

The concept of "environmental sustainability" in scientific and information space

N Pavlyk, N Seiko and S Sytniakivska

Department of Social Technologies, Zhytomyr Ivan Franko State University,
V. Berdychivska str., 40, 10008 Zhytomyr, Ukraine

E-mail: pavnad@ukr.net

Abstract. The main idea of the study is based on the assumption that the level of representation of a term in scientific journals and articles can represent the main stages of this term formation in scientific discourse. The analysis of the representation of the term "environmental sustainability" in open access scientific journals provides an opportunity to explore the basic patterns of development the idea of environmental sustainability in certain areas of knowledge. The aim of the study is to analyze statistical data on the use of the term "environmental sustainability" in scientific journals to outline the scope of scientific content of environmental sustainability in scientific and information space. The analysis was carried out in two directions: the use of the term in certain areas of research; general presentation of the term in the scientific apparatus of articles. It is established that the leading factors of general social content, which led to the emergence of the concept of ecological sustainability in scientific texts, were global environmental problems. The dynamics of using the term over the past few decades is described and three main stages of this concept implementation in the scientific and information space are identified: fragmentary, gradual stability and dynamic.

1. Introduction

Modern education needs to change its educational paradigm according to the Sustainable Development Goals and the United Nations General Assembly Resolution 2030 Agenda for Sustainable Development. Pursuant to this document, the priority task for the international community, countries, governments, business, public initiatives, educational institutions is to ensure sustainable development. The model of sustainable development is implemented through comprehensive and balanced support of economic, social and environmental components.

There is a strong link between the social and economic well-being of each individual and the sustainability of their environment. The first component determines the creation of conditions for personal self-realization in conditions of dignity and equality. The second is ecological transformation in order to ensure the health of the environment, the preservation of the planet and all its resources (air, land, river, lakes, oceans, seas). This relationship allows us to define environmental sustainability as the initial value and prerequisite condition for all social changes. Environmental sustainability, introduced within the framework of the Earth Charter Initiative, involves not only the implementation of the sixteen principles outlined by this initiative, but also the creation of an appropriate information space around the problem of environmental sustainability.



Such a space encourages scientific, research analysis of environmental sustainability; it is concentrated in scientific publications, analytical reports, legal documents, etc. The role of education in solving modern global and local problems in the direction of ensuring environmental sustainability is described in the following papers: Manuela Messi on the creation of new emancipatory narratives that put at the center of educational activities the human person and its original role in building peace, development, justice [1]; Luis Francisco Miranda, Jorge Oswaldo Sánchez Buitrago, Javier de Jesús Vilorio Escobar and their works in the main areas of research on environmental sustainability in universities: environmental education, integration of environmental sustainability, environmental protection [2]; Edinei Aparecido Mora, Patrícia Pereira Gomes, Norma Barbado, in their work the connection of ecological, social and economic ideas of primary school children is shown, based on the initial idea of the child's sense of belonging [3]; M. M. Sulphrey, Shaha Faisal, who in their scientific research proceed from the hypothesis of the existence of a relationship between the environmental behavior of individuals due to the presence of an attitude to care for the environment and environmental sustainability [4]; a team of authors from the Environmental Association of Southern Africa (Sharon Bramwell-Lalor, Keith Kelly, Therese Ferguson, Carol Hordatt Gentles, Carmel Rooft), who describe cases of incitement of students, graduate students, teachers to measures concerning preservation the environment and sustainable development through specially organized educational activities [5].

Analysis of modern research on the problem of environmental sustainability shows that only some scientific studies relate to the relationship between education and sustainable development, implement the principle of interdisciplinary concept of "environmental sustainability", and present the results of empirical research of psychological, social, pedagogical and other prerequisites for ensuring environmental sustainability in order to achieve the goals of sustainable development. Due to the presence of unresolved research issues within environmental sustainability and education in the scientific and information space, we have identified two key issues in our research:

1. What is the level of representation of the concept "environmental sustainability" in certain areas of scientific knowledge?
2. Are there separate patterns and stages of scientific research of ecological sustainability in scientific publications of recent decades?

