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DIFFERENTIATED INSTRUCTION AT HIGHER EDUCATION INSTITUTIONS: BIBLIOMETRIC ANALYSIS

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ABSTRACT

The article examines the implementation of differentiated instruction in higher education institutions through bibliometric analysis using Scopus database data and Bibliometrix software. Differentiated instruction addresses diverse student needs, interests, and capabilities, aligning with global educational trends emphasizing flexibility, inclusivity, and lifelong learning. Historically focused on special and gifted education, recent studies highlight its broader applications, including STEM, language learning, and online education. The analysis includes 129 relevant publications, representing 13% of all differentiated instruction related research in Scopus. The main areas in the research topic are foreign language teaching, inclusive education, innovative pedagogies, and teacher training. Prominent trends include the integration of differentiated instruction in technology-enhanced learning, its impact on student engagement and academic performance, and its role in fostering inclusivity and equity. The study underscores the necessity of teacher readiness and training to implement differentiated instruction effectively. By mapping current knowledge and identifying gaps, the article provides a foundation for advancing differentiated instruction practices in higher education institutions, emphasizing its potential to enhance student outcomes and educational equity in a digitalised context.

Keywords: *differentiated instruction, higher education, higher education institution, bibliometric analysis, Bibliometrix, Biblioshiny*

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INTRODUCTION

Personalisation of the educational process is one of the requirements for modern education. The EDUCAUSE Horizon Report 2023 (Educause, 2023) notes that social trends include growing demands for convenience and flexibility in teaching methods, expanding and strengthening requirements for equitable and inclusive teaching and learning, and changes in the student population due to the need for lifelong learning and

workplace learning. The ‘Vision of the Future of Education and Science of Ukraine’ defines education's focus as the individual at different stages of life, and the main tasks of education are to ensure the development and realisation of each participant in the educational process (Ministry of Education and Science of Ukraine, 2023). The priorities of education include person-centred education, as well as barrier-free and inclusive education, taking into account each student's needs, interests and capabilities. One of the strategic goals of higher education development is to create an environment that provides maximum learning opportunities. Differentiated learning is one of the ways to achieve the realisation of the diverse educational needs, interests and goals of students. The first scientific studies using the term ‘differentiated instruction’ appeared in the 1960s. However, until the early 1990s, these were isolated studies aimed at researching the education of students with special needs and gifted students. An analysis of the papers indexed by the Scopus scientometric database with the search terms TITLE-ABS-KEY(‘differentiated instruction’) AND (EXCLUDE AFFILCOUNTRY, ‘Russian Federation’) shows that the topic of differentiated instruction is widely studied, with a total number of 983 documents found. However, the number of publications related to differentiated instruction and higher education institutions is 129 documents, which makes up 13% of all publications in the Scopus scientometric database on differentiated instruction. As the studies concerning differentiated instruction and higher education institutions may include a wide range of topics, bibliometric analysis can be used to understand the studied and unexplored areas. Bibliometric analysis based on the quantitative analysis of bibliographic characteristics of documents provides a basis for identifying trends and patterns inherent in a sample of publications.

LITERATURE REVIEW

There are a few studies presenting a bibliometric analysis of differentiated instruction in general and in higher education in particular. Shareefa & Moosa (2020) analyse the most-cited publications on differentiated instruction in Scopus between 1990 and 2018. The characteristics they explore about the publications are areas of publications, patterns of citations, most frequently used keywords, authors' countries, authors' collaborations, and journals where the documents were published. The main groups of keywords except for ‘differentiated instruction’ included ‘differentiation’, ‘curriculum’, ‘mathematics’, and ‘reading’. The related to them keywords included ‘learning preferences’, ‘gifted (students)’, ‘inclusion’, ‘teacher literacy’, ‘problem-based learning’, ‘elementary school’, ‘interactive learning environment’, and ‘word reading’. The USA authors contributed the most to the topic. Top-3 journals publishing articles on differentiated instruction (‘Gifted Child Quarterly’, ‘Exceptional Children’, and ‘Educational Leadership’) deal with teaching gifted students and inclusive education, which also indicates trending areas in the selected period of time. Sun & Xiao (2021)

confirm the statement that the leadership in the differentiated instruction study belongs to the USA. Their analysis of publications indexed by the Web of Science database between 2000 and 2020 shows that Web of Science contains more documents on the studied topic than Scopus. The main trending areas concerning differentiated instruction include assessment, universal design for learning, and STEM education. Hadi, et al. (2023) performed an analysis of publications in Scopus between 1961 and 2023 that included 746 documents. Compared to the analysis by Shareefa, & Moosa (2020) there is a significant difference in leading journals and authors. This indicates active development of the topic and proves the need for regular bibliometric analysis performance to provide the current stage of the topic study. Some of the keywords mentioned in the previous publications are also mentioned as trending by Hadiy et al. (2023). However, there are also several new ones such as ‘e-learning’, ‘educational computing’, ‘learning systems’, which shows that differentiated instruction has also gone digital. The development of differentiated instruction studies is covered in the paper by Utami et al. (2024). Similarly, to Shareefa, & Moosa (2020), they used as the basis for the study Scopus scientometrics database and such indicators as journals, countries, researches, and citation. Cluster analysis was used to trace connections between keywords, authors of publications, countries, etc. The only study found that deals directly with the bibliometric analysis of differentiated instruction in higher education is by Au-Yong Oliveira et al. (2022). The study analysis 24 papers on differentiated instruction published between 2002 and 2022. The keywords used for the search are ‘differentiated instruction’ and ‘higher education’. The following research areas are defined within the search results: learning styles, blended learning, hybrid learning, teaching and learning strategies, flipped classroom, e-learning, universal design for learning, English as a foreign language, etc. Taking into consideration the rapid development of differentiated instruction topic and the small amount of the previous research with bibliometric analysis, the author, considers the sphere of the current research timely and relevant.

RESEARCH OBJECTIVES

The purpose of this study is to determine the level of research on the implementation of differentiated instruction at higher education institutions (HEIs) and to outline the prospects for further research on the topic in the context of digitalisation of education. In accordance with the objective, the following tasks have been identified: to analyse publications on differentiated instruction in the Scopus scientometric database; to identify the main areas of research on differentiated instruction at higher education institutions; to determine the prospects for further research on the topic in the context of the digital transformation of education, in particular the implementation of

differentiated instruction at a university using learning and content management systems (LCMS).

RESEARCH METHODS

In the article, the bibliometric analysis method is used to obtain and process data from Scopus scientometric database. Bibliometric analysis belongs to quantitative research methods and is used to analyse scientific publications to explore the current stage of the research on the chosen topic, trends and potential research areas. Bibliographic analysis includes the following stages of performance: defining keywords of the search, specification of the search using filters, export of data, and data analysis and visualisation using software (Wang & Su, 2020). For the analysis of the data obtained from Scopus, Bibliometrix software was used, specifically the web-interface application for Bibliometrix - Biblioshiny. Clustering by Coupling analytics and Conceptual Structure analysis were used. Descriptive analysis was used to interpret the data analytics performed in Biblioshiny.

RESULTS

From the analysis of recent studies, we can see that the search query ‘differentiated instruction’ presents higher education only in terms of training future teachers and in-service training of practicing teachers. In order to determine the state of research on differentiated instruction in higher education institutions (HEIs), there is a need to specify the search query. To refine the search, it was decided to add the keywords ‘university’, ‘higher education institution’, ‘higher education’ and ‘HEI’. The search terms TITLE-ABS-KEY (‘differentiated instruction’ AND university) AND (EXCLUDE (AFFILCOUNTRY, ‘Russian Federation’)) in the Scopus database found 90 publications; TITLE-ABS-KEY(‘differentiated instruction’ AND ‘higher education institution’) and (EXCLUDE (AFFILCOUNTRY, ‘Russian Federation’)) – 5 publications; TITLE-ABS-KEY(‘differentiated instruction’ AND ‘higher education’) and (EXCLUDE (AFFILCOUNTRY, ‘Russian Federation’)) – 39 publications; TITLE-ABS-KEY(‘differentiated instruction’ AND hei) and (EXCLUDE (AFFILCOUNTRY, ‘Russian Federation’)) – no publications found. After comparing the search results and removing duplicate sources, the total number of publications related to differentiated instruction and higher education institutions is 129 documents, which is 13% of all publications in the Scopus scientometric database on differentiated instruction.

The analysis by Author's Keywords with the Global Citation Score allows us to identify 9 main clusters, as shown in *Table 1*.

