

BIBLIOMETRIC RESEARCH ON THE ANALYSIS OF THE EVOLUTION OF THE EUROPEAN EDUCATIONAL AREA.

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Abstract

The present article proposes an analysis of how the European Education Area is approached within existing articles in the Web of Science database. Considering that the education system at the European level and at Romania's national level is continuously reformed, if teachers or researchers want to carry out research or implement projects regarding the state of the educational system, in addition to the official information that can be found, they also need specific information contained in the scientific research within the articles, which contain, in their body, the presentation of the phenomena, the description of the literature specific to the discussed issue, a research methodology and tool, specific results, and conclusions filtered through the experience and training of the authors of the articles. The research methodology consisted of the development of a bibliometric analysis in the field of European education, being carried out based on articles from the Web of Science platform. The query displayed 404 scientific articles containing "European educational space" in the document's title, abstract, or keywords. The results show that most articles address the field of higher education, and most authors are affiliated with higher education structures and even European consortia made by universities at the European level. Information on the chosen topic can also be gathered from within the consortia of the universities where the authors of the article are affiliated. The analysis of the clusters of the 404 analyzed articles with the VosViewer program showed that the articles can be grouped according to five of the six strategies adopted by the European Council for the creation of the European Education Area.

Keywords: European Education Area, bibliometric research, quantitative research, Vosviewer , Web of Science

J.E.L. classification: I 21, I 23, H75, N43,

1. Introduction

The present paper proposes the analysis of the stage in which the creation of the European Education Area (EEA) is approached in the scientific articles because the educational process is currently being reformed at both European and national levels. "Education is a very important socio-economic variable because investments in education influence the formation of human capital, which is an important factor for sustainable development. Education has contributed substantially to improving the quality of life in the last millennium in most countries, especially in the European Union's member states". (Dănăcică et al, 2023).

Thus, the European Commission wants to make the European Education Area a reality by 2025. At the end of this period, the goal is to create a space that will benefit participants in the educational process. In the second part of 2023, the European Commission will carry out and publish an analysis of the progress made in the creation of the EEA, which is intended to encourage the maintenance of the pace, the commitment, and the participation of all in its realization. Following this report, conclusions will be drawn on the progress achieved at the European level and the priorities of the actions necessary to be carried out to achieve the commitments for the period up to 2025 will be established. Thus, the premises will be ensured for the beginning of the second education reform cycle from 2026-2030, the one in which the European policy will be adapted to the reality and needs of the European education space or to any other major developments in the European Union. Considering these achievements at the European level, the funds made available for education, the structural changes made in the educational environment and the degree of adaptability to the new realities at the national, European and world levels stand out as research areas. (E.C. 2022 b)

At the national level, in 2023, the Pre-University Education Law no. 198/2023 and the Higher Education Law no. 199/2023 will be enforced 60 days after publication in the Official Gazette, i.e., on September 2, 2023. The educational and professional training systems in Romania are the trigger for training new generations for social-economic life. (Pirvu and Țenea, 2021). A future research point that the authors would look at will be how the new legal provisions ensure education reforms in the European context.

If a researcher proposes an analysis of the progress of the implementation of the European Education Area for the realization of a scientific article or for the implementation of an education reform project, in addition to the data obtained from the official sources of the European Commission and of the national structures within each European state another source is the individual research carried out in scientific articles. Thus, in this work, the authors tried to analyse how to treat this aspect through scientific articles, because each article contains a presentation of the phenomenon, has an analysis of the literature present at the time of publication and each article investigates an aspect of the implementation of the educational system reform. Following the application of the filters and the "European educational space" theme, our selection contains 404 scientific articles and following the bibliometric analysis, it is observed that the studies within the scientific articles partially overlap as definitions over the strategies of the European Commission, especially for higher education.

2. Literature review

The EEA provides for a total of 40 actions at EU level, of which 14 are strategic initiatives on the EEA to be decided by the College of Commissioners, most of which are jointly implemented by the Commission and the Council.

These initiatives provide a framework for action and policy guidelines to make progress in the main areas of intervention for reform and European cooperation. The Commission has already proposed eight of these initiatives and the Council has adopted six of them:

Table no. 1 Strategic EEA initiatives already adopted.