The search for answers to these questions led to the choice of research topic and its purpose that is to analyze statistics on the use of the term "environmental sustainability" in scientific journals to outline the scope of scientific interests and scientific content of environmental sustainability in the scientific and information space.

2. Methodology and research methods

Documentary research methodologies or the use of documentary sources in social research involves the analysis of documents that contain information about the studied process or phenomenon in order to characterize, systematize, interpret. The advantage of using such a methodology may be a higher level of the study objectivity, as documents exist outside the subjectivity (attitude, speech, evaluation) of certain individuals [6]. The idea of using open databases of scientific journals as a source of documents to study the representation of certain concepts and terms in the scientific space belongs to Daniel Moxon, who used this methodology to study the level of children and youth participation in political and social processes [7].

The idea of the study is based on the assumption that the level of representation of a certain term in scientific journals and articles may represent the main stages and patterns of formation of this term in scientific discourse. Accordingly, the analysis of the representation of the term "environmental sustainability" in open access scientific journals will allow us to explore the basic patterns of formation and development of the idea of environmental sustainability in certain areas of knowledge.

Accordingly, we collected data using the EBSCO search database, the Directory of Open Access Journals (DOAJ) (<https://doaj.org/>), which provides access to open access scientific journals and represents more than 6 million articles. Key word combination to search in the database is

"Environmental Sustainability"; the analysis was carried out in two directions: the use of the term in certain areas of research; general presentation of the term in the scientific apparatus of articles (title, keywords, abstracts).

The search time limits were determined automatically: the lower limit (1997) is the year of the first publication using the term "Environmental Sustainability"; upper limit (2021) is the date of our study.

3. Interdisciplinarity of the concept of ecological sustainability

The concept of ecological sustainability, despite its seemingly obvious affiliation with the natural sciences, is in fact a purely interdisciplinary concept, and contains the actual ecological, economic, social, ethical content. In a literal sense, ecological sustainability is an innovative concept of human functioning that defines a way of life that ensures the preservation of the environment in all its manifestations. This term is relatively young; it has been used since the First World Conference on the Environment in Stockholm (1972) [8]. In connection with insufficient development of the concept of ecological sustainability it is variously interpreted in scientific sources: as type of interaction of the person and environment; as a philosophy of human existence in the post-postmodern social space; as a process and result of the transformation of all social institutions in favour of a stable state of human life and nature [9]; as a balance between socio-economic and socio-environmental human needs [10].

At the same time, it was impossible to identify scientific investigations that would directly link the problems of education and environmental sustainability, or analyze the interdependence of these scientific concepts. Education is most often associated in scientific publications with the ecological worldview (M. Kiselyov [11]), ecological competence (O. Dzham [12]), ecological culture (N. Demchenko [13]) or consciousness (V. Akopyan [14]), or the concept of ecological education is considered (S. Boychenko and T. Saenko [15]) as a partial manifestation of environmental sustainability.

Instead, the concept of sustainability is mainly considered in the context of sustainable development, where ecology occupies a significant but subordinate place in the system of other concepts – development, sustainability, support, and others. In addition, research on environmental sustainability is concentrated mainly in sectoral segments of science – ecology, biology, geography; instead, the social sciences rarely choose ecological sustainability as the object of study. Ecological sustainability is directly connected with a problem of maintenance of people's quality of life, including their educational, sociocultural, social and economic level. According to Bookchin's research (2007) [16], the social mission of ecological sustainability (to which we include educational and socialization processes) is almost more important than the traditional conservation of biodiversity.

Ecological sustainability for education, in our opinion, determines the set of relevant knowledge and skills of each citizen (through the system of formal and non-formal environmental education, and by intensifying the activities of NGOs, local communities and each family as an educational institution) – in everyday life and in the prognostic, conceptual sense. A systematic approach to the educational process in the interests of environmental sustainability will provide training for Ukrainian society in the skills of building the trajectory of their own lives, taking into account the principles of environmental sustainability. However, systematicity in this process cannot be achieved at present, and scientific research is scattered in partial research areas in compliance with the traditional scientific thesaurus, as discussed above. Among the sixteen principles of ecological sustainability, in our opinion, the following have the greatest scientific and educational weight:

- 1) Affirm that with increased freedom, knowledge, and power comes increased responsibility to promote the common good;
- 2) Empower every human being with the education and resources to secure a sustainable livelihood, and provide social security and safety nets for those who are unable to support themselves;
- 3) Provide all, especially children and youth, with educational opportunities that empower them to contribute actively to sustainable development;
- 4) Recognize the importance of moral and spiritual education for sustainable living.

