

PARADIGMS OF INFORMATION TECHNOLOGY IMPACT ON ECONOMIC EDUCATION

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Abstract. Economic education is changing under the influence of information technology, but research on this transformation remains thematically heterogeneous. The article aims to identify the main thematic paradigms and research trends in studies on the impact of information technology on economic education. The study is based on articles and conference proceedings indexed in the Web of Science database for 2015–2024. Publications were selected in the Abstract field using the query "information technology AND economic education". The final dataset included 1,749 documents, whose metadata were processed in VOSviewer. The bibliometric mapping revealed six thematic clusters: economic development, education and information technology; the social impact of IT and digital education; digital technologies, the labour market, and economic models; information literacy and the digital divide; policy, sustainable development, and technology strategies; and online learning, teaching, and educational technologies. The novelty of the study lies in structuring a fragmented research field and interpreting the identified clusters as broader paradigms of IT impact on economic education. The results indicate that economic education is increasingly discussed through digital transformation, human capital development, labour-market change, inclusion, and institutional adaptation. The main limitation is the focused search strategy, which did not include broader terms such as "digital education" or "EdTech" and therefore should be interpreted as a focused bibliometric mapping rather than an exhaustive review of the field.

Keywords: economic education, information technology, impact, digital technologies, digital tools, digital education, training of economists

PARADYGMATY WPŁYWU TECHNOLOGII INFORMACYJNYCH NA EDUKACJĘ EKONOMICZNĄ

Streszczenie. Edukacja ekonomiczna zmienia się pod wpływem technologii informacyjnych, jednak badania dotyczące tej transformacji pozostają tematycznie zróżnicowane. Celem artykułu jest identyfikacja głównych paradygmatów tematycznych oraz trendów badawczych w pracach poświęconych wpływowi technologii informacyjnych na edukację ekonomiczną. Badanie opiera się na artykułach i materiałach konferencyjnych indeksowanych w bazie Web of Science w latach 2015–2024. Publikacje wybrano w polu "Abstract" z użyciem zapytania "information technology AND economic education". Ostateczny zbiór danych obejmował 1749 dokumentów, których metadane zostały przetworzone w programie VOSviewer. Mapowanie bibliometryczne ujawniło sześć klastrow tematycznych: rozwój gospodarczy, edukacja i technologie informacyjne; społeczny wpływ technologii informacyjnych i edukacji cyfrowej; technologie cyfrowe, rynek pracy i modele ekonomiczne; kompetencje informacyjne i przepaść cyfrowa; polityka, zrównoważony rozwój i strategie technologiczne; oraz kształcenie online, nauczanie i technologie edukacyjne. Nowość badania polega na uporządkowaniu rozproszonego pola badawczego oraz interpretacji zidentyfikowanych klastrow jako szerszych paradygmatów wpływu technologii informacyjnych na edukację ekonomiczną. Wyniki wskazują, że edukacja ekonomiczna jest coraz częściej omawiana przez pryzmat transformacji cyfrowej, rozwoju kapitału ludzkiego, zmian na rynku pracy, inkluzji oraz adaptacji instytucjonalnej. Główne ograniczenie badania wynika z ukierunkowanej strategii wyszukiwania, która nie obejmowała szerszych terminów, takich jak "digital education" czy "EdTech". Dlatego uzyskane wyniki należy interpretować jako skoncentrowane mapowanie bibliometryczne, a nie jako wyczerpujący przegląd całego pola badawczego.

Słowa kluczowe: edukacja ekonomiczna, technologia informacyjna, wpływ, technologie cyfrowe, narzędzia cyfrowe, edukacja cyfrowa, szkolenie ekonomistów

Introduction

Thanks to globalization and digitalization, society is constantly evolving. Technologies are rapidly improving, and new digital analysis, modelling, and forecasting tools are emerging [19]. This means that changes are taking place not only in the economy, which is increasingly focused on the digital world, but also in the priorities of economic education. In recent years, economic education has taken on new forms based on information and communication technologies [5, 7, 27].