Table 1

Results of Clustering by Coupling analytics in Biblioshiny (Bibliometrix)

Keywords	Cluster	Frequency	Centrality	Impact
differentiated instruction – conf 89.8% differentiation – conf 60% english for specific purposes – conf 100% inclusion - conf 100%	1	44	1.637	2.631
professional development - conf 60% and materials - conf 100% content literacy - conf 100% instructional strategies - conf 50%	2	2	0.371	0
inclusive education - conf 50% special education - conf 100% differentiating instruction - conf 100% diversity - conf 50%	3	3	0.518	1.75
differentiation - conf 40% active learning - conf 100% gifted education - conf 100% identification - conf 100%	4	2	0.392	0
differentiated instruction - conf 10.2% higher education - conf 71.4% administration/supervision - conf 100% bibliometrix - conf 100%	5	5	1.995	0
flipped classroom - conf 50% block mode - conf 100% collaboration - conf 50% flipped learning - conf 100%	6	2	0.341	1.25
higher education - conf 28.6% cognitive development - conf 100% emi - conf 100% english-medium instruction - conf 100%	7	2	0.589	0
self-efficacy - conf 100% differentiated instructional - conf 100% foreign language teaching - conf 100% kazakhstan - conf 100%	8	2	1.22	0
english language teaching - conf 100% backward design model - conf 100% blind students - conf 100% curriculum - conf 100%	9	2	1.22	3.579

The cluster analysis helps identify the main directions and trends in studying the relevant topics. Clusters 1, 7, 8 and 9 are united by a focus on foreign language learning, including English. Cluster 1 deals with differentiated instruction for ESP and inclusive education. This cluster is the largest, with the second-highest centrality (1.637) and impact (2.631). The Impact/Centrality graph (*Fig. 1*) shows that the publications included in this cluster are the most cited and, at the same time, contain numerous recent studies. This indicates that the topic of differentiation in foreign language teaching in higher education is one of the leading ones among those presented in the

Scopus scientometric database. Cluster 7 focuses on the cognitive aspects of differentiated instruction in higher education, especially in English language teaching. This cluster has a moderate centrality and no impact, which demonstrates the relative novelty of this topic and the lack of citations, probably due to the narrow specificity of this area and the recent indexing of publications in Scopus. Cluster 8 focuses on the application of differentiated instruction in foreign language teaching, with an emphasis on independent learning and ensuring students' personal effectiveness. This cluster has a high centrality (1.22) and no impact, which may be due to the specific geographical context of the publications in this cluster (Kazakhstan). Clusters 3, 4 and 9 are united by their focus on groups of students with special educational needs. Cluster 3 contains publications that focus on the use of differentiated instruction in the context of inclusive and special education, emphasising the importance of taking into account the diversity of students. On the Impact/Centrality graph (*Fig. 1*), it is located moderately above the impact line and slightly to the right of the centrality line with values of 1.75 and 0.518, respectively, reflecting the high level of citations of publications in this cluster and the relative longevity of interest in these topics, which are still in the focus of contemporary scholarship. Cluster 4 focuses on the application of differentiated instruction for gifted students, emphasising active teaching methods and giftedness identification. The low centrality (0.392) and lack of influence indicates little interest in this topic in the past and a lack of recent publications. Comparing the data from this cluster with the indicators for the study of the use of differentiated instruction for gifted students in general, we can conclude that this topic has remained relevant at the school level but has not gained popularity in higher education. Cluster 9 focuses on the specific application of differentiated instruction in English language teaching, particularly focusing on inclusion (blind students) and curriculum development. This cluster has a high centrality (1.22) and the highest impact (3.579), but unlike Cluster 1, it is small. This suggests that this cluster contains a few documents, including publications with a high citation index. Cluster 2 is concerned with designing and implementing differentiated instruction, including teacher training and developing appropriate materials. It focuses on content literacy, professional development, teaching strategies and materials. The low centrality (0.371) and lack of impact indicate that this topic has not been developed significantly within higher education. Cluster 5 is related to research aspects of differentiated instruction in higher education, including administrative aspects and bibliometric analysis. It has the highest centrality (1.995), which demonstrates the significant interest in the development of the topic of differentiated instruction in higher education in modern research. The absence of influence in this case indicates the novelty of the research. Cluster 6 considers innovative pedagogical approaches, especially the concepts of flipped classroom and collaboration in the context of differentiated instruction. This cluster has a low centrality (0.341) and moderate impact (1.25), which

indicates the citation of publications on this topic published in previous years, but a small number of more recent studies.

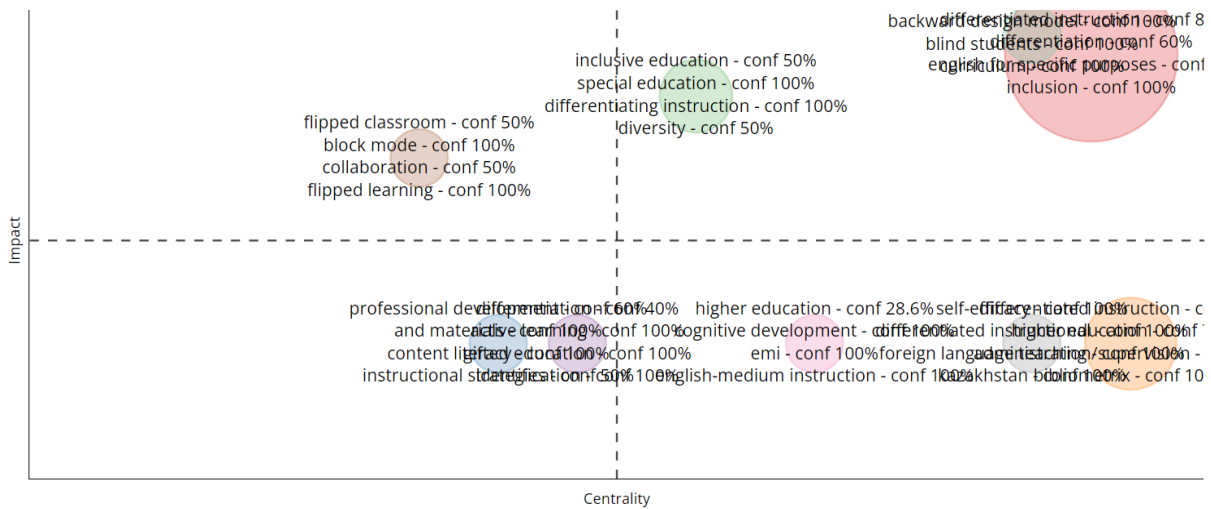


Fig. 1. Results of Clustering by Coupling Analytics in Biblioshiny (Bibliometrix)

The bibliometric analysis of keywords on differentiated instruction in higher education shows that research on differentiated instruction in higher education covers a wide range of topics, from inclusive education and language teaching to innovative pedagogical approaches and specific contexts of application. The most influential clusters focus on the general principles of differentiated instruction, inclusion and English language teaching.

The analysis of the network of co-occurrences based on the annotations of scientific publications (Fig. 2) from the Scopus scientometric database identifies 3 clusters and reflects the interconnection of terms in research related to differentiated instruction in higher education.

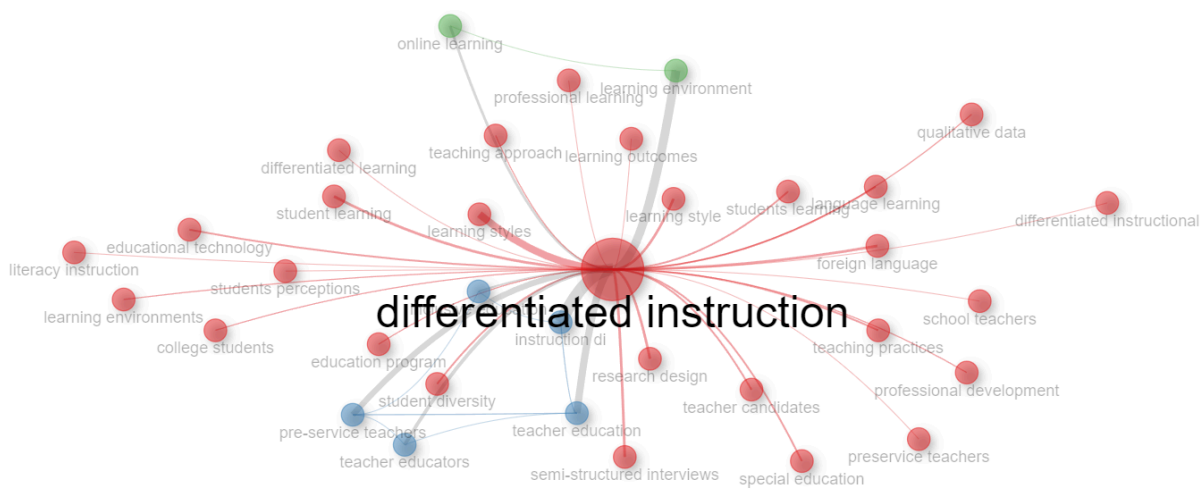


Fig. 2. Results of Conceptual Structure Analysis in Biblioshiny (Bibliometrix)

Cluster 1 (red) is the largest and covers a wide range of topics related to differentiated instruction, including foreign language teaching, consideration of learning styles, diversity of students in groups, classes and teaching approaches, educational technologies and environment, special and inclusive education, and professional development of teachers and lecturers. The term ‘differentiated instruction’ has particularly strong links with the terms ‘learning styles’, ‘student learning’, and ‘teaching approach’, which emphasises the importance of adapting teaching methods to the needs of students. The topics ‘special education’, ‘literacy instruction’, and ‘foreign language’ are located on the periphery but have direct links to the central node, indicating specific areas of application of differentiated instruction. Cluster 2 (blue) focuses on teacher training and inclusive education. The terms ‘pre-service teachers’ and ‘teacher education’ have a strong connection to each other and to the central node, indicating the importance of preparing future teachers to use differentiated instruction. Cluster 3 (green) focuses on online learning and learning environments. It reflects the growing importance of technology and online platforms in differentiated instruction.

The network of meetings demonstrates the complex interplay between different aspects of differentiated instruction in higher education, highlighting its multifaceted nature and wide application in different contexts of the educational process. In the analysed list of research studies, there is a strong emphasis on preparing teachers to implement differentiated instruction, inclusive education and taking into account student diversity are essential topics and technology and online learning are seen as having a significant role to play in the context of differentiated instruction. Among the newest and potential areas of studying the implementation of differentiated instruction in higher education are the study of the effectiveness of differentiated instruction in online environments, the study of the impact of differentiated instruction on student learning outcomes in different disciplines, the development of specific differentiated instruction strategies for inclusive education in higher education institutions.

The results of the analysis are presented in more detail in *Table 2*.

Table 2.

Results of Conceptual Structure Analysis in Biblioshiny (Bibliometrix)

Node (keyword)	Cluster	Betweenness	Closeness	Page Rank
differentiated instruction	1	553.179	0.029	0.416
foreign language	1	0	0.015	0.016
learning styles	1	0	0.015	0.024
professional development	1	0	0.015	0.012
student diversity	1	0	0.015	0.014

students learning	1	0	0.015	0.014
college students	1	0	0.015	0.012
language learning	1	0	0.015	0.014
special education	1	0	0.015	0.014
teaching practices	1	0	0.015	0.014
literacy instruction	1	0	0.015	0.01
differentiated instruction	1	0	0.015	0.01
education program	1	0	0.015	0.012
educational technology	1	0	0.015	0.014
learning environments	1	0	0.015	0.012
learning outcomes	1	0	0.015	0.01
learning style	1	0	0.015	0.016
preservice teachers	1	0	0.015	0.01
qualitative data	1	0	0.015	0.012
research design	1	0	0.015	0.016
student learning	1	0	0.015	0.016
differentiated instructional	1	0	0.015	0.01
professional learning	1	0	0.015	0.01
school teachers	1	0	0.015	0.01
semi-structured interviews	1	0	0.015	0.016
students perceptions	1	0	0.015	0.01
teacher candidates	1	0	0.015	0.014
teaching approach	1	0	0.015	0.012
pre-service teachers	2	0.367	0.016	0.04
teacher education	2	0.229	0.016	0.043
instruction di	2	0.162	0.015	0.042
inclusive education	2	0.063	0.015	0.025
teacher educators	2	0	0.015	0.028