Directly related to these postulates are modern trends in the development of education and research, providing the ethical and social components of the concept of environmental sustainability. The Earth Charter states that social institutions, values and lifestyles must be transformed in the process of creating a global civil society. Scientific research on the problem of environmental sustainability confirms this view.

In addition to the Earth Charter, the UN Environment Program, the UN International Conference on Environment and Development (1992), the World Summit on Sustainable Development (2002), and the UN Conference on Sustainable Development had a significant impact on the formation of the environmental sustainability thesaurus and the concept itself (2012).

4. Analysis of the term "Environmental Sustainability" usage in scientific periodicals

In open access journals articles that contain the concept of environmental sustainability in the scientific apparatus have been presented since 1997 (2 articles):

1) Douglas, Ian. Urban environmental sustainability: implementing Local Agenda 21 in Manchester (Portugal, Coimbra University Press) [17];

2) Torp-Donner, Heidi & Juga, Jarmo. Sustainability – a challenge to animal production and breeding (Finland, Scientific Agricultural Society of Finland) [18].

The first article (by Ian Douglas) was published in Portugal, marked by the field of research Technology: Engineering (General). "Civil engineering (General): Disasters and engineering" and contains data on the development, implementation and impact on the physical environment of Local Agenda 21. The author raises for the first time the problem of ensuring urban environmental sustainability.

The second article (by Heidi Torp-Donner & Jarmo Juga), published in Finland, focuses on "Agriculture: Agriculture (General)" and raises the issue of sustainability from an environmental, ethical and economic point of view.

Thus, it can be concluded that the concept of "environmental sustainability" entered the scientific and information space in the areas of technology and agriculture. The active development of the concept in these areas of knowledge is confirmed by general research data (Table 1): 46.76% of all publications presented in the database, which contain the concept of environmental sustainability (1917 articles out of 4100 found), come from the field of knowledge "Technology"; 8.19% of articles belong to the field of agricultural research. In general, as can be seen from the results of the analysis of search data, at the beginning the concept of environmental sustainability was not pervasive; there are some years in which there is no data of this topic publications (1998, 2000).

In 1999, 3 publications were found:

1) Jacobi, Pedro. Local self-government, social policy and sustainability [19] (Brazil, Universidade de São Paulo) – LCC subjects: Social Sciences: Economic history and conditions; Social Sciences: Economic theory. Demography: Economics as a science.

2) Foladori, Guillermo. Environmental sustainability and social contradictions [20] (Brazil, Associação Nacional de Pós-Graduação e Pesquisa em Ambiente e Sociedade) – LCC subjects: Medicine: Public aspects of medicine.

3) Chaudhuri, Basudeb & Damian, Michel & Gerbier, Bernard. Globalization and sustainability: The collapse of the myth of compatibility [21] (Colombia, Universidad Nacional de Colombia) – LCC subjects: Geography. Anthropology. Recreation: Human ecology. Anthropogeography.

From their general review it is seen that the concept of ecological sustainability began to be used in social sciences and anthropology. The authors of the articles note and study certain factors influencing sustainable development and environmental sustainability: popularization of the idea of international public good [21], inclusion of environmental issues in political power, ensuring citizen participation [19], the relationship of social relations and environmental issues [20]. It is worth noting that the authors of these articles partly identify sustainable development and environmental sustainability, present the relationship of these concepts.

