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Developing a Green Economy Based Economic Education Learning Model to Increase Student Participation

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A B S T R A C T

This study aims to design a green economy–based economics learning model to enhance student participation and support the achievement of the Sustainable Development Goals (SDGs). Using a bibliometric approach through citation and content analysis of leading journal articles, the research identifies trends and relationships in prior studies on economics education and the green economy. The findings show that integrating sustainability principles into economics learning significantly increases student participation and fosters greater awareness of environmental and social responsibility, indicating the model's effectiveness in promoting active and sustainability-oriented learning.

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INTRODUCTION

Developing a green economy-based economic learning model is crucial amid increasingly complex global challenges, such as climate change, environmental degradation, and social injustice. In this context, economic education that integrates sustainability principles serves not only to provide theoretical knowledge but also to shape students' proactive attitudes and behaviors in addressing environmental issues. By adopting a green economy approach, students are expected to understand the relationship between economic activity and its impact on the environment, as well as develop the skills necessary to create sustainable solutions. This aligns with the Sustainable Development Goals (SDGs), which emphasize the importance of quality education and environmental awareness as part of global efforts to achieve sustainable social and economic well-being.

The research problem formulation focuses on how a green economy-based economic learning model can be designed and implemented to increase student participation in the teaching and learning process. The bibliometric approach used in this study allows researchers to analyze relevant literature and identify trends and patterns in previous research on economic education and the green economy. Through this analysis, this study can reveal key elements that have been proven effective in increasing student participation and provide evidence-based recommendations for the development of more innovative learning models. Thus, the results of this study are expected to provide not only academic but also practical contributions to the development of educational curricula that are more responsive to current environmental challenges.

Thus, this study conducted a bibliometric analysis aimed at examining the development of a green economy-oriented economic education learning model with Problem-Based Learning and Project-Based Learning models based on the principles of Education for Sustainable Development (ESD) (Lehmann et al., 2025) (Habash, 2024). By increasing student participation in green economy-based learning, it is hoped that the younger generation can become active agents of change in creating a more sustainable and prosperous future.

LITERATURE REVIEW

Green Economy

In educational studies, green economics and economic education are interrelated in shaping students' attitudes, literacy, and participatory behavior towards sustainability. Several researchers have shown that economic literacy and environmental literacy simultaneously have a positive influence on students' green consumer behavior, with a learning approach that involves using the environment as a learning resource and active student interaction in real-life activities. For example, Pratiwi, Nuryatin, Prawirasuyasa, Suryani, & Agustira (2023) found that economic and environmental literacy significantly influence students' green consumer behavior, which is an important part of economic education that is responsive to ecological issues. (Tania Pratiwi et al., 2023)

Education

Educational approaches that emphasize the development of green entrepreneurship through curriculum integration and character education models are also widely discussed; the study "The Role of Education: Building Student Entrepreneurship Character Through Green Economy" states that project-based education with a green economy theme can foster entrepreneurial character that is innovative, independent, and environmentally responsible. (Li et al., 2023)

Green Economy Education

Environmental education also plays a role as a mediator that strengthens students' understanding of the green economy and participation through themes such as sustainable consumption, renewable resources, and the circular economy; research on the role of environmental education shows that the more frequently students are exposed to green economy materials through formal and non-formal education, the higher their awareness and involvement in green economy practices. (Marcia et al., 2025)

METHODOLOGY

This study uses a bibliometric approach to analyze research trends and developments related to the topic of "green economy" in the scientific literature (Rotondo et al., 2025). Data were collected from scientific databases by searching for the keyword "green economy" focused on the article title, abstract, and keywords (Yulianto et al., 2024). Next, the data were filtered based on the 2015–2025 timeframe. Then, they were further categorized based on relevant scientific fields, namely Business, Accounting, and Management and Economics, Econometrics, and Financ. The document type was limited to 1,373 articles and then filtered based on the English language, resulting in 1,305 documents. Finally, to increase the openness and accessibility of the research, documents with open access status were selected, resulting in 438 documents for further analysis. The analysis was conducted using bibliometric software such as VOSviewer to map keywords, authors, institutions, and key topic trends in "green economy" research, which aligns with the SDGs goals in the context of sustainable development (Donthu et al., 2021).