Analysing research related to economic education, the study of economic disciplines in higher education institutions, the requirements for training of specialists in the field of economics, and the results of such training, we note a wide range of research topics.

We consider the broadest group of studies to be those related to changing learning strategies. In particular, researchers emphasize the feasibility of using immersive technologies based on IT simulations. The authors argue [1] that simulations not only model typical situations but also help students understand the concepts of information asymmetry in economics and management. At the same time, the soft skills of future professionals are additionally developed. Another study [22] proves the success of a case study using a spreadsheet-based simulation of the international political economy. Student teams tried to improve a country's economic status by producing and exchanging goods with other countries. They tracked the activity by five parameters: "global production, global

trade, global finance, global knowledge, and global security." The authors argue that this approach to economic education contributes to students' cognitive development by helping them perceive the problem-based approach as an effective strategy for their professional training.

Researchers believe that microlearning on digital platforms is effective. In particular, the authors [18] emphasize that entrepreneurs should use digital educational platforms. Entrepreneurs can simplify the solution of various tasks, save time and flexibility by receiving timely, automated additional/advisory information for management and decision-making, and reduce the likelihood of errors. The author concludes that the development of IT in the field of taxation should be spread along with the training of micro-entrepreneurs and their self-development.

A separate group of studies focuses on interactive methods of teaching economic disciplines. In particular, the study [8] shows that interactive case-based learning for students in economic and business specialties at colleges and universities effectively develops skills for solving real problems, especially in developing countries. The success of using game technologies is described in [13]. The author's game, "eKinomy," on international trade for students in grades 5-8, involves developing strategies for making economic decisions. Another study [9] demonstrates the effectiveness of role-playing games (in which participants play the role of mine owners). The game provides insight into price signals, sudden increases in scarcity, intertemporal choice, market power, information relevance, and property rights. Another study [21] describes the successful

use of an escape room as a game-based learning environment for future economists. The authors argue that the game is a tool to stimulate students' motivation in economic faculties, facilitating the assimilation of professionally oriented economic content.

We highlight another group of scientific publications that actualize the modularization of economic education content driven by IT. In particular, the research [23] highlights the trend of IT penetration into the economy and education, and, therefore, the relevance of modernizing educational and professional programs for training economic specialists through changing approaches to teaching and changing the content of professionally oriented disciplines. In this context, a separate group includes research on mastering specific digital tools for economic purposes. For example, Yang & Hong [24] emphasize the development of fintech (digital financial platforms) and its impact on education, particularly in regions with limited educational resources, low educational achievement, and slow economic growth. At the same time, access to distance economic training is becoming more relevant. Fernandez Llera [6] identifies some practical limitations, including unequal access to information technology for students of different social or economic groups, analyses digital teaching of economic disciplines, and emphasizes the importance of motivation in learning.

The preliminary analysis of scientific research shows that the educational sector is responding to the spread of information technology in the economic sphere of society and modernizing established approaches and requirements for economic training. At the same time, research confirms a very diverse landscape of IT use in the training of economists and the development of economic education under the influence of information technology. Therefore, it seems appropriate to generalize scientific research in this area to identify general trends in the modernization of economic education.

Although the growing body of research confirms the increasing relevance of information technology in economic education, this field remains conceptually fragmented. Existing studies address digital platforms, online learning, simulations, digital skills, labor-market demands, and educational inequality, yet these directions are often discussed in parallel rather than within a shared interpretive framework. In such circumstances, bibliometric analysis is useful not only for identifying the most visible thematic clusters but also for showing how separate lines of inquiry are connected within the broader transformation of economic education. Therefore, the present study uses bibliometric mapping as a basis for a more structured understanding of how information technology is represented in contemporary research on economic education.