Table 1. Quantitative indicators of the term "Environmental Sustainability" usage in scientific periodicals, depending on the year of publication and field of study

Years	All subjects	Including subjects										
		Agriculture	Education	Fine Arts	General Works	Geography. Anthropology. Recreation	Medicine	Philosophy. Psychology. Religion	Political science	Science	Social Sciences	Technology
1997	2	1										1
1999	3					1	1				1	
2001	4					1	2					
2002	3					2				1	1	
2003	1					1						
2004	2					1				1		
2005	8	1				1	1			1	5	1
2006	14	1	1	1		5	1	1		1	2	2
2007	16	4		2		4	2			1	2	2
2008	25	8	2	1		4	3	1		2	5	4
2009	48	9		3		6	8		1	11	18	9
2010	50	11	1	2		11	1			14	15	11
2011	67	9	2			12	5		7	10	15	22
2012	81	14	3	1		20	4	1	3	6	23	22
2013	98	14	1	1	1	27	4	3	3	20	23	34
2014	149	16	3	4	2	33	17	3	4	34	37	48
2015	174	14	5	9	2	57	9	2	6	31	42	49
2016	280	27	6	5	3	76	12	2	3	32	36	154
2017	335	21	12	10	3	93	18	4	4	53	59	168
2018	444	36	11	9	6	160	22	3	4	85	63	194
2019	542	41	12	4	3	178	37	10	10	120	83	263
2020	881	65	7	14	15	335	55	8	4	210	129	455
2021	873	44	6	8	6	341	57	5	4	235	93	478
<i>Total</i>	<i>4100</i>	<i>336</i>	<i>72</i>	<i>74</i>	<i>41</i>	<i>1369</i>	<i>259</i>	<i>43</i>	<i>53</i>	<i>868</i>	<i>652</i>	<i>1917</i>
<i>Percentage of total</i>		<i>8.2</i>	<i>1.7</i>	<i>1.8</i>	<i>1.0</i>	<i>33.4</i>	<i>6.3</i>	<i>1.0</i>	<i>1.3</i>	<i>21.2</i>	<i>15.9</i>	<i>46.8</i>

Source: The tables are constructed by the authors based on the analysis of the data of the EBSCO search database, the Directory of Open Access Journals (DOAJ) (on September 09, 2021)

That is, the concept of environmental sustainability, originating in technological research, is gaining ground in the social sciences (the total number of publications, according to table 1 is 15.90%)

of articles). Most of the articles on environmental sustainability are also presented in the field of "Geography. Anthropology. Recreation": 33.39% of the total articles.

Based on the table above and the statistics contained in it, we can conclude that there are actually three main stages of the study of environmental sustainability (according to the relevant key concept) over the past decades. We describe the first of these stages as fragmentary; during 1997-2005 the number of publications using the concept of "environmental sustainability" was small, and the dynamics was unstable. 2006-2013 can be attributed to the second period that is gradual stability; we named this stage in such a way based on the fact that the number of publications using the concept of environmental sustainability has not reached 100, but there is a gradual accumulation of statistics each year. Instead, the third stage – dynamic – confirms the rapid growth of scientific interest in the problem of environmental sustainability. During 2014-2021, the indicators of this concept usage in publications increase by almost 100 each year, which allows us to draw a conclusion about the steady interest of scientists in environmental sustainability at the level of theoretical and empirical research.

Table 2. Quantitative indicators using the term "Environmental Sustainability" in scientific periodicals, depending on the year of publication and components of the scientific apparatus of the article.

Years	All fields	Including fields		
		Title	Absrtact	Keywords
1997	2	1	1	1
1999	3	1	2	
2001	4		4	
2002	3		3	
2003	1		1	
2004	2	1	2	
2005	8	2	5	2
2006	14	4	13	3
2007	16	7	12	5
2008	25	3	20	2
2009	48	4	38	8
2010	50	3	41	16
2011	67	11	55	14
2012	81	19	62	12
2013	98	14	75	22
2014	149	25	113	21
2015	174	27	139	20
2016	280	22	171	47
2017	335	41	205	47
2018	444	61	311	54
2019	542	72	386	82
2020	881	114	569	129
2021	873	118	536	109
<i>Total</i>	<i>4100</i>	<i>550</i>	<i>2764</i>	<i>594</i>

Source: The tables are constructed by the authors based on the analysis of the data of the EBSCO search database, the Directory of Open Access Journals (DOAJ) (on September 09, 2021)

In fact, the same division into stages of research on the problem of environmental sustainability, we get in terms of representation of this concept in the titles of publications, abstracts and lists of keywords (Table 2).

