

Formation of Online Content Patterns of Higher Education Based on Trends to Preserve Intellectual Capital Quality Decreasing in Ukraine During Wartime

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Abstract: *The article examines the current stage of forming online content in higher education worldwide and in Ukraine. The main goal of this paper is to develop patterns for creating educational content to improve the learning process at universities despite the full-scale war, including flexibility. To achieve these, the author used bibliometric, trends and cluster analysis. As analytical tools, Google Trends and VosViewer were chosen. The investigation is divided into three parts: study patterns of online content in higher education (HE) based on a literature review, identify trends in HE, and examine online educational content in the context of the flexible learning process at universities. The investigation stage of key trends in the development of higher education in Ukraine is initial because it demonstrates up-to-date theoretical background worldwide, and particularly in Ukraine, especially publication after 2019. The main approaches to renovating the educational system included improving distance or blended learning as a modern study pattern. The key stakeholders are students and teachers. However, teachers transform into facilitators who prepare educational content and support learners in self-directed learning based on their inquiries. As for Ukraine, the tendency was intensified because students affected by full-scale war cannot study in the traditional (in-person) way. To find how trends in HE in Ukraine during key political changes were modified in Ukraine, the author used Google Trends to search inquiries of main consumers of educational services in Ukraine concerning higher education through the keywords “university” in three languages. The customizing periods showed the reactions of the young to critical political changes in Ukraine. In such a way, attitudes towards higher education during the beginning of the Orange Revolution, the Revolution of Dignity, the war in the east of Ukraine and the full-scale war were investigated. The significant changes were noticed after February 24, 2022, compared to November 30, 2013. There was an increasing popularity of inquiries based on universities abroad and learning as a tool to get employment. The most relevant inquiries in forming online content are “distance learning” and “дистанційна освіта”. Moreover, the tendency of increasing inquiries in the Ukrainian language compared with russian inquiries of approximately 10% was found. It was confirmed that trends could be used as a tool of formation patterns of educational content. That is why the paper aims to explore terms across years such as “educational content trends”, “educational trends” (205 articles), “online content trends” (305 articles), and “educational online content trends” (25 articles) at the Web of Science (WOS) platform. Key sectors of educational online content include Education, Educational Research, Economics, Social Sciences, Interdisciplinary, Multidisciplinary Sciences, and Management categories. In addition, Ukraine leads in publishing articles in forming online educational patterns with Poland, russia, the USA, Bulgaria and others. Furthermore, “educational content trends” and “online content trends” were compared to measure theoretical gaps by cluster analysis, where the main clusters are teacher, content analysis, development, quality, educational progress, and social media. The findings of this study hold valuable implications and recommendations for the formation of online content in higher education, particularly during times of war and in post-war periods.*

Keywords: higher education, online content, educational trends, patterns, open educational resources.

JEL Classification: I21, I23, I25, O34.

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Introduction

The education system in Ukraine currently faces several challenges caused by active military operations. According to the report of the International Organization for Migration (IOM, 2023), there are 5.4 million internally displaced persons and 8 million refugees in European countries and beyond. At the beginning of 2023, the United Nations Office for the Coordination of Humanitarian Affairs (UNHCO) found that 40% of the country's entire population needs humanitarian assistance. However, as of January 2023, more than 19 million people remained affected by some form of displacement, including 5.4 million internally displaced persons (IDPs) – 58% of whom had been there for six months or more – and 5.5 million people. Some of these indicators are formed by higher education seekers – students. In other words, many students do not have the opportunity to thoroughly study at a higher education institution due to geographical, financial, or other reasons. You can look at this problem through another context, namely population concentration. The issue of internal migration and population concentration in large cities was considered by the MES (MES, 2022:10) as early as the beginning of 2022, before the start of a full-scale war on the territory of Ukraine, in the developed strategy for the development of higher education in Ukraine 2022-2023 and the strategic pyramid. This problem is only getting worse due to political factors of influence. Thus, the top 5 regions in terms of the share of admitted forcibly displaced persons (IDPs), which make up 48% of IDPs, are: Kyiv (13%), Dnipropetrovsk (12%), Lviv (8%), Kharkiv (8%), Poltava (7 %). The consequences of these phenomena are a decrease in the quality of human capital and the loss of human capital due to the presence of remote alternative educational platforms separate from universities. For these reasons, it is necessary to form updated patterns of higher education content.

Literature Review

Recently, many authors have conducted extensive bibliometric analyses to determine critical patterns in higher education. It includes distance education, online learning, and educational technologies. Their comprehensive studies have led to significant insights regarding the trends and themes shaping the field. They have contributed extensively to the development of actionable frameworks for educational practitioners. The paper of Terry Anderson (2008) examined a theory of online learning. It clarified that the main task of the online course designer and/or teacher is to choose, adapt, and improve the content through feedback, assessment and other kinds of reflections of all participants and educational activities that maximize the capacities of educational web platforms to delineate which modes, methods, activities, and actors are most cost and learning effective in creating and distributing quality e-learning programs. Integrating the new tools and affordances of the educational Semantic Web and emerging social software solutions will further enhance and make more accessible and affordable quality online learning experiences (Anderson, 2008: 7).

The necessity to generate such research appeared when traditional patterns of the education process became outdated in comparison to the progressive world. For example, the current paper examines weaknesses in university education. Halabieh et al. (2022) identified four key disadvantages of higher education institutions (HEIs) failing to provide accessible, high-quality, affordable postsecondary education. The method of structured literature search using six databases and two search engines in consultation with research librarians at 3 HEIs was used, extracting a rubric to identify and evaluate twelve HEIs that effectively apply new and innovative models that address these four problems. (Halabieh, Hawkins, Bernstein, Lewkowict, Unaldi, Fleming, and Levitin, 2022: 15).

On the other hand, Halabieh H., Hawkins S., Bernstein A., Lewkowict S., Unaldi B., Fleming L. and Levitin D. (2022) identified nine fundamental barriers in higher education based on a literature search of 3,000+ documents, where were extracted current and best practices for curriculum development, the progress of implementing the science of learning, new methodologies and innovations. The result was qualitatively and quantitatively distinctive, evaluating the 33 universities to create recommendations for higher education best practices. The investigation used interviews with stakeholders (Halabieh, Hawkins, Bernstein, Lewkowict, Unaldi, Fleming, and Levitin, 2022: 14).

Bibliometric analysis is a common approach to investigating higher education. Zhang et al. (2022) also used bibliometric analysis to study online learning in higher education around the globe during COVID-19. The researchers analyzed documents with co-citation analysis and text mining afforded by VOSviewer published between January 2020 and August 2021. The findings of this study indicated that scholars from 103 countries investigated factors associated with the adoption and impacts of pandemic-imposed online learning. Medical and chemical education were the most investigated disciplines of the large quantity of research. Inquiry-based, discovery, hands-on, and collaborative learning emerged as instructional approaches frequently discussed or utilized across the target studies (Zhang Ling, Carter Jr. Richard, Qian Xueqin, Yang Sohyun, Rujimora James, Wen Shuman, 2022: 17).

The scientific horizons were expanded within the paper of Bozkurt A. and Zawacki-Richter O. (2021). The authors conducted bibliometric data and identified pivotal theoretical contributions, including that distance education and educational technology converge. The bibliographic analysis was applied by data mining and analytic approaches to explore publication patterns and thematic trends in distance learning (DE) 1,362 peer-reviewed publications between 2014 and 2019. The following DE research were found: (a) issues related to open education; (b) the design, support, and quality assurance of online DE; and (c) the implementation and use of educational technology, media, and digital tools (Bozkurt & Zawacki-Richter, 2021: 13). Distance & online learning started actively investigated during the global pandemic in 2019-2022. The population needs to consider distance learning as a safe alternative to traditional education if it is not feasible due to particular circumstances. As a result, there has been an increase in publications on the theoretical basis of blended or distance learning. In Ukraine, distance learning has acquired a new meaning. It has become a key tool for the flexibility of the educational process despite forced displacement, the impossibility of physically visiting educational institutions, etc. Blended and distance learning was investigated by Sharov S. (2022), Semenikhina et al. (2022) and Savga L., Krykliy O., & Kyrychenko K. (2018).

Blended learning was studied by Sharov, S. (2022) as the formation of new patterns of the educational process in higher education institutions. The author found that distance learning systems, mass open online courses, software for organizing video conferences, instant messaging, social networks, blogs are used to ensure blended learning. The author noticed that the effectiveness of blended learning introduction in the educational process of higher depends on school management and teachers: an adequate level of information culture of students and teachers, their readiness to conduct classes in this form, and appropriate software should be provided. General scientific methods of analysis, synthesis, and generalization of the scientific literature to consider the possibilities and advantages of distance learning in addition to traditional education because it combines the advantages of these education forms and compensates for each disadvantage of the education type (Sharov, 2021: 4).