Article selection process and methods

The bibliographic data search mechanism in Scopus was implemented on March 10, 2025, with initial findings of 11,004 documents based on searches related to the TITLE ("green economy"). The selection process began with filtering over a specific period, namely 2015-2025, to obtain a final data of 6,417 documents. Then, it was continued with the "Subject Area" filter, namely "Business, Accounting, and Management AND economics, Econometrics, and Finance"), and obtained 1,807 documents. Continued using the "Document Type" filter, namely "Article", and obtained 1,373 related article titles. Next, the filtering was repeated using the "English Language" category and obtained 1,305 articles. These articles were further narrowed down to obtain 488 documents

with the "Open Access" filter. The entire selection process can be depicted in Figure 1.

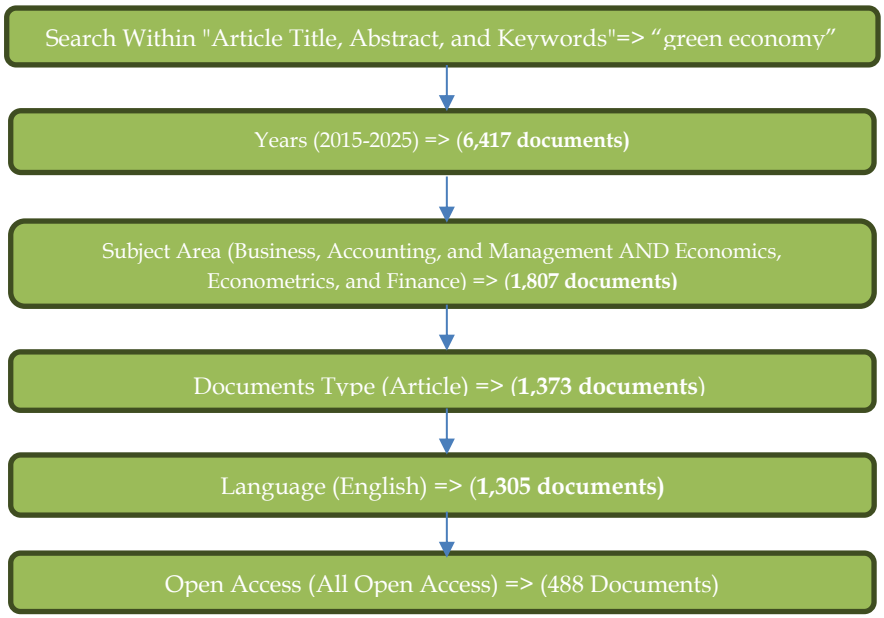

Figure. 1. Article Selection Process and Method

Data Analysis

The filtered data was extracted into a Microsoft Excel file (.csv) containing information such as institutional affiliation, author names, article titles, country of origin, journal names, and keywords used. This file was then analyzed to produce a descriptive overview relevant to the research focus. To visualize the bibliographic data, this study utilized Bibliometrix software, which offers various features for conducting a comprehensive bibliometric analysis of scientific publications, including the number of publications, citations, author collaboration networks, and keyword analysis. This software also provides standardized and consistent bibliometric indicators and measurements, ensuring reliable analysis results and comparability with other literature on similar topics, particularly in adaptive learning. The analysis was conducted both descriptively and quantitatively to uncover key information, such as article titles, the most productive journals or sources, the countries with the most contributions, and the institutions that publish most frequently. This study also explored citation patterns among authors through an analysis of author collaborations. Finally, trends in adaptive learning research to support the achievement of the SDGs were identified, including by analyzing key themes and keywords. The frequency and position of keywords in the knowledge network are used to indicate the level of popularity and relevance of a particular term in this research field.

RESEARCH RESULT

Main information

Table 1. Main information of bibiometric.