Action	Area of intervention
<i>Inclusion measures framework for the Erasmus+ and European Solidarity Corps programs 2021-2027: measures to promote inclusion, equity and diversity in both programs.</i>	Quality, equity, inclusion and gender equality
<i>Blended learning approaches for high-quality and inclusive primary and secondary education: combining learning environments and tools to build more resilient primary and secondary education and training systems in the context of the COVID-19 pandemic.</i>	The digital transition
<i>Mobility of young volunteers in the EU: providing opportunities for young people to volunteer in other EU countries by increasing inclusion, quality, recognition and sustainability.</i>	Quality, equity, inclusion and gender equality
<i>European strategy for universities: supporting the higher education sector to cope with changing conditions and strengthening cross-border cooperation</i>	Higher education
<i>Building bridges for effective European cooperation in higher education: achieving deeper cooperation by supporting alliances of higher education institutions to develop joint programs and initiatives</i>	Higher education
<i>European approach to micro-certificates for lifelong learning and employability: The Council wishes to support providers of micro-certificates, and thus learners, by introducing a unified EU-wide approach to their issuance and use, thus increasing inclusion and equality of chances.</i>	Lifelong learning and mobility

Source Commission Communication SWD(2022) 750 final} - {SWD(2022) 751 final

In addition to these strategic initiatives to be adopted by the Commission and the Council, other important actions to support policy reform and cooperation between education and training institutions have been launched in the period 2021-2022, often involving financial support from the European Union.

Table no. 2 Selected EU-funded EEA actions

Action	Applying	Area of intervention
Jean Monnet actions for schools and VET	Annual calls for proposals from 2021 to promote active citizenship and learning about the EU in Erasmus+ countries. EUR 15 million under the Erasmus+ program 2021-2022: teacher training; school networks; learning about the EU for innovative ways to teach about the EU, its policies and values	Quality, equity, inclusion and gender equality
Centers of professional excellence	Over €90 million for 25 Erasmus+ projects for 2021 and 2022 to drive reforms and ensure high-quality skills and competences that contribute to quality jobs and career opportunities that to meet the needs of an innovative, inclusive and sustainable economy	Quality, equity, inclusion and gender equality
Girls and women in STEM and ICT fields	Digital and entrepreneurial skills for girls and women; European Institute of Innovation and Technology's Girls Go Circular project and knowledge and innovation communities: the program was completed in 2021 by 11,205 students, 7,682 of whom were girls, with 10,000 girls participating in the program by the end of 2022 from 10 countries; ESTEAM online communities for girls and women were established and in 2022, 5 ESTEAM festivals were organized to develop entrepreneurial skills and skills in STIAM (Science, Technology, Engineering, Arts and Mathematics) fields	The digital transition

Climate Education Coalition	A bottom-up, co-created initiative to engage EU, national and local education communities to share initiatives to support green skills development and behaviour change. Climate Education Platform, Climate Education Day celebrated every year, 10 active community challenges, mobilizing over 4,400 official community members	The green transition
Erasmus+ academies for teachers	Annual calls for proposals to support networks of teacher training providers in order to develop and test effective, innovative and transferable programs that increase the European dimension and level of internationalization of teacher training according to EEA priorities. Academies develop and test innovative models of teacher mobility. In 2022, 11 teacher academies were launched. EUR 37.5 million under the Erasmus+ program 2021-2022	Teachers and trainers
European award for innovative teaching	Annual award for presenting innovative teaching practices in line with EEA priorities (2021: distance learning and blended learning; 2022: promoting creativity and sustainability). 104 projects from 31 countries participating in the Erasmus+ program were awarded in 2021; 98 projects from 29 countries participating in the Erasmus+ program were awarded in 2022	Teachers and trainers
European Universities Initiative	Continue the implementation of the European Universities initiative, with the support of transnational alliances of higher education institutions that develop long-term structural, strategic and sustainable cooperation, creating inter-university campuses. 44 European universities. €1.1 billion of funding under Erasmus+ 2021-2027	Higher education
Intensification of cooperation with the Western Balkans	Agenda on innovation, research, education, culture, youth and sport for the Western Balkans and the approach based on a strengthened partnership with the Western Balkans. The accession of North Macedonia and Serbia to the Erasmus+ program and the accession of North Macedonia to the European Solidarity Corps. Implementation of the economic and investment plan for the Western Balkans, with a focus on human capital development	The geopolitical dimension

Source Commission Communication SWD (2022) 750 final} - {SWD (2022) 751 final

Thus, some EU initiatives are worth mentioning: *Climate Education Coalition* connects EU teachers and researchers and provides several facilities such as a forum and a resource sharing platform (Education for Climate Coalition, 2022) (Mirică et al., 2023).