One more tendency in higher education is the stakeholder approach. For instance, the paper of Savga L., Krykliy O. & Kyrychenko K. (2018) is dedicated to identifying the role of stakeholder analysis in determining the most important stakeholder groups with direct and indirect influence on the HEIs. In the article, the authors develop a model, which includes classification criteria: location, level of responsibility, level of impact on decision-making concerning activities of HEI, a form of performance of influence, the scale of impact, financial ties, involvement status, the potential for cooperation and threat (Savga, Krykliy, & Kyrychenko, 2018: 8).

Vermunt J.D. & Donche V.A. (2017) aimed to review the state of the research and theory development on student learning patterns in higher education and beyond. Thus, the authors examined research published since 2004 on student learning patterns: new evidence on internal and external relationships of learning patterns, the dimensionality and the internal relationships of learning patterns and relationships of learning patterns with personal, contextual, and outcome variables (Vermunt, J.D. & Donche, 2017: 6). Vermunt, J.D. and Donche, V.A. (2021) examined patterns of student perspectives on higher education, while Serhat A. et al. (2022) reviewed the current state of research and development of the theory of student learning patterns in higher education and beyond. Additionally, Anderson T. (2008) investigated the role and value of online education, the principles of interaction between key participants, and the e-learning model.

The new evolution stage of patterns of higher education is self-directed hybrid learning. Abdullah Md, Mamun Al, Lawrie Gwendolyn, and Wright Tony (2022) investigated the nature of student interactions with self-directed hybrid and online learning environments (blended learning pedagogies) guided inquiry-based learning in the absence of the teacher, guided inquiry-based, self-directed learning environment to explore their approaches to learning. The predict-observe-explain-evaluate was reached by quantitative data (engagement measures)

collected through students' interviews and written responses. As a result, diversity in learning approaches among students was observed and student engagement in terms of persistence, systematic investigation and understanding of the science concepts based on the individual learners' differences in their prior online experiences and existing chemistry knowledge (Abdullah Md, Mamun Al, Lawrie Gwendolyn, Wright Tony, 2022: 18). On the other hand, Semenikhina O.V. et al. (2022) found a weak indicator of interest among young people in open educational resources (Coursera, Edx, Udemy, and INTUIT) for metamathematical courses but found a favourable reaction among young people to the placement of these resources on the websites of universities within the country and in the world.

Above evolution, the pattern of the higher educational process changed, and the gap between the real world and education stayed the same. In 2016, OECD spoke about the technology-driven innovation process gap between education and learning is not yet going through the same as other sectors in compared to digital technologies in work, communicate and day life. Education systems are critically important for innovation through the development of skills that nurture new ideas and technologies (OECD, 2016: 19). Another significant problem was shown in the paper of Matviichuk L., Ferilli S., and Hnedko N. (2022), which clarified significant difficulties in studying among Ukrainian students. The key challenges are the war in Ukraine and military operations in settlement of students, lack of the Internet, psychological discomfort at explosions, electricity supply absence and risk of explosions. The authors substantiated the possibilities of organizing and implementing e-learning in higher educational institutions of Ukraine in the conditions of a full-scale war (Matviichuk, Ferilli, Hnedko, 2022: 3).

Kalashnikova S., and Orzhel O. (2022) analyzed the European experience of optimization and their trends in optimization universities and restructuring the landscape of national higher education systems of countries – Belgium, Denmark, Estonia, Finland, France, Ireland, Norway, Sweden, the United Kingdom, and identified the key features of network optimization institutions of higher education in each of these countries. The relevance of the research problem is determined by the reform of the higher education system in Ukraine, the strategic goals of its development, the processes caused by the military aggression on the part of the Russian Federation, and the tasks of the post-war reconstruction of Ukraine (Kalashnikova & Orzhel, 2022: 16) Kondratiuk Y.A., & Ionova, I.M. (2019) also studied open online resources as a trend in modern education.

Taking these publications as a step further, some of these authors have employed innovative research methods such as using Internet queries and analysing key concepts based on the Google Trends tool. By considering alternative versions of key terms and the factor of seasonality in patterns, these researchers have provided a wealth of invaluable data that can be used to advance our understanding of the field further. In such way, the study of Kaidashev, I. & Morokhovets, Halyna & Rodinkova, Victoria & Bousquet, Jean (2019) aimed to examine translations of main definitions in translating terms in different languages (Cyrillic equivalents, especially in Ukrainian and Russian) by comparing the seasonality of queries in Ukraine in the field of pollen via Google Trends (GT) approach. Data collection for 2013-2015 was conducted using volumetric methods (Kaidashev et al., 2019). Speaking about the education sector, Arslan S., Tiwari M., and Piech C. (2020) searched trend data via Google Trends to measure patterns in subject literacy to estimate trends in computer science education across countries and over time. Computer science was the most priority for the authors. Their results anticipated search trend data growing relevance to the learning science community. This approach is becoming a standard tool for learners (Serhat Arslan, Mo Tiwari, Chris Piech, 2020: 5).

The field of scientific research, particularly concerning higher education, has been actively studying the patterns that shape the educational landscape for students. In this regard, students' needs and preferences have been identified as a significant factor in shaping the direction and focus of university services, especially in Ukraine. However, there is a gap in our studying of how patterns of online content in the context of wartime in Ukraine affect higher education. Despite the importance of providing educational services amidst war, much remains to be researched in this area, and further exploration of this topic can greatly inform educational practices and ultimately shape the future of higher education in Ukraine.

Methodology and Research Methods

Based on a literature review, bibliometric analysis and trends analysis are actively used to study the patterns of higher education. This article used the following research tools:

➤ Trends analysis was implemented via the Google Trends tool to track trend changes in educational services among universities, using the “university” as a keyword. Requests in Cyrillic (in Ukrainian and Russian) were also analyzed to improve the results of this research and compare the seasonality of demands in Ukraine related to

revolutions and martial law. The following time series caused by the stressful political situation in the history of Ukraine were used for the study:

- 1) November 22, 2004 (the beginning of the Orange Revolution);
- 2) November 30, 2013 (the beginning of the Revolution of Dignity, later the war in the East of Ukraine);
- 3) February 24, 2022 (the beginning of the full-scale war in Ukraine).

➤ Bibliometric analysis with VosViewer tool was carried out to research publications on the WOS platform by key inquiries: “educational trends Ukraine” (205 results), “trends online educational content” (307 results), and “educational online content Ukraine” (25 results). There is no time reference for bibliometric analysis. The data were analyzed by year, country and category.

➤ Cluster analysis via VosViewer was used to investigate the gap between educational and other sectors of real life. The terms “educational content trends” and “online content trends” were chosen. The surveyed data include Web of Science platform publications filtered by Title and Abstract.

Analyzing of Global Patterns of Online Content in Higher Education (HE). Before Covid-19, online content and traditional content were considered separate concepts since education in higher education institutions always took place in classrooms in the presence of a teacher and students. Distance education in the period of forced quarantines forced the world to rethink the usual form of education and opened opportunities for more accessible education. The comprehensive understanding of what “educational content” means in the context of higher education (HE). Furthermore, it is necessary to comprehend the intricacies of online content in HE and develop more effective research strategies to explore this exciting and rapidly evolving field. Ahead of forming of new pattern starts with establishing existing patterns of learning content in higher education. Such context is formed by distance learning and blended learning. Creating education patterns in higher education (HE) could be based on the most common correlating terms such as “distance learning” (online learning/e-learning) and “blended learning”.

On the one hand, distance learning is a term used to define a studying process excluding physical proximity, while e-learning or online learning involves using the Internet as a means of gaining knowledge or receiving an education. These terms may be used interchangeably in literature (Bozkurt, Zawacki-Richter, 2021). On the other hand, blended learning combines traditional education and distance learning. This approach allows students to experience both traditional face-to-face learning and the flexibility of distance learning. Figures 1 and 2 demonstrate different models of blended learning (Sharov, 2022), (Savga, Krykliy, & Kyrychenko, 2018), (Zhang et al., 2022).

Anderson T. (2008) highlighted e-learning system changes by four main e-learning centres (knowledge-, community-, and assessment-centred). The education process excluded active interaction with students directly. The teachers become facilitators (“agents”) and creators of selecting, personalizing, and reusing online content and content changes in response to individualized and group learner models (Anderson, 2008). As a result, the online learning model was created (Figure 1). Implementing modern technologies started to provide new integrated models, where content became prior learning using interactive technology tools. However, the modern online learning model changed among publications and started based on the stakeholders’ approach to managing the education process. As a result, the model of Abdullah M. (2022) was based only on the learner and did not include the teacher (Figure 2).

