularly in areas like data privacy and algorithmic bias.

The urgency of integrating ethics into technology-driven education is underscored by global challenges. UNESCO estimates that 244 million children and youth remain out of school, with many more facing barriers to accessing quality education due to socioeconomic and technological divides. Ethical considerations are critical to ensuring that technological advancements promote inclusivity and equity rather than deepening existing inequalities

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(Imran 2023; Kooli, 2023). The growing use of artificial intelligence and data analytics in education further highlights the necessity of robust ethical frameworks to guide their application.

This study addresses these gaps by examining how ethical perspectives can be integrated into education within the frameworks of Society 5.0 and SDG 4. A bibliometric approach is employed to analyze academic and professional literature, complemented by qualitative analysis to identify trends, challenges, and opportunities in ethical and inclusive education. The review draws from diverse sources to assess current practices and propose actionable strategies for embedding ethical principles into educational systems.

The findings aim to provide valuable insights for policymakers and educators in designing curricula that extend beyond technical skill development to include character-building and moral education. The ultimate objective is to create educational environments where technology not only enhances learning outcomes but also supports sustainable social and moral development. This approach aligns with the broader goals of SDG 4 and Society 5.0, contributing to the ongoing discourse on how education can bridge technological innovation and ethical sustainability. By fostering a future society that is both advanced and compassionate, this research highlights the transformative role of education in achieving sustainable development.

2. METHODOLOGY

2.1 Research Design

This study adopts a bibliometric analysis design to systematically examine scientific publications addressing ethical perspectives in education within the frameworks of the Sustainable Development Goals (SDGs) and Society 5.0. The methodology emphasizes descriptive analysis to evaluate the volume, distribution, and structural patterns of publications over time, alongside impact assessment to determine the academic influence of these works through citation analysis (Donthu et al., 2021). Key contributors, including authors, institutions, and regions, are identified to map the intellectual landscape and collaborative networks within the field.

2.2 Data Collection Technique

The data collection process was meticulously designed to ensure comprehensive and reliable coverage of relevant academic literature. Google Scholar was selected as the primary database due to its extensive and multidisciplinary repository. The inclusion criteria targeted articles focused on Ethical Education (EE), Sustainable Development Goals in Education (SDGsE), and Technology in Education (TE).

Table 1. Search Criteria

Criteria	Details
Database	Google Scholar
Citation Index	SCIE (Science Citation Index Expanded) and SSCI (Social Sciences Citation Index)
Topics	"*Ethical Education*" (EE), "*Sustainable Development Goals and Education*" (SDGsE), dan "*Technology in Education*" (TE)
Time Span	2010 – 2024
Document Type	Articles, proceedings papers, reviews

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Keywords such as “Ethical Education,” “Sustainable Development Goals and Education,” and “Technology in Education” were used to retrieve documents published between 2010 and 2024. The search encompassed journal articles, conference proceedings, and review articles to ensure diverse perspectives. A total of 401 documents meeting these criteria were analyzed, offering broad insights into the interplay of ethics, technology, and sustainability in education.

The accuracy of bibliometric studies relies heavily on the quality of search results obtained from databases or journals. Ensuring adequate representation of the field requires selecting databases with comprehensive coverage and accurate data while avoiding issues such as duplicate entries and inconsistent author names. To uphold methodological rigor, the PRISMA criteria were applied for systematic evaluation, as illustrated in Figure 2.

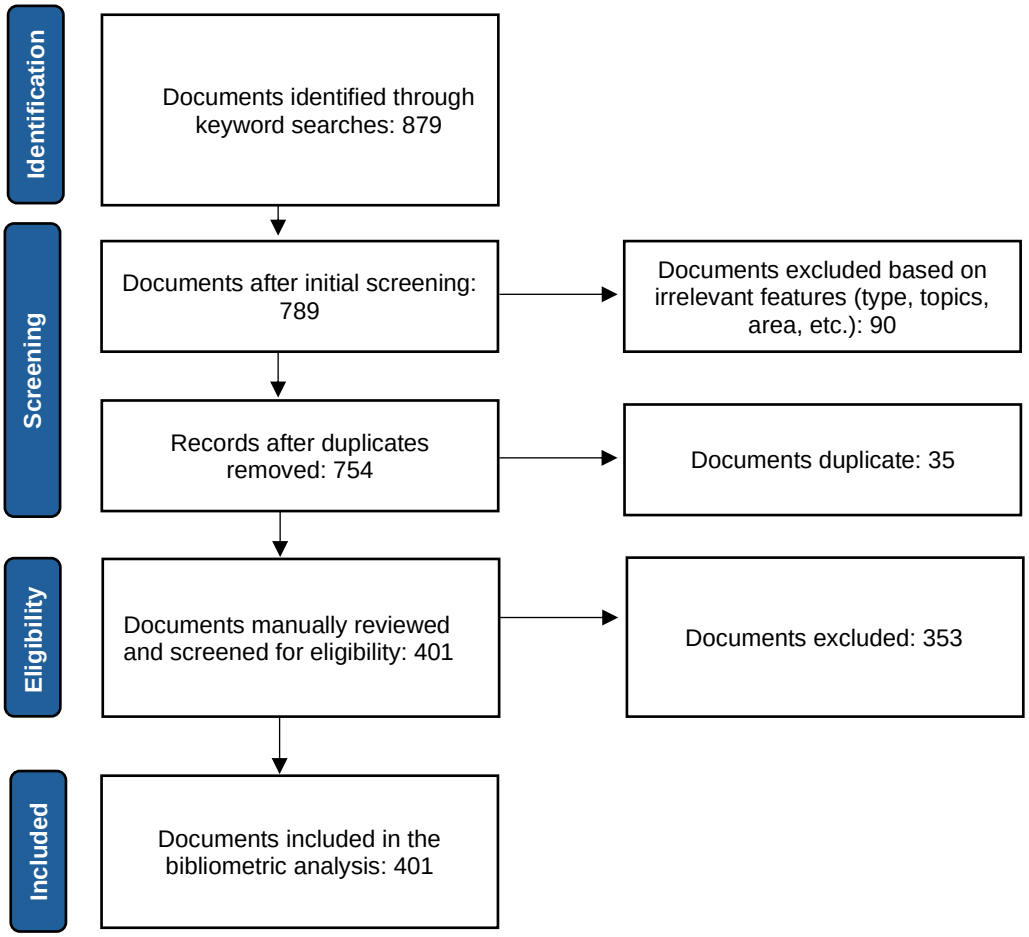

Figure 1. PRISMA Guidelines Describing the Collection of Documents from Google Scholar

The search focused on three key themes: Ethical Education, Sustainable Development Goals in Education, and Technology in Education. While these themes are often discussed interchangeably, no bibliometric analysis has yet evaluated them collectively. To ensure comprehensive coverage, the dataset included journal articles, conference papers, and review articles. A total of 401 publications from 2010 to 2024 were selected for analysis, encompassing relevant discussions across these interconnected topics.

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2.3 Data Analysis Technique

The study employs a systematic bibliometric analysis to evaluate data, focusing on key dimensions of research. Content analysis was conducted to identify recurring themes, authorship patterns, and journal distributions, which revealed dominant topics and research gaps. Citation analysis measured the impact of publications based on citation counts, highlighting influential works, authors, and institutions. Collaboration analysis mapped co-authorship networks to evaluate partnerships among authors, institutions, and countries. VOSviewer software was used to visualize these patterns and identify key contributors. Co-occurrence analysis examined keyword relationships to uncover research trends and thematic clusters. Bibliometric maps generated with VOSviewer illustrated co-citations and thematic clusters, offering a comprehensive view of the field's structure and dynamics.

Data collection was conducted using Publish or Perish (PoP) software, which extracted metadata such as author names, affiliations, journal titles, and citation counts (Rullyana et al., 2023). The data was processed in Microsoft Excel to facilitate filtering, categorization, and grouping by themes, authors, and citation metrics. This process ensured the creation of a consistent and comprehensive dataset for analysis (Adeoye et al., 2023).

3. RESULT AND DISCUSSION

3.1. Result

The annual increase in publications during this period demonstrates an upward trend, as illustrated in the graphic image below, with the exception of 2024. It is important to note that the final search parameter was set for May 2024. Based on the type of material analyzed, 76.46% of the publications are journal articles, 21.87% are conference proceedings, and the remainder consists of editorial reviews.

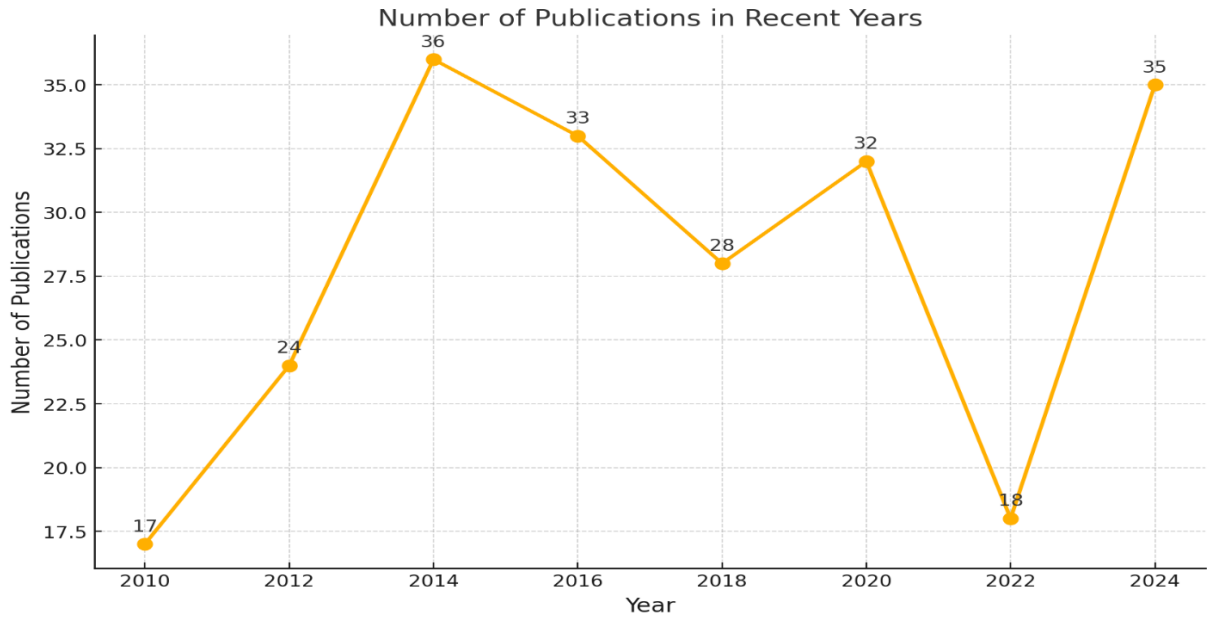

Figure 2. Number of Publications in Recent Years

This study examines relevant academic and professional works to gain a comprehensive understanding of current practices and proposed approaches for integrating ethical values into educational purposes in the era of Society 5.0. The number of publications, as illustrated

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in Figure 3, spans from 2010 to 2024, highlighting notable periods of peaks and declines. At the start of the decade, the number of publications began with 17 in 2010 and increased rapidly, reaching a peak of 36 publications in 2014. This trend reflects the growing interest and recognition of the importance of ethics in educational objectives, driven by technological advancements and the development of the Society 5.0 concept.

Despite an overall annual increase, interest in ethical topics in education aligned with the SDGs and Society 5.0 continues to grow. Fluctuations in publication numbers can be attributed to changes in research priorities or external factors influencing scientific production, leading to declines in certain years. Within this category, the primary sources analyzed, which focus on ethical perspectives in educational goals related to sustainable development, are presented in Table 3. The most relevant articles, based on the number of citations, are summarized in Table 2.

Table 1. Ranking of the 10 Sources that Contain the Analysed Records

Source Titles	Records	% of 401	JCR Impact Factor	SJR Impact Factor
Journal of Moral Education	32	7.98	1.7	0.685
Ethical Theory and Moral Practice	21	5.24	1.0	0.518
Science and Engineering Ethics	14	3.49	3.7	1.194
Policy Futures in Education	12	2.99	1.5	0.623
Procedia-Social and Behavioral Sciences	10	2.49	0.513	0.158
Teaching and Teacher Education	10	2.49	4.130	1.663
Environmental Education Research	8	1.99	3.2	1.054
Journal of Beliefs & Values	7	1.75	1.1	0.351
Ethics and Education	7	1.75	0.9	0.319
Nursing ethics	5	1.25	4.2	1.279

Table 3 highlights the top ten journals addressing ethics in education within the context of SDGs and Society 5.0, with a predominant focus on higher education. Leading examples include Journal of Moral Education and Ethical Theory and Moral Practice, which emphasize ethical issues in academic settings. Journals covering broader topics, such as Science and Engineering Ethics and Policy Futures in Education, follow closely, underscoring the significance of interdisciplinary approaches in incorporating ethical considerations across various educational fields.

Table 2. Ranking of the 10 Most CIted Documents

Authors	Source Title	Year	Total Citations
Bullough, 2011	Teaching and Teacher Education	2011	282
Newell & Nelson-Gardell, 2014	Journal of Social Work Education,	2014	247
Nasibulina, 2015	Procedia-Social and Behavioral Sciences	2015	221
Martinov-Bennie & Mladenovic, 2015	Journal of Business Ethics	2015	207

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Authors	Source Title	Year	Total Citations
Ali et al., 2019	Personal Robots Group	2019	173
Abdurakhmonova et al., 2021	The American Journal of Social Science and Education Innovations	2021	152
Huda & Teh, 2018	Mentorship strategies in teacher education	2018	99
Flores-Vivar & García-Peñalvo, 2023	Revista Comunicar	2023	85
Dennis & Harrison, 2021	Journal of Moral Education	2020	38
Molina & Úcar, (2019)	Journal of Applied Ethics	2019	13

Table 4 highlights that the most frequently cited publications primarily focus on actions universities should take to address the demands of the SDGs, as seen in articles 6, 7, 8, and 9. Publications such as Ethical and Moral Matters in Teaching and Teacher Education and Education for Sustainable Development and Environmental Ethics extend this discussion by identifying strategies and methodologies aligned with these objectives. Additionally, A Competency-Based Approach to Teaching Professional Self-Care underscores the importance of university social responsibility.

Other publications, such as Reflections on the Ethics, Potential, and Challenges of Artificial Intelligence in the Framework of Quality Education (SDG4), emphasize the challenges involved in evaluating the development of the SDGs within university settings, highlighting the complexity of measuring progress in this dimension. Having identified the most referenced works on the subject, Table 4 also presents the most productive authors, as shown in the preceding sections.

Table 3. Ranking of the 10 Authors Who Contributed the Most Publications

Authors	Institution	Country	Records	% of 401
K Tirri	University of Helsinki	Finland	6	1.50
O Franck	niversity of Gothenburg	Sweden	6	1.50
E Bosio	Tokyo University	Japan	5	1.25
B Maxwell	Université du Québec à Trois-Rivières	Canada	5	1.25
J Öhman	Örebro University	Sweden	4	0.99
C Osbeck	University of Gothenburg	Sweden	4	0.99
W Veugelers	University of Humanistic Studies	Netherland	4	0.99
D Carr	University of Birmingham	UK	4	0.99
M Huda	Universiti Pendidikan Sultan Idris	Malaysia	4	0.99
K Meyer	Humboldt-Universität zu Berlin	Germany	3	0.75

3.2. Discussion

Data processed using VOSviewer enabled a co-authorship analysis to examine the structure of scientific collaboration in research on educational ethics and the Sustainable Development Goals (SDGs). This analysis aimed to uncover patterns of collaboration among researchers and map the intellectual networks that underpin discussions and innovations in this field. The visualization below illustrates how researchers interact, collaborate, and collectively contribute to knowledge generation within these communities.

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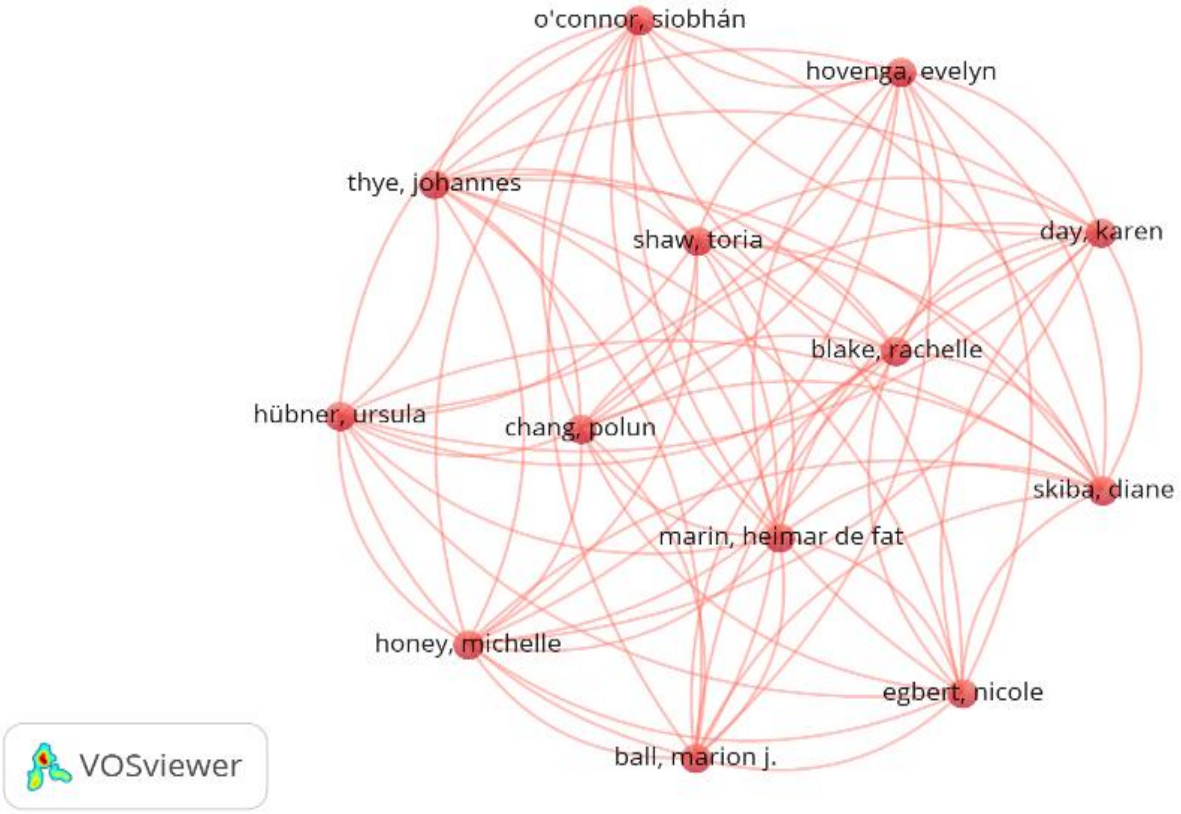

Figure 3. Network Visualization Analysis for Co-Authorsip

The visualization of research collaboration reveals a network that has significantly contributed to the literature on educational ethics and the SDGs. This figure highlights important relationships between key researchers in the field. Researchers such as “Hübner, Ursula,” “Shaw, Tonia,” and “Egbert, Nicole” emerged as central nodes within the network, indicating their pivotal role in collaborative research. The network also displays clusters of researchers who work closely together, suggesting the presence of subgroups that focus on specific research topics or employ similar methodologies. The visualization illustrates relationships that measure the degree of collaboration and the strength of professional connections. Researchers with extensive networks and strong collaborative ties often hold significant influence in their fields, contributing to foundational studies that serve as key references in educational ethics and sustainable development.

The results of the cluster analysis conducted with VOSviewer identified four primary clusters based on 59 terms with an occurrence greater than two. These clusters represent distinct research paths explored by the analyzed publications. The first cluster focuses on the foundations of ethical education, while the second addresses applied ethics in professional contexts. The third cluster examines ethics and sustainability within higher education, and the fourth highlights emerging trends in ethical education. Figure 5 provides an overview of the interconnectedness of these clusters and the overarching themes linking them. This visualization offers a comprehensive perspective on how research in this field is organized and interconnected, demonstrating the thematic diversity and depth within the study of educational ethics and sustainable development.

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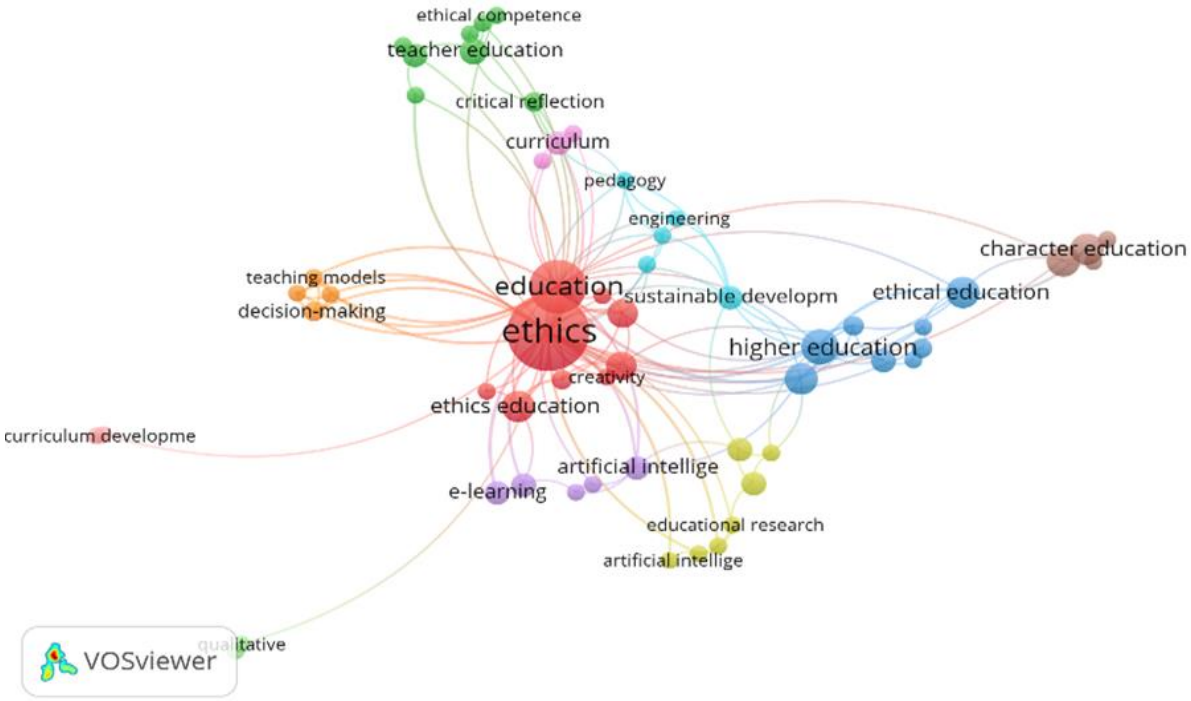

