TRAINING OF TEACHERS FOR THE IMPLEMENTATION OF UNIVERSAL DESIGN IN EDUCATIONAL ACTIVITIES

[a]NADIIA BYRKO, [b]HANNA TOLCHIEVA, [c]OLHA BABIAK, [d]ANNA ZAMSHA, [e]OKSANA FEDORENKO, [f]NATALIIA ADAMIUK

[a]*Pedagogy and Psychology Department, Khmelnytskyi Regional Institute of Postgraduate Pedagogical Education, Khmelnytskyi, Ukraine*
[b]*Department Olympic and Professional Sport, Luhansk Taras Shevchenko National University, Luhansk, Ukraine*
[c]*Department of Psychological Support of Children with Special Educational Needs, Institute of Special Education and psychology named by Mykola Yarmachenka, National Academy of Educational Sciences of Ukraine, Kyiv, Ukraine*
[d,f]*Sign Language Education Division, Mykola Yarmachenko Institute of Special Education and Psychology of the National Academy of Educational Sciences of Ukraine, Kyiv, Ukraine*
[e]*Department of Special and Inclusive Education, Borys Grinchenko Kyiv University, Kyiv, Ukraine*
email: [a]nadiabm@ukr.net, [b]asergeeva29@gmail.com, [c]olga-babjak@ukr.net, [d]zamsha_anna@ukr.net, [e]of.fedorenko@kubg.edu.ua, [f]natbor07@gmail.com*

Abstract: The relevance of the research implies the need to clarify the priority methods and their components in order to train teachers for the implementation of a universal design in educational activities at secondary education institutions based on an understanding of the inclusive needs of students and the effectiveness of the educational process. The purpose of the research is to determine ways in order to train teachers for the implementation of a universal design in educational activities at secondary education institutions. 378 teachers (Ukraine) on the Google-forms platform took part in the survey. It has been highlighted that the basic differences between the theory and practice of the implementation of inclusion and universal design are as follows: inclusion is more difficult to apply in practice; design needs clarification of some practical concepts. It has been determined that the most common methods of involving into the implementation of universal design are manifestation of enthusiasm, providing examples and feedback to students; representation through class discussions, laboratory experience and images; group discussions in the classroom, projects, workshops and tests. It has been noted that UD can be used to create educational applications in order to adapt the learning space to the needs of the student (elements of physical spaces and instructions in order to make them more accessible, useful, and comprehensive). It has been revealed that universal design should be manifested in the context of massification; digitization; transdisciplinarity; deformalization. The system of barriers that prevent the implementation of UD has been outlined, namely: state support of teachers; the need for administrative support, the need to improve the general knowledge components; additional on-site training on universal design; additional advanced training on the implementation of universal design. It has been noted that teachers analyze the system of implementation of universal design through information about the participants, courses and mode of conducting, independent and dependent variables, strategies for introducing the effectiveness of implementation. Recommendations have been given on the involvement of computer communication, web-based classroom management systems, and links with technologies. The practical significance of the research was the presentation of the system of teachers' training for the implementation of universal design in educational activities through the basic semantic and structural elements of UD in the environment of SEI.

Keywords: Secondary education institution (SEI), pedagogical activity, universal design, concept implementation, teachers' training.

1 Introduction

The introduction of universal design for learning (UDL) is a critical issue for educational institutions not only in Ukraine but also abroad, forasmuch as UDL is an inclusive system based on learning science that supports and eliminates barriers to education for everybody, while maintaining high expectations for results.

Universal Design for Learning (UDL) is a framework for curriculum and lesson planning through which educators can maximize accessibility and minimize barriers often experienced by students.

Global learning practices strengthen and complement UDL, defining accessibility as a goal for the equity of education and encouraging educators to study the latest technologies for implementing this accessibility.

In such a way, the need to clarify the priority methods and their components to train teachers for the implementation of universal design in educational activities in secondary education institutions is actualized on the basis of understanding the inclusive needs of students and the effectiveness of the educational process.

2 Literature review

Universal design (UD) has recently become increasingly important as a new paradigm aimed at a holistic approach that varies within the scope of public services, including education (Moezzi, Muhammad, Kamarudin, & Wahab, 2014).

The term "Universal Design for Learning" is one of the most commonly used terms in the literature to describe UD in education when compared to other terms such as "universal instructional design" and "universal learning design". On this basis, the results of investigations of Seok, DaCosta, & Heitzman-Powell (2020) emphasize the benefits of using UD. Learning communities (for instance, discussions or groups of classes) and practical activities (for instance, modification of individual curricula and implementation of learning technologies) conducted both online and directly (F2F) are one of the two most common forms of educational activity used in the application of UD principles.

Fundamentals of Universal Design (UD) and Universal Design for Learning (UDL) offer unique ways to create inclusiveness in education systems (Dalton, Lyner-Cleophas, Ferguson, & Mckenzie, 2019).