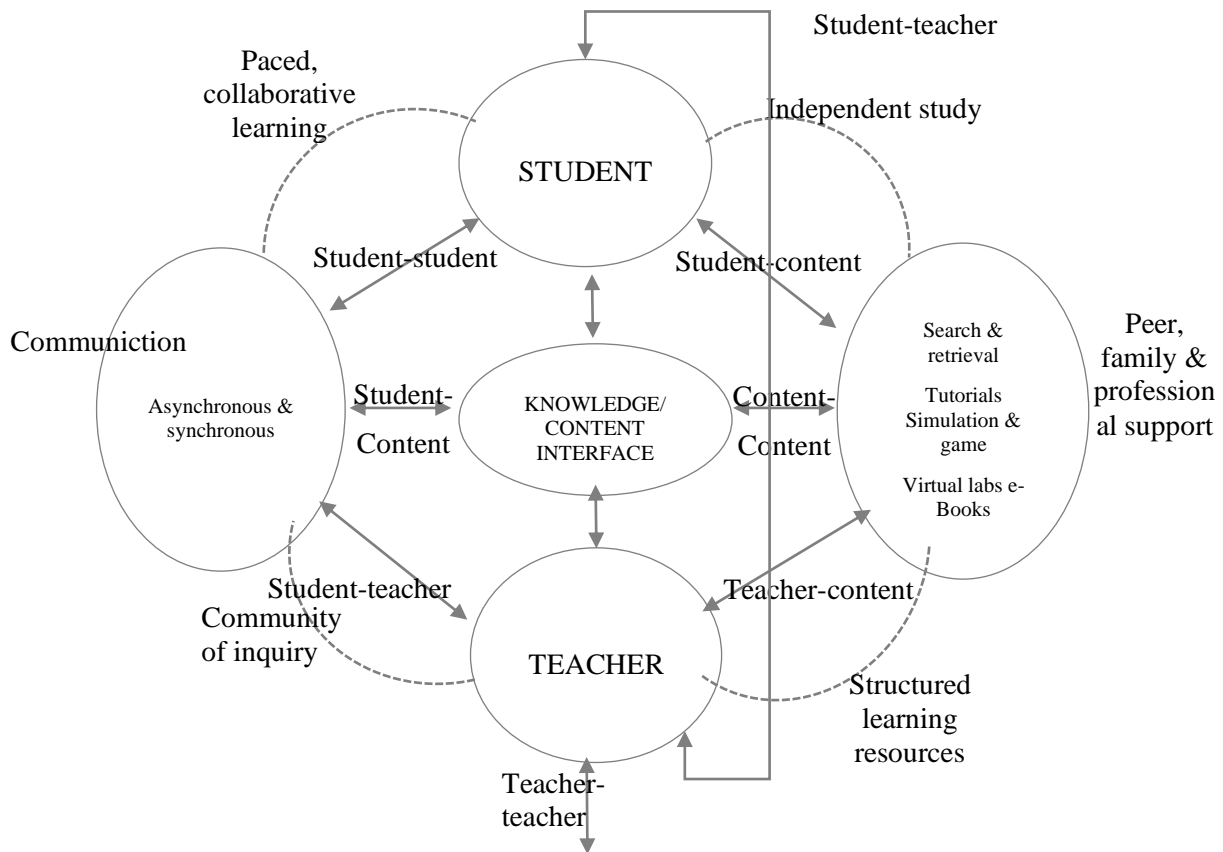


Figure 1. A Model of Online Learning WITH Teacher

Source: Anderson, 2008

The Anderson model showcases the key variables that interact to create online educational experiences and contexts (Figure 1). It focuses on the “knowledge/content interface” and includes search, tutorials, games, labs, e-Books, and support. This model helps to create engaging and interactive learning experiences online. The Anderson model explains how to create effective online educational experiences. Since 2019, inquiry-based online learning has garnered increasing attention in academia as a cutting-edge method for developing educational materials. This approach involves the creation of online content based on students' inquiries during the learning process. Abdullah M.'s (2022) model demonstrates such theoretical frameworks, positing that higher education content creation should revolve around learners' inquiries, potentially enabling self-directed learning without the traditional role of a teacher. This new learning pattern offers promising avenues for optimizing the efficacy of online education, as it leverages learners' interests and curiosities as driving forces for learning. Since research in this area advances, inquiry-based online learning may emerge as a transformative paradigm shift in modern education (Abdullah et al., 2022: 18).

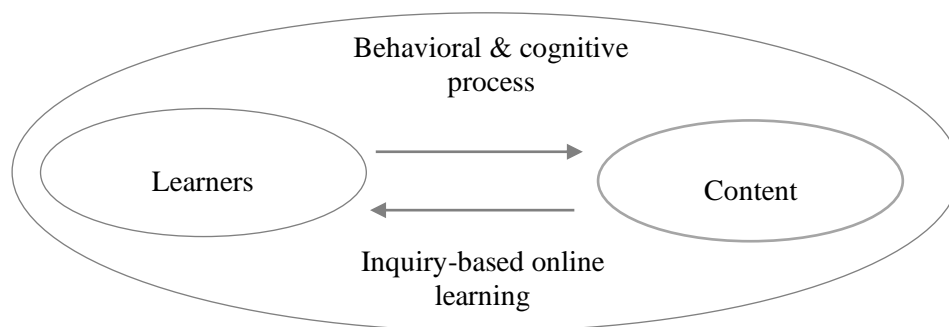


Figure 2. A Model of Online Learning WITHOUT Teacher

Source: Abdullah et al., 2022: 18

According to Figure 2, Abdullah M.'s model for higher education is an approach based on both behavioural and cognitive learning processes. This model considers inquiry-based online learning, allowing a more interactive and student-centred approach to coursework. Through this approach, students can engage with content more meaningfully and are allowed to take charge of their own learning experience. Abdullah M.'s model is also designed to shift away from traditional teaching methods and instead focuses on creating an environment conducive to optimal student learning. By prioritizing learners and content over the standard pattern of information delivery, Abdullah M.'s model promotes a more authentic and holistic approach to higher education which will lead to better-equipped graduates who are more adaptable in today's constantly evolving job market (Abdullah et al., 2022: 18). The formation pattern of learning content in higher education is crucial for an effective higher education system. The formation pattern of learning content in higher education could be based on understanding the needs of consumers of HE services and the challenges creators face. By meeting these challenges, institutions can create optimal formation patterns leading to elevated student engagement, learning outcomes and overall success.

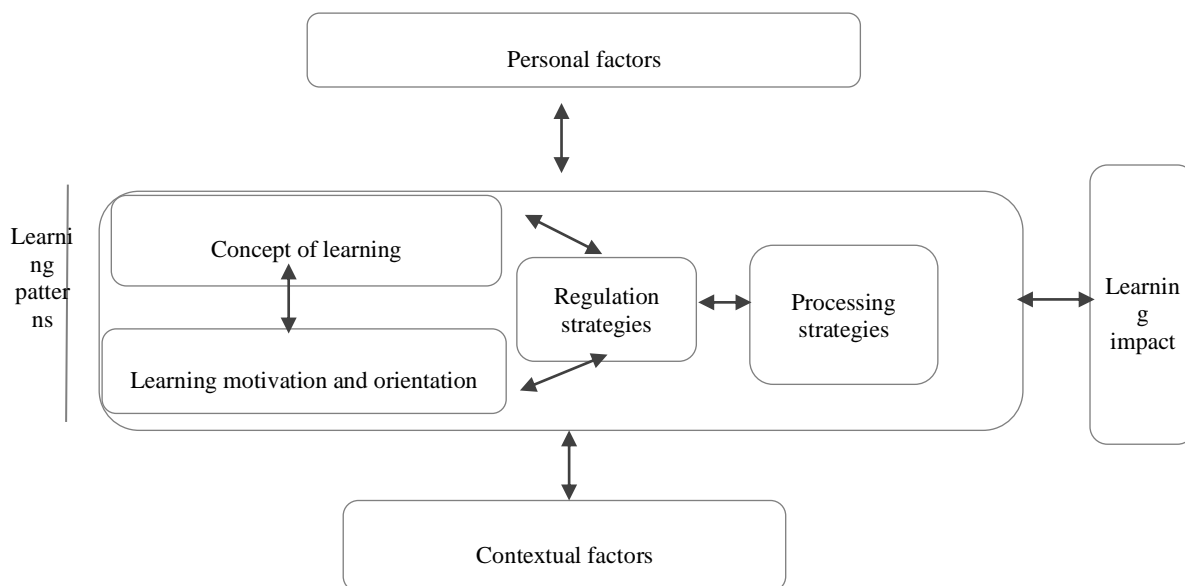


Figure 3. A Learning Patterns Model of Student Learning

Source: Vermunt, J.D. & Donche, V.A. (2017)

Vermunt, J.D. & Donche, V.A. model showed that learning patterns consist of the conception of learning, learning motivation/orientation, and regulatory and processing strategies. Contextual and personal factors affect learning patterns (Figure 3). The learning outcomes are not only results of creating content but factors which affect the content. Indeed, the papers above investigated the transformation of traditional higher education in literature oriented towards enhancing higher education's effectiveness within changing student and teacher roles. As per the current research, the key stakeholders are students because they significantly affect online content and educational content in general. All online course content must be based on their needs and queries to ensure their satisfaction and optimal learning experience. Implementing trends analysis is deemed an appropriate solution to achieve this objective.