5. Conclusions

The obtained results of the research are pilot and require confirmation by qualitative methods of research of their content. At the same time, they allow us to formulate conclusions on the formation of the concept "Environmental Sustainability" in the scientific and information space:

1. The leading factors (of general social content) that led to the emergence of the concept of ecological sustainability in scientific texts were global environmental problems caused by human activities in postmodern society.
2. The concept of ecological sustainability was first used during the First World Conference on the Environment in Stockholm (1972). However, according to the results of our research, this concept has been introduced into scientific circulation since 1997.
3. Using the method of analysis of open access scientific journals databases as a source of documents to study the representation of individual concepts and terms in the scientific space, we established the dynamics of using the concept of environmental sustainability over the past few decades and identified three main stages of implementation of this concept (1997-2005), gradual stability (2006-2013) and dynamic (2014-2021).

References

- [1] Mesa M 2019 Education for Global Citizenship: Promoting Democracy. *Revista Internacional de Educación para la Justicia Social* **8**
- [2] Miranda L F, Buitrago J O S and Escobar J J V 2021 Environmental Sustainability in Higher Education: Mapping the Field. *Revista Electrónica de Investigación Educativa* **23**
- [3] Mora E A, Gomes P P and Barbado N 2021 Environmental Education and sustainability: case study at Campo Padre Antônio Vieira State School. *Revista Brasileira de Educação do Campo* **6**
- [4] Sulphery M M and Faisal S 2021 Connectedness to Nature and Environmental Concern as Antecedents of Commitment to Environmental Sustainability. *International Journal of Energy Economics and Policy* **11**
- [5] Bramwell-Lalor S, Kelly K, Ferguson T, Gentles C H and Rooft C 2020 Project-based Learning for Environmental Sustainability Action. *Southern African journal of environmental education* **36**
- [6] Mogalakwe M 2006 The Use of Documentary Research Methods in Social Research. *African Sociological Review*, **10** 221-30
- [7] Moxon D 2021 Understanding Children and Young People's Voice as Intergenerational Dialogue within the Context of Children and Young People's Participation (University of Central Lancashire)
- [8] Report of the UN Conference on Environment and Development 1992 (Rio de Janeiro)
- [9] Mocherny S V , Larina Y S, Ustenko O A and Yuriy S I 2005 Economic encyclopedic dictionary (Lviv: Svit) **1** 282-83
- [10] Filipenko A S 2007 Global forms of economic development: history and modernity (Kyiv: Knowledge)
- [11] Kiselyov M 2005 Ecological consciousness as a phenomenon of the educational process. *Philosophical thought* **2** 130-49
- [12] Dzham O 2016 Ecological competence as an indicator of quality of ecological education and ecological safety in the system of principles and strategies of sustainable development. *Bulletin of Kharkiv Karazin National University* **14** 102-5
- [13] Demchenko N 2009 The role of ecological culture in the reproduction of society and a human being. *Topical issues of the economy* **8** 168-73

- [14] Akopyan V 2011 The phenomenon of ecological consciousness in the field of modern scientific discourse. *Higher education of Ukraine* **1** 27-31
- [15] Boychenko S and Saenko T 2013 Ecological education is the basis of sustainable development of society (Kyiv: University "Ukraine")
- [16] Bookchin M 2007 *Social Ecology and Communalism* (Oakland: AK Press) 19
- [17] Douglas I 1997 Urban environmental sustainability: implementing Local Agenda 21 in Manchester. *Territorium: Revista Portuguesa de riscos, prevenção e segurança* **4**
- [18] Torp-Donner H and Juga J 1997 Sustainability – a challenge to animal production and breeding. *Agricultural and Food Science* **6**
- [19] Jacobi P 1999 Poder local, políticas sociais e sustentabilidade (Local self-government, social policy and sustainability). *Saúde e Sociedade* **8**
- [20] Foladori G 1999 Sustentabilidad ambiental y contradicciones sociales (Environmental sustainability and social contradictions). *Ambiente & Sociedade* **5**
- [21] Chaudhuri B, Damian M and Gerbier B 1999 Globalization and sustainability: The collapse of the myth of compatibility. *Ensayos de Economía* **9**