https://doi.org/10.28925/2617-5266/2025.1014

DIGITAL TOOLS SELECTION FOR INCLUSIVE COURSE DESIGN AT UNIVERSITY

Liudmyla Bilousova
ORCID ID 0000-0002-2364-1885
PhD in Physics and Mathematics, professor
Academy of Cognitive and Natural Sciences,
54 Universytetskyi Ave., Kryvyi Rih, 50086, Ukraine (Ukrainian Branch)
LIB215@gmail.com

Liudmyla Gryzun
ORCID ID 0000-0002-5274-5624
Doctor of Science in Pedagogy,
Professor of the Information Systems Department
of Simon Kuznets Kharkiv National University of Economics.
9A Nauky Ave., Kharkiv, 61166, Ukraine,
Lgr2007@ukr.net

ABSTRACT

The paper addresses the currently important issues of building an inclusive learning environment at universities and the design of courses as components of this environment. According to the goals of the work, it explores and elaborates a functional approach to the selection of didactic and digital tools that provide a design of inclusive learning courses based on the universal learning design (UDL) concept associated with neuropsychology. This includes identifying three large-scale brain networks, which are responsible for certain aspects of information perception, information processing, and decision-making. Building on these neuropsychological explorations, we identified the didactic approaches and matched them with the necessary digital tools. This allows for achieving such variability within an inclusive course design for each component of the learning process (supported by a proper large-scale brain network) and at all three levels. In addition, the paper highlights the experience and preliminary results of the pilot implementation of an online course as a component of a virtual inclusive campus, which was designed based on the elaborated approach. After the course piloting, the key findings were summed up, including the strengths and weaknesses of the course. After the improvements, the course is going to be disseminated to a larger cohort of trainees with follow-up empirical research on the students'

satisfaction, level of accessibility, and learning motivation, which makes a prospect of the research.

***Keywords**: inclusive learning environment, university ecosystem, inclusive course design, universal design for learning, variability, accessibility, digital tools.*

INTRODUCTION

In the rapidly evolving landscape of higher education, the imperative to create inclusive learning environments has never been more urgent. Universities are challenged not only to accommodate a diverse student population but also to ensure equitable access to quality education for all learners, including those with varying abilities, backgrounds, and learning preferences. The transition to digital and blended learning formats, accelerated by global events and technological advancements, has further highlighted the necessity for thoughtfully designed courses that address the principles of inclusivity and universal access (Denysova & Tsapro, 2024; Mospan & Sysoieva, 2022; Mospan, 2023).

Despite significant progress in educational technology, many institutions still face obstacles in selecting and integrating didactic and digital tools that genuinely support inclusive pedagogy. The Universal Design for Learning (UDL) framework has emerged as a leading paradigm, offering a set of principles and guidelines to guide the development of flexible, accessible, and engaging learning experiences. However,

practical approaches for the systematic selection and implementation of such tools determined by UDL principles remain underexplored in the context of course design at the university level.

Thus, it is important to explore theoretical pillars of building accessible and inclusive courses, and to pick up relevant didactic and digital tools which could help implement these theoretical pillars into the practice of the said courses' design. Therefore, our research addresses this critical gap by exploring and elaborating a functional approach to the selection of didactic and digital tools for the design of inclusive learning courses, explicitly anchored in UDL principles.

RESEARCH OBJECTIVES

The purpose of this research is to explore and elaborate on a functional approach to selecting didactic and digital tools that provide the design of inclusive learning courses based on UDL principles. In addition, the paper highlights the experience of piloting an online course as part of a virtual, inclusive campus. The paper comprises the interconnected sections: introduction, where the importance and urgency of the work are formulated; theoretical framework analyses of recent studies related to the topic and providing the proper theoretical background for the research; the results and discussion subsection, which highlights and interprets the progress of the work, and conclusions closing the paper.

METHODOLOGY AND THEORETICAL FRAMEWORK

The theoretical framework of the research is made by the results of learning of recent studies and other resources devoted to the: (1) challenges of building an inclusive learning environment at contemporary university; (2) design of the courses as a component of learning environment; (3) concepts of UD and UDL as a pedagogical and psychological pillars for inclusive courses structuring, design and implementation.

According to various resources and educational evidence, the creation of an accessible and inclusive learning environment at contemporary universities is really urgent, and at the same time, very challenging. Recent studies (Rudnik, 2022; Vergara et al., 2025; Vieriu, 2025) highlight that the drive for inclusivity in higher education is shaped by increasing student diversity, technological advances, and evolving pedagogical expectations. In particular, it is pointed out that there is often a gap between institutional policies and their practical application, mainly due to inconsistent teacher training and technical limitations. While available digital tools can support flexible and inclusive pedagogical designs, shortcomings like the lack of automated accessibility checks and limited support for specific disabilities persist (Vergara et al., 2025). In addition, the inconsistent implementation of inclusive practices (especially in Ukrainian institutions) is constrained by the insufficient conceptual, methodological, and financial base for the overwhelming and

correct implementation of advanced techniques of inclusive higher education (Afonso et al., 2025; Vergara et al., 2025).