Adopting and combining both principles of universal design and principles of universal design for learning is not about facilitating it, however about proposing a framework of principles (McNutt, & Craddock, 2021) and guidelines with the aim of creating an adapted education scheme for all participants of the educational process.

Global changes in higher education (Tabrizi, & Sungur, 2017; Jacobs, 2021) are most clearly manifested in the sequential progression of functional university models (from university 1.0 to university 4.0), accompanied by equally important changes in educational processes (Pavlovskaya, 2020). Universal design opportunities should be provided for all students, including students with disabilities, while studying at university campus. The design of the university campus is an important factor in the functioning and maintenance of higher education. Universal design concept of lecture space in CADL ITB building can facilitate the activities of students with hearing impairments (Harahap, Martokusumo, Wahjudi, & Santosa, 2019). Scientists argue that using the parameters of the universal design principles, the factors involved in the application can be classified to define the lecture space problem in CADL ITB buidling as a case study. The universal concept of design in the lecture space in CADL ITB is not optimal; however, such an example can serve as a design solution to maximize the universal design concept for students with hearing impairments.

On the basis outlined, young graduate teachers of HEIs are more likely to apply inclusive teaching practices such as UDL when they have a positive attitude towards them, shaped by their culture, experience and training. Administrators have a unique position to influence the teacher's attitude by creating an inclusive school culture and providing leadership guidance (Gothberg, 2021). UDL yields benefit to all students, not just those with unique needs, forasmuch as it engages in learning and removes learning barriers (Grillo, 2021; Hickey, 2021).

Teachers' perception of their disciplines in the context of universal design should be consistent with the current educational goal for all students, as well as the appropriate level of training of teachers. In order to successfully implement Universal Design technologies, the classroom environment,

accessibility, and flexible materials needed to conduct the classes must be prepared (Lee, & Kim, 2018).

Adherence to the principles of universal design in education makes it possible to configure the convenience and accessibility (Cressey, 2020) of the base of the proposed knowledge and concepts.

Scholars Scott, Bruno, Gokita, & Thoma (2019) describe this possibility of the UDL and UDT frameworks (Copeland, & Mallary (2020), which makes it possible to develop lesson plans for all students, including students with disabilities in general education classes. UDT frameworks make learning opportunities more engaging and relevant to students.

Based on new investigations in neuroscience sphere, Universal Design for Learning (UDL) constitutes an educational approach that promotes access, participation and progress in a general curriculum for everybody. UDL recognizes the need to create opportunities in order to engage students with different abilities by offering curricula and learning activities that allow using a variety of means of representation and expression of their own opinions.

UDL requires joint planning of teachers' activities with different knowledge and skills of the curriculum. Complaints that often arise include a lack of time for joint planning as well as a lack of resources for teaching a differentiated curriculum (Riviou, & Kouroupetroglou, 2014).

Some scholars, including Hromalik, Myhill, Ohrazda, Carr, & Zumbuhl (2021), argue that universal design for learning (UDL) supports educators in developing inclusive learning environments. However, few scientists have examined the implications of the content of UDL professional development programs for teachers. After undergoing specialized training on the introduction of universal design technologies in their work, teachers and staff have statistically deepened knowledge about UDL; consequently, they could better provide examples of how to apply them in practice.

Denning, & Moody (2018) argue that teachers can apply the principles of UDL to the curriculum and materials as a first step to support all students. UDL methods (Hamraie, 2017) may encourage application of research practices that offer the opportunity to individualize learning needs. UDL strategies can help students better understand information by allowing them to share their knowledge in different forms. The main focus of UDL lies in creating lessons aimed at specific mechanisms of the brain. UDL provides teachers with a framework for implementing materials and assessments to cover the competencies of all students.

In order to properly understand the functioning of UD in education, it is necessary, according to Edyburn (2020), to identify three types of examples of its implementation, namely: platform tools, web applications and built-in support.

Roski, Walkowiak, & Nehring (2021) emphasize the importance of carefully adopting and implementing UDL principles for learning and ensuring its accessibility in the conditions of inclusive education.

Students may have different opportunities even in an ordinary classroom; however, school closures and the technological requirements of distance learning can disproportionately affect students, especially those with special educational needs or those at risk group. From the point of view of inclusive education and the principles of universal design, teachers take on new roles and responsibilities forasmuch as they are expected to meet the needs of all students in their class (Frumos, 2020).

Thus, despite such a wide range of scientific research related to the introduction of universal design in the education system, the issue of how to train teachers for the implementation of universal design in educational activities in secondary education institutions still remains poorly studied.

3 Aims

The aim of the research is: to identify ways in order to train teachers for the implementation of universal design in educational activities at secondary education institutions.
Research objectives:
Achieving the research aim involves solving a system of problems, as follows:

- outlining the main differences between the theory and practice of implementing inclusion and universal design;
- establishing the most common methods of engaging in universal design implementation;
- representation of trends in the introduction of universal design; creative experience of primary school students;
- outlining barriers to the implementation of a system of universal design;
- categorization of the system of universal design implementation;
- description of independent and dependent variables of UD implementation;
- identification of systems of educational strategies;
- coverage of a variety of designs for UD implementation;
- providing recommendations for the systematic training of teachers for UD implementation.