The article aims to identify the main thematic paradigms and research trends in studies on the impact of information technology on economic education through bibliometric analysis.

1. Materials

We used publications indexed in the Web of Science database, which is widely recognized by the international scientific community [25, 26]. It covers a wide range of scientific areas, helping identify interdisciplinary links and indexing high-quality publications, ensuring the reliability and credibility of the analysis results. The database contains digital tools for filtering and researching publications by year of publication, scientific field, document type, and by citation, author activity, affiliation, institution, country, etc. Thanks to the ability to search by various metadata, including keywords, the database helps to identify research objects and predict trends. In addition, it supports exporting data in multiple formats for further analysis using specialized software, such as VOSviewer.

We collected metadata from publications over the past ten years (2015–2024). We only considered articles and conference materials. We did not consider other publication types (e.g., review articles, books) to better identify research objects (hereinafter, documents).

2. Methods

We searched for publications using filters in the Web of Science database. Publications were selected by the "Abstract" field using the query "information technology AND economic education."

The search query was formulated narrowly and intentionally. The expression "information technology AND economic education" was selected to identify publications in which the relationship between information technology and economic education was explicitly reflected in the abstract and, therefore, could be treated as a central element of the study rather than as a peripheral or incidental topic. Broader terms such as "digital education", "EdTech, "online learning," or "digital technologies" were not included in the primary query because they could substantially expand the corpus and shift the focus from economic education to the wider field of digital transformation in education. This decision helped maintain the thematic coherence of the dataset, although it also narrowed the scope of the bibliometric mapping.

As a result of the search, we obtained 1,749 documents for 2015–2024, which were analysed quantitatively using the VOSviewer application (<https://www.cwts.nl>). This application used the found documents to build a network for the found materials and calculated the indicators (Fig. 1).

The developers built the app's algorithm to identify individual clusters based on the connections found. Since a large number of keywords of a certain set can make the network visually challenging to perceive and analyse, the developers have provided the possibility of limiting the network through the "depth" indicator (the number M , which means that each word of the network occurs in at least M publications of the network), i.e., the depth allows you to neglect less essential keywords and links.

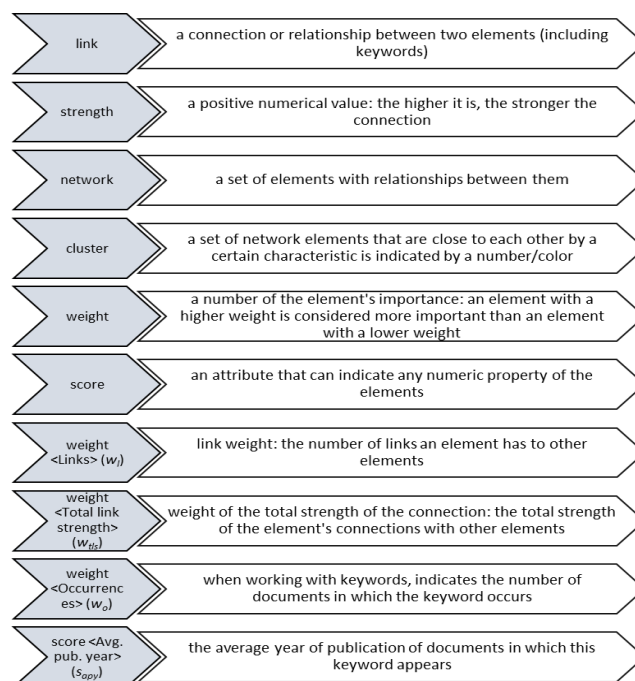


Fig. 1. Network indicators in the VOSviewer application

3. Results of research

3.1. General quantitative analysis

We visualized the results of the quantitative search by year in a diagram (Fig. 2).