The additional actions needed to achieve the EEA by 2025 comprise six EU-wide strategic initiatives being developed:

Table no. 3 EEA strategic initiatives to be adopted by 2025.

Action	Area of intervention
<i>Enabling factors for digital education:</i> the aim will be to support Member States in the digital transformation of their education and training systems by highlighting the key enabling factors for effective and inclusive digital education.	The digital transition
<i>Improving the supply of digital skills in education and training:</i> the aim will be to support Member States to face common challenges related to the level of digital skills of different segments of the population and increase the capacity of their education and training systems to ensure the supply of digital skills.	The digital transition
<i>European Learning Mobility Framework:</i> The aim will be to promote transnational learning mobility at all levels, identify remaining barriers and provide guidance on how to overcome these barriers.	Lifelong learning and mobility
<i>European quality assurance and recognition system:</i> the objective will be to review current quality assurance and recognition mechanisms and ensure their	Higher education

fitness for purpose in the context of an ever-evolving landscape of higher education.	
<i>Common European Diploma Label</i> : the aim is to test the diploma label, which will be issued voluntarily to certify the learning outcomes acquired and the competencies developed within the framework of common European programs involving deep transnational cooperation.	Higher education
<i>A possible legal status for alliances of higher education institutions</i> : the objective is to test a program that involves deeper cooperation between higher education institutions through institutionalized tools that allow the exchange of human, technical, data, educational and of research and innovation, as appropriate.	Higher education

Source Commission Communication SWD (2022) 750 final } - {SWD (2022) 751 final

The Commission is working to ensure that the previously mentioned strategic initiatives (in table number 3) are adopted by 2025 and provides support for Member States to implement all strategic initiatives on the EEA. The design of new EEA strategic initiatives as well as the experience of monitoring all EEA initiatives at the national level will be discussed in the mid-term review in 2023. By the end of 2023, the Commission will propose a European framework for learning mobility, so that learning periods spent on internships abroad become the norm rather than the exception. The new framework will encourage Member States to make mobility experiences a valuable part of all education and training pathways and to integrate the opportunity for mobility into education and training programmes.

In the period 2022-2023, projects funded by the Erasmus+ program tested a common European diploma label, based on European criteria, as well as institutionalized cooperation tools to facilitate closer cooperation between higher education institutions at European level, thus testing the concept of a possible legal status for alliances of higher education institutions. Based on the results of these pilot projects, the next steps will be determined together with Member States and stakeholders. (E.C. 2022 a)

In addition to the analysis of the progress, financing and accession proposals of the European Commission, an analysis of the aspects dealt with in the articles of our selection is also required. We will also carry out bibliometric analysis of the articles and conclude what we need to follow and how we need to combine the information so that we have an overview of the current stage of the creation of the European Education Area, of the existing funding to carry out the reforms necessary to reach the set targets at European level and of the steps to follow in the next period so as to reach the sustainability objectives for 2030.

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A population educated and qualified to high European standards is essential for the efficient creation, acquisition, dissemination, and use of relevant knowledge, which tends to increase total factor productivity and, therefore, economic growth. (Nicolae, 2010).

” Regardless of the professional role in which the future specialists will act, namely the role of creator (research, design, organization) or the role of a creative beneficiary (programming-development, management), the educational process in which they are trained must consider the structuring of creative capacities to satisfy the social requirement of progress. Group activities by

stimulating cooperation at the European level stimulate the creation of ideas and often the ideas of some people are generated, or the ideas of others are enriched” (Ignat, 2019).

In the context of the COVID-19 pandemic, given the forced transition from face-to-face teaching to online education (Catană et al, 2022), online platforms have become the support for students around the world. The courses have undergone countless improvements to contribute to the economic recovery after the pandemic, offering effective business ideas, new cyber skills to use electronic platforms and applications, technology training and various language courses. (Szabo, 2021). Education is currently faced with overcoming multiple crises, a growing economic recession, and a state of armed conflict existing at the European level. Continuing the educational process in adverse conditions: natural disasters, recession, isolation, war, etc. aimed at adapting specific technologies and strategies to the available resources, with a particular preference for the use of different IT tools for distance communication. (Jianu et al, 2022)