Descrition	Result
Timespan	2015:2023

Timespan	2015:2025
Sources (Journals, Books, etc)	151
Single-authored docs	40
References	0
MAIN INFORMATION ABOUT DATA	
Keywords Plus (ID)	539
International co-authorships %	38.38
Documents	198
DOCUMENT TYPES	
DOCUMENT CONTENTS	
Document Average Age	4.97
Co-Authors per Doc	2.61
Average citations per doc	18.97
Authors of single-authored docs	39
AUTHORS COLLABORATION	
AUTHORS	
Authors	505
Author's Keywords (DE)	736
article article	1

Table 1 shows the results of a bibliometric analysis related to the topic of "Green Economy" between 2015 and 2023. During this period, 151 sources (journals, books, and others) and 198 documents were analyzed, with a total of 539 references, and no documents were written by a single author. The percentage of international collaboration reached 38.38%, with an average of 2.61 authors per document and 18.97 citations per document. A total of 505 authors were involved in this publication, with 736 author keywords used. This analysis indicates that the topic of "Green Economy" developed collaboratively with extensive contributions from various authors and institutions. (Donthu et al., 2021)

Public Trends

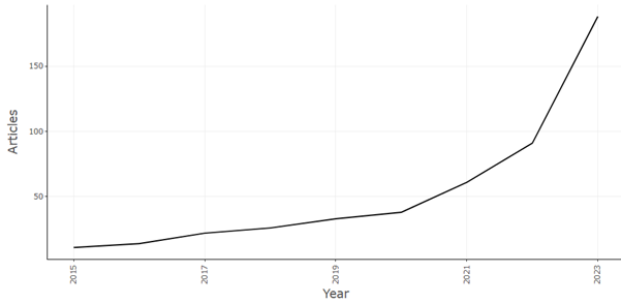

Figure. 2. Annual Scientific Production of Green Economy

Figure 2 shows a graph of Annual Scientific Production, showing the increasing trend in the number of scientific articles published annually on the topic of "Green Economy" from 2015 to 2023. Scientific production experienced steady growth at the beginning of the period, but began to show a significant surge after 2020, with a sharp increase in the number of publications reaching a peak in 2023. This reflects the growing attention and interest of researchers in green economy issues in recent years (Romero-Infante et al., 2022).

These data indicate that the Green Economy is no longer merely a normative discourse but has evolved into a strategic and applicable research field (Gao et al., 2019). The surge in publications after 2020 may have been driven by international commitments to the 2030 Agenda and the Paris Agreement, which encourage countries to accelerate the transition to sustainable economic development. This indicates that scientific research is beginning to become a crucial foundation for green policy formulation, environmentally friendly technological innovation, and economic transformation. The implications are far-reaching. Governments, the private sector, and higher education institutions need to strengthen collaboration to encourage solutions-based research within a green economy framework. (D'Amato et al., 2017)

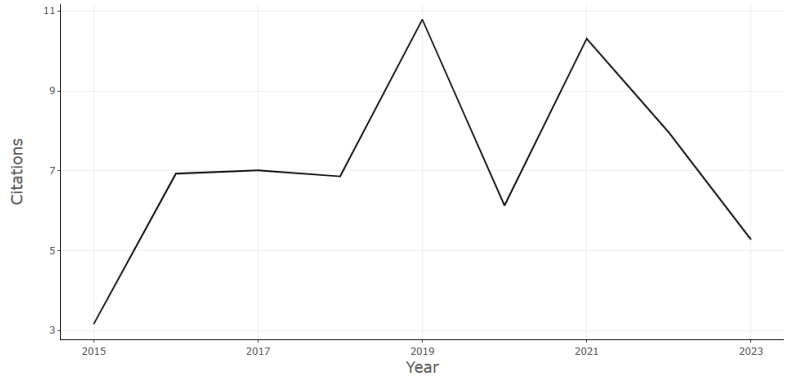

Figure. 3. Average citions per year

Figure 3 shows a graph of Average Citations per Year for scientific publications related to the topic of "Green Economy" from 2015 to 2023. This graph illustrates the fluctuation of the average number of citations per year, where there was a sharp increase in 2019 which reached a peak, then decreased in the following year (Dlimbetova et al., 2016). After that, the average citations increased again in 2021 before finally decreasing again until 2023. This pattern shows that the level of influence or relevance of publications to the scientific community changes every year, depending on the quality and topics discussed in the publication (Shavkatbek, 2025).

These fluctuations in average citations provide important insights into the importance of a publication's influence, not just quantity, but also quality and relevance within its temporal context. High citation rates in certain years may indicate that research findings from those years have become an important foundation for policy or technological innovation in the green economy (Budiyansa et al., 2023). This demonstrates that scientific literature serves not only as a source of knowledge but also plays a strategic role in shaping the direction of environmental and sustainable economic policies. From a practical

perspective, these data emphasize the importance of researchers identifying strategic moments or periods for publication to maximize impact (Mustapha, 2016). Research institutions and universities can also use this information to design research agendas that not only follow trends but also anticipate future needs. Understanding citation patterns is invaluable in evaluating the productivity and quality of scientific contributions at the national and global levels. (Bornmann & Daniel, 2008)

Researcher profile and source title

Top Writer

Table 2. List of top authors and their impact on Green Economy

Authors	Article	Article Fractionalizedh	Total Citation
PARRILLI MD	3	1.2	247
BURDETT K	2	0.7	23
CARRILLO-TUDELA C	2	0.7	23

Table 2 lists the top authors and their impact on the field of adaptive learning. The table lists three main authors: **PARRILLI MD, BURDETT K, and CARRILLO-TUDELA C. PARRILLI MD** is in first place with three articles, a fractionalized article value of 1.2, and a total of 247 citations, making him the author with the greatest influence among the three (Sampene et al., 2024). Meanwhile, **BURDETT K and CARRILLO-TUDELA C** each contributed two articles, with a fractionalized article value of 0.7 and the same number of citations, namely 23. These data indicate that although the number of articles written by **BURDETT K and CARRILLO-TUDELA C** is the same, their scientific influence or impact is still far below **PARRILLI MD** (Li et al., 2023). This table provides an overview of the individual contributions of authors to the development of adaptive learning studies, both in terms of the quantity of publications and their impact in the form of citations (Meng et al., 2024).

The importance of quality scientific work in shaping academic discourse on the green economy. Highly cited authors such as PARRILLI MD can be considered thought leaders in this field, whose work is widely referenced by other researchers. This is crucial for literature mapping and developing further research, as these authors can serve as primary references or even strategic collaboration partners in research. For academic institutions and policymakers, this data helps identify centers of academic excellence in the green economy (Telukdarie et al., 2024). Furthermore, measuring scientific contribution through metrics such as fractionalized articles and total citations provides a fairer and more detailed picture of academic influence, especially in an era of increasingly complex research collaborations (Ma et al., 2024).

Top Sources

Table 3. Top sources and their local impact

Authors	N	H_Index	G_Index	M_Index	TC	Py_Start
RESEARCH POLICY	6	6	0.545	426	6	2015
REVIEW OF ECONOMIC STUDIES	4	4	0.500	355	4	2018
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	4	6	0.364	104	6	2015
Source Name	**N**	**H_Index**	**G_Index**	**M_Index**	**TC**	**Py_Start**
Journal Of Economic Dynamics And Control	7	3	4	0.300	19	2024
Journal Of Money, Credit And Banking	6	5	6	0.455	84	2014
Knowledge-Based Systems	6	4	6	0.364	198	2015
Source Name	N	H_Index	G_Index	M_Index	TC	Py_Start
Journal Of Economic Dynamics And Control	7	3	4	0.300	19	2024
Journal Of Money, Credit And Banking	6	5	6	0.455	84	2014
Knowledge-Based Systems	6	4	6	0.364	198	2015

The table above displays two sections presenting bibliometric information from various scholarly journals considered primary sources in the fields of economics, finance, and knowledge-based systems. Each journal is assessed based on several indicators, such as the number of articles published (N), the H-Index, which measures citation productivity and impact, the G-Index, which gives more weight to highly cited articles, and the M-Index, which adjusts the H-Index for the length of publication (Zhu et al., 2024).. Additionally, total citations (TC) and the year of publication (Py_Start) are also listed to provide temporal context for the journal's performance. The first table lists three journals with outstanding performance: the Journal of Economic Dynamics and Control, the Journal of Money, Credit and Banking, and Knowledge-Based Systems. Of these,

Knowledge-Based Systems has the highest total citations (198) despite a similar number of articles to the other journals, indicating a significant impact from its publications since 2015 (Jose et al., 2025).

These indicators provide an overview of the journal's contribution and impact in the related research field. For example, the Journal of Money, Credit and Banking has the highest H-Index (5) and G-Index (6) with an M-Index of 0.455, indicating a high level of consistency and publication quality compared to other journals (Lu et al., 2024). On the other hand, Knowledge-Based Systems has the highest number of citations (198), indicating that this journal is highly cited in relevant studies, reflecting considerable local and global influence even though its H-Index is not as high as the Journal of Money, Credit and Banking (Wartoyo & Haida, 2023).