The general analysis of the materials indicates a moderate number of documents on the impact of IT on economic education. This number ranged from 141 in 2015 to 208 in 2019, then gradually decreased to 160 in 2024. In 2015–2019,

We additionally summarized the quantitative data for the constructed document network. In the table (Table 1), we have left the leading words for each cluster. The whole table is provided in the appendix (Appendix A).

Table 1. Indicators of network elements in clusters

Label	Cluster	Weight <Links>	Weight <Total link strength>	Weight <Occurrences>	Score <Avg. pub. year>
Education	1	120	422	177	2019.9
ICT	1	112	349	111	2019.9
Impact	1	109	325	84	2021.1
Innovation	1	85	219	83	2019.7
Covid-19	2	65	123	52	2021.9
Framework	2	56	84	25	2019.4
Health	2	50	94	33	2020.6
Management	2	80	165	63	2020.4
Performance	2	59	102	35	2021.1
Challenges	3	76	129	29	2021
Digitalization	3	53	91	31	2021.3
Higher education	3	74	180	88	2018.9
Knowledge	3	65	108	45	2019.9
Model	3	79	148	39	2020.8
Sustainable development	3	67	105	32	2020.8
Digital divide	4	64	171	58	2019.4
Internet	4	82	191	58	2019.9
Students	4	74	164	52	2020.6
Technology	4	99	315	106	2020
Determinants	5	75	149	36	2021.4
Information-technology	5	53	82	16	2019.6
Policy	5	58	87	26	2019.6
E-learning	6	44	81	43	2018.9
Integration	6	45	66	20	2019.2

We emphasize the key concepts of education, ICT, technology, and impact. They have a high level of citation and are often found in publications. This indicates their importance in the field of economic education.

The table analysis provides additional characteristics of the set of documents found. Most studies fall within 2021 and 2022, indicating active interest in the digitalization of education during this period. The period of active research for the red cluster "Economic development, education, and information technology" is 2019–2021. During this period, scientists' interest in using information technology in education and its economic impact is growing rapidly. The period of active research of the green cluster "Social Impact of IT and Digital Education" falls on 2020–2021, when interest in distance learning increased significantly after the pandemic. The period of active research that characterizes the purple cluster "Digital technologies, labour market, and economic models" spans 2020 to 2022, during which researchers focused on the digital economy and its impact on global markets. The period of active research for the yellow cluster "Information Literacy and the Digital Divide" is 2019–2021, during which there was a sharp increase in research on digital literacy. The period of active research for the blue cluster "Policy, Sustainable Development and Technology Strategies" falls from 2020 to 2022. During this time, there is an increased focus on climate policy and technology. The period of active research in the turquoise cluster "Online Learning, Teaching, and Educational Technologies" spans 2018 to 2021, during which time EdTech rapidly developed.

4. Discussion

The dynamics of publications show an increase in interest in the use of information technology in economic education until 2019, after which scientists' activity decreased, probably due to external factors (the pandemic). The resumption of the growing trend in 2022 was short-lived, and recent years have shown some stabilization or decline. This may indicate either the accumulation of sufficient experience in this area, which will lead to a new research focus, or it may be a signal for further analysis of current trends in the development of information technology and its cautious use for economic training. Viewed more broadly, these dynamics may also be interpreted through the lens of digital transformation in higher education, where technology is not merely a set of instructional tools but a driver of changes in the educational space, institutional practices, and the roles of teachers and learners. In this sense, fluctuations in publication activity may reflect not only interest in separate tools, but also a wider restructuring of educational systems under conditions of accelerated digitalization" [3].

The clusters we identified illustrate the impact of IT on economic education and education in general. The built network shows that research on economic education under digitalization is organized around several interconnected domains. From a pedagogical perspective, these trends can be partially interpreted through constructivist approaches, which hold that digital environments support active knowledge construction through simulation, interaction, and problem-solving rather than the passive reception of information. This interpretation is especially relevant for studies on simulations, game-based learning, immersive technologies, and flexible online learning environments in economic education.