4 Research methods and methodology

The methodological framework is based on sociological and statistical methods of the research, as well as on a systematic analysis of the importance of understanding the role of teachers' training for the implementation of universal design in educational activities. Sociological methods (sociological survey, method of information analysis); statistical methods (ranking method, descriptive statistics) have made it possible to identify a system of components applied in teachers' training for the implementation of UD.

378 teachers (Ukraine) were involved in the research by applying the Google-forms platform. Respondents were asked to answer different types of questions in order to determine the system of components in teachers' training for the implementation of UD at SEIs.

5 Results

378 teachers from Ukraine took part in the sociological survey. The survey was conducted on the online Google-forms platform. The respondents were teachers who had a need to apply the components of the universal design concept in their professional activities. The questionnaire has been compiled in such a way as to determine the basic elements of UD, requiring a particular attention and further identify the means of its implementation. Respondents were asked to answer the question in the affirmative or in the negative form, as well as to rank certain categories.

The first question was regarding the search for the main differences between the theory and practice of the implementation of inclusion and universal design. 187 respondents – teachers have answered that inclusion is more difficult to apply in practice; 191 respondents have identified that universal design needs clarification of some practical concepts. The results are presented in Figure 1.

Figure 1. The basic differences between the theory and practice of inclusion and universal design.
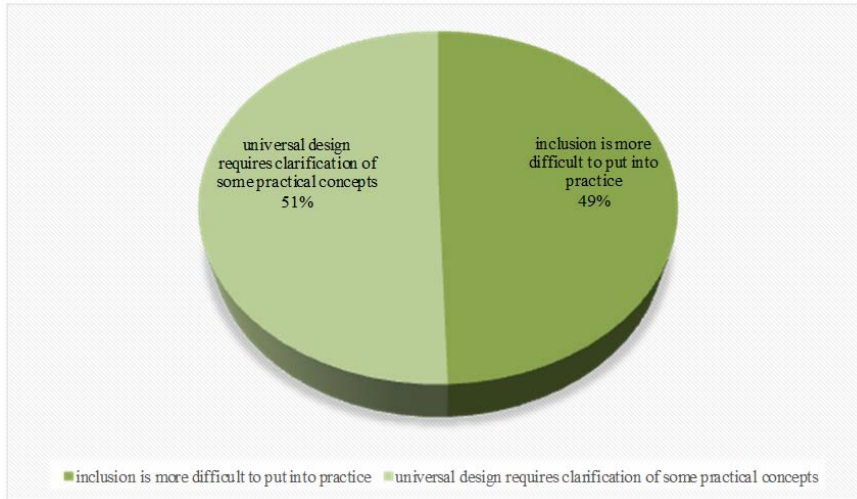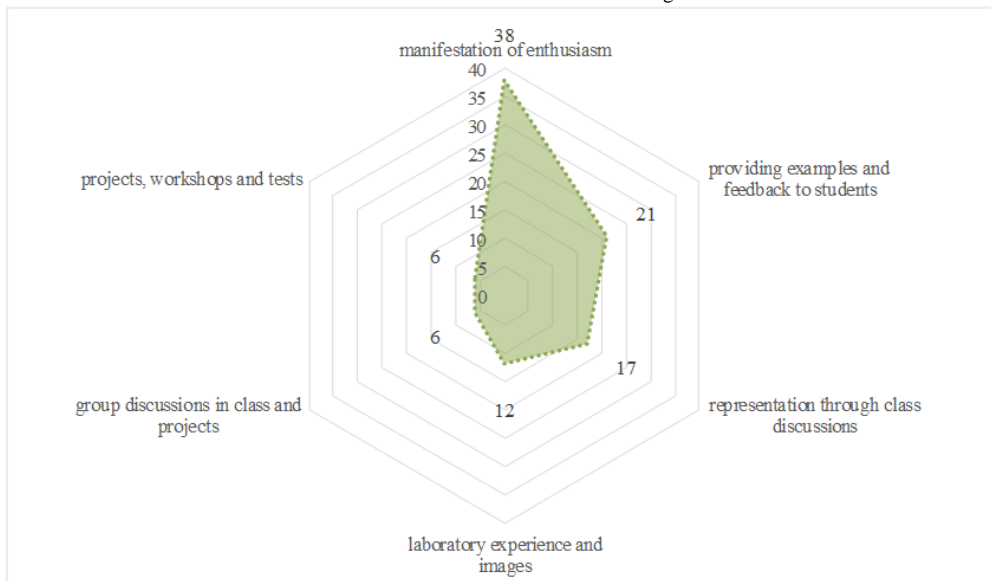

Source: author's development; concluded on the basis of the answers of the respondents.