Figure 4. Overview Network Visualization for Co-Occurrence

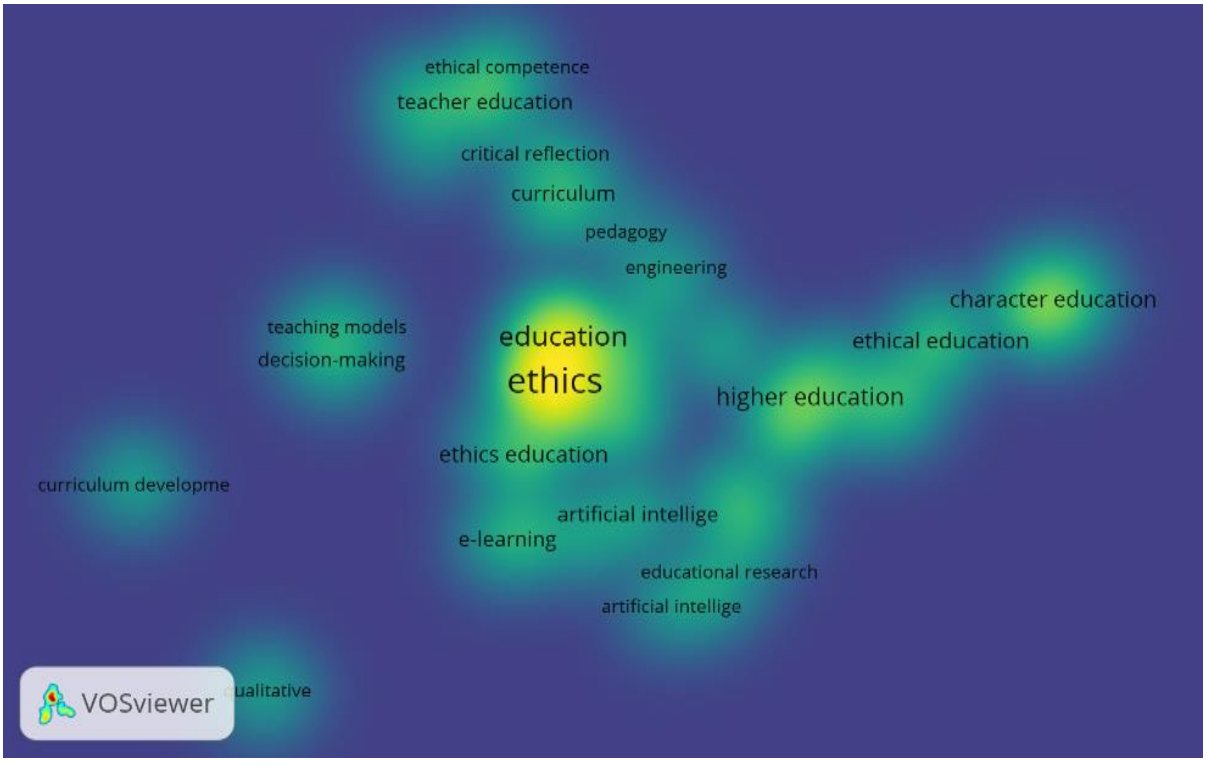

Figure 5. Overview Density Network Visualization for Co-Occurrence

The visualization in Figure 6 illustrates research collaboration networks, where keywords are represented by labels and circles. The size of each label and circle corresponds to the weight of the item, with higher weights resulting in larger labels and circles. Additionally, the density visualization in Figure 6 provides an overview of research focus distribution in the

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relevant field. Areas with higher light intensity indicate concentrated research attention on specific topics.

Table 5 presents the data obtained from Cluster 1, "Foundations of Ethical Education," which lists the five most frequently used labels and their respective weights. The bibliometric analysis reveals the central role of ethical education in fostering quality and responsible learning. Ethical education is not only instrumental in shaping individual character and guiding moral decisions but also critical in developing leaders who apply ethical principles in their practices (Agisilaou & Harris, 2023; Teja, 2011). Through ethical education, individuals gain skills to recognize and address ethical dilemmas, a necessity in today's complex and diverse society. By establishing a foundation that extends beyond personal and professional success, ethical education contributes to creating a more just and sustainable society. Educational institutions play a vital role in crafting curricula that embed ethical values, addressing global challenges, and ensuring that education is not merely a transfer of knowledge but also a platform for fostering ethical leadership and social sensitivity (Bullough, 2011; Pham, 2019).