A viable and practical way to start this process is creating a comprehensive model, which serves as the foundation of theory creation. It becomes simpler to understand the needs of online learners and create content that directly caters to them. Thus, it is essential to have an established model and continuously update it based on trends and feedback from the students. Overall, it is crucial to maintain a student-centric approach towards online education to ensure satisfaction and a successful learning outcome.

Identification of Trends in Higher Education in Ukraine. Google Trends is chosen to conduct detailed trend analyses in this paper. Initially, Google Trends has been a powerful research tool in recent years worldwide. Most Ukrainians, including existing and potential students, use Google as a research tool. It is confirmed that almost 90% of users worldwide use Google for their internet searches, which is established as the global search engine market leader, with 83.84% of the market share. Moreover, Google's continuous updates and development with algorithms aim to identify relevant search queries and provide users with the

most accurate and helpful search results. Therefore, such analysis will provide significant results (Ahlgren, 2023). In scientific prospects, Kaidashev I., Morokhovets H., Rodinkova V., & Bousquet J. (2019) used Google Trends for investigation patterns based on internet inquiries in Ukraine. The authors considered a fact of different languages among Internet users in Ukraine and analysed Ukrainian and russian inquiries (Kaidashev et al., 2019). On top of that, this article will apply to English language inquiries among Ukrainian users.

The most relevant traditional term for higher education among students is “university”; in other words, higher education institutions because each potential student starts at an appropriate university to graduate for comparative at labour market. In addition, terms such as “education” and “training” are more general concepts, so they were irrelevant to this research. The article by Arslan S., Tiwari M., and Piech C. (2020) searched trend data via Google Trends to measure patterns in subject literacy to estimate trends in computer science education across countries and over time. This approach could be used in the higher education investigation because the learning process also includes seasonal aspects such as starting of the academic year, the summer and winter holidays.

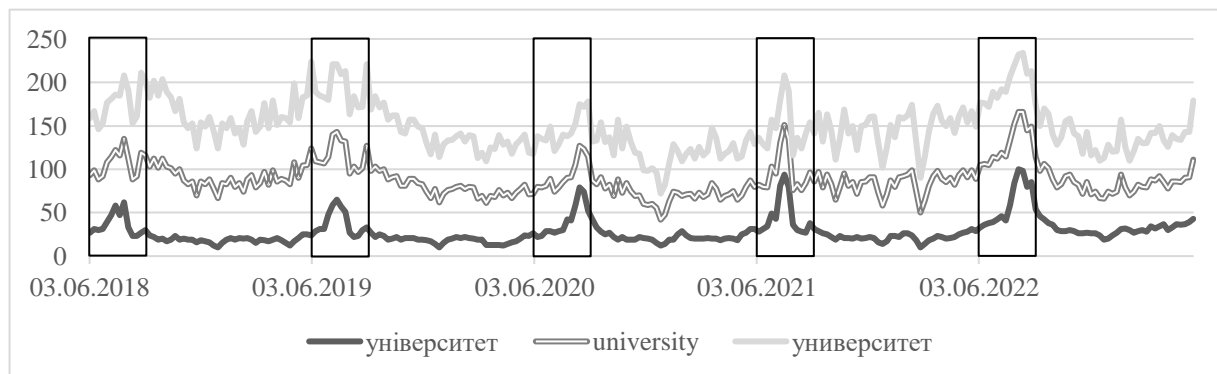


Figure 4. Number of Inquiries in Google Trends within Keyword “університет”/“university”/“университет” in Google Last 5 Years by Summer Holidays

Source: Compiled by the authors based on Google Trends

The inquiries in Figure 4 demonstrate a cycle tendency in higher education with seasonal aspects in Ukraine during the last five years based on searches in three languages. The “університет” (Ukrainian language) and “университет” (russian language) inquiries are synchronous. At the same time, “university” is similar, but without rapid changes as other inquiries. There is an increasing interest among Ukrainian users in July and August each year when admission to the university begins. Therefore, the highest number of inquiries in 2022 on August 7, 2022, is 100 inquiries with “university” and 68 inquiries with “університет”. There are 68 inquiries “университет”, which is lower by 14,7% (78 quantity) on July 14, 2019. The lowest bottom point is 10-12 inquiries “університет” at the end of December each year. The correspondence of the data to real trends is approving of relevant data from Google Trends.

The further trends analysis of trends in higher education are focused on three times start points affected by political aspect:

- November 22, 2004 (the beginning of the Orange Revolution) (Figure 5-7);
- November 30, 2013 (the beginning of the Revolution of Dignity, later the war in the East of Ukraine) (Figure 8-10);
- February 24, 2022 (the beginning of the full-scale war in Ukraine) (Figure 11-13).

To begin with, the author investigated some inquiries in Google Trends within the keywords “університет” “university”, “университет” in Ukraine after February 24, 2022.

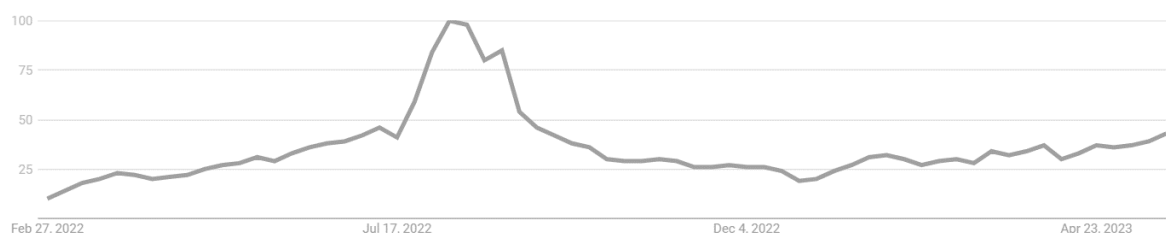


Figure 5. Number of Inquiries in Google Trends within Keyword "університет" in Ukraine after February 24, 2022

Source: Compiled by the authors based on Google Trends



Figure 6. Number of Inquiries in Google Trends within Keyword “university” in Ukraine after February 24, 2022

Source: Compiled by the authors based on Google Trends

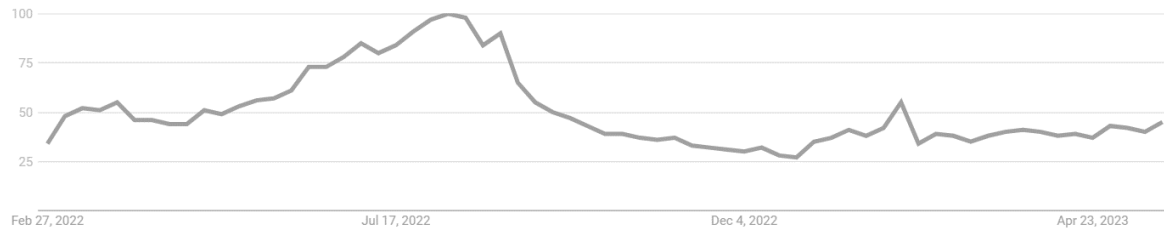


Figure 7. Number of Inquiries in Google Trends within Keyword "университет" in Ukraine after February 24, 2022

Source: Compiled author based on Google Trends

The graphics in Figure 5-7 with keywords “університет” and “университет” are synchronous in comparison to “university” internet requests. The search inquiries “університет” and “университет” after February 24, 2022, demonstrate significant peaks in August 2022, which showed an increase of interest of potential consumers in higher educational services after starting full-scale war in Ukraine. The reason is the raising of inquiries about universities in European countries as a way to continue the educational process among Ukrainians despite military actions, which cause different types of challenges, war in Ukraine, and military operations in settlement of students. Lack of the Internet, psychological discomfort at explosions, electricity supply absence and risk of explosions (Matviichuk, Ferilli, Hnedko, 2022: 3). Plus, there are a lot of forced displacement persons among Ukrainian students (IOM, 2022: 21). After dropping in March 2023, it begins to increase again in May 2023, when the entrance exams start. From February 24, 2022, to May 14, 2023, the traditional cycle of search requests is observed during the beginning of the academic year. The other trends analysis includes reviewing data after November 30, 2013, to compare the after starting war in east part of Ukraine.

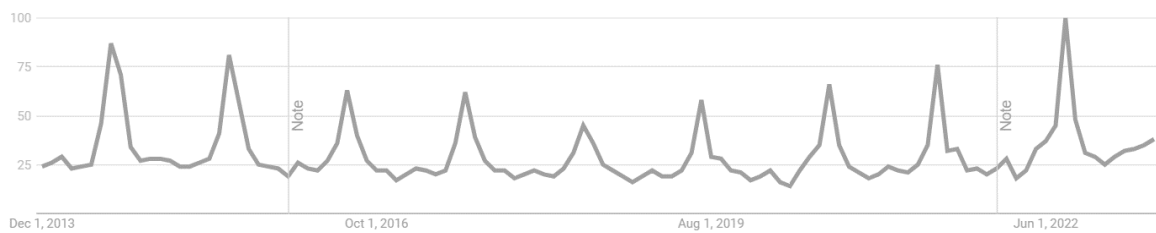


Figure 8. Number of Inquiries in Google Trends within Keyword “университет” in Ukraine after November 30, 2013

Source: Compiled by the authors based on Google Trends

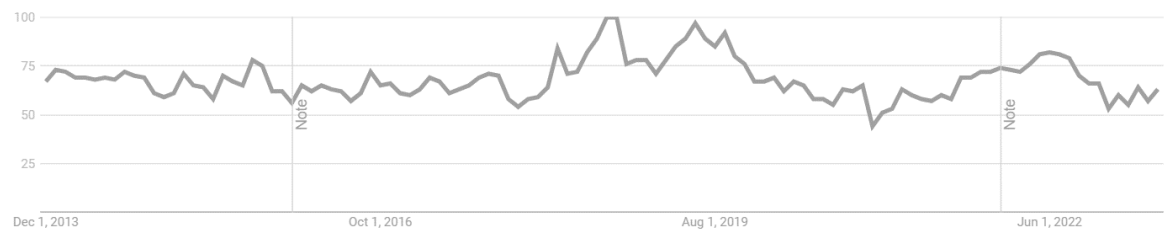


Figure 9. Number of Inquiries in Google Trends within Keyword “university” in Ukraine after November 30, 2013

Source: Compiled by the authors based on Google Trends

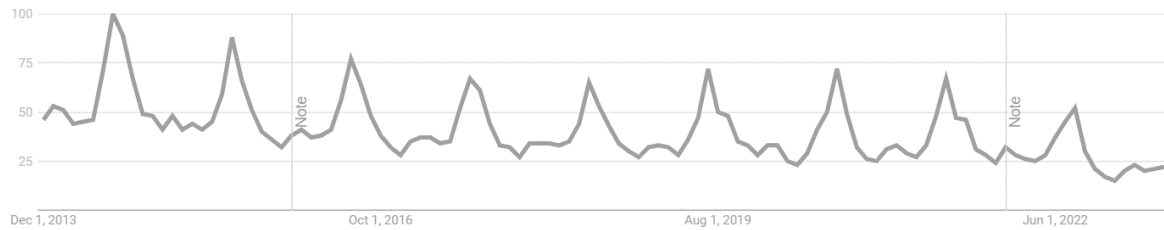


Figure 10. Number of Inquiries in Google Trends within Keyword “университет” in Ukraine after November 30, 2013

Source: Compiled by the authors based on Google Trends

The trend analysis after November 2004 was arranged to examine level of interest to higher education during last 20 years.



Figure 11. Number of Inquiries in Google Trends within Keyword “университет” in Ukraine after November 22, 2004

Source: Compiled by the authors based on Google Trends

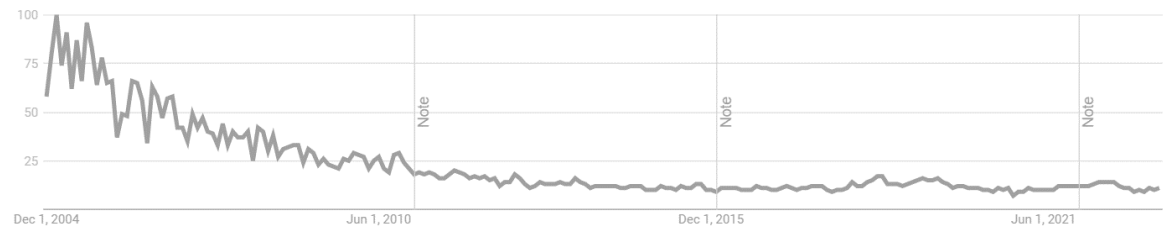


Figure 12. Number of Inquiries in Google Trends within Keyword “university” in Ukraine after November 22, 2004

Source: Compiled by the authors based on Google Trends



Figure 13. Number of Inquiries in Google Trends within Keyword “университет” in Ukraine after November 22, 2004

Source: Compiled by the authors based on Google Trends

The graphics in Figure 5-7 with keywords “университет” and “университет” are synchronous in comparison to “university” internet requests. The search inquiries “университет” and “университет” after February 24, 2022, demonstrate significant peaks in August 2022, which showed an increase of interest of potential consumers in higher educational services after starting a full-scale war in Ukraine. The reason is the raising of inquiries about universities in European countries to continue the educational process among Ukrainians despite military actions, which cause different types of challenges, the war in Ukraine, and military operations in settlement of students. Lack of the Internet, psychological discomfort at explosions, electricity supply absence and risk of explosions (Matviichuk, Ferilli, Hnedko, 2022: 3). Plus, there are a lot of forced displacement persons among Ukrainian students (IOM, 2022: 21). After dropping in March 2023, it begins to increase again in May 2023, when the entrance exams start. From February 24, 2022, to May 14, 2023, the traditional cycle of search requests is observed during the beginning of the academic year. The other trends analysis includes reviewing data after November 30, 2013, to compare the starting war in the east part of Ukraine.

Additionally, the following inquiries in Google Trends are gaining popularity dramatically in the current period based on the collected data regarding the “Related topics” section:

- after November 22, 2004 – universities in various regions from Kharkiv, Lviv, Kyiv, Prykarpattia etc.
- after November 30, 2013 – universities in the western part of Ukraine and foreign universities in Poland, Latvia, and Canada; inquiries about education as a way of finding a job.
- after February 24, 2022, only Polish, Slovak, and Czech Republic universities were famous, increasing inquiries about various distance and blended learning.

Additionally, one of the changes in trends is the popularisation of the Ukrainian language in search queries during the war (Yarova, 2022: 24). Using this tool, researchers analysed the popularity of certain queries for the same period before and after the start of the war. The number of requests in Ukrainian increased by 11% (from 26% to 35%). The results show that Ukrainian-language sources significantly outnumber russian-language content. The further Google Trends will be in English and Ukrainian languages.

The analysis of different terms in Ukrainian and English was used to find key patterns in HE in Ukraine (Figure 14).

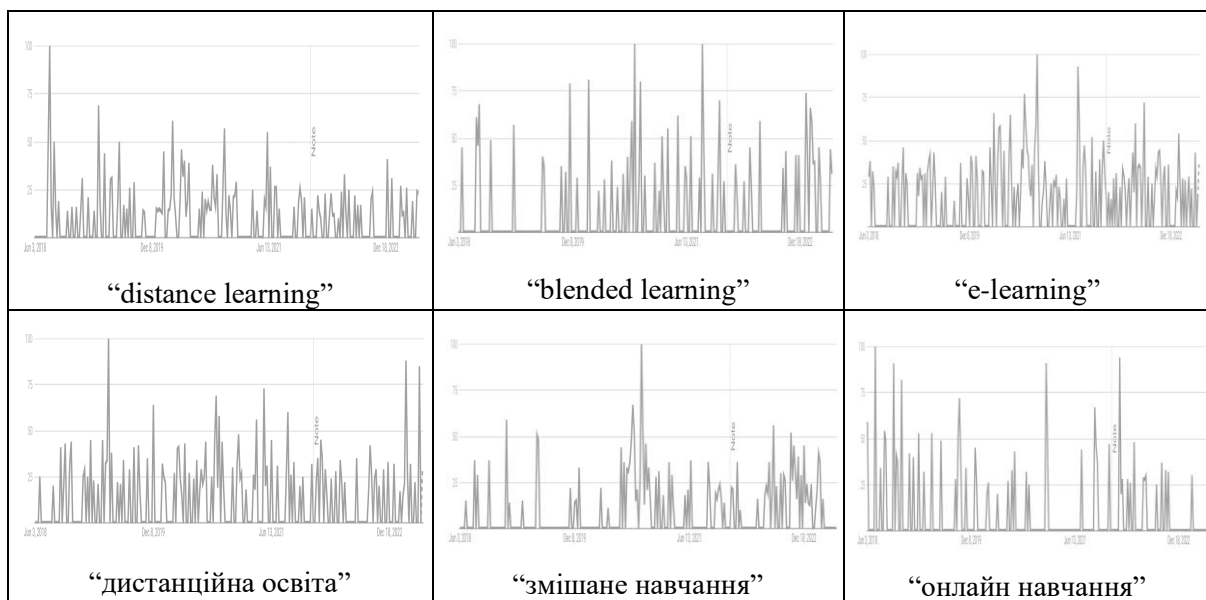


Figure 14. Number of Inquiries “distance learning”, “blended learning” and “e-learning” in English and Ukrainian Languages in Google Trends within Keyword in Field of Online Education in Ukraine Last 5 Years

Source: Compiled by the authors based on Google Trends

According to Figure 14, “blended learning” and “e-learning” are actively inquired by Ukrainian users, while parallel inquiries “змішане навчання” and “онлайн навчання” have a lot of gaps during last five years. The “distance learning” and “дистанційна освіта” are more similar. However, internet requests made the Ukrainian language more relevant, especially in 2022 and 2023. Thus, the most constantly relevant inquiries about education in Ukrainians are “дистанційна освіта” and “distance learning” (Figures 15 and 16).



Figure 15. Number of Inquiries in Google Trends with Terms “дистанційна освіта” in Ukraine Last 5 Years

Source: Compiled by the authors based on Google Trends

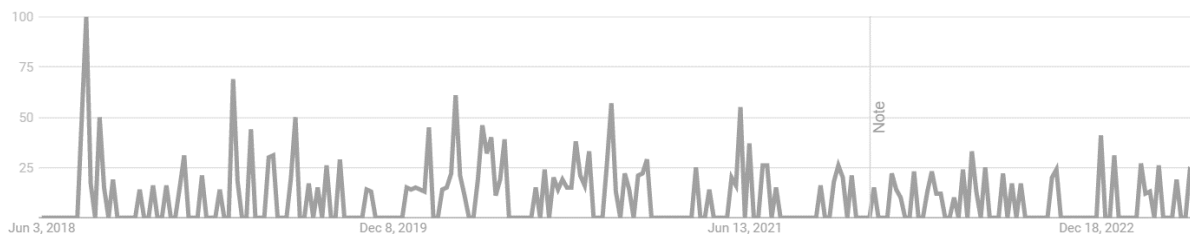


Figure 16. Number of Inquiries in Google Trends with Terms “distance learning” in Ukraine Last 5 Years

Source: Compiled by the authors based on Google Trends

Some inquiries in Google Trends with the terms “дистанційна освіта” and “distance learning” were considered in Ukraine last five years with the same tendency. Additionally, the terms “дистанційна освіта” appeared in searching more regularly in February and May 2023. Along with distance education, according to Google trends, the question “for whom can distance education be most effective” (“для кого дистанційна форма освіти може бути найбільш ефективною”) (Figure 17) and “what opportunities do distance education provide” (“яку можливість надає дистанційна освіта”) (Figure 18) began to gain popularity, which reveals the acute problem of Ukrainians being informed about the principles of distance education. That is, one of the contents of the online content should be an excursion on distance education for students of education and persons who influence the student’s choice (parents, grandparents, guardians, etc.).

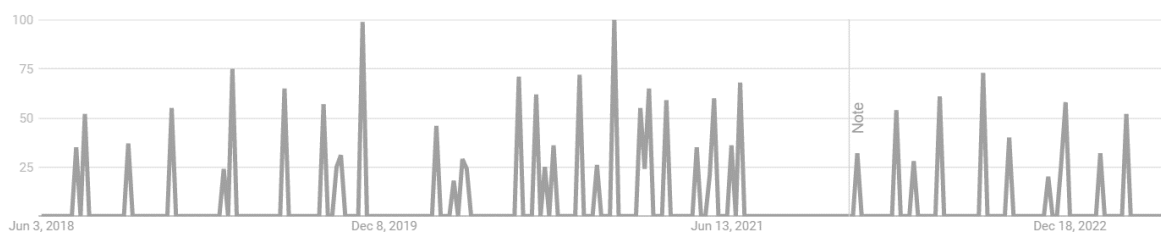


Figure 17. Number of Inquiries in Google Trends with Key Phrase to “для кого дистанційна форма освіти може бути найбільш ефективною” in Ukraine Last 5 Years

Source: Compiled by the authors based on Google Trends

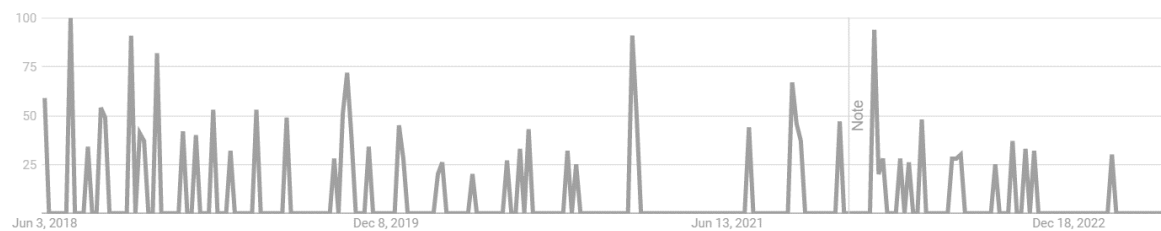


Figure 18. Number of Inquiries in Google Trends within Key Phrase “яку можливість надає дистанційна освіта” in Ukraine Last 5 Years

Source: Compiled by the authors based on Google Trends

The questions “for whom can distance education be most effective” (“для кого дистанційна форма освіти може бути найбільш ефективною”) and “what opportunities do distance education provide” (“яку можливість надає дистанційна освіта”) appeared periodically during last five days, but regularly in comparison to inquiries in higher education. The inquiries are dropping during the summer and winter holidays. However, the inquiries “for whom can distance education be most effective” was a long pause period after June 13, 2021, while the inquiries “what opportunities do distance education provide” was a long pause period before June 13, 2021. The reason is the quarantine period in Ukraine. Thus, students in Ukraine were searching for opportunities to pass exams at the end of the year after half year of e-learning and the process of reviewing patterns of online content in higher education.

As a result of trend analysis, it was found that interest in higher education is seasonal and should be promoted accordingly to attract potential students by forming relevant online content. Results indicated that different queries related to higher education have varied time frames. Thus, creating relevant patterns of online content based on trends is crucial. Educational services should be advertised on time and posted on the university's website as advised in May, July and August when interest is highest. It will help to attract more students. Considering the changing trend in higher education, requests from different universities must

be taken into account to introduce online education. The tendency of searching demonstrates that keywords for higher education and online content are “universities”, “університети”, “distance learning” and “дистанційна освіта”. Creating online content that explains the effectiveness and purpose of distance learning is also recommended. Related and Similar Queries are valuable clues for universities to shape online content as per the direction suggested by trend analysis. In addition, the most popular inquiries of universities could be examples of developing online content patterns in higher education. Furthermore, the mobile phone is an increasingly popular medium for accessing web content. In 2022, 59.21% of Google users accessed web pages via mobile devices. Hence, higher education content must also be made available on phones. Plus, universities must use Chrome to optimize the browsing experience.

Educational Online Content as a Key Element of Flexible HE in Ukraine. Comparison of existing trends among publications about online content worldwide and Ukraine were coordinated to analyse formation patterns of educational content that will be flexible to all external factors. The WOS platform was used to collect the data over the years. As a result, the following key categories in this topic were chosen for analysis:

- Educational trends Ukraine (1) – 202 results.
- Educational online content trends (2) – 307 results.
- Educational online content Ukraine (3) – 25 results.

The first stage is analyzing number of publications by Publication Years to find the most correlating period of forming online pattern in higher education.



Figure 19. Number of Publications by Publication Years with Terms “educational trends Ukraine” (1) at WOS Platform

Source: Compiled by the authors

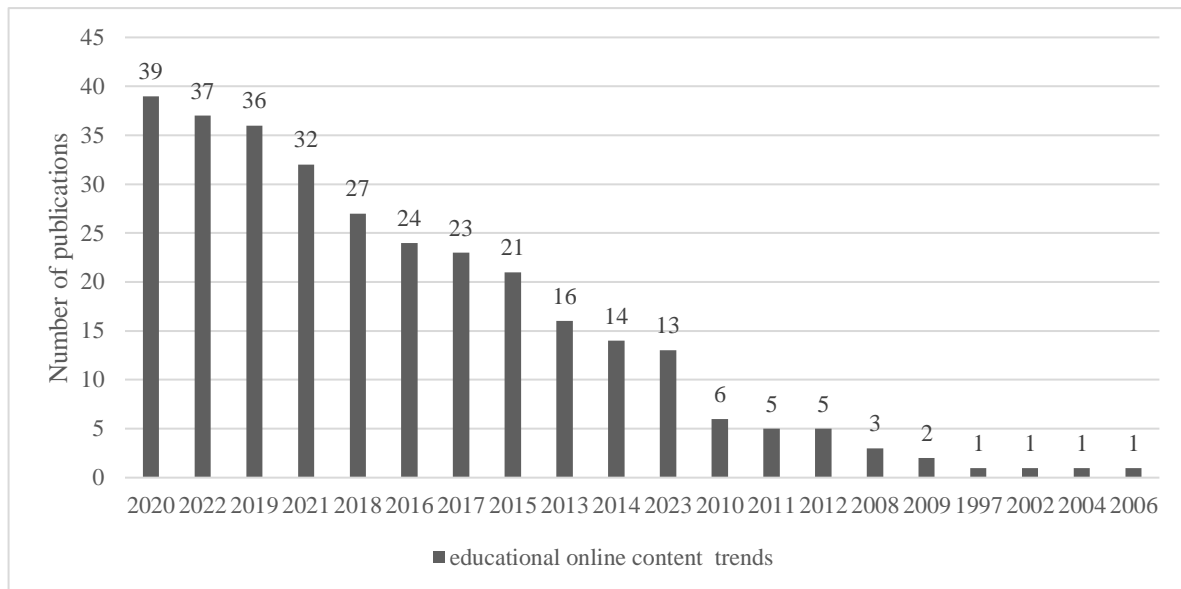


Figure 20. Number of Publications by Publication Years with Terms “trends educational online content” (2) at WOS Platform