It is also underlined (Afonso et al., 2025; Bindhani et al., 2024) that the effectiveness of inclusive education is closely tied to systematic training of educational staff. Without ongoing professional development, educators may resist implementing inclusive strategies due to their lack of readiness in both theoretical and practical terms. Teachers' training (re-training) must be focused on their professional development in terms of mastering the psychological and didactic basics of the inclusive ecosystem of a university. Besides, the teachers should also be equipped with proper digital tools that allow the educators to implement accessibility and diversity of delivered educational services. As it is claimed in the academic and practical resources, these things are challenging and remain urgent and unsolved. There is a lack of systematic approaches to equity and inclusion, and more research is needed to address these gaps (Sharma, 2019).

Existing resources and systemic barriers are also emphasised in some studies as challenges to building an inclusive learning environment at a university. Attitudinal barriers (like misconceptions about disabilities), inadequate funding, and rigid curriculum frameworks prevent the provision of individualised support. These systemic issues can lead to segregation and discrimination, undermining the goals of inclusive education (Bindhani et al., 2024). It is underlined the need for holistic approaches implementation: successful inclusive education initiatives prioritise collaboration

among stakeholders, flexible curriculum design, and access to specialised support services. These approaches foster a sense of belonging and promote empathy and understanding among all students (Afonso et al., 2025).

The next theoretical pillar of our work is based on the studies devoted to the problems of designing inclusive courses as components of the learning environment. The courses are seen as a central thing to shaping the learning environment, and their design significantly impacts accessibility, inclusivity, and student engagement. Inclusive courses are also considered essential elements that ensure equal access to education for all students (Chamblin, 2017; Moore et al., 2007). According to studies, the process of inclusive online course design includes some stages that are similar to the design of conventional courses, but their results are different. These stages include:

(1) Students' needs analysis: understanding the specific needs of students to adapt the course to their abilities.

(2) Development of educational materials and learning content: creating materials in various formats (text, video, audio) and ensuring their accessibility for all students.

(3) Interactivity support: including interactive elements (surveys, discussions, group projects) to ensure active students' engagement and participation. It is admitted that the design of online and hybrid courses, guided by the Online Engagement Framework (OEF), can significantly enhance students' engagement. Redesigning courses to include cognitive,

behavioural, and emotional elements leads to higher student satisfaction and success (Freels et al., 2025; Mohammed et al., 2019; Ren et al., 2024).

(4) Adaptive technologies implementation: using technologies that support inclusion (e.g., text-to-speech programs, accessible PDF documents).

(5) Providing monitoring and evaluation: continuous monitoring of student progress and adapting the course according to their needs.

Based on the papers' analysis (Chamblin 2017; Freels et al., 2025; Schott et al., 2015), we distinguished the peculiarities of the design stages of inclusive courses in comparison with typical conventional ones (Table 1).

Table 1

Comparison of the Design Stages of Conventional and Inclusive Learning Courses

Stage of design	Conventional Course	Inclusive Course
Needs Analysis	General student analysis	Consideration of each student's specific needs
Materials (content) Development	Text-based materials	Various formats (text, video, audio)
Interactivity	Testing, surveys	Additional interactive elements
Adaptive Technologies	May be limited	Use of adaptive technologies
Monitoring	General assessment of success	Individualised approach to assessment

Thus, as it is emphasised (Álvarez-Chaves, 2025; Semerikov et al., 2025; Smith & Ragan, 2005), an inclusive course is an important component of an inclusive university environment. Such a course is intended to provide: (1) equal access to learning: courses are designed to accommodate the needs of students with different disabilities (e.g., through the use of adapted fonts, text alternatives for graphics, and subtitles for videos); (2) personalizing the learning process that is reached through flexible deadlines for assignments, different forms of assessment, and access to learning materials at a time convenient for the student; (3) additional means of engagement and interactivity like forums, virtual discussion rooms, group projects that promote active interaction between students and the teacher; (4) adapting teaching approaches: teachers can use blended learning methods that encompass both traditional and digital means of presenting material.

However, in advanced educational centres which promote efficient inclusive practices, it is emphasised that a high-quality inclusive course should be built based on the concept of universal learning design and must meet the set of special requirements. Therefore, it is important to highlight the theoretical foundations of Universal Design (UD) and Universal Design for Learning (UDL) as pedagogical and psychological pillars for inclusive course structuring, design, and implementation. This allows us to justify the didactic basics and the selection of digital tools for the development of the said courses as a part of the university ecosystem.

Universal Design (UD) and Universal Design for Learning (UDL) are recognised as educational approaches for guiding educational practice that provide flexibility and adjustability in the ways of learning content representation, students' engagement, knowledge expression, and skills demonstration by the students. The approaches allow for reducing barriers in instruction, providing appropriate accommodations, supports, and challenges, and maintaining high achievement expectations for students. Besides, UDL aims to eliminate architectural, pedagogical, and curricular barriers, providing equal learning opportunities for all students. It advocates for flexible, interactive, and proactive instructional approaches (Wakefield, 2018).

The key UDL Principles can be used as a fundamental for inclusive course design. In fact, UDL is built on three core principles: provision of variety and multiple means of engagement, representation, and action/expression. These principles ensure that learning environments are flexible and accessible, accommodating diverse abilities, backgrounds, and learning styles (IDA, 2021; Priyadharsini, 2024).

UDL Principles contribute to teachers' competence development. Training in UDL significantly enhances teachers' ability to value diversity and implement accessible lesson planning. The effectiveness of UDL training is independent of course duration or delivery mode, making it a scalable solution for teacher development. In terms of integration with policy, UDL aligns with international conventions (e.g., UN CRPD) and

national policies, reinforcing the right to inclusive education. Its adoption is seen as a paradigm shift in inclusive education, moving from one-size-fits-all to need-based, personalised learning (IDA, 2021; Priyadharsini, 2024).

Finally, inclusive learning environments face persistent challenges, including inconsistent practice, resource limitations, the need for ongoing teacher development, and others. Courses make up the core of the inclusive learning environment. The process and results of their design, especially within blended learning, can either support or prevent inclusivity at a university. The concept of UDL provides a robust framework for structuring, designing, and implementing inclusive courses, emphasising flexibility, accessibility, and the removal of barriers. At the same time, the course design based on UDL principles put forward the task of picking up proper didactic ways and justified selection of digital tools for these principles' realisation, which is the core purpose of our work.

RESULTS AND DISCUSSION

The theoretical issues were implemented to elaborate on the strategy of selecting the proper didactic and digital tools. In particular, the functional approach was used, which allowed us to match neuropsychological functions of large-scale brain networks with the leading components of the tutorial process determined by UDL principles. We also picked up proper didactic and digital

tools for their realisation. The main ideas of this process of matching and selection are depicted below.

The core pillar is that the UDL concept is associated with neuropsychology, identifying three large-scale brain networks. According to neuropsychology (IDA, 2021; Priyadharsini, 2024; Wakefield, 2018), the learning process is based on the interaction of several large-scale brain networks, each of which is responsible for certain aspects of information perception, information processing, and decision-making.

One of the large-scale brain networks involved in the learning process is the affective network, focusing on why a human being learns. It is responsible for motivation, interest, and emotional aspects of learning (Wakefield, 2018). For instance, using interesting, relevant and personally-driven learning content can maintain students' motivation. Affective networks interact with receptive large-scale brain networks that are focused on what a person learns. It is in charge of the perception and processing of information via vision, hearing, and touch, which encourages educators to envisage presenting learning content in different formats (text, audio, video).

Finally, there are also strategic large-scale brain networks focusing on how we learn and are responsible for planning, organising and completing learning tasks that make educators think about allowing students to choose the formats of completing and performing the tasks. These networks and their interaction help to develop teaching strategies that consider the

neuropsychological diversity of learners (Chamblin, 2017; Wakefield, 2018). Exactly from the understanding of the functions of the said large-scale brain networks, the three UDL principles ensure variability and design options in the realisation of the learning components: (1) Students' Engagement; (2) Learning Content Presentation; (3) Students' Action & Knowledge Expression. Moreover, the design options are essential at different levels: at the level of physical and direct accessibility to the learning content, at the level of cognitive accessibility to the learning content, and at the level of executive function of a learner. Thus, it is necessary to determine the ways and tools to achieve such variability within an inclusive course design for each component of the learning process and at all three levels.

Let us determine the didactic ways and select proper tools to achieve variability of Learning Content Representation. The presentation of learning content in an inclusive course should be adapted to the diverse cognitive and sensory needs of students. This includes ensuring that information is accessible through different channels and formats at different levels of presentation of learning content.

Thus, at the level of physical access and perception of learning content, the variability in the course can be achieved via:

- providing learning content in various ways (through sight, hearing, touch, etc.);
- providing information in a format that allows the user to customise it.

Digital tools selection may include the following instruments:

(1) embedded tools of LMSs (accessibility widgets);

(2) services for converting textual educational content into video (sound) format (e.g., InvideoAI, ElAI);

(3) means for adding subtitles.

At the second level of so-called cognitive access of learning content, where the linguistic-symbolic form of learning content representation is recommended to be used, the variability in the course can be achieved thanks to the representation of the learning content:

- in various forms from the standpoint of its cognitive perception and awareness (through explanation of textual and symbolic information, different structuring, multiple visualisation using various multimedia tools);

- in different languages.

Therefore, selected digital tools may include the following groups of instruments:

(1) graphic organisers and smart infographics tools (e.g., Lucidchart, Napkin, Canva);

(2) tools for semantic analysis of the text (e.g., Voyant Tools, TextAnalyzer).

Finally, at the highest level of cognitive accessibility (awareness of educational content and building learners'

knowledge), the variability in the course can be achieved through the following ways:

- appealing to previously acquired knowledge;
- generalisation of educational information in various ways (through a semantic portrait of educational content, infographics, supporting (video) summaries);
- managing the process of assimilation (processing) of educational content using interactive visualisation.

Respectively, the digital tools that can be used to achieve this level of variability should include the applications and platforms for the creation of interactive video and presentations (e.g., H5P, ISLCollective, EddPuzzle, Mentimeter).

We would like to emphasise that, in terms of the provision of inclusion and ensuring universality of learning within the inclusive course, in the context of the learning content representation. The suggested didactic and digital tools promote active awareness, understanding, and assimilation of content by students with different types of intelligence and with different abilities. In fact, the suggested tools allow us to achieve the main goal of UDL: not only to make information accessible for perception, but rather to teach students to transform the information available to them into knowledge ready for their application. Then, we should select proper tools to achieve variability for the students' engagement component while implementing an inclusive course design.

At the level of welcoming and maintaining interest in the learning engagement component, the priority must again be focused on accessibility of educational content. Psychologists emphasise that information that is not paid attention to, that does not engage students in learning effectively, remains inaccessible to them. Multiple ways of drawing attention to relevant information contribute to its accessibility for students with different levels of interest and preferences. So, at the level of welcoming and maintaining interest in learning, the variability in the course can be achieved through the following:

- varied ways to draw attention to relevant information;
- supporting individual choice and autonomy;
- custom settings to minimise distractions and a 'mistake-proof' strategy.

Respectively, the digital tools that can be used to achieve this level of variability for the Students' Engagement component should include embedded in the learning platforms means of attention attraction and its retaining; emotional connection through personalised greetings; discussions in forums and personal encouragement from the teacher side.

At the second level, where sustaining effort and persistence should be supported, the variability can be achieved thanks to the following didactic means:

- increasing the relevance of goals and objectives;

- variation (ranking) of the course and microtasks requirements;
- stimulating collaboration through various means of interactivity;
- increasing feedback aimed at improving learning outcomes.

It is essential to underline that the learning of skills and strategies requires sustained attention and effort. Students vary considerably in their ability to self-regulate in this way. Their differences reflect differences in their initial motivation, abilities and skills, receptivity to context, and so on. Thus, to realise the said didactic means for the students' diversity, in an inclusive course, there should be implemented such groups of digital tools like:

(1) platforms for creating quizzes that increase students' interest in learning and interactive surveys for collecting students' opinions in real time (e.g. Kahoot, Mentimeter, Slido);

(2) tools to implement gamification strategies both in individual and team mode (e.g. ClassCraft platform);

(3) interactive whiteboards for collaboration and exchange of ideas between students (for instance, Padlet or Zoom whiteboard and others).

At the third level of the students' engagement, it is recommended to apply the following didactic means:

- promoting expectations and beliefs that enhance motivation;
- developing personal skills and coping strategies;
- developing self-esteem and reflection.

We would like to underline that students in general develop self-regulation skills on their own, via trial and error or by observing successful practices. In the whole, learners experience significant difficulties developing these skills, and individual differences are more likely than uniformity. Thus, a successful approach should focus on providing enough alternatives to assist students with varying abilities to effectively manage their own engagement in studying. Therefore, at this level, there can be applied digital tools which involve students with different levels of motivation and eagerness to learn in practically driven activities (special e-environments for exact subject domains, simulators, gamification platforms). Besides, the tools help to organise group projects and provide transparency in the distribution of tasks (e.g., Trello platform).

Finally, we are going to suggest the didactic ways and select proper tools to achieve variability at different levels for the Students' Action & Knowledge Expression component while an inclusive course design. According to studies, it is really important to provide students with the opportunity to choose how

to complete tasks and demonstrate their knowledge. This promotes creativity and reduces barriers to learning.

At the lowest level of physical actions to access and navigate learning content, variability in an inclusive course can be achieved via varied navigation and feedback methods and supporting individual access to learning tools and assistive technologies. In the course design, it is essential to understand that the learning content that is difficult to access or illogically arranged creates a barrier to its accessibility, remaining inaccessible to the students. Thus, alternative methods of navigation contribute to its physical accessibility for students with different needs. The digital tools in this context are embedded tools for efficient and alternative navigation in LMSs, including built-in accessibility widgets. At the second level of this component of learning, focused on students' knowledge and communication, in the didactic dimension:

- variety of communication tools;
- opportunities for students to demonstrate knowledge through a variety of tools, forms and formats;
- assessment flexibility through graded levels of support for practical tasks and performance.

These solutions seem to be correct, as there is no single way to express knowledge that is optimal for all students. Therefore, providing options for learning activities and ways of expression is

important to provide equal opportunities for academic achievements for all students.

Thus, in an inclusive blended learning environment, learners should be supported to use a variety of digital tools to express their knowledge in the format that is the most appropriate to them in terms of physical and cognitive accessibility. Therefore, the different groups of digital tools should be available for students to express their knowledge in the best way possible. These groups include:

(1) tools for creating infographics as an alternative way for students to express their knowledge and opinions (e.g., Lucidchart, Napkin, Canva);

(2) tools for storytelling design (e.g., MyStorybook, Moovly, Adobe Spark);

(3) tools for design of interactive video and presentations **(**e.g., H5P, ISLCollective, EddPuzzle);

(4) teamwork tools (e.g., Miro, Trello) to collaborate on projects.

On the highest level of this component of learning, executive functions are implemented. Psychologically, executive functions are the abilities which allow a learner to overcome impulsive, short-term responses to the environment and instead set long-term goals, plan strategies to achieve the targets, monitor their progress, and adapt strategies if needed. Thus, in terms of students' diversity, the educators should focus on:

- managing the right goal setting;
- supporting planning and developing learning strategies;
- enhancing the ability to monitor learning progress;
- using formative assessment (self-reflection or peer assessment), encouraging students to reflect on their learning outcomes.

The digital tools can indirectly assist students and teachers. As a recap of our explorations, these theoretical deliverables allowed us to match neuropsychological functions of large-scale brain networks with the leading components of the tutorial process determined by UDL principles. Specifically, we picked up proper didactic and digital tools for the principal's realisation in the progress of design of inclusive courses as an integral part of the university. The depicted didactic and psychological pillars, as well as proper digital tools, made a basis for the development and implementation of the author's course "Tools for inclusive course design" as a component of the inclusive virtual campus piloted within an Erasmus+ project, Academic Freedom and Inclusion through Digitalisation (AFID).

The course was deployed on the MS Teams platform, whose embedded facilities were implemented to provide primary physical level of accessibility to the learning content

presentation, navigation, and students' engagement. The course was designed based on the said UDL principles, providing the variability of all the components of the tutorial process using the didactic ways and digital tools presented above. Besides, the essence of learning content got the students (mostly, they were PhD students and university teachers who are eager to design themselves inclusive courses) familiar with theoretical basics of inclusive environment building, peculiarities of a course design based on UDL pillars, and their neuropsychological foundations. The practical focus of the course was the selection and mastery of different groups of digital tools in the context of their facilities for achieving variability for potential students' engagement, learning content presentation, and students' action. Thus, we could expect the designed and implemented inclusive course as an important component of an inclusive university ecosystem may become an instrument for empowering students by providing: access to learning resources from anywhere in the world; use of adaptive platforms that adapt to the student's pace and learning style; integration of accessibility technologies to create a comfortable learning environment for all participants.

The current students of the piloted course (in total 32 trainees) were assigned a spectrum of various analytical and practical tasks that allowed them to choose the format and tools for their performance and provided them with freedom of choice and necessary variability. Fig. 1 presents the episodes

of students' tasks done within the course, piloting and mastering proper digital tools (services for converting textual educational content into video (sound) format (InvideoAI, ElAI); graphic organisers and smart infographics tools (Lucidchart, Napkin, Canva); tools for semantic analysis of the text (Voyant Tools)) to learn how to achieve variability of Learning Content Representation.

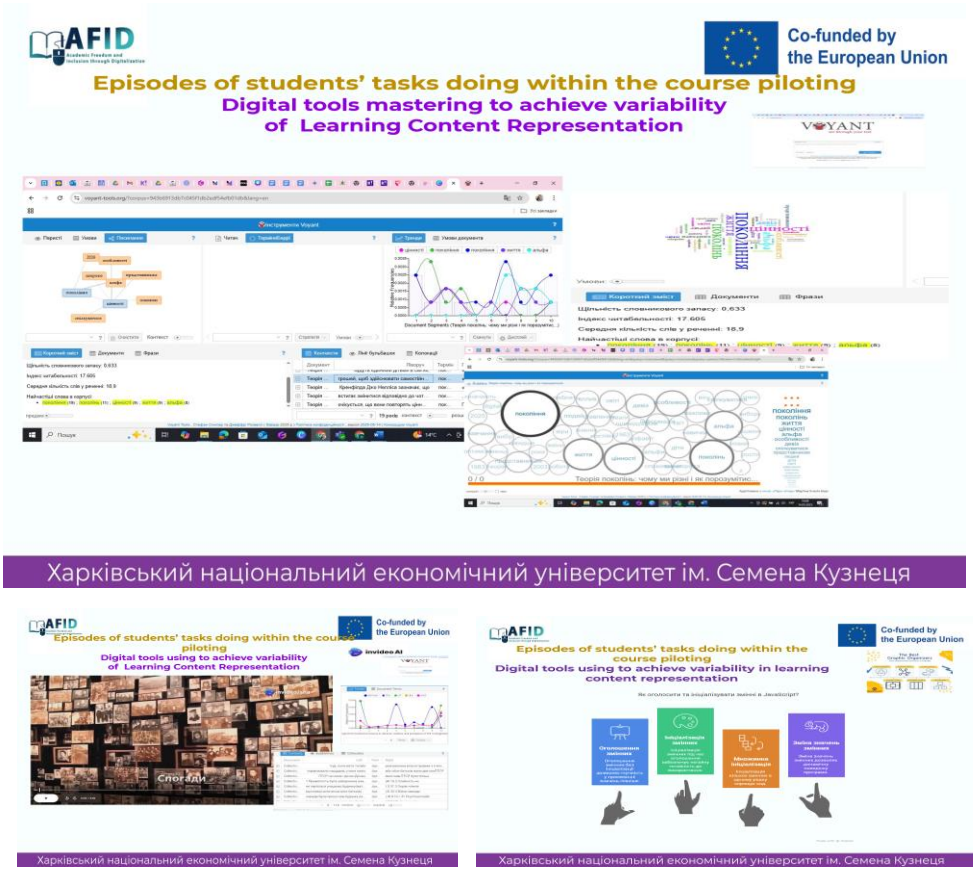

Figure 1 *Students' Works Done in the Course with Digital Tools to Achieve the Variability of Learning Content Representation*

Fig. 2 presents the episodes of students' tasks performing within the course piloting and mastering digital tools (gamification

platforms (e.g., ClassCraft); platforms for creating quizzes that increase students' interest in learning and interactive surveys for collecting students' opinions in real time (e.g. Kahoot, Mentimeter, Slido) and their combinations) to learn how to achieve variability in the Students' Engagement and Motivation.

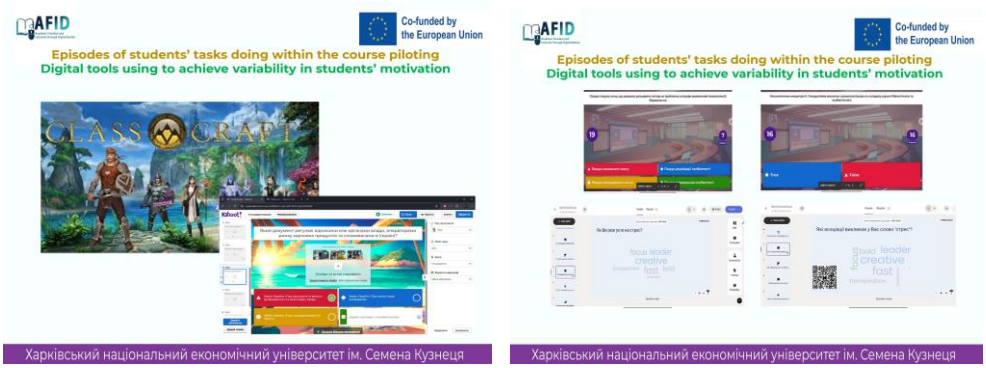

Figure 2 *Students' Works Done in the Course with Digital Tools to Achieve Variability in Students' Engagement and Motivation.*

Fig. 3 presents the episodes of students' tasks performing within the course, piloting and mastering various digital tools to learn how to achieve variability in Knowledge Expression.

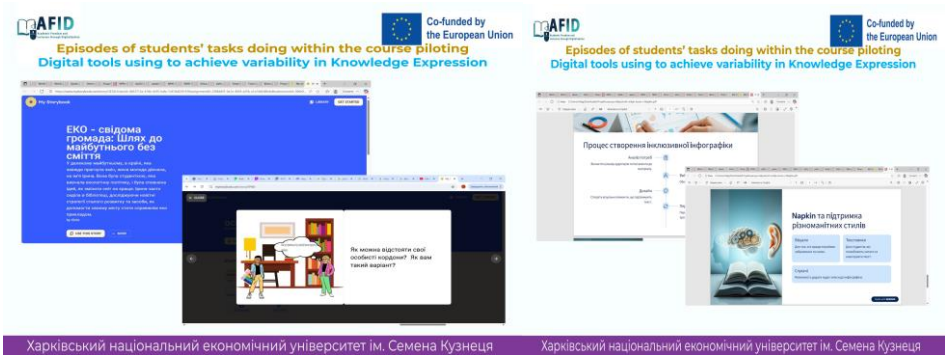

Figure 3 *Students' Works Done in the Course with Digital Tools to Achieve* Variability *in Knowledge Expression*

After the course piloting, there were summed up the key findings according to proper metrics (maximum rating is 5). In particular, it was revealed:

- Inclusion Feedback: 99% of students who felt supported.
- Instructor Evaluation: 4.9-5 rating for training adequacy and support effectiveness.
- Satisfaction Levels: average 4.55-4.9 rating for content, accessibility.
- Accessible inclusivity features (subtitles, multilingual materials, visual generalisation of the content): average rating 4.55.
- The structure of the course materials was clear and logical, and the content was very detailed: average rating 4.9.
- High engagement: active participation, the tasks were engaging, interactive, and contributed to the development of the students' skills: average rating 4.9.
- Effective instructor–student interactions: average rating 4.9.

Besides, analysing the students reviews as feedback after piloting, there were underlined some important strengths of the course that included: (1) high level and quality of educational service, (2) the course is practical, interesting and as meaningful as possible; (3) the knowledge gained within the course are implemented by students in their practical activities (teaching, scientific, educational, practical-psychological/therapeutic,

volunteer); (4) the program of the course is logically and qualitatively planned, (5) students appreciated the variety of the formats of learning content presentation and others. There were also revealed some challenges and areas of improvement which include occasional technical difficulties (e.g., connectivity, platform navigation), need for more personalised support, content enhancement opportunities and others. After the improvements, the course is going to be disseminated for a larger cohort of trainees with follow-up empirical research on the students' satisfaction, level of accessibility and motivation to learning, which makes a prospect of our research.

CONCLUSIONS

The paper treats the currently important issues of building an inclusive learning environment at contemporary universities and the design of the courses as components of the said environment. Based on recent studies' analysis, it is proved the urgency of the research associated with the importance of exploring theoretical pillars of building accessible and inclusive courses has been proven. To elaborate a functional approach to the selection of didactic and digital tools for the design of inclusive learning courses, resting on the paradigm of universal learning design.

According to the goals of the work, it is explored and elaborated functional approach to the selection of didactic and digital tools which provide a design of inclusive learning courses based on the UDL concept associated with neuropsychology. This

includes identifying three large-scale brain networks, each of which is responsible for certain aspects of information perception, information processing, and decision-making. Exactly from the understanding of the functions of the said large-scale brain networks, the three UDL principles come and determine the necessity to ensure variability and design options in the realisation of each of the components of the learning process: (1) Students' Engagement; (2) Learning Content Presentation; (3) Students' Action & Knowledge Expression. It is also underlined by psychologists that the importance of ensuring these design options at different levels: at the level of physical and direct accessibility to the learning content, at the level of cognitive accessibility to the learning content, and at the level of executive function of a learner.

Resting on these neuropsychological explorations, we determined the didactic ways and matched them with groups of necessary digital tools. This allows for achieving such variability within an inclusive course design for each component of the learning process (supported by a proper large-scale brain network) and at all three levels.

In addition, the paper highlights the experience and preliminary results of the pilot implementation of an online course as a component of a virtual inclusive campus, which was designed based on the elaborated approach. After the course piloting, the key findings, including the strengths and weaknesses of the course, were summed up. It was concluded that after the improvements, the course should be disseminated to a larger number of trainees

with follow-up empirical research on the students' satisfaction, level of accessibility and motivation to learning, which makes a prospect of our research.

REFERENCES

Afonso, A., Morgado, L., Carvalho, I. C., & Spilker, M. J. (2025). Facing Challenges in Higher Education: Enhancing Accessibility and Inclusion Through Flexible Learning Design. *Education Sciences, 15*(8), 1013. https://doi.org/10.3390/ educsci15081013

Álvarez-Chaves, A., & Saborío-Taylor, S. (2025). Hybrid learning in higher education: Considerations for its implementation in course design. *Journal of Digital Educational Technology, 5*(1), ep2505. https://doi.org/10.30935/jdet/15859

Bindhani, S., Gopinath, G. (2024). Inclusive Education Practices: A Review of Challenges and Successes. *International Journal for Multidisciplinary Research, 6*(2), 1–9. https://www.ijfmr.com/papers/2024/2/17341.pdf

Denysova, N., & Tsapro, G. (2024). Thesaurus of the lemma 'teacher' in the academic discourse of online learning: A corpus-based study. *The Modern Higher Education Review*, 9, 30–51. https://doi.org/10.28925/2617-5266/2024.92

Freels, J., & Sankaranarayanan, R. (2025). Insights at the Nexus of accessibility, instructional design, and student success. *Online Learning, 29*(3), 158–175. https://doi.org/10.24059/olj.v29i3.4965

Chamblin, M. (2017). Using the ADAPT strategy to facilitate the thinking process of creating universal design-based instructional adaptions and differentiation in lesson plans for diverse learners. *Open Access Library Journal*, 4, 1–17. https://doi.org/10.4236/oalib.1103585

International Disability Alliance (IDA). (2021). Universal Design for Learning and its Role in Ensuring Access to Inclusive Education for All. https://www.internationaldisabilityalliance.org/sites/default/files/ universal_design_for_learning_final_8.09.2021.pdf

Moore, S., Rose, D., & Meyer, A. (2007). Teaching every student in the digital age: Universal design for learning. *Educational Technology Research and Development*, 55, 521–525. https://doi.org/10.1007/s11423-007-9056-3

Mohammed, M., & Muesser, N. (2019). Blended learning motivation model for instructors in higher education institutions, *International Journal of Educational Technology in Higher Education, 16*(12). https://doi.org/10.1186/s41239-019-0145-2

Mospan, N. V., & Sysoieva, S. O. (2022). Trends in digital adaptation of schools during the COVID-19 pandemic. *Information Technologies and Learning Tools, 91*(5), 21–35. https://doi.org/10.33407/itlt.v91i5.5063