The identified clusters also point to the transformation of higher education under the influence of IT and to the growing connection between education, technology, and the digital divide. These areas are supported by recent studies on digital platforms, digitally relevant professional skills, and technology-mediated teaching strategies in economic education [6, 18, 23, 24]. At the same time, less obvious are the research areas that, although related to the use of information technology in economic education, are grouped in other clusters. These patterns suggest that the development of economic education is increasingly intertwined with digital tools, labour-market change, and broader institutional transformations, which warrants further research.

The data analysis (Table 1) allows us to identify several promising areas that could form the basis for future research.

1) The digital economy and Industry 4.0 impact economic education and the labour market. This trend may also be interpreted through human capital theory, which treats education as an investment that increases productivity, innovation capacity, and future economic returns. From this perspective, the growing emphasis on AI, big data, digital transformation, and labour market readiness in the literature reflects a shift in economic education toward the formation of digitally relevant human capital" [16]. This trend is reflected in the prominence of keywords related to the digital economy, Industry 4.0, employment, labour market, and digital transformation. The combination of these words in the network indicates that the digitalization of the economy is radically changing the requirements for specialists and the content of economic education; society demands that educational programs be updated to focus on big data analytics, business process automation, and AI. Our conclusion is supported by a study [17] on the competencies of a modern business school graduate, which argues for updating the professional competencies of future economists. Another review study [11] emphasizes the move away from traditional assessments (knowledge and skills) and toward a comprehensive evaluation of learning outcomes based on randomized controlled trials and quasi-experiments. Promising research in this area may address the implications of the digital economy for graduate skills,

curriculum renewal, and the educational use of data-driven technologies.

2) Digital divide and information literacy in global economic education. This trend is associated with keywords related to the digital divide, digital literacy, access, skills, and technology adoption. The digital divide remains critical, as unequal access to IT resources limits economic opportunities and education, and the lack of, or insufficient development of, digital skills directly affects graduates' competitiveness in the labour market. This direction is consistent with the findings [15] on the feasibility of using technology to improve the digital skills of students of economic specialties and with the findings [10] on the potential of blended learning to develop critical thinking of future economists. Topical issues in line with this trend include how the digital divide affects the level of economic education across regions and whether digital education helps overcome economic inequality. Promising research may focus on digital literacy development, gender inequality in access to digital education, and their broader economic implications.

3) The use of artificial intelligence and data analytics in economic education. This trend is shaped by the prominence of AI-, data-, and digital-transformation-related keywords. Artificial intelligence and machine learning technologies can radically update educational processes by personalizing learning and automating data analysis. This is emphasized by scientists who have devoted their research to assessing graduate students' achievements [14]. The assessment platform developed by the authors is based on blockchain technology and protects the reliability and confidentiality of assessment data. Another review study [2] emphasizes the prospects for using artificial intelligence in behavioural finance and little-studied topics such as AI-driven behavioural macroeconomics. Promising research may examine AI-supported teaching, data-driven approaches in economics and finance education, and personalized educational platforms.

4) Distance learning and digital educational technologies in economic education. This trend is reflected in keywords related to online and distance learning in higher education. Since the COVID-19 pandemic has become a catalyst for the digital transformation of education, the effectiveness and long-term consequences of using digital technologies for economic education remain insufficiently researched. Scientists have come to a similar conclusion [22]. The strategy of integrating problem-based, online, and collaborative learning proved effective, leading researchers to conclude that virtual and augmented reality (VR/AR) could potentially train economic professionals. In the study's conclusions [12], we found a similar view: the authors consider the strategy of using online simulations with feedback promising for improving learning performance and ensuring long-term effects. Promising research may address gamification and VR/AR in economic education, the effects of blended learning, and the quality of interaction in digital learning environments.