Meanwhile, the bottom of the table shows three additional journals: Research Policy, Review of Economic Studies, and Technological Forecasting and Social Change. Research Policy performed the highest with 426 total citations, an H-Index and G-Index of 6 each, and the highest M-Index (0.545), indicating consistency and significant influence on the development of the literature since 2015 (Gatti Junior et al., 2020). Review of Economic Studies, despite being launched later in 2018, performed well with an M-Index of 0.500 and 355 total citations. On the other hand, Technological Forecasting and Social Change had lower citation rates and M-Index despite having the highest G-Index (6), indicating the presence of some highly influential articles, but its overall impact is still limited compared to other journals. Overall, this table provides a comprehensive overview of the quality and relevance of key journals in supporting research in economics and technological innovation (Stanković et al., 2024).

The significance of this data in the research context is to show which journals are most relevant, influential, and frequently used in similar research (Murzyn et al., 2024). This is important because it can serve as a primary reference for future researchers in understanding the literature landscape and determining which journals they wish to publish their work in. Thus, this source analysis not only helps navigate the academic literature but also reflects the evolution of the field of study, the interrelationships between topics such as economics, technology, and education, and the urgency to adapt to technological developments in education (Xu & Shang, 2025).

Knowledge structures analysis

Conceptual Structure

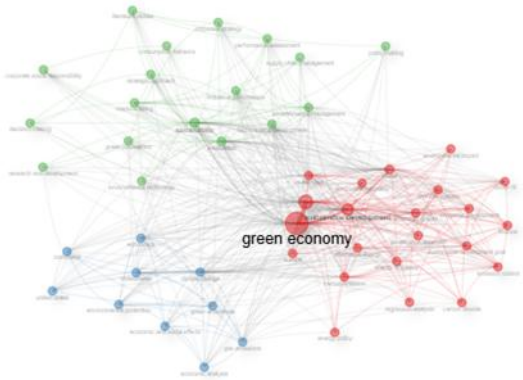

Figure 4. Co-occurrence Network

Figure 4 is a Co-occurrence Network visualization depicting the conceptual structure of the topic "green economy" based on the co-occurrence of keywords in various scientific publications. In this network map, the size of the circles indicates the frequency of occurrence of a keyword, while the lines connecting the nodes indicate the associative relationships or links between one keyword and another (Abo-Khalil, 2024).

The red cluster in this co-occurrence network consists of terms closely related to policy approaches and climate change mitigation strategies. The terms "sustainable development" and "climate change" are closely related to the core term "green economy," indicating that the green economy paradigm is inseparable from global efforts to address climate change and achieve sustainable development. The terms "policy" and "implementation" indicate the research's focus on the crucial role of public policy and regulatory frameworks as tools for realizing a green economy (Stanković et al., 2024).

Furthermore, the presence of keywords such as renewable energy and carbon emissions emphasizes the importance of the energy transition as a central element of a green economy, including decarbonization strategies and increased energy efficiency. The interconnectedness of these keywords creates a unified understanding that the green economy is not merely an abstract concept but requires a systematic approach involving policymaking, environmental protection, and structural changes within the economic system (Gatti Junior et al., 2020).

The green cluster demonstrates how the green economy relies not only on policies and technology but is also closely linked to the process of knowledge transfer, public education, and capacity building (Xu & Shang, 2025). The terms education and training indicate that the transformation towards a green economy requires the role of educational institutions in developing human resources who understand the principles of sustainability (Zhao et al., 2023). The terms innovation and knowledge indicate that science-based innovation is the foundation for promoting green practices, both in the industrial sector, government, and civil society (Kwilinski et al., 2025). Furthermore, terms such as awareness and capacity building emphasize the importance of increasing public

awareness and strengthening institutions for the implementation of a green economy to be comprehensive and sustainable (Wang et al., 2025).

The blue cluster in this linkage network focuses on the role of macroeconomics and financial instruments in supporting the transition to a green economy (C. Liu et al., 2025). Keywords such as economic growth and GDP reflect an orientation toward economic growth, but within a more sustainable framework. The presence of terms like green finance and investment indicates that green financing instruments such as green bonds, microfinance for environmentally friendly businesses, and green fiscal policy are important areas of study in this literature(X. Liu et al., 2025). Furthermore, the linkages with employment and markets demonstrate that the green economy also impacts labor market dynamics and the creation of new, environmentally friendly economic sectors, such as renewable energy and clean technology. Thus, the blue cluster demonstrates that the green economy is positioned not only as a tool for environmental conservation but also as a driver of inclusive and adaptive economic growth to global challenges (Hardi et al., 2025).

This network as a whole illustrates that the green economy is a multidisciplinary topic that connects various themes ranging from policy and technology to environmental issues and sustainable development. This visualization is important to understand how key concepts are interrelated and form a research map in the field of green economy (Zheng et al., 2023).

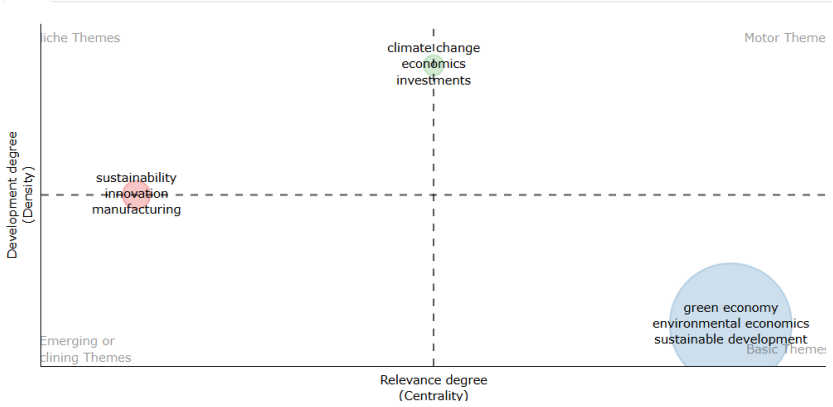

Figure 5. Thematic Map

Figure 4 shows a Thematic Map used to map research themes based on two main dimensions: centrality (degree of relevance) and density (degree of development). This map is divided into four quadrants: the upper right quadrant shows motor themes or core themes that have developed and are highly relevant, such as "climate change," "economics," and "investments." These themes play a crucial role in the knowledge structure and are key drivers in the research field analyzed (Ngare et al., 2022).

In the lower right quadrant (Basic Themes), terms such as "green economy," "environmental economics," and "sustainable development" form a very important basic theme. These themes have a high centrality value, meaning they are highly relevant and frequently appear in various studies. However, their density is low, indicating that, despite their importance, these themes are still developing in terms of internal structure or specialization. This reflects that the

concept of the green economy serves as a key foundation for discussions in the literature, yet remains open for further exploration and development (Gryaznova et al., 2020).

Meanwhile, in the upper right quadrant (Motor Themes), the terms climate change, economics, and investments emerge. These themes are highly relevant and well-developed in the literature, making them motor themes. This means that these themes are not only frequently discussed but also have a strong, in-depth structure of study, and serve as key drivers of research development in this field (Desha & Hargroves, 2014).

Conversely, the upper left quadrant (Niche Themes) contains terms such as sustainability, innovation, and manufacturing. These themes have high density but low centrality, meaning they have been discussed in depth in specific fields but are less connected to the main themes in the literature. These themes can be specific topics or specific case studies that are less general, but provide strong theoretical contributions within a limited scope (Micangeli et al., 2014).

Finally, the bottom left quadrant (Emerging or Declining Themes) does not show any prominent themes in this figure, which could mean that no topics are currently emerging or declining significantly, or that the data does not reflect rapid shifts in themes (Andersson et al., 2013).

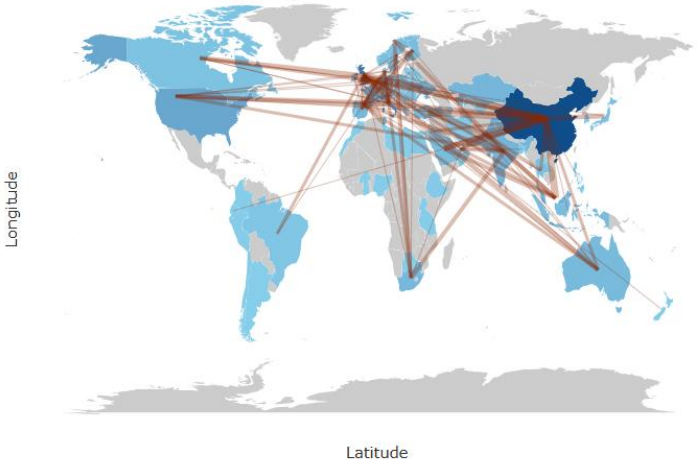

Figure 6. Countries' Collaboration World Map

Figure 5 shows the Countries' Collaboration World Map, a world map depicting international collaboration between countries in research, particularly on the topic of the green economy. The lines connecting countries indicate the flow of research collaboration, while the intensity of the blue color indicates the level of participation in the collaboration—the darker the color, the greater the country's role. China is the country with the most dominant collaborative contribution, indicated by the dark blue color and numerous connection lines leading to various countries in Europe, Asia, the Americas, and Australia (Badjeena et al., 2024).

This collaboration map shows that China is the most significant center of research activity in the green economy, indicated by the dark blue color and numerous connections to other countries. China is closely connected to countries

such as the United States, Germany, the United Kingdom, India, and Australia (Ngare et al., 2022).. Meanwhile, the United States also plays a significant role in facilitating cross-continental collaboration, particularly with European and Asian countries. The presence of a relatively dense network in the European region indicates a high level of cooperation among Western European countries on green economy topics. This cross-national collaboration is an important indicator that green economy research is not solely conducted domestically but also relies heavily on the transfer of knowledge, resources, and policy approaches across countries (Moshi et al., 2024).

This map also shows that European countries such as Germany, the United Kingdom, and France, as well as Asian countries such as India and South Korea, play a significant role in building global research networks (Zhu et al., 2024). Furthermore, this pattern demonstrates that issues related to the green economy and sustainable development have become global concerns, encouraging cross-regional collaboration to produce more inclusive and impactful scientific solutions. This map is important for understanding the geographic distribution of academic collaboration and identifying key centers of knowledge in the field.

CONCLUSIONS AND RECOMMENDATIONS

This research has successfully developed a green economy-based economics education learning model designed to increase student participation in the learning process while strengthening the link between the economics curriculum and the Sustainable Development Goals (SDGs). Supported by a bibliometric analysis of global literature related to the topic of green economy, the results of the study indicate that the integration of green economy principles into the learning process not only increases student engagement but also broadens their understanding of the role of economics in environmental sustainability and social development. This is in line with the finding that an active, contextual, and participatory pedagogical approach can significantly boost knowledge retention, critical thinking skills, and students' readiness to face real-world challenges.

Bibliometric analysis conducted using the Scopus database and Bibliometrix software indicates that the green economy is a rapidly growing research area with strong links to environmental education, management, and policy. International collaborations, key research themes, and top journal sources provide a strong foundation for relevant and data-driven curriculum design. Therefore, this study uses the Problem-Based Learning and Project-Based Learning models based on the principles of Education for Sustainable Development (ESD). This combination enables economics learning to be contextual, participatory, and relevant to real-world challenges, while contributing to future-oriented economics education policies. The implications of these findings suggest that integrating green economy values into learning can be the basis for developing economics education policies that are more adaptive, contextual, and relevant to current global challenges. For future research, it is recommended that this model be tested more broadly across various educational

levels and contexts, and further developed with the support of digital technology to strengthen student engagement in sustainability-based learning.

ADVANCED RESEARCH

Future research should advance this study by developing and empirically validating a multi-layered green economy learning framework that integrates Problem-Based Learning, Project-Based Learning, and data-driven digital learning ecosystems to enhance student engagement across diverse educational contexts. Scholars may incorporate learning analytics, AI-supported assessment, and real-time environmental data to evaluate how digital augmentation strengthens students' systems thinking, sustainability competencies, and long-term behavioral change. Cross-country comparative studies are also essential to examine how socio-cultural, institutional, and policy environments influence the adaptability and effectiveness of green economy–based pedagogical models. In addition, longitudinal designs can be used to assess the lasting impact of these learning interventions on students' ecological awareness, civic responsibility, and readiness to contribute to sustainable economic transitions.

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