UDC: 372.851:37.091.64:376
Подано до редакції: 19.01.2026
Прийнято після рецензування: 16.02.2026
Затверджено до друку: 27.04.2026
Опубліковано: 29.04.2026
https://doi.org/10.32405/2411-1309-2026-36-5-15

IMPLEMENTATION OF UNIVERSAL DESIGN PRINCIPLES IN MATHEMATICS TEXTBOOKS FOR SELF-STUDY DURING WARTIME

Daryna Vasylieva,
PhD in Pedagogical Sciences, Senior Researcher,
Head of the Department of Mathematics and Computer Science Education,
Institute of Pedagogy of the National Academy of Educational Sciences of Ukraine
https://orcid.org/0000-0002-4083-681X
vasilyevadarina@gmail.com

Abstract. Under the conditions of war, where the instability of distance learning critically limits access to quality education, the presence of a printed textbook serves as an autonomous tool for resilience, guaranteeing the continuity of the educational process regardless of technical or infrastructural challenges. This article analyzes global experience in creating textbooks during armed conflicts, detailing the models of Syria and Palestine, which prioritize short autonomous blocks and a dialogic style; the Afghan model, which utilizes a strict methodological sequence as a 'road map' for students; and the experiences of Croatia and Kosovo, focusing on worked examples as templates for independent action.

The study argues that designing textbooks based on Universal Design for Learning (UDL) principles allows for the preemptive removal of barriers through multimodality and varied information representation. Particular focus is placed on the specialized UDL Math model, which is built upon six strategic elements: a supportive environment, meaningful contexts, a focus on core ideas, multimodality, feedback, and the development of metacognition. The article specifies requirements for the structure, content, and format of mathematics textbooks aligned with this model. These design conditions are illustrated with examples from a current Ukrainian Algebra textbook for the 9th grade, where UDL Math solutions have been successfully implemented and have proven their effectiveness.

Keywords: Universal Design for Learning; UDL; UDL Math; mathematics textbook; textbook creation; self-study; crisis conditions; war; scaf olding in textbooks.

Problem statement. The full-scale military aggression against Ukraine has caused an unprecedented crisis in the general secondary education system, characterized by the mass displacement of students and teachers, the destruction of educational infrastructure, and constant threats to the safety of educational process participants. Under these extreme conditions, access to quality education has become critically limited: a portion of students are forced to study in distance or blended formats, which are frequently interrupted by air raid alerts, power outages, and unstable communication.

One of the most acute challenges is the presence of learning losses among Ukrainian students, which have a cumulative effect and are most critical in the field of mathematics, where mastering the discipline requires a systemic approach (Linnik et al., 2024; Topuzov et al., 2023). Considering that mathematical competencies are the foundation for economic recovery, these losses pose long-term threats to national well-being. The situation is further complicated by the fact that constant stress and psychological trauma cause cognitive regression in schoolchildren, reducing their ability to concentrate and master abstract material (Burda & Vasylieva, 2022).

An important factor in the resilience of the educational process is the availability of a printed textbook, which significantly facilitates the organization of learning in distance and blended formats for teachers, serving as a reliable foundation for structuring lessons, selecting exercises, and assigning homework (Topuzov et al., 2023). For students in crisis conditions, the textbook can be an autonomous tool that allows them to independently study material, review previous lessons, or fully catch up on knowledge in case of forced absences. Furthermore, a paper textbook serves as a clear reference point for parents, who under extreme conditions are often forced to take on some pedagogical support functions and require a reliable source of information to assist their child.

However, textbooks do not always account for the needs of students with different levels of preparation, varying information perception styles, or those working under high psychological stress (Valbone, 2015). A textbook is typically oriented toward the 'average' student and requires significant teacher intervention to adapt the material to the needs of each individual learner (Waddle, 2016). Therefore, there is a necessity to develop textbooks that are accessible to the widest possible range of students without the need for additional adaptation – that is, those created on the basis of Universal Design for Learning (UDL).

Literature Review. Most studies of educational processes in countries during war indicate that the printed textbook is one of the primary and most stable sources of educational information (Salha et al., 2024).