5) Interconnection of sustainable development, information technologies, and economic education. This trend is associated with sustainability, policy, and adaptation-related research. This trend shows that economic education is increasingly integrating environmental aspects and principles of sustainable development. We believe that this trend is correlated with the study [4], in which the authors, among other things, investigate organizational resilience (the aggregate ability of an enterprise to recover from adverse shocks to its ecosystem and the speed with which it can do so) and emphasize the importance of employees' digital skills, their dynamic abilities to search for and acquire strategic knowledge and arbitrage effectively. Another descriptive study [20] emphasizes the importance of revising the structures of business administration curricula to include Challenge-Based Learning as an effective educational strategy. This study emphasizes the transformation of requirements for economic education outcomes and highlights

the problems posed by information technology's impact on business sustainability. Promising research may examine how sustainability concepts are integrated into economics curricula and how digital technologies shape green and sustainable economic development.

5. Conclusions

This study has shown that research on the impact of information technology on economic education constitutes a broad, internally differentiated field structured around several stable thematic directions. The bibliometric analysis of Web of Science publications from 2015 to 2024 made it possible to identify six interconnected clusters that reflect the main lines of scholarly attention: the relationship between education, ICT, and economic development; the social impact of digital education; digital technologies and labour-market change; information literacy and the digital divide; policy and sustainability; and online learning and educational technologies. Taken together, these clusters indicate that economic education is increasingly discussed not only in terms of disciplinary content but also in relation to technological change, employability, social inclusion, and institutional adaptation.

The results suggest that the digitalization of economic education is represented in the literature through three broader interpretive perspectives. First, the identified research reflects a pedagogical shift toward more active, technology-mediated forms of learning, including simulations, online interaction, gamified formats, and immersive environments. Second, a substantial segment of the literature links economic education with the development of human capital for the digital economy, especially through the growing emphasis on digital skills, analytics, automation, and labour-market relevance. Third, the cluster structure points to the digital transformation of education as a broader institutional process that affects curriculum design, delivery models, access, and the role of educational policy. In this sense, the bibliometric findings reveal not only topical diversity but also the conceptual expansion of economic education under digital conditions.

Particular visibility in the analysed publication set was observed for themes such as artificial intelligence, big data, online and blended learning, digital literacy, sustainability, and digital transformation. However, these findings should be interpreted with methodological caution. The identified trends demonstrate the prominence and interconnectedness of these topics in the scholarly literature, but they do not, by themselves, prove the pedagogical effectiveness of specific technologies or their uniform implementation across educational settings. Therefore, the contribution of this study lies primarily in mapping the structure of the research field and identifying the thematic directions that shape current academic discussion on the digitalization of economic education. Future bibliometric studies may expand the search strategy by including adjacent terms such as "digital education", "EdTech", and "online learning"; however, such an expansion would require a separate dataset and a new interpretation of the resulting cluster structure.

The study also shows that the literature does not present digitalization as an exclusively positive or linear process. Alongside themes related to innovation, flexibility, and new competencies, the keyword network also highlights digital inequality, differences in access, and the continuing importance of information literacy. This indicates that the transformation of economic education is accompanied by social and institutional tensions that remain highly relevant for further research. As a result, the future development of this field is likely to depend not only on the spread of new technologies but also on how educational systems respond to questions of inclusion, preparedness, and the responsible integration of digital tools.

Based on the identified clusters and keyword relations, the most visible directions for future research include artificial

intelligence and data analytics in economic education, the role of digital skills in graduate competitiveness, the use of immersive and flexible learning environments, the relationship between technological change and curriculum renewal, and the integration of sustainability-related issues into the training of future economists. These directions appear to be the most conceptually connected areas within the current bibliometric landscape and therefore provide a useful basis for further theoretical and empirical studies.

6. Limitations

The set of publications analysed was taken from the Web of Science Database. The overall analysis excludes materials published before 2015 or after 2024.

One methodological limitation concerns the selected search rule. The query "information technology AND economic education" was applied only to the Abstract field in Web

of Science. This enabled focusing on publications that explicitly articulated the relationship between information technology and economic education. At the same time, this decision narrowed the dataset. The corpus may not include studies that discuss relevant phenomena through broader or adjacent terms, such as "digital education", "EdTech", "online learning", "digital technologies", "artificial intelligence", "cloud technologies", "teaching", or "learning". Therefore, the results should be interpreted as a focused bibliometric mapping of one clearly defined segment of the research field rather than as an exhaustive representation of all studies on digital transformation in economic education.

We limited the documents to articles and conference proceedings, excluding other publications from the scientometric database.

We are also aware of the risk of overlooking or neglecting certain highly specialized aspects of IT use in economic education.

Appendix A. Indicators of network elements in clusters

Label	Cluster	Weight <Links>	Weight <Total link strength>	Weight <Occurrences>	Score <Avg. pub. year>
Africa	1	42	73	17	2020.2
co2 emissions	1	22	53	10	2022.8
competitiveness	1	22	28	18	2019.9
consumption	1	27	32	11	2020.2
culture	1	9	11	10	2019.3
developing countries	1	28	34	12	2020
economic development	1	31	38	13	2019.4
economic growth	1	37	81	24	2020.6
economic-growth	1	51	120	26	2021.6
education	1	120	422	177	2019.9
efficiency	1	17	25	10	2020.7
energy	1	36	49	13	2020.8
energy-consumption	1	25	60	12	2021.3
entrepreneurship	1	41	57	20	2020.1
environment	1	38	46	13	2020
financial development	1	24	57	10	2021.6
globalization	1	38	58	24	2019.4
growth	1	52	109	32	2020.7
higher-education	1	43	60	16	2019.6
human capital	1	35	50	19	2019.2
ICT	1	112	349	111	2019.9
ICT4D	1	16	21	11	2018.6
ICTs	1	25	33	11	2018.3
impact	1	109	325	84	2021.1
income	1	33	50	16	2020.9
inequality	1	28	38	13	2020.2
Information and communication technologies	1	36	58	42	2020.2
Information and communication technology	1	40	65	18	2020.2
innovation	1	85	219	83	2019.7
investment	1	30	38	11	2021.9
knowledge economy	1	40	78	26	2019.1
panel-data	1	41	73	17	2022.1
productivity	1	36	61	19	2020.7
quality	1	53	73	22	2019.8

Label	Cluster	Weight <Links>	Weight <Total link strength>	Weight <Occurrences>	Score <Avg. pub. year>
augmented reality	2	21	27	11	2022.5
barriers	2	41	52	16	2020.2
behaviour	2	29	35	16	2020.8
care	2	39	58	19	2020.3
china	2	42	64	23	2022
Covid-19	2	65	123	52	2021.9
design	2	22	28	15	2020.2
development	2	32	45	12	2018.3
framework	2	56	84	25	2019.4
health	2	50	94	33	2020.6
implementation	2	32	34	13	2021.5
industry	2	35	46	13	2021.8
interventions	2	27	35	10	2018.3
management	2	80	165	63	2020.4
motivation	2	16	19	11	2020.6
online	2	19	23	10	2020.5
outcomes	2	26	36	11	2020.5
pedagogy	2	23	30	12	2020.4
performance	2	59	102	35	2021.1
poverty	2	44	74	23	2019.9
program	2	20	24	10	2019.6
research	2	14	23	11	2018.2
satisfaction	2	27	38	11	2020.3
science	2	50	80	26	2019.2
system	2	42	57	20	2021.6
systems	2	51	84	24	2020.1
telemedicine	2	15	22	10	2020
training	2	17	22	10	2020
university	2	50	84	32	2020.4
women	2	41	54	17	2020.7
artificial intelligence	3	37	43	16	2021.5
big data	3	37	57	22	2019.9
blockchain	3	32	52	16	2020.5
challenges	3	76	129	29	2021
cloud computing	3	23	29	10	2018.1

Label	Cluster	Weight <Links>	Weight <Total link strength>	Weight <Occurrences>	Score <Avg. pub. year>
competences	3	24	28	13	2019.2
digital economy	3	33	49	26	2020.1
digital technologies	3	27	37	16	2020.2
digital transformation	3	35	44	19	2020.9
digitalization	3	53	91	31	2021.3
economics	3	32	39	12	2020.2
employment	3	26	28	15	2020.5
future	3	40	59	13	2019.5
higher education	3	74	180	88	2018.9
industry 4.0	3	24	33	14	2019.9
information technologies	3	24	26	19	2019.9
information technology	3	54	84	38	2019.7
institutions	3	39	55	13	2020.6
knowledge	3	65	108	45	2019.9
labour market	3	19	24	11	2019
labour market	3	20	24	11	2018.5
model	3	79	148	39	2020.8
population	3	23	26	10	2020.8
sustainable development	3	67	105	32	2020.8
technologies	3	55	71	23	2020
transformation	3	29	38	10	2020.1
trends	3	36	39	13	2020.2
universities	3	28	42	14	2020.3
acceptance	4	37	52	15	2021.9
access	4	46	97	23	2020.9
achievement	4	32	52	17	2020.6
attitudes	4	38	50	17	2019.8
digital divide	4	64	171	58	2019.4
digital literacy	4	27	37	15	2020.1
divide	4	32	49	11	2020.8
gender	4	52	86	31	2019.9
information	4	94	264	76	2020.1
information literacy	4	26	37	15	2020.6
internet	4	82	191	58	2019.9
internet use	4	23	29	12	2019.9
literacy	4	34	50	16	2019.9
mathematics	4	17	28	10	2020

Label	Cluster	Weight <Links>	Weight <Total link strength>	Weight <Occurrences>	Score <Avg. pub. year>
media	4	24	29	11	2019.2
media literacy	4	17	22	10	2020.8
skills	4	51	86	30	2019.2
social media	4	35	47	16	2020.1
south Africa	4	20	21	10	2020
students	4	74	164	52	2020.6
technology	4	99	315	106	2020
usage	4	43	66	13	2020.5
youth	4	18	25	13	2020.8
adaptation	5	29	55	17	2020.9
adoption	5	80	199	56	2021.7
agriculture	5	43	76	25	2020.6
business	5	37	47	13	2020.5
climate change	5	23	41	17	2021.7
climate-change	5	28	42	10	2022.6
determinants	5	75	149	36	2021.4
diffusion	5	38	57	13	2018
farmers	5	21	31	10	2021.6
governance	5	26	28	10	2020.6
impacts	5	32	46	14	2020.9
information-technology	5	53	82	16	2019.6
perceptions	5	44	70	21	2021
policy	5	58	87	26	2019.6
services	5	45	63	17	2020.9
strategies	5	35	47	11	2022.4
sub-Saharan Africa	5	33	45	13	2019.8
sustainability	5	50	83	33	2020.2
technology adoption	5	33	44	17	2020
user acceptance	5	49	81	20	2020.6
communication	6	34	45	17	2020.2
distance education	6	10	14	10	2019
distance learning	6	16	27	18	2019.1
e-learning	6	44	81	43	2018.9
integration	6	45	66	20	2019.2
learning	6	21	39	14	2020.1
teachers	6	31	49	19	2020
teaching	6	18	26	12	2020

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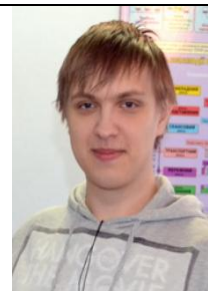
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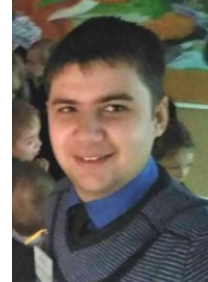
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