In the second question, teachers were asked to rank the most common methods of involvement in the implementation of universal design in descending order. According to the respondents' answers, the first place with a result of 38 % was occupied with manifestation of enthusiasm; providing examples and feedback to students was in second place (21 %); the representation through class discussions was in third place with a result of 17 %; laboratory experience and images received 12 %; group discussions in class and projects, workshops and tests received 6 % each. The results are presented in Figure 2.

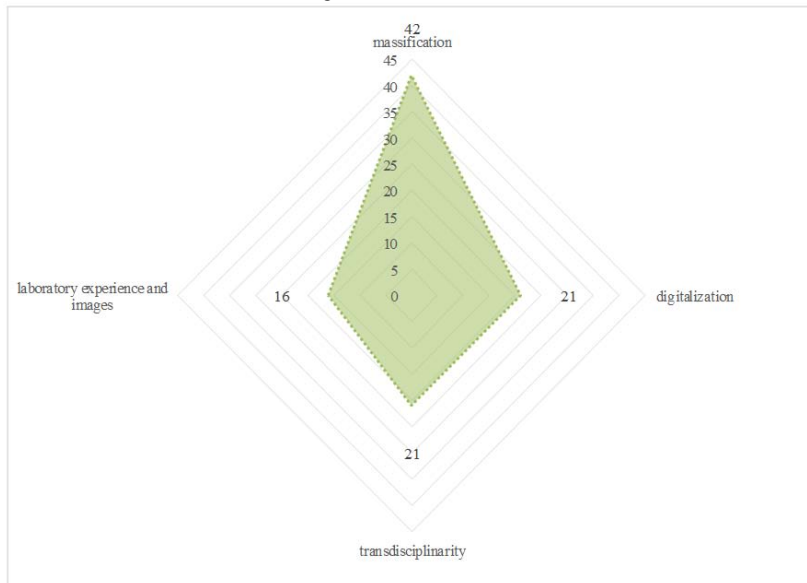Figure 2. The most common methods of involvement to the introduction of universal design.

Source: author's development; concluded on the basis of the answers of the respondents.

In the third question, teachers were asked to rank the trend of universal design in descending order. According to the respondents' answers, the first place with a result of 42 % was occupied with massification; the second place was shared between digitalization and transdisciplinarity (21 % each); deformalization was in third place with a result of 16 %. The results are presented in Figure 3.

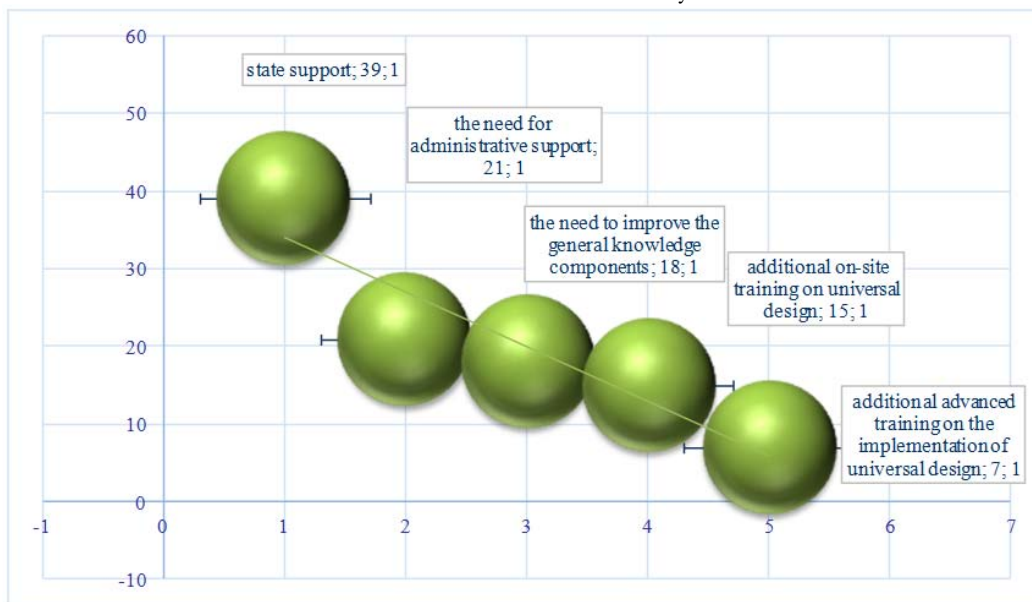Figure 3. UD tendencies to the introduction of universal design.

Source: author's development; concluded on the basis of the answers of the respondents.

The next question was related to identifying a system of barriers that hinder the inclusion of students with disabilities in the education system, even when teachers have applied inclusive strategies. The teachers– respondents outlined the barriers as follows: the poor support of teachers by the state; the need for administrative support; the need to improve general knowledge components; additional on-site training on universal design; additional advanced training on the implementation of universal design with results of 39 %; 21 %; 18 %; 15 %; 7 %, respectively. The results are presented in Figure 4.

Figure 4. Barriers that hinder the inclusion of students with disabilities in the education system.
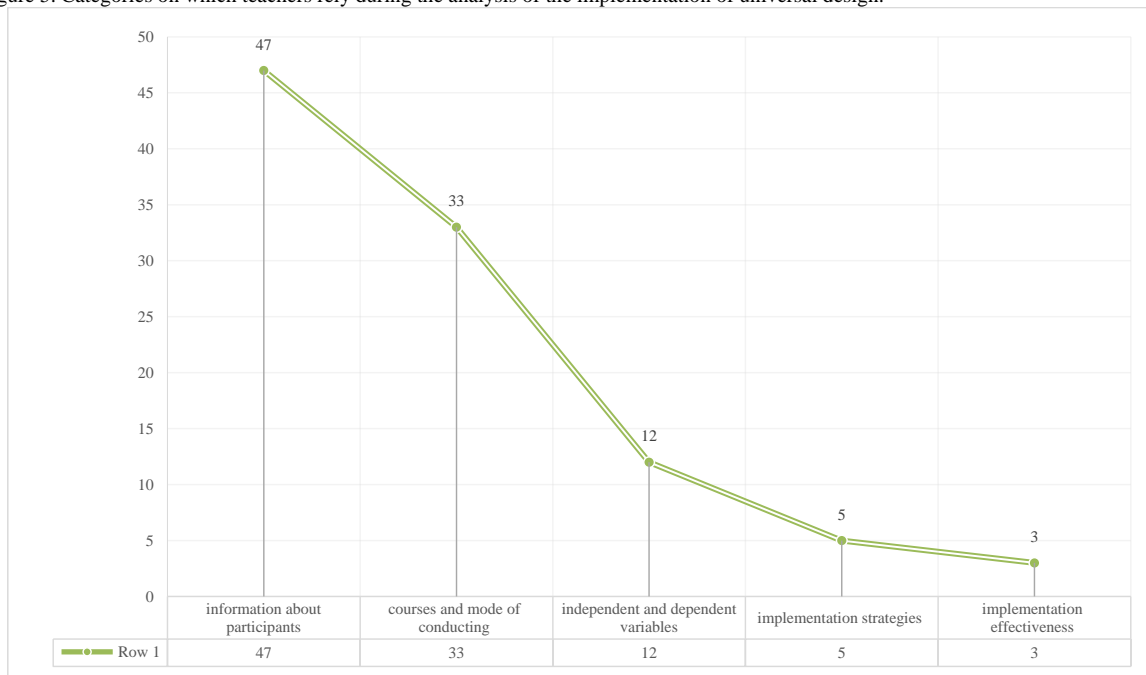

Source: author's development; concluded on the basis of the answers of the respondents.

The next question was related to clarifying the categories on which teachers rely during the analysis of the implementation of universal design. Among such categories, teachers revealed as follows: details of information about participants (47 %), courses and mode of conducting (33 %), independent and dependent variables (12 %), implementation strategies (5 %), implementation effectiveness (3 %). The results are presented in Figure 5.

Figure 5. Categories on which teachers rely during the analysis of the implementation of universal design.

	information about participants	courses and mode of conducting	independent and dependent variables	implementation strategies	implementation effectiveness
Row 1	47	33	12	5	3

Source: author's development; concluded on the basis of the answers of the respondents.

In this context, the sixth question was related to identifying the most common independent variables during the implementation of UD. According to the respondents' answers, the first place with a result of 56 % was occupied with the development and implementation of courses based on the principles of universal design, practical measures. The rest of the criteria remained on the following indicators, namely: training of instructors – 27 %, training of teams under the guidance of colleagues – 10 %, joint model of professional development – 7 %. The results are presented in Figure 6.

Figure 6. The most common independent variables during the implementation of UD.

	development and implementation of courses based on the principles of universal design, practical measures	training of instructors	training of teams under the guidance of colleagues	joint model of professional development
Row 1	56	27	10	7
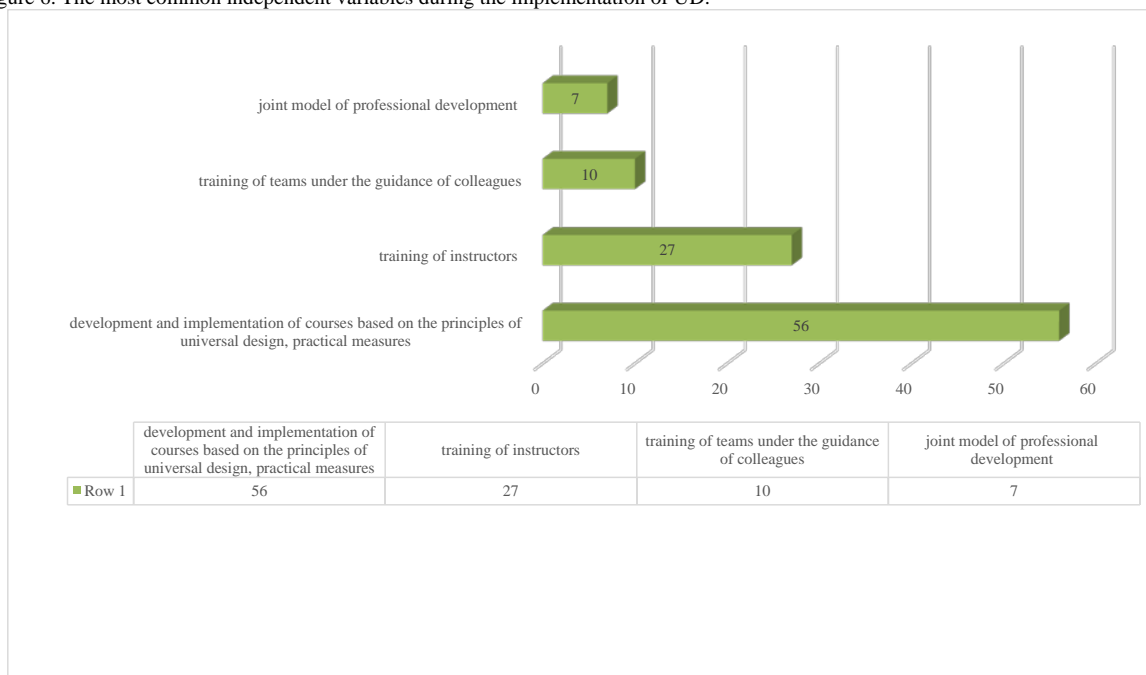
Source: author's development; concluded on the basis of the answers of the respondents.

Independent variables in implementation covered the following criteria, namely: course evaluation – 62 %, learning outcomes (revision of lesson plans and application of technologies) – 19 %; level of trust (acquisition of knowledge about UD and disability) – 19 %. The results are presented in Figure 7.

Figure 7. The most common independent variables during the implementation of UD.

	course evaluation	level of trust (acquisition of knowledge about UD and disability)	learning outcomes (revision of lesson plans and application of technologies)
Row 1	62	19	19
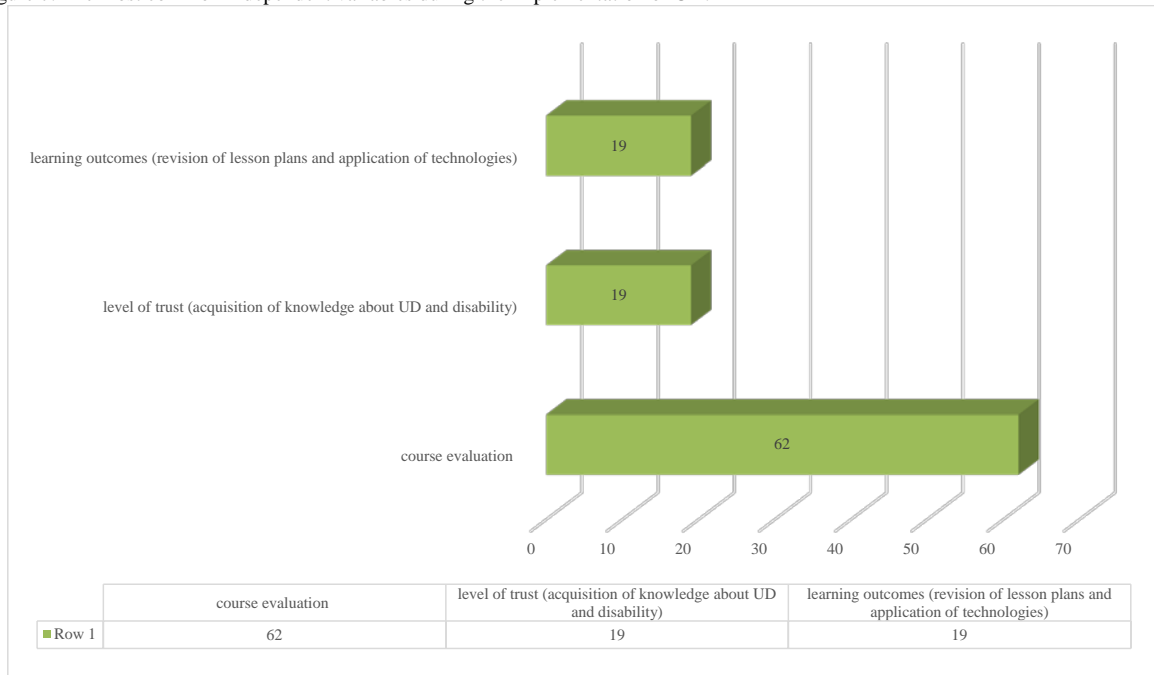
Source: author's development; concluded on the basis of the answers of the respondents.

The eighth question was related to the ranking of the system of learning strategies. According to the respondents' answers, the first place with a result of 53 % was occupied with computer communication through the network (53 %); web-based classroom management systems – (31 %) were in second place; interactions with technology and other participants and the learning community – (16 %) were in third place. The results are presented in Figure 8.

Figure 8. Systems of training strategies during the implementation of UD.
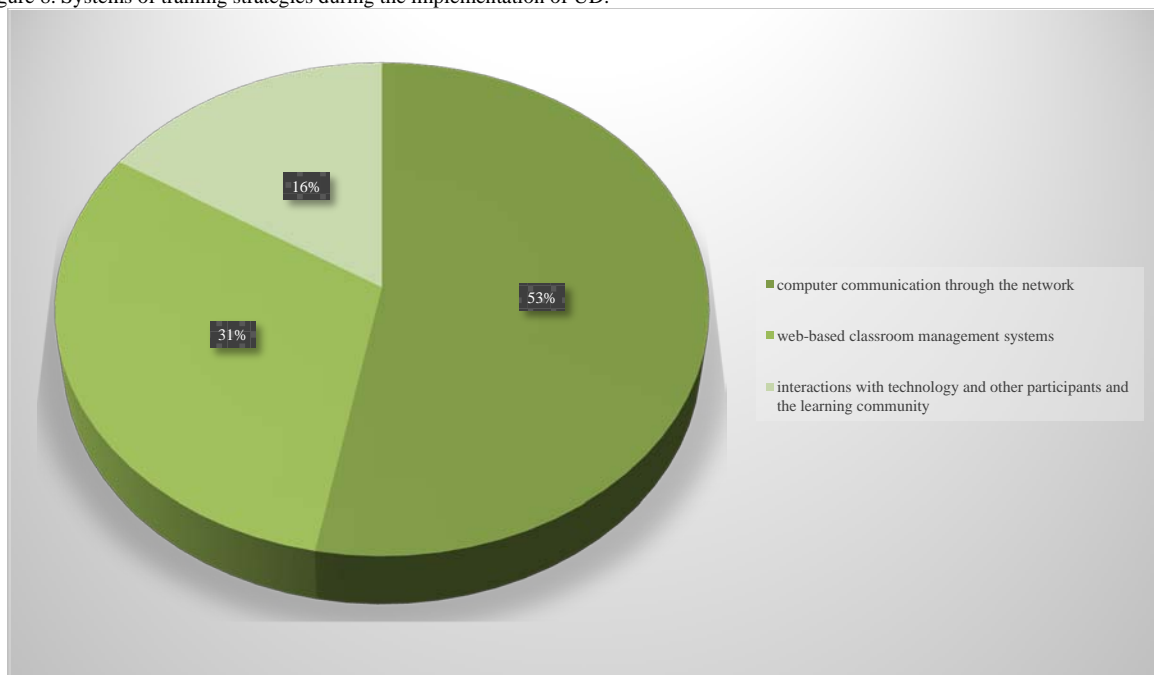
Source: author's development; concluded on the basis of the answers of the respondents.

The last question was aimed at clarifying the digital constructions of UD implementation, covering the activities of digital environments. Among the proposed options, respondents gave the greatest number of marks to e-books (37 %), shared stories (27 %), audio system (22 %), software (7 %), and educational events (7 %). The results are presented in Figure 9.

Figure 9. Digital constructions of UD implementation.
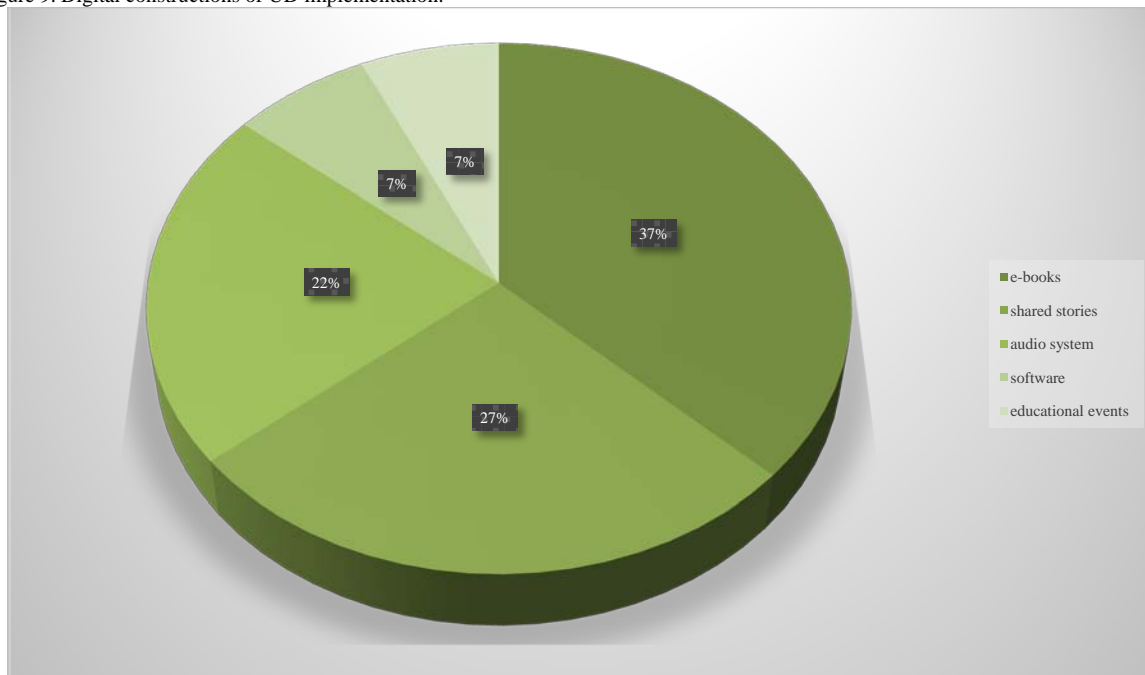
Source: author's development; concluded on the basis of the answers of the respondents.

6 Discussion

On the basis of a significant number of investigations devoted to the issue under discussion, we single out the following provisions, namely:

1. The basic differences between the theory and practice of implementation of inclusion and universal design are as follows:
▪   inclusion is more difficult to be applied in practice;
▪   design needs clarification of some practical concepts (Laurian, 2017);
2. The most common methods of involvement in the implementation of universal design are as follows:
▪   manifestation of enthusiasm;
▪   providing examples and feedback to students;
▪   representation through class discussion;
▪   laboratory experience and images;
▪   group discussions in class;
▪   projects, workshops and tests (Murphy, Panczykowski, Fleury, & Sudano, 2020.)
3. Universal design (UD) can be used to create educational applications in order to adapt the learning space to the needs of the student (elements of physical spaces and instructions to make them more accessible, useful and comprehensive) (Burgstahler, 2020).
4. Universal design should be manifested in the context of trends, namely:
▪   massification;
▪   digitization;
▪   transdisciplinarity;
▪   deformalization (Pavlovskaya, 2020).
5. The inclusion of students with disabilities in SEIs often depends on the teacher's freedom to use inclusive learning strategies; however, there are some barriers (Scott, 2018) to implementing a system of universal design, as follows:
▪   support of teachers by the state;
▪   the need for administrative support;
▪   the need to improve the general knowledge components;
▪   additional on-site training on universal design;
▪   additional advanced training on the implementation of universal design.
6. Teachers analyze the system of universal design through the following categories:

▪   information about participants;
▪   courses and mode of conducting;
▪   independent and dependent variables;
▪   implementation strategies;
▪   implementation efficiency (Seok, DaCosta, & Hodges, 2018).
7. The most common independent variables were as follows:
▪   development and implementation of courses based on the principles of universal design;
▪   practical measures;
▪   training of instructors;
▪   team training under the guidance of colleagues;
▪   common model of professional development.
8. Dependent variables included as follows: course assessment, learning outcomes (review of lesson plans and application of technologies, and the level of trust or knowledge about UD and disability) (Seok, DaCosta, & Hodges, 2018; Guffey, 2021)
9. It is recommended to use numerous learning strategies, namely:
▪   computer communication through the network;
▪   web class management systems;
▪   interaction with technology and other participants and the learning community (Seok, DaCosta, & Hodges, 2018).
10. Universal design should comprise a variety of implementation constructions, covering the work of digital environments, namely;
▪   e-books;
▪   shared stories;
▪   audio systems;
▪   software;
▪   educational events (AlRawi, & AlKahtani, 2021).
11. Open Discovery Space is a portal for viewing and creating educational content, lesson plans and scenarios based on the principles of UDL (Riviou, & Kouroupetroglou, 2014).

7 Conclusions

Therefore, on the basis of the researches conducted it is possible to conclude that in order to conduct successful training of teachers for implementation of universal design in the educational environment, it is necessary to adhere to the following recommendatory requirements concerning educational implementation of UD presented in Table 1.

Table 1. Recommended requirements for the educational implementation of UD

Trend	Learning strategies	Methods of involvement in the implementation of universal design	Categories	Independent variables	Dependent variables	Implementation constructions
Massification	Computer communication through the network	Manifestation of enthusiasm + providing examples and feedback to students	Information about participants	Development and implementation of courses based on the principles of universal design	Course evaluation	E-books, educational events
Digitization	Web class management systems	Representation through class discussion	Courses and mode of conducting	Practical measures	Learning outcomes	Shared stories
Transdisciplinarity	Interaction with technologies	Laboratory experience and images	Independent and dependent variables	Training of instructors	Level of trust	Audio systems
Deformalization	Interaction with other participants and the learning community	Group discussions in class + projects, workshops and tests	Implementation strategies + implementation efficiency	Team training under the guidance of colleagues + a common model of professional development	Acquiring knowledge about UD and disability	Software

Source: author's development; concluded on the basis of a consolidated analysis of respondents' answers.

Thus, the results of the research conducted indicate that the systematic implementation of UD in the educational environment is a complex process requiring unconditional teachers' training.

An important area of further research will be an attempt to present *systems for training teachers* in order to implement universal design in educational activities through the main semantic and structural elements of UD in the environment of secondary educational institutions.

The practical significance of the research was the presentation of the system of teachers' training for the implementation of universal design in educational activities through the main semantic and structural elements of UD in the environment of secondary educational institutions.

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