Source: Compiled by the authors

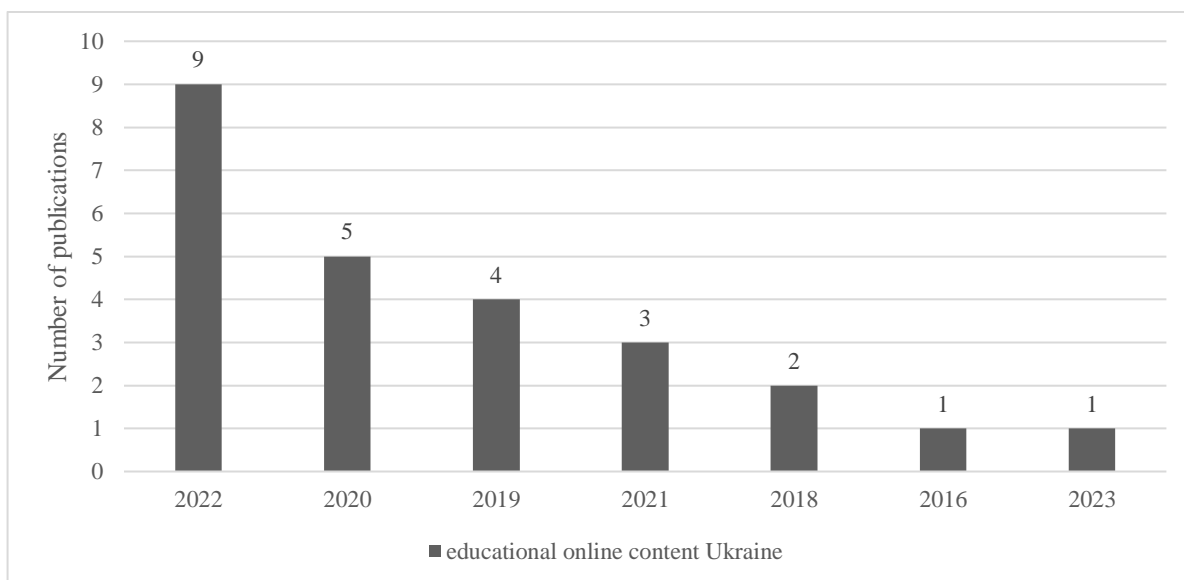


Figure 21. Number of Publications by Publication Years with Terms “educational online content Ukraine” (3) at WOS Platform

Source: Compiled by the authors

Figures 19-21 presented the dynamics of the number of publications with terms “educational trends Ukraine” (1), “trends educational online content” (2) and “educational online content Ukraine” (3) at the Web of Science platform during 2019-2022. In such a way, “educational trends Ukraine” (1) 2022 is the year with the highest number of articles (49 papers per year), while 1999, 2009 2013 are the lowest - 1 paper per year. In 2020, there is the record number of scientific articles about “trends in online educational content” (2), which stands for 39 papers. On the other hand, 1997, 2002, 2004, and 2006 published only one paper on such topic. According to data from WOS, the subject of “educational online content Ukraine” (3) started investigation actively after 2016, reaching nine periodicals per year during 2022 accordingly. The publications in higher education analyzed by Categories could be used as significant tools to form patterns of educational content and investigate the most demanding areas.

Table 1. Number of Publications by Categories within Terms “Educational Trends Ukraine” (1), “Trends Educational Online Content” (2), “Educational Online Content Ukraine” (3) Gained from WOS Platform

Categories for 1 (200)	#	%	Categories for 2 (307)	#	%	Categories for 3 (25)	#	%
Education Educational Research	69	34.2	Education Educational Research	149	48.5	Education Educational Research	17	68
Economics	25	12.4	Computer Science Interdisciplinary Applications	22	7.2	Computer Science Information Systems	2	8
Social Sciences Interdisciplinary	15	7.4	Educational Sciences Disciplines	22	7.2	Engineering Electrical Electronic	2	8
Multidisciplinary Sciences	14	6.9	Computer Science Information Systems	18	5.9	Business	1	4
Management	11	5.4	Computer Science Theory Methods	13	4.2	Information Science Library Science	1	4
Humanities Multidisciplinary	10	5	Social Sciences Interdisciplinary	13	4.2	Language Linguistics	1	4
Computer Science Information Systems	8	4	Computer Science Artificial Intelligence	9	2.9	Multidisciplinary Sciences	1	4
History	7	3.5	Psychology Multidisciplinary	9	2.9	Telecommunications	1	4
Business	6	3	Communication	8	2.6	-	-	-
Business Finance	6	3	Information Science Library Science	8	2.6	-	-	-

Source: Compiled by the authors

Education Educational Research is a central study field of educational trend papers in Ukraine and worldwide (Table 1). Moreover, this research is almost half (48.5%) articles about “trends in online educational content” with Educational Sciences Disciplines (7.2%) and Computer Science Information Systems (7.2%). The key five sectors of educational trend in Ukraine are Education Educational Research (69 articles), Economics (25 articles), Social Sciences Interdisciplinary (15 articles), Multidisciplinary Sciences (14 articles) and Management (11 articles) which is 60% of sectors. As for “educational online content Ukraine”, Education Educational Research (68%), Computer Science Information Systems (8%), Engineering Electrical Electronic (8%) and Business (4%) are the researched categories.

According to Arslan S., Tiwari M., & Piech C. (2020), Ukraine is most like Romania and Poland regarding educational patterns in the computer and mathematical sciences sector. It could be assumed that there is the same tendency for publication in “educational trends Ukraine” and “educational online content Ukraine”. This hypothesis can be confirmed or refuted through bibliometric analysis of publications filtered by geographical characteristics.

Table 2. Number of Publications by Country with Terms “educational trends Ukraine” (1), “trends educational online content” (2), “educational online content Ukraine” (3) Gained from WOS Platform

Country for 1	#	%	Country for 2	#	%	Country for 3	#	%
UKRAINE	192	95.05	USA	50	16.287	UKRAINE	24	96.000
POLAND	7	3.465	russia	32	10.423	USA	2	8.00
russia	6	2.970	SPAIN	30	9.772	LATVIA	1	4.00
USA	5	2.475	CHINA	27	8.795	SWITZERLAND	1	4.000
BULGARIA	2	0.990	ENGLAND	14	4.560	TURKEY	1	4.000
LATVIA	2	0.990	TURKEY	13	4.235	-	-	-
SPAIN	2	0.990	AUSTRALIA	12	3.909	-	-	-
ENGLAND	1	0.495	GERMANY	11	3.583	-	-	-
ESTONIA	1	0.495	CANADA	10	3.257	-	-	-
FRANCE	1	0.495	ROMANIA	10	3.257	-	-	-
GERMANY	1	0.495	GREECE	9	2.932	-	-	-
INDIA	1	0.495	ITALY	9	2.932	-	-	-
ITALY	1	0.495	UKRAINE	8	2.606	-	-	-

Source: Compiled by the authors

Table 2 shows the total number of publications about “educational trends Ukraine” is 205 papers, “trends online educational content” – 307 articles and online educational content Ukraine is 25 publishes. Ukraine is the first country to publish articles based on educational trends and online educational content in domestic countries (more than 90%). However, the countries by “educational trends Ukraine” are Poland, russia, the USA and Bulgaria. The central countries by trends in online educational content (2) are the USA, russia, Spain, China, England, and Turkey (54% of the number of publications). The publication about “educational online content Ukraine” were held by Ukraine, USA, Latvia, Switzerland and Turkey.

The OECD Report of 2016 discussed the technology-driven innovation process gap between education and other sectors of human life compared to digital technologies (OECD, 2016: 19). Cluster analysis was used for publications about HE at the WOS platform to investigate this gap between the higher education system and the real world. The keywords are “educational content trends” and “online content trends”. The results are demonstrated in Figures 26 and 27. The cluster analysis of “educational content trends” showed key developed by research approaches in formations of educational content within traditional, blended and distance learning. In contrast, “online content trends” demonstrates a key approach to creating online content for users without a specific purpose (Figure 26 and 27).

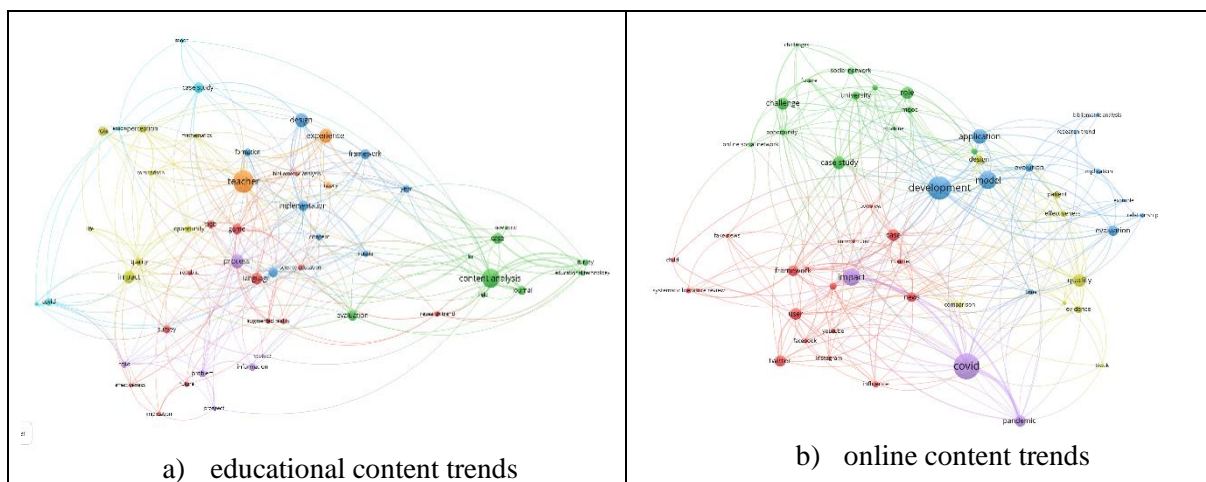


Figure 22. Cluster Analysis Terms of “educational content trends” and “online content trends” by Titles

Sources: Compiled by the authors

Key clusters for “educational content trends” and teacher (orange), process (purple), content analysis (green); “online content trends” are b) impact & covid (purple), development (blue), universities (green) and quality (yellow), a user (red) (Figure 22). The results by titles of publication demonstrate the difference between directions of trends in educational and online sectors. However, online content trends are related to the developing role of universities in development. This analysis could be detailed by finding closely related clusters. The additional variable, such as Abstracts, is used. The results are shown in Figure 23.

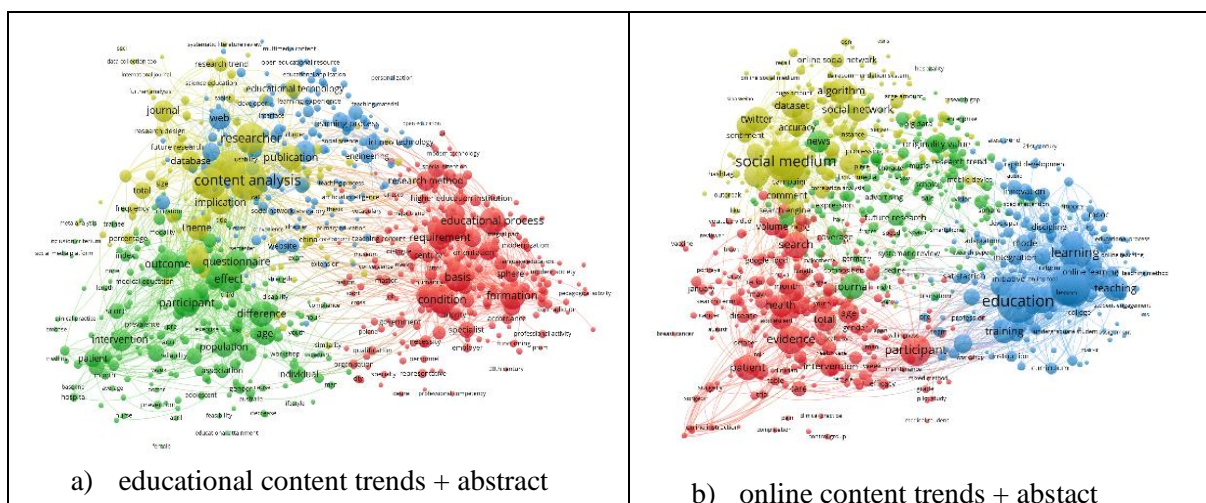


Figure 23. Cluster Analysis Terms “educational content trends” and “online content trends” by Abstracts

Sources: Compiled by the authors

Figure 27 demonstrates abstract-based clusters for “educational content trends” and “online content trends”. There are key clusters for each keyword group: a) by educational content trends: participants with the outcome (green), educational process (red), content analysis (yellow); b) online content trends: education (blue), social media (yellow), the participant (red). The cluster analysis showed that the gap between “**educational content trends**” and “**online content trends**” is present. However, the online content includes educational sources used for development. One should note that content analysis actively presents in Titles and Abstract of scientific others.

The bibliometric analysis reveals 205 papers in “educational trends Ukraine”, 307 articles in “trends in educational online content” and 25 publishes in “educational online content Ukraine”. From 2019 to 2022, there was a significant presence of important publications focusing on online content formatting in education. Specifically, in 2022 and 2020, the topics of “educational trends Ukraine” and “trends in online educational content” had the highest number of articles, with 49 and 39 papers per year, respectively. Moreover, the investigation of “educational online content Ukraine” reached nine annual publications by 2022, which is the highest record. Education Educational Research emerges as the predominant field of study in educational trend papers. 48.5% of the articles pertain to “trends in online educational content,” with notable contributions from disciplines such as Educational Sciences Disciplines and Computer Science Information Systems.

The primary sectors associated with educational trends in Ukraine comprise Education Educational Research, Economics, Social Sciences Interdisciplinary, Multidisciplinary Sciences, and Management, collectively accounting for 60% of the sectors. In “educational online content Ukraine,” the predominant research categories include Education Educational Research (68%) with a minor part of Computer Science Information Systems, Engineering Electrical Electronic and Business. Ukraine has a significant presence in publishing articles on formatting online content patterns. HE determined over 90% of the publications originated from Ukraine. However, other countries such as Poland, russia, the USA, and Bulgaria also contribute to the literature on “educational trends Ukraine.” The primary countries focusing on trends in online educational content include the USA, russia, Spain, China, England, and Turkey (54% of the total publications). Publications on “educational online content Ukraine” involve Ukraine, the USA, Latvia, Switzerland, and Turkey.

The clusters identified for “educational content trends” based on the title encompass teacher, process, and content analysis. In contrast, abstract clusters comprise participants with outcomes, educational processes, and content analysis. As for “online content trends”, the key title-based sets include impact & covid, development, universities, quality, and user. Additionally, the abstract-based clusters encompass education, social media, and participation.

Conclusions

The analysis focuses on transforming traditional higher education towards enhancing effectiveness in student and teacher roles. Students are identified as key stakeholders due to their significant impact on online content and education. Therefore, it is crucial to tailor the online course content to meet their needs and queries by implementing trend analysis. Creating a comprehensive model is a practical starting point for understanding online learners' requirements and developing targeted content. Continuous updating of the model based on trends and student feedback is essential for success. The study also reveals that interest in higher education is seasonal, and relevant online content should be promoted accordingly to attract potential students. Keyword trends suggest that universities should focus on topics “universities”, “distance learning”, and “дистанційна освіта” (distance education). Mobile accessibility is crucial, as many web users access content through mobile devices. Chrome optimization is recommended for a better browsing experience.

Bibliometric analysis shows that "educational trends Ukraine" has 205 papers, "Trends in online educational content" has 307 articles, and "educational online content Ukraine" has 25 publications. From 2019 to 2022, there has been a notable presence of publications on online content formatting in education. "Educational Trends Ukraine" and "Trends in online educational content" had the highest article counts in 2022 and 2020, respectively. Education Educational Research is the primary field of study in educational trend papers, accounting for 48.5% of articles, followed by contributions from Educational Sciences Disciplines and Computer Science Information Systems. Key sectors in educational trends in Ukraine include Education Educational Research, Economics, Social Sciences Interdisciplinary, Multidisciplinary Sciences, and Management. Ukraine leads in publishing articles, but other countries such as Poland, russia, the USA, and

Bulgaria also contribute. The main countries focusing on trends in educational online content are the USA, Russia, Spain, China, England, and Turkey. Clusters identified for “educational content trends” are teacher, process, and content analysis, while “online content trends” include impact & covid, development, universities, quality, and user. Clusters identified for “educational content trends” are teacher, process, and content analysis, while “online content trends” include impact & covid, development, universities, quality, and user. The funding designated in the paper provides theoretical and trends background for future research in the formation of patterns of online content in higher education during periods of war and post-war contexts. The articles focused on advertising different education services in higher education institutions serve as one of the patterns of online educational content that aims to engage more in education potential and existing students.

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