The second cluster, "Applied Ethics in Professional Contexts," examines the application of ethical principles in everyday professional practices. This cluster highlights the importance of professional ethics in education and training, particularly for individuals preparing to enter various professional fields. Findings indicate that ethical decision-making courses and critical reflection are essential components of professional education, equipping individuals to address and manage ethical issues effectively (Maxwell, 2020; Warnick & Silverman, 2011). Beyond technical expertise, a deep understanding of ethics promotes fairness, integrity, and public trust in professional practices. Strengthening ethics education at all levels of professional training prepares individuals for the ethical complexities of an interconnected global workforce (Maxwell & Schwimmer, 2016).

The third cluster, "Ethics and Sustainability in Higher Education," explores how universities and higher education institutions integrate ethics and sustainability into education, research, and practice. Findings suggest that higher education serves as a critical platform for advancing the Sustainable Development Goals (SDGs). Universities not only teach the importance of sustainability but actively involve students in service-based learning projects that combine academic experiences with tangible contributions to the community (Akrivou & Bradbury-Huang, 2015; Tejedor et al., 2018). These efforts demonstrate the potential of higher education institutions to lead in promoting innovative and sustainable solutions across various sectors. By integrating sustainability principles into their curricula and research, universities act as incubators for new ideas that bridge academic knowledge with real-world applications (da Silva & de Souza Freire, 2023; Kopnina & Meijers, 2014).

Cluster 4, "Emerging Trends in Ethical Education," addresses how ethical education is adapting to dynamic changes in technology, society, and global ethical norms. The findings highlight a shift toward incorporating advanced technologies, such as artificial intelligence (AI), alongside a stronger emphasis on social justice and human rights, particularly children's rights. The integration of AI in education presents new challenges, including privacy concerns, algorithmic bias, and the implications of automation on decision-making processes (Akgun & Greenhow, 2022; Ranjan Puhan et al., 2014). In response, ethical education now involves the study of moral applications in educational technology to ensure equitable and inclusive learning. Furthermore, the renewed focus on social justice and children's rights reflects the evolving role of moral education in fostering a more just and sustainable society. By aligning traditional moral values with global and digital contexts, moral education continues to adapt to remain relevant and effective in shaping responsible global citizens.

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4. CONCLUSION

This study presents a bibliometric analysis of the integration of ethical perspectives in education within the frameworks of the Sustainable Development Goals (SDGs) and Society 5.0. The findings reveal increasing scholarly attention to ethical education, with notable growth observed in 2012 and 2023, corresponding to periods of societal and technological transformation. Although a minor decline was recorded in 2021 due to global challenges, the overall trend emphasizes the centrality of ethics in fostering inclusive and sustainable educational practices. Ethical education emerges not only as an academic area of interest but also as a foundational pillar for promoting societal resilience and sustainability.

The study highlights the growing incorporation of SDGs into educational curricula, particularly in recent years, demonstrating the critical importance of embedding ethical reasoning and sustainability awareness into learning frameworks. These developments underscore the necessity for educational models that harmonize technological innovation with ethical integrity, ensuring education continues to serve as a transformative catalyst for societal advancement.

The significance of this research lies in its contribution to understanding the evolving role of ethical education within the contexts of the SDGs and Society 5.0. Key trends, research gaps, and future opportunities are identified, emphasizing the alignment of education with sustainability and ethics. Future research should prioritize the development of actionable strategies for integrating ethics into technological and digital education to ensure equitable access and inclusivity. Longitudinal studies are also recommended to evaluate the long-term impact of ethical education initiatives on societal outcomes, particularly in the context of advancing technologies and shifting cultural norms. These efforts will support the creation of an education system that equips learners with both technical expertise and ethical awareness, fostering sustainable and equitable societal progress.

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