learning environment	3	0	0.015	0.032
online learning	3	0	0.015	0.022

DISCUSSION

Bibliometric analysis presented the results with an indication of the main areas of study in differentiated instruction. The author is going to specify the research in each area to provide a deeper insight into differentiated instruction study. In scientific publications with the keywords ‘differentiated instruction’ and ‘higher education’, the following main areas can be traced: flipped classroom technology, inclusive education, student-centred learning, teaching English, online learning, adaptive learning. Altemueller & Lindquist (2017) consider differentiated instruction as one of the tools that can be used in the implementation of flipped classroom technology in the context of meeting the educational needs of students with learning difficulties in inclusive settings. Kwan, et al. (2024) note that flipped classroom technologies, as a student-centred approach, encourage the use of differentiated instruction. Differentiated learning improves student learning outcomes and promotes teacher-student interaction (Chiang & Wu, 2021). Liou, et al. (2023) also refer to differentiated instruction as a solution that can provide students with various learning opportunities and meet the educational needs of students with different academic abilities and strengths. Differentiated instruction increases students' interest in learning, promotes self-direction and independent thinking, improves academic performance, and provides a favourable learning environment. Kohnke & Moorhouse (2022), describing the experience of implementing differentiated instruction, note that one of the obstacles to the implementation of differentiated instruction is the high workload of teachers who initially do not even consider this approach to the organisation of the educational process. However, after getting acquainted with differentiated instruction technologies, teachers note their usefulness in organising work with inclusive online classes in higher education institutions. The need for a proactive approach to creating an inclusive educational environment is declared by Attachoo & Imsa-ard (2024), which includes proactive communication, implementation of differentiated instruction and ongoing support for students. Differentiated learning is recommended to take into account the different capabilities and special needs of students. At the same time, when implementing differentiated instruction, it is recommended to take into account the risks associated with lowering teachers' expectations of certain groups of students, including over-simplification of learning materials or narrowing of topics compared to the curriculum of the discipline. Onyishi & Sefotho (2020) also point out the limited time frame for teaching disciplines as one of the problems of implementing differentiated instruction. A survey of 382 teachers trained in differentiated instruction in inclusive

classrooms found that more information is needed on how to develop rubrics; targeted student assessment; how to manage a large class when implementing differentiated instruction; how to use differentiated instruction without diluting the content of the curriculum; changes in classroom structure to accommodate small groups; and the need for more training on differentiated instruction and the provision of a variety of teaching aids. The authors note that differentiated instruction should form a critical part of the curriculum for teacher training colleges and pedagogical faculties of universities. Hernandez, et al. (2023) note that the quality of differentiated instruction has declined with the transition to online learning due to the lack of readiness to use online tools to implement such learning. In online learning, students tend to rely on self-motivation and self-direction. They can potentially distance themselves from the learning group if they do not get the same results as in face-to-face learning, leading to dissatisfaction with learning outcomes, obstacles to academic performance and loss of motivation. Saban & Atay (2023) found that (English) teachers prefer to differentiate students by level of knowledge more than by interests or learning profile and to differentiate the learning environment over differentiating content, process or product. Supplementary materials for low-achieving students and grouping are used, while text variation, interest grouping and allowing students to complete assignments in different formats are rare. The use of differentiated instruction has been shown to be effective in self-study English language courses (Meşe & Mede, 2022): groups that used differentiated instruction improved their language skills significantly more than groups that used a generalised approach. Students positively evaluated online practices used for differentiated instruction, such as formative assessment, differentiated speaking tasks in a survey on group work organisation. This approach can also be seen in the study by Kupchyk & Litvinchuk (2020): to implement differentiated instruction, students were pre-tested and divided according to their level of knowledge into homogeneous groups, into which content, teaching methods and assessment tools were already differentiated. The use of methods that correspond to the level of knowledge of students in individual groups, constant feedback and reflection allow for a highly motivating learning environment and increase the likelihood that learners will be interested in improving their language competence. Elyas, et al. (2020) take a different approach to the use of differentiated instruction in the process of learning a foreign language. They suggest starting from the cognitive profiles of learners and taking into account the cognitive diversity in different environments where learners can learn English for different purposes and needs. It is recommended that at the higher education level, consideration should be given to the use of differentiated instruction when planning teacher and lecturer training programmes, in-service training programmes and courses, and when establishing criteria for evaluating teachers' work with the classroom/group. Boelens, et al. (2018)

examine differentiated instruction in the context of blended learning. The study shows that the most commonly used strategy for differentiated instruction in the context of blended learning was to provide students with additional support during the educational process. The three main strategies for responding to student diversity among teachers are ignoring, adapting and transforming. Adaptation involves providing additional support in existing blended learning schemes, while transformation involves changing blended learning schemes to meet the needs of students. Differentiated learning is seen as a way to improve the quality of blended learning by personalising it to reflect the diversity of learners.

In scientific publications with the keywords ‘differentiated instruction’ and ‘higher education institution’ and ‘differentiated instruction’ and ‘university’, the main areas of research are the impact of differentiated instruction on the academic achievements of students, the level of involvement of students in learning, training and professional development of teachers and teachers, assessment strategies, inclusive education, teaching English as a foreign language and the use of innovative technologies. Gebremeskel, et al. (2024) consider differentiated instruction in the context of multiple intelligences to improve university students' reading skills. Teaching strategies based on the theory of multiple intelligences take into account the individual characteristics of students and improve academic performance and satisfaction. The results of the study demonstrated the positive impact of differentiated instruction based on the theory of multiple intelligences on various aspects of students' reading skills. Moallemi's study (2024) notes the positive impact of differentiated instruction on student engagement in the educational process at the university. The variety and choice of content is positively perceived by students. Although not all students interact with the differentiated approach in the same way, it allows everyone to engage in learning at their own level. At the same time, the role of the teacher remains key, as students cannot always choose what is best for them. Therefore, two-way feedback is important for analysing interests, assessing readiness and learning profiles and ensuring student engagement. The importance of differentiated instruction in creating equal opportunities for success for all students, especially in diverse learning environments, is also emphasised in the study by Chua et al. (2024). Letzel-Alt, et al. (2024) and Nketsia, et al. (2024) raise the issue of differentiated instruction teaching teachers and future teachers. They found a connection between two areas of differentiated instruction: strategies and readiness, and a correlation between the roles of participants and their self-assessment of readiness to implement distance learning. Practicing teachers showed a higher level of readiness than students of pedagogical specialities. The results of the study indicate that each of the principles of differentiated instruction (content, process, educational environment, readiness, interest and learning profile) is important in the preparation of future teachers and in-service teacher training. Obrovská, et al. (2023) describe different levels of pro-

and re-activity of differentiation strategies of teacher education students in relation to the diversity of students in the classroom during their practice placement. The study demonstrated that future teachers unevenly differentiate their teaching practice, proactively responding to students who stand out, moderately addressing the needs of high-performing students, but being reactive to the individual educational needs of the majority of the class. A number of studies on differentiated instruction focus on teaching English as a foreign language. Synekop (2020) investigates the use of webquest technology to implement differentiated teaching of professional English. The main approaches to differentiated instruction using webquests are distinguished: student-centred, experience-based, reflective and collaborative. The flexibility of webquest technology allows organising differentiated instruction based on language learning styles and foreign language proficiency. Learning styles and language proficiency levels are also used as a basis for organising differentiated instruction in Spanish language teaching in a study by Jiménez & Ponce (2021). The learning was focused on the areas of competence that each student needed to improve, and the learning materials and activities were designed for the students' learning styles, which helped them significantly improve their final test scores. Synekop (2020) also investigated the influence of the level of self-learning skills on the implementation of differentiated instruction in teaching English for specific purpose. Students with a high level of self-organisation have better results in individual learning, while students with a lower level of self-organisation get better results in social regulation (peer, group, teamwork). Sarzhanova, et al. (2023) study the relationships between differentiated teaching, pedagogical and technological competences of students studying at a foreign language faculty. According to the regression analysis, both pedagogical competence and technological competence, individually and together, have a significant impact on students' self-efficacy in differentiated teaching. The study by Rafi & Pourdana (2023) emphasizes the importance of combining diagnostic assessment and collaborative learning for the successful integration of a differentiated approach in inclusive education. The results showed that conducting electronic diagnostic assessments positively impacted the outcomes of groups of students with both individual and group learning, however, students who worked collectively achieved better results compared to individual participants. The research by Estaiteyeh & DeCoito (2023) emphasizes the importance of integrating the principles of equity, diversity, and inclusion into teacher training programs to enhance their ability to implement differentiated instruction. Key outcomes of teacher training include the ability to develop inclusive curricula that take into account the diverse levels of preparedness, interests, and profiles of students. The main successes are related to the ability to differentiate the learning process, although the content and products remain more challenging to implement. Krishan & Al-rsa'i

(2023) investigate the impact of technology-oriented differentiated instruction on student motivation and use a quasi-experimental approach to assess the effectiveness of this teaching method. The results showed that technology-oriented differentiated instruction significantly enhances students' motivation to study science compared to traditional methods. This underscores the importance of adapting teaching strategies to the needs and interests of students. The technological approach to responding to the diversity of students in groups is also considered by Balchin & Bouzakis (2022). A wide range of technological tools available now can take into account the individual differences of students, allowing for modifications in the content of lessons, tasks, modes of learning, teaching and learning strategies, assessment strategies, and the level of difficulty, which, in turn, enhances student engagement in the educational process and their learning outcomes. Palahicky (2015) notes that when using learning management systems as the means of technology-oriented differentiated instruction, a teacher is limited in pre-designing a course that would correspond to the needs of learners, as the needs should be identified first. The course will require constant tailoring according to the students' progress. This makes the issue of developing a methodology for creating a differentiated course using learning management systems relevant.

CONCLUSIONS

This study presents a comprehensive bibliometric analysis of differentiated instruction in higher education institutions, addressing its development, current research trends, and potential for future exploration. The findings underscore the increasing importance of differentiated instruction as a strategy for meeting diverse educational needs, including in the context of digital transformation.

The analysis of 129 publications from the Scopus database reveals that while differentiated instruction research has expanded beyond its initial focus on special and gifted education, its application in higher education institutions remains limited compared to primary and secondary education. Nine main clusters of research were identified, reflecting a broad range of topics, including foreign language teaching, teacher training, flipped classroom technologies, and inclusive education. Notably, the most influential clusters focus on using differentiated instruction to enhance student learning outcomes, promote equity, and integrate innovative teaching methods.

The study highlights critical challenges in implementing differentiated instruction, such as the need for teacher training, balancing workload, and developing adaptive strategies to address diverse student needs effectively. Technology-oriented approaches to differentiated instruction, such as blended learning and online instruction, offer promising solutions but require further exploration to optimize their use.

Prospects for Further Research. Future research should investigate the impact of differentiated instruction on academic performance across disciplines, develop strategies

tailored for inclusive education, and explore the integration of differentiated instruction into online learning environments.

This study provides a foundation for advancing differentiated instruction practices, reinforcing its role in creating flexible, equitable, and inclusive educational experiences in higher education.

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ДИФЕРЕНЦІЙОВАНЕ НАВЧАННЯ В ЗАКЛАДАХ ВИЩОЇ ОСВІТИ: БІБЛІОМЕТРИЧНИЙ АНАЛІЗ

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Стаття розглядає за допомогою бібліометричного аналізу наукових джерел з наукометричної бази даних Scopus та програмного забезпечення Bibliometrix питання впровадження диференційованого навчання в закладах вищої освіти. Диференційоване навчання враховує різноманітні потреби, інтереси та можливості студентів, що відповідає глобальним освітнім тенденціям, таким як гнучкість навчання, інклюзивність та навчання протягом життя. Історія диференційованого навчання розпочалась зі спеціальної освіти та навчання обдарованих дітей, однак нещодавні дослідження підкреслюють його ширше застосування, включаючи STEM, вивчення мов та онлайн-освіту. Аналіз включає 129 публікацій, що становлять 13% від усіх досліджень у Scopus, пов'язаних з диференційованим навчанням. Основні напрямки дослідження включають викладання іноземних мов, інклюзивну освіту, інноваційні педагогічні методиками та підготовку вчителів. Освітні тренди включають інтеграцію диференційованого навчання в навчання за допомогою цифрових технологій, його вплив на залученість учнів та академічні досягнення, а також його роль у сприянні інклюзивності та рівності. Дослідження підкреслює необхідність готовності та підготовки

викладачів для ефективного впровадження диференційованого навчання. Створюючи мапи поточних знань та виявляючи прогалини в дослідженнях диференційованого навчання, стаття закладає основу для вдосконалення практик диференційованого навчання в закладах вищої освіти, підкреслюючи їхній потенціал для покращення результатів студентів та забезпечення освітньої рівності в цифровому середовищі.

Ключові слова: диференційоване навчання, вища освіта, заклади вищої освіти, бібліометричний аналіз, *Bibliometrix*, *Biblioshiny*

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