Mospan, N. (2023). Trends in emergency higher education digital transformation during the COVID-19 pandemic. *Journal of University Teaching & Learning Practice, 20*(1), 50–70. https://doi.org/10.53761/1.20.01.04

Ren, W., Wang, R., Nor, S.A.M., Mao, Ch., & Harutyunyan, H. (2024). Factors influencing students' learning satisfaction and students' learning outcomes in blended learning. *International Journal of Education and Practice, 12*(1). 95–108. https://doi.org/10.18488/61.v12i1.3624

Rudnik, Y. (2022). Teacher students training to implement AR and VR technologies in foreign language teaching. *The Modern Higher Education Review,* 7, 84–93. https://doi.org/10.28925/2518-7635.2022.78

Schott, F., & Seel, N. M. (2015). Instructional design. In Wright, J. (Ed.) (2012). *International Encyclopedia of Social and Behavioral Sciences* (2nd ed.). Oxford: Elsevier. https://doi.org/10.1016/B978-0-08-097086-8.92032-4

Semerikov, S.O., Nechypurenko, P.P., Vakaliuk, T.A., Mintii, I.S., & Fadieieva, L.O. (2025). Differential effects of Moodle course design on student subpopulations: advancing personalized learning in higher education. *Smart Learning Environment,* 12, 46. https://doi.org/10.1186/s40561-025-00400-6

Smith, P.L, & Ragan, T. J. (2005). A framework for instructional design. In P.L. Smith & T.J. Ragan(Eds.), Instructional Design (3rd ed., pp. 127–150). New York, NY: Wiley & Sons

Priyadharsini, V., & Sahaya, M. (2024). Universal Design for Learning (UDL) in inclusive education: Accelerating learning for all. *Shanlax International Journal of Arts, Science and Humanities, 11*(4), 2024, 145–50. https://doi.org/10.34293/ sijash.v11i4.7489

Vergara, D., Bosque, A., García-Sardón E., & Fernández-Arias, P. (2025). Universal accessibility and engineering: A 21st-century bibliometric review and SDG links. *World*, *6*(4), 152. https://doi.org/10.3390/world6040152

Vieriu, A. M. (2025). Inclusive education as a pillar of sustainability: An experimental study on students' attitudes towards people with disabilities. *Education Science*, *15*(11), 1522. https://doi.org/10.3390/educsci15111522

Wakefield, M. (2018). *Universal design for learning guidelines version 2.2 [graphic organizer]*. CAST https://mtsac.libguides.com/udl/principles

ВИБІР ЦИФРОВИХ ІНСТРУМЕНТІВ ДЛЯ РОЗРОБКИ КУРСУ ЯК КОМПОНЕНТА ІНКЛЮЗИВНОГО НАВЧАЛЬНОГО СЕРЕДОВИЩА В УНІВЕРСИТЕТІ

Людмила Білоусова,
кандидат фізико-математичних наук, професор, Академія когнітивних та природничих наук (Українська філія), просп. Університетський, 54, 50086, Кривий Ріг, Україна, LIB215@gmail.com

Людмила Гризун,
доктор педагогічних наук, професор кафедри інформаційних систем Харківського національного економічного університету імені С. Кузнеця, просп. Науки, 9А, 61166, Харків, Україна,
Lgr2007@ukr.net

У дослідженні розглядаються актуальні питання побудови інклюзивного навчального середовища в сучасному університеті та проєктування курсів як компонентів цього середовища. Відповідно до цілей роботи, досліджується та розробляється функціональний підхід до вибору дидактичних та цифрових інструментів, які забезпечують проєктування інклюзивних навчальних курсів на основі концепції універсального дизайну для навчання (UDL), пов'язаної з нейропсихологією, визначаючи три великомасштабні мережі мозку, кожна з яких відповідає за певні аспекти сприйняття інформації, обробки інформації та прийняття рішень. Спираючись на ці нейропсихологічні дослідження, в роботі запропоновано дидактичні методи та зіставили їх із групами необхідних цифрових інструментів, які дозволяють досягти такої варіативності в рамках інклюзивного дизайну курсу для кожного компонента навчального процесу (підтримуваного відповідною великомасштабною мережею мозку) та на всіх трьох рівнях. Крім того, у статті висвітлено досвід та попередні результати пілотного впровадження онлайн-курсу як компонента віртуального інклюзивного кампусу, який був розроблений на основі розробленого підходу. Після пілотування курсу було підсумовано деякі ключові висновки, включаючи сильні та слабкі сторони курсу. Після внесення покращень курс буде поширено на більшу когорту слухачів з подальшим емпіричним дослідженням щодо задоволеності студентів, рівня доступності та мотивації до навчання, що є перспективою нашого дослідження..

Ключові слова*: інклюзивне навчальне середовище, екосистема університету, проєктування інклюзивного курсу, універсальний дизайн для навчання, варіативність, доступність, цифрові інструменти.*

Received: *25.11.2025*

Accepted: *10.12.2025*