Education represents a very complex activity and is often complicated, it represents an adventure in the realm of human knowledge, from the origins to the present, but through this journey, or for this journey to be more captivating, we must also have a very well-prepared presenter. That is why, in the opinion of some, online education is a loss compared to offline, and in the view of others, online teaching is adapted to current needs (Stegăroiu, 2020). To make the most of the digital transformation imposed by current realities (post-pandemic evolution, educational reforms promoted by the EC), actors in the educational environment need a wide” range of cognitive skills in addition to digital capabilities that represent creativity, problem-solving and socio-emotional skills. Given that a substantial part of our lives is spent in educational settings for acquiring skills and preparing for a career, societal changes, developing skills and learning are becoming increasingly linked”. (Fleaca et al, 2022)

” Each university is free to define its curriculum according to its field and the experience of its human resources, but in the current context of promoting cooperation at European level and creating European university consortium higher education institutions are in a continuous process adapting the curriculum and practices considering the sustainability objectives for 2030” (Dumitrescu et al, 2022).

In the current context of global challenges, closer cooperation between European higher education institutions is required, the role of higher education institutions on the world stage is simulated, making Europe a pioneer in effectively solving global challenges, a source of inspiration worldwide and an attractive destination for students, academics and researchers. Through the implementation of the European Research Area, the mobility of researchers and the flow of knowledge, the stimulation of investments in research and innovation will be strengthened. (E.C. 2022 b)

European cooperation in education and training is a strategic priority in establishing the EEA, which emphasises the need to integrate knowledge related to sustainability and adaptability at all levels and types of education to consider the changes implemented at the European and national levels. (Fleaca et al, 2023).

3. Research methodology

To make the comparison we proposed for this article, we will biometrically analyse the data from the Web of Science using the World Art and Vosviewer programs. Thus, from the analysis of the existing documentation at the level of the European Commission and that existing within the articles in our selection, we can generate new points of view regarding the application of the European Education Area.

Web of Science data is an open educational resource that can be accessed by a multitude of researchers at any time from any corner of the world. The term "open" shows how users have access to the resource, which involves 0 costs to them, but with certain conditions regarding copyright and non-distribution for commercial purposes. (Brătășanu, 2023)

Bibliometrics has its starting point in bibliography and statistical bibliography and has its roots in librarianship. The terminology of bibliometrics was defined by Pritchard, who presented it as the application of mathematical and statistical methods to books and other means of communication. Currently, bibliometrics is useful in exploring scientific documentation and for academic presentations (Yang, et al., 2020).

For the bibliometric analysis, we chose to use the existing scientific articles in the Web of Science database. The first query was for the tag "European educational space", without filters, the result was 809 articles. Analysing the annual density of article publications, we decided to limit the research period between 2017-2023, and after this filter, 443 articles remained in the selection. I chose 2017 as the starting year because that was when the Rome Declaration was signed, and the commitment was to act for a *Union where young people receive the best education and training and where they can study and find jobs across the continent*. The year 2013 was chosen because even if it is half, it has 138 citations of articles written in previous years. The last filter applied to our selection was represented by the country of origin of the authors, European countries, with a result of 404 articles. With this number of articles, the bibliometric analysis was undertaken.

In the study within the present article quantitative (number of articles by year, by country, affiliation) and qualitative (phrase and word frequencies) evaluations to capture as many relationships as possible between the articles and the theme of our research. (Moiceanu and Paraschiv, 2022)

The first approach on bibliometric analysis and density analysis, which were performed according to year of publication, the number of articles per country (also via WOSviewer), affiliation and the funding organization.

Next, we carried out a comparative analysis starting from the word density through the word cloud, to see the association of words often used in association with "*europaean educational space*", according to the *name of the articles, the abstract, author keywords and keywords plus*.

The following analysis was carried out by means of the WOSviewer software, to identify the density of phrases or words used within those articles in the selection. I used filters *co-occurrence, author keywords, fractional counting, minimum 6 co-occurrences*. "Co-occurrence networks are generated when connecting pairs of items using a specific set of co-occurrences that define the criteria set when using the WOSviewer software" (Radu et al, 2022)

In this part of the research, we also analysed the 6 resulting clusters by associating them with the existing policies at the EU level.

4. Results

A first query of the Web of Science database for the tag "*europaean educational space*", without filters, resulted in 809 articles. Analysing the annual density of article publications, we decided to limit the research period between 2017-2023, and after this filter, 443 articles remained in the selection. The last filter applied to our selection was represented by the author's country of origin, European countries, resulting in 404 articles. Graphically, these searches can be presented as follows:

Table no. 4 Filters used when querying Web of Science

Filter applied	Item number in the selection
<i>europaean educational space</i>	809
Publication years 2017-2023	443
Origin of the authors - Europe	404

I also checked if there is any bibliometric analysis in this selection, and the result was only one article, namely "Active Learning in an Environment of Innovative Training and Sustainability. Mapping of the Conceptual Structure of Research Fronts through a Bibliometric Analysis" but this

analysis was carried out in 2020. Thus, the bibliometric analysis in this article will include current data for 3 years.

The year distribution of articles for the selected period was as follows:

Table no. 5 Distribution of the 404 articles retrieved from the Web of Science query.

Year	2017	2018	2019	2020	2021	2022	2023
Number articles	69	56	76	69	73	45	16

Source: Web of Science database (accessed on 27.07.2023)

Through bibliometric analysis and density analysis, authors' origin from Europe was classified for the first 9 countries as follows:

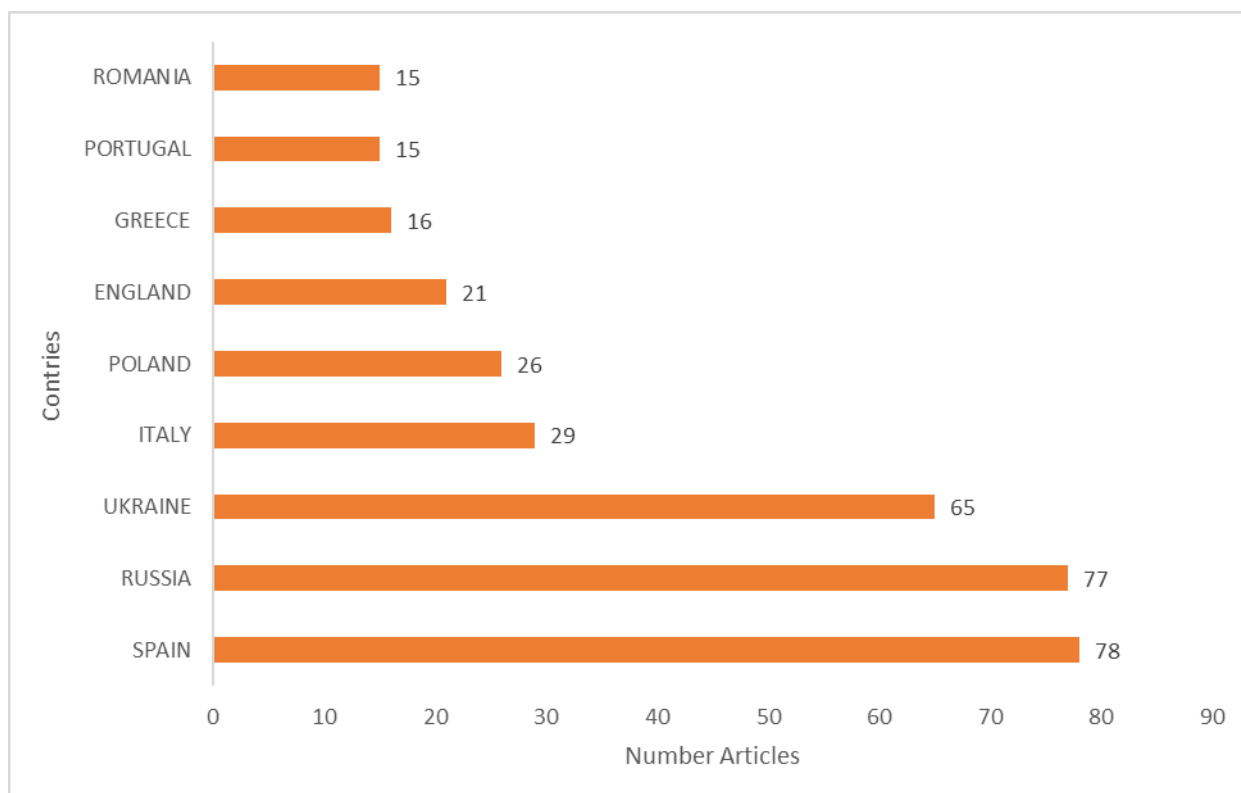


Figure no. 1 Origin of authors for the top 9 countries retrieved from the Web of Science query.
Source: Own conceptualization, data processing from Web of Science (accessed on 27.07.2023).

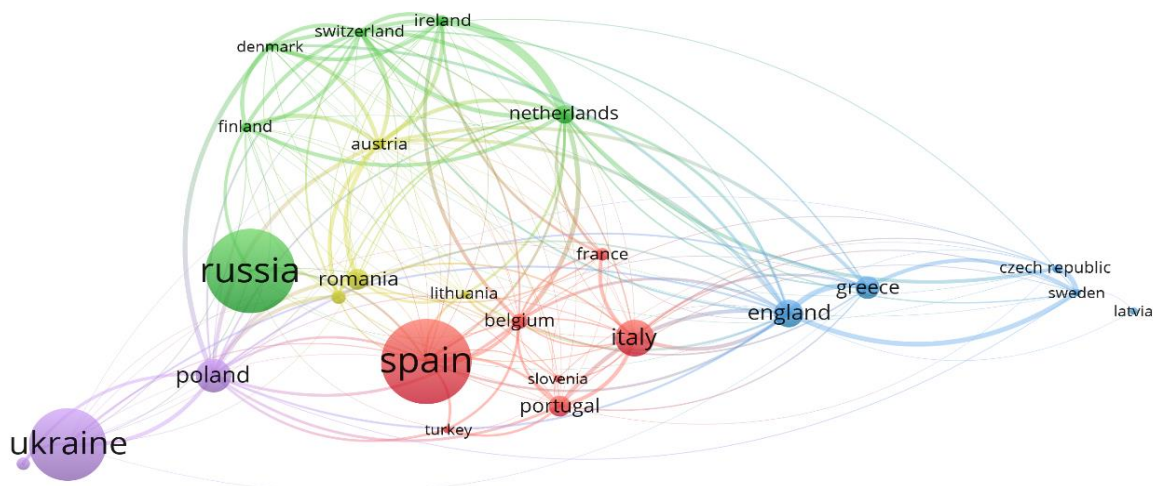


Figure no. 2 Origin of authors for the top 9 countries retrieved from the Web of Science query.
Source: Own conceptualization, data processing from WOS (accessed on 27.07.2023) with VOSviewer software.

VOSviewer helps us to see the links between articles in addition to the actual number. Thus, following the analysis, we have the following:

Table no. 6 Links between analysed articles by country of origin

Country	Documents	Citations	Total link strength
Netherlands	13	203	1163
Ireland	7	141	850
England	21	162	815
Austria	7	203	810
Poland	26	133	732

Source: Own conceptualization, data processing from WOS (accessed on 27.07.2023) with the VOSviewer software.

Another analysis undertaken in our research is that of the affiliation of the authors of the articles.

Table no. 7 Affiliation inferred from a Web of Science query.

Affiliations	Record Count
MINISTRY OF EDUCATION SCIENCE OF UKRAINE	54
ARQUS	11
CIVIS	10
NATIONAL ACADEMY OF EDUCATIONAL SCIENCES OF UKRAINE	10
RUSSIAN ACADEMY OF SCIENCES	9
PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA	8
UNIVERSIDAD POLITECNICA DE MADRID	8
CHARM-EU	7
UNIVERSIDADE DE LISBOA	7
UNIVERSITY OF GRANADA	7

Source: Own conceptualization, data processing from WOS (accessed on 27.07.2023).

It is observed that within these results, most affiliates are the authors of scientific articles from the university academic environment. In Ukraine and Russia, most of the articles are published under affiliation with government structures. ARQUS is an alliance made up of 9 European universities, CIVIS is an alliance made up of 11 European universities including the University of Bucharest and CHARM-EU is an alliance made up of 9 European universities. Thus,

we can conclude that articles on the European educational space are promoted at the level of university consortia created at the European level.

When analysing the funders of the 404 articles, only 96 articles had information on their funding, and the hierarchy of the top 11 sources was:

Table no. 8 Top 11 funding sources from Web of Science query

Funding Agencies	Publications
European Union Eu	15
European Commission Joint Research Centre	8
Fundacao Para A Ciencia E a Tecnologia Fct	6
Russian Foundation for Basic Research Rfbr	6
Erasmus	4
Rudn University Program 5 100	4
Eu H2020 Ahead2020 Project	3
Horizon 2020	3
Irish Research Council for Science Engineering and Technology	3
Science Foundation Ireland	3
Spanish Government	3

Source: Own conceptualization, data processing from WOS (accessed on 27.07.2023).

From this analysis regarding the funding source, the main financier of the scientific articles that dealt with the European educational space is the EU through various programs for several 33 articles. Thus, we can conclude that in addition to its own analyses, the EU has also funded independent studies by researchers. Corroborating with the information from the previous analysis, we can affirm that within the Horizon 2020 program, part of the research carried out at the level of the European university consortia was also focused on the analysis of the European educational space.

Another conclusion emerging from this analysis is that only 24% of the 404 articles in our selection mentioned a funding source, the rest for publication being supported by the researchers or the organizations where they are affiliated. So, the subject of the European educational space is of interest to many authors of scientific articles.

The first qualitative analysis of the sample of articles was carried out through the word cloud regarding the words contained in the article title, author keywords, plus keywords and abstracts. Plus keywords in a bibliometric analysis are as effective as author keywords in investigating the structure of knowledge in a given scientific field. However, they may be less exhaustive when representing the content of the article" (Rodríguez-Sabiote et al, 2020) The words with the highest frequency of use were: *Educate, European, Develop, Space, Student, Culture, Learn, Research, Study, Universe, Process, School, Higher, Social, Language, Active, Inform*. From the analysis of the frequency of the words, the conclusion emerges that the scientific articles are oriented towards research, modifications, and targets that have the student at the centre. The graphical representation is as follows:

Cluster 1 (5 items)	Cluster 2 (5 items)	Cluster 3 (5 items)
higher education students sustainability teachers teaching	academic mobility educational space europe mobility spain	citizenship european union governance policy space
Cluster 4 (5 items)	Cluster 5 (4 items)	Cluster 6 (2 items)
architecture culture innovation leadership performance	education globalization technology university	bologna process educational process

Source: Own conceptualization, data processing from WOS with VOSviewer (accessed on 27.07.2023).

The first cluster is specific to the EC action *Building bridges for effective European cooperation in the field of higher education*, the second cluster is specific to the EC action *European strategy for universities*, cluster 3 to the action *Mobility of young volunteers in the EU*, cluster 4 to the action *Based approaches on blended learning for high-quality and inclusive primary and secondary education*., cluster 5 for the action *Building bridges for effective European cooperation in the field of higher education* and cluster 6 for the action *Framework of Inclusion Measures for Erasmus+ programmes*. We see that only the action *European approach to micro-certificates for lifelong learning and employability* cannot be assigned to a group of scientific articles. Perhaps to capture the specific aspects of this action we should perform a query specific to this domain.

Limitations of the study

In order to correctly evaluate the results of a high-quality bibliometric analysis, it is necessary to mention its limits.

First, the analysis was performed using only platform data from Web of Science, therefore further studies should address other databases as well.

Second, even though this study had quantitative and qualitative assessments, some important aspects may be lost due to the filter selection because some scientific articles were excluded. In addition, bibliometric maps/networks can be extended beyond the current study to show networks of co-authors, co-words, correlations between membership groups, etc.

5. Conclusions

The bibliometric analysis conducted in this paper is a tool through which researchers can observe the status of a selected topic.

Following the bibliometric-bibliometric analysis of the scientific articles in the selection, the authors found that the main research on EEA is carried out at the university level. At European level, the European Commission is committed to making the European Education Area a reality by 2025. Any reform must be supported financially and a new research path would be to study, at European level, the attraction of funds from programs intended for higher education: funds of cohesion policy at the European level, funds from the Recovery and Resilience Mechanism, the main instrument of the Next Generation EU program, and the Erasmus+ program, whose budget is twice as large as that of the 2014-2020 period (over 26 billion euros), can be game changers in achieving the objectives of the European Education Area at all levels. (E.C. 2022 c)

If an author wants to conduct EEA-specific research in areas of interest, such as the quality of the educational process, equity, inclusion, and gender equality, and the digital transition of higher education, he can apply the words found in the six clusters as filters in the selection from the Web of Science. Thus, you will obtain a group of articles that have links between them and respond to the theme of interest.

In the future, the authors can use as sources of information the materials from the consortia where the Polytechnic University of Bucharest, West University of Timișoara, University of Life Sciences "King Michael I," University of Medicine and Pharmacy Timișoara, the affiliated universities of the authors are members, considering the European Commission's priorities and the sources of funding placed in the dissociation of the creation and development of university consortia at the European level.

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