The experience of Syria demonstrates that students can effectively master material even in the absence of systematic direct interaction with a teacher. Syrian mathematics textbooks are written in simple language using a dialogic style with minimal text. They include instructions, such as direct prompts for taking breaks, which helps students experiencing stress avoid overexertion. The learning material in these textbooks is divided into short, autonomous blocks. Working through these blocks requires only a few minutes of attention, which is critical for students who cannot dedicate significant time to learning due to safety concerns or domestic hardships. The

textbooks feature rubrics for self-assessment, enabling students to monitor their progress and experience a sense of achievement. They also include tasks designed to help students adapt to crisis conditions, such as solving real-life problems related to survival or resource conservation. Palestinian textbook development during the war was based on the Syrian experience (Salha et al., 2024).

Unlike the Syrian model, which was dominated by a dialogic style of address, the Afghan textbook model during the USA-led war relied more on a strict sequence of the methodological apparatus and support through external channels, such as radio. The textbooks contained both theoretical exposition and teaching methodology, allowing the student to follow the book's structure as a 'road map' in the absence of a teacher. Each paragraph of the textbook corresponded to a lesson and followed a specific sequence: 1) main presentation of the material, 2) exercises for solving, 3) questions and tasks for assessment, and 4) homework assignments. This structure provided the student with a clear algorithm of actions, imitating the logic of conducting a real lesson. Explanation of the textbook material also occurred over the radio, with relevant programs broadcast during prime time and repeated twice a day (Yazdani, 2020).

During the war, Croatian textbooks were developed based on a model where theoretical exposition was strictly accompanied by worked examples that served as templates for students' subsequent independent work. These textbooks also included an extensive range of tasks – from simple to complex – allowing students to independently transition from basic knowledge reproduction to solving more intricate problems. Croatian textbooks emphasized procedures and the reproduction of knowledge, which facilitated the independent performance of typical exercises but sometimes restricted opportunities for creative problem-solving approaches. Croatian teachers deliberately emphasized working with the textbook during lessons to train students in its use for future self-directed learning. During classroom instruction, teachers followed the textbook closely so that, due to the consistency between the classroom presentation and the textbook, students who missed a lesson would not face significant disparities (Gracin & Matić, 2016).

The architecture of Kosovo's textbooks also consisted of three parts: a textual explanation of the topic, worked examples, and exercises for independent student work. However, the tasks were not differentiated by level of difficulty, and the textbook structure did not provide for self-assessment. Furthermore, these textbooks lacked any references to the use of digital technologies (Valbone, 2015).

In Ukraine, every student is provided with a free printed textbook accompanied by an electronic supplement. This guarantees educational accessibility for all categories of students, regardless of technical challenges or territorial location. Consequently, in crisis conditions, the textbook can be viewed as an autonomous tool for ensuring the resilience and continuity of education, enabling students to catch up on material independently or with the help of parents.

In the Ukrainian reality during the war, authors face the challenge of designing textbooks so that they are accessible to the maximum number of students. This creates a strategic demand for developing textbooks based on the principles of UDL.

The theoretical foundations of UDL were established by researchers at the CAST center (A. Meyer, D. Rose), who proposed shifting the focus from adapting the student to the curriculum toward creating a flexible curriculum through engagement (affective), representation (recognition), and strategic action. This approach recognizes that curriculum which ignores learner variability will inevitably fail, necessitating a change in the design of educational tools rather than demanding students change to meet rigid classroom requirements (Bernardo, 2024).

In accordance with the principles of UDL, the primary requirement for textbooks is multimodality and ensuring multiple means of information representation, allowing students to perceive content regardless of their sensory or motor capabilities. Textbooks should be provided in various formats, including large print, Braille for students with visual impairments, and accessible digital versions. Digital learning materials must feature functionality for text-to-audio conversion and vice versa, options for adjusting font size and background color, and the use of specialized fonts friendly to students with dyslexia. A critical requirement is the integration of multimedia components, such as captioned videos and sign language interpretation, ensuring inclusiveness for deaf and hard-of-hearing students (Kolupaieva & Nakonechna, 2021).

Pedagogical requirements for textbook content based on UDL focus on adaptability and supporting student autonomy. The language and complexity of material presentation must correspond to students' individual abilities, while scientific terminology should be clearly defined to avoid misinterpretations. Textbooks must be designed to stimulate self-learning, containing support structures, prompts, and tasks of varying difficulty levels. A critical requirement is cultural sensitivity and inclusivity of representation; content should be free of bias and reflect the experiences of various social groups. Technical and aesthetic criteria for textbook design involve adhering to the principles of clarity and legibility, as well as ensuring a balance between text and illustrations, which must be accurate, relevant to the content, and helpful in conceptualizing key ideas. From the standpoint of practicality and sustainability, textbooks should be manufactured from durable materials that ensure their long-term use over several years. Economic efficiency necessitates the rejection of the 'textbook-workbook' format where students write in the book, as this makes the volume single-use and increases the cost of the educational process in the long term (Cambridge, 2020).

Empirical research confirms that textbooks and their supplements, constructed on the principles of UDL, significantly improve mathematical learning outcomes, making the process more accessible for every student. The use of integrated visual-textual prompts reduces cognitive load by 44%, while the implementation of worked examples alongside self-explanation prompts significantly enhances procedural knowledge and the ability of students to anticipate errors (Wood, 2016). Furthermore, the atomization of content and its sequential structuring based on a child's level of readiness in digital textbooks or electronic applications allow for a 32-38% increase in problem-solving accuracy (Mao, 2025). Textbooks designed on the basis of UDL, even in the context of autonomous learning without direct teacher assistance, enable students to successfully master a significant portion of complex mathematical concepts, thereby strengthening their confidence and motivation (Khoo, 2018).

Rachel Lambert sought to adapt UDL to the specifics of mathematics and developed the UDL Math model, which is based on six specific design elements:

- *supportive environment* (mistakes are permitted, and effort is valued more than speed);
- *meaningful Math for students* (students have the opportunity to choose, and interesting tasks are offered, particularly applied ones);
- *focus on core ideas* (special attention is given to the most important themes and concepts without which further progress is impossible, as well as tasks that are understandable to everyone but can lead to further deep reflection);
- *multimodality* (accessibility of content through various sensory channels);
- *feedback* (the presence of timely constructive feedback aimed at developing students' competencies);
- *understanding oneself as a mathematician* (development of metacognition, self-regulation strategies, and executive functions) (Lambert, 2021).

This article examines how to apply the UDL Math model to the creation of mathematics textbooks, aiming to ensure that the maximum number of students can study independently under crisis conditions.

Aims and Objectives is the theoretical substantiation and verification of a structural-methodological model for a mathematics textbook based on UDL Math principles, serving as an autonomous tool for independent learning in such environments.

Methods. To achieve the research objectives, methods of theoretical generalization, comparative analysis, and qualitative content analysis of educational literature were employed.

Results and Discussion. Designing mathematics textbooks based on UDL Math principles is aimed at creating a flexible learning environment that preemptively removes barriers and supports the diversity of student needs. In the following sections, we will examine in detail how each element of UDL Math can be implemented during the creation of mathematics textbooks.

To create a ***supportive environment,*** a textbook must feature user-friendly navigation: a table of contents, a glossary of terms, the highlighting of specialized rubrics, and the use of unified pictograms, which are critical for ensuring the student's independent orientation.

Authors should adhere to a dialogic style of material presentation. Traditional imperative instructions ('Complete', 'Solve') should be replaced with partnership-oriented and encouraging phrases: 'Let's do it together', 'Which method will you choose?', which will help in overcoming mathematics anxiety among students. The use of inclusive and gender-sensitive language is mandatory; this helps to avoid social stereotypes and strengthens each student's identity as a successful mathematician.

To minimize cognitive load, the textbook architecture must adhere to the principles of predictability and algorithmization. The implementation of the 'one paragraph – one lesson' or 'one spread – one lesson' principle with a unified arrangement of structural blocks is particularly effective. The learning process is facilitated through the division of content into short autonomous modules and paragraphs, supplemented by illustrations or examples of solved tasks. It is essential for the textbook to contain guidelines, algorithms,

and samples of reasoning that help the student autonomously transition from observation to independent action. Furthermore, it is important that the proposed tasks are distributed by difficulty levels.

An example of how these approaches are implemented is the modern Ukrainian Algebra textbook for the 9th grade by Bevz et al. (2026). At the beginning of the textbook, a link is provided to revise the 8th-grade material, creating a 'safe start' for students with knowledge gaps. The entire textbook is divided into chapters; each chapter begins with a topic overview (what will be studied and why), followed by a series of paragraphs. Each paragraph consists of the following sequence of rubrics: 1) 'Using acquired competencies' (material that is useful to recall to master the new content); 2) 'Keywords' (main terms of the topic provided in Ukrainian and English); 3) 'Main theoretical material'; 4) 'Do you want to know even more?' (additional theoretical information); 5) 'Check yourself' (self-control questions); 6) 'Let's do it together!' (solved typical exercises of the topic that serve as step-by-step samples); 7) 'Do it orally' (the simplest tasks recommended for oral completion); 8) 'Do it in writing' (tasks of two difficulty levels: level A and level B); 9) 'Interesting tasks' (tasks with a logical load); 10) 'Revision exercises' (tasks from previous topics); 11) 'Treasure trove of achievements' (a brief summary of the topic).

The implementation of the ***meaningful Math*** element of the UDL Math model in a mathematics textbook is aimed at bridging the gap between abstract concepts and a child's lived experience. This approach demonstrates the use of mathematics in diverse real-life situations, providing students with opportunities for choice and engaging them in the active creation of meaning. It is essential to ensure support for students' motivation and emotional resilience. To this end, it is advisable for each topic to begin with preliminary goal-setting and a visualized ‘road map’ that clearly explains the practical significance of the acquired knowledge in real life.

This can be achieved through a system of tasks grounded in meaningful contexts for a modern teenager, such as finance, ecology, and technology. Such applied content fosters the development of a positive mathematical identity and strengthens the sense of belonging to the subject, transforming learning into a clear and engaging process.

In Algebra textbook by Bevz (2026) for goal-setting, the introduction includes an address to the students: 'It is essential to remember: you are the main architect of your own knowledge. Success in the modern world is impossible without independence and responsibility for your own learning'. Furthermore, each chapter begins with a brief overview of the topic that motivates its study. At the beginning of each chapter, the authors explain why this knowledge is necessary; for example, algebra is described as a language in which all sciences 'speak, write, and think,' ranging from architecture to music.

The design of the textbook incorporates quotes from prominent figures. For instance, a quote by Yu. O. Mitropolsky – 'Mathematics is like poetry. This similarity lies not only in the beauty of forms or the refined rigor of mathematical theories but also in the power of mathematics' influence on other sciences' – underscores the cultural and aesthetic significance of the subject. Finally, the 'Do You Want to Know Even More?' rubric provides additional context for those interested in the deep connections between mathematics and other subjects.

The textbook offers tasks with contexts that are interesting to students. For example, estimating the budget for creating an online course by a blogger, analyzing the tariff plans of internet providers, or calculating the profit from a charity fair, finding the concentration of medicine in the blood, analyzing the trajectory of a tennis ball, or measuring the height of a mountain pass. There are also tasks that highlight the activities of people in certain professions (lighting technicians in a theater, photographers in a studio, or logisticians transporting cargo, etc.). In many paragraphs, open-ended tasks are offered – tasks where students must independently supplement the conditions and construct their own mathematical model.

At the end of the textbook, a series of educational projects is proposed: 'Energy Efficiency and Energy Conservation,' 'Financial Calculations,' and 'Functions Around Us'. These projects allow students to see where mathematics is applied in daily life or professional activities.

An important component is ***the focus on core ideas***, which involves special attention to the most significant themes and concepts without which further progress is impossible.

Each paragraph of Algebra textbook by Bevz (2026) begins with the rubric 'Using Acquired Competencies', which connects the new topic with facts already known to the student, creating a sense of continuity and ensuring logical links between concepts of different topics, even during independent mastery of the material.

The rubric 'Let's Do It Together!' is a key element of support. It contains step-by-step solved problems with detailed comments (for example, proving inequalities or solving systems), allowing the student to first observe the model of reasoning and then act independently.

To support students during their independent problem-solving, some tasks in the textbook already include a proposed solution plan, where students must construct a model or solve the problem based on that plan. For other tasks, either ready-made models (drawings, tables, diagrams, etc.) are provided, or models that students are required to complete.

The textbook also features a clear system of visual signal-symbols, making the learning process structured through the use of highlighted icons for pair work, group work, research-oriented tasks, and the use of ICT. Furthermore, for most tasks, an analogous problem is proposed (underlined); solving multiple similar problems allows students to re-test their abilities, consolidate their success, and refine their skills. The end of the textbook includes a glossary of terms indicating the specific pages where each term is first introduced.

To ensure a focus on core ideas, each paragraph features 'Key Words' – specific terms intended to center the students' attention. Within the presentation of the primary material, essential content such as definitions, rules, and theorems is highlighted in bold, and the text is formatted to ensure high readability. In the 'Treasure Trove of Achievements' rubric at the end of each paragraph, the material summarizes what the student should currently know and be able to do, as well as what they will learn in the future. Finally, at the end of each chapter, a QR code leads to a specialized summary or outline that presents all the material for that specific educational topic.

To ensure ***multimodality***, the material presented in the textbook must be accessible through various sensory channels, meaning mathematical concepts should be presented in multiple formats – such as text, diagrams, infographics, and audio/video support via QR codes. This approach enables the maximum number of students to master the material in the format most convenient for them.

For example, in the aforementioned Algebra textbook by Bevz (2026), these approaches are implemented during the presentation of primary material by providing concepts through text, symbols, and visualizations; for instance, inequalities are illustrated using height or speed limit road signs. Additionally, animations have been created for certain concepts, which students can access via QR codes using a smartphone.

Accompanying the paper textbook is an open-access electronic version that allows for zooming, which is particularly helpful for students with visual impairments. Furthermore, there is an electronic supplement (the GIOS online platform) that allows students to review theoretical material through short animated instructional videos and summaries featuring diagrams.

In the case of independent work with a printed textbook, it is extremely difficult to provide an element such as ***feedback***. However, an electronic supplement to the textbook, which allows students to practice solving tasks in a gamified format, can easily provide instant feedback.

To ensure the development of ***understanding oneself as a mathematician*** it is desirable to have tools for self-verification and self-control (answers, tests, checklists, marginal prompts) in the textbook, allowing students to immediately check their assumptions, which fosters self-confidence.

In the Algebra textbook by Bevz (2026), there are rubrics such as 'Check Yourself', providing a system of questions at the end of each theoretical block. This helps students independently evaluate their level of material understanding before transitioning to practical exercises. Furthermore, in addition to the answers at the end of the textbook, a knowledge check test is proposed for each educational topic. Independent work with the electronic supplement (the GIOS online platform) ensures 'instant feedback' and the opportunity to learn from one's own mistakes in a game-based format.

Conclusions. Analysis of international experience confirms that in conditions of armed conflict, the printed textbook serves as the most stable source of information and an autonomous tool ensuring the continuity of education. However, the effectiveness of independent learning in crisis conditions depends critically on textbook design. Traditional models frequently ignore the diversity of student needs, leading to a demand for designing textbooks based on the principles of UDL, which allows for the preemptive removal of barriers to students at the creation stage.

The UDL Math model addresses the specific nature of mathematics, consisting of six elements: a supportive environment, meaningfulness, focus on core ideas, multimodality, feedback, and understanding oneself as a mathematician. Based on this model, this article has detailed the requirements for the structure, content, and format of textbooks, the adherence to which transforms a mathematics textbook into an

effective tool for independent learning. The application of such a model involves using a predictable architecture, dialogic presentation, and a system of methodological scaffolding, allowing students to confidently master complex concepts without constant direct teacher assistance.

The described theoretical requirements and design conditions are supported by examples from current Ukrainian Algebra textbooks for the 9th grade, where these structural and methodological solutions have already been successfully implemented and have proven their viability during the crisis period. The synergy between the printed textbook and its digital supplement represents an effective solution for minimizing learning losses in the mathematical field under the conditions of martial law.

References

Bernardo, F. G. (2024). Universal Design for Learning in teaching of Mathematics: Theoretical and practical aspects in the education of students with visual impairments. *Revista Internacional De Pesquisa Em Educação Matemática*, *14*(5), 1–17. https://doi.org/10.37001/ripem.v14i5.3680

Bevz, H. P., Bevz, V. H., Vasylieva, D. V., & Vladimirova, N. H. (2025). *Algebra: Textbook for the 9th grade of general secondary education institutions*. Osvita Publishing House.

Burda, M. I., & Vasylieva, D. V. (2022). Peculiarities of teaching mathematics under martial law (methodological recommendations). *Mathematics in the Native School*, (4-5), 6–15. https://lib.iitta.gov.ua/id/eprint/731956/

Cambridge University Press & Cambridge Assessment. (2020). *The Learning Passport: Research and recommendations report*. Cambridge University Press & Cambridge Assessment. https://www.cambridgeassessment.org.uk/Images/577273-the-learning-passport-research-and-recommendations-report..pdf

Glasnović Gracin, D., & Jukić Matić, L. (2016). The role of mathematics textbooks in lower secondary education in Croatia: An empirical study. *The Mathematics Educator*, *16*(2), 31–58. https://math.nie.edu.sg/ame/matheduc/tme/tmeV16_2/02.pdf

Khoo, G. H. (2018). Designing self-directed learning in mathematics for high ability learners in Dunman High School, Singapore. *International Journal for Cross-Disciplinary Subjects in Education (IJCDSE)*, *9*(3), 3877–3885. https://doi.org/10.20533/ijcdse.2042.6364.2018.0481

Kolupaieva, A., & Nakonechna, L. (2021). Universal design in teaching and learning: Approaches, definition and use [Універсальний дизайн у підготовці та навчанні: підходи, визначення та використання]. *Education of Persons with Special Needs: Ways of Development*, *1*(13), 19–23. https://doi.org/10.33189/epsn.v1i13.74

Koshevets, O. (2025). Creating modern educational literature as a means of providing personalized learning in general secondary education institutions. *Problems of the Modern Textbook*, (35), 17–23. https://doi.org/10.32405/2411-1309-2025-35-17-23

Lambert, R. (2021). The magic is in the margins: UDL Math. *Mathematics Teacher: Learning and Teaching PK-12*, *114*(9), 660–669. https://doi.org/10.5951/MTLT.2020.0322

Linnik, O., Bozhynskyi, V., Hrynevych, L., Kryzhanovska, V., Nikolaiev, Ye., & Riy, G. (2024). *Education during war: The Ukrainian schools' experience. Analytical report*. Kunsht NGO; OsvitAnalytics Think Tank of Grinchenko University. https://www.skeptic.in.ua/wp-content/uploads/2024-Education-during-War-Ukrainian-Schools-Experience-EN.pdf

Mao, X., Dai, Y., Liu, Y., Jiang, Y., & Zhang, Y. (2025). Optimizing cognitive load in digital mathematics textbooks: A mixed-methods study on content organization and application models. *Journal of Educational Technology and Innovation*, *7*(3), 44–59. https://doi.org/10.61414/pxn87q66

Salha, S., Tlili, A., Shehata, B., Zhang, X., Endris, A., Arar, K., Mishra, S., & Jemni, M. (2024). How to maintain education during wars? An integrative approach to ensure the right to education. *Open Praxis*, *16*(2), 160–179. https://doi.org/10.55982/openpraxis.16.2.668

Topuzov, O., Holovko, M., & Lokshyna, O. (2023). Educational losses during martial law: Problems of diagnosis and compensation. *Ukrainian Educational Journal*, (1), 5–13. https://doi.org/10.32405/2411-1317-2023-1-5-13

Waddle, E. (2016). *An accessibility analysis of 8th grade math textbooks: Implications for diverse learners* [Honors thesis, Texas A&M University-Commerce]. Digital Commons @ TAMU-C. https://digitalcommons.tamuc.edu/honorstheses/44

Wood, M. B., Turner, E. E., Civil, M., & Eli, J. A. (Eds.). (2016). *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. The University of Arizona. https://files.eric.ed.gov/fulltext/ED583764.pdf

Yazdani, H. (2020). *Peace education in Afghanistan: A comparative study of conflict and post-conflict school textbooks* [Doctoral dissertation, University of Otago]. https://hdl.handle.net/10523/10447

Дарина Васильєва, *кандидат педагогічних наук, старший дослідник, завідувачка відділу математичної та інформатичної освіти Інституту педагогіки НАПН України, Київ, Україна.*

ВПРОВАДЖЕННЯ ПРИНЦИПІВ УНІВЕРСАЛЬНОГО ДИЗАЙНУ В ПІДРУЧНИКИ З МАТЕМАТИКИ ДЛЯ САМОСТІЙНОГО НАВЧАННЯ В УМОВАХ ВІЙНИ

Анотація. В умовах воєнних дій, коли нестабільність дистанційного формату навчання критично обмежує доступ до якісної освіти, саме наявність друкованого

підручника виступає автономним інструментом стійкості, що гарантує безперервність освітнього процесу незалежно від технічних чи інфраструктурних викликів.

У статті проаналізовано світовий досвід створення підручників в умовах збройних конфліктів. Детально описано моделі Сирії та Палестини, де підручники будувалися за принципом коротких автономних блоків та діалогічного стилю викладу. Розглянуто афганську модель, яка використовувала сувору послідовність методичного апарату та підтримку через зовнішні канали. Вивчено досвід Хорватії та Косово, де акцент робився на використанні розв'язаних прикладів як зразків для самостійної дії учнівства.

Зазначено, що проєктування підручників на основі принципів універсального дизайну дає змогу превентивно усунути бар'єри через мультимодальність та множинні способи представлення інформації. Особливу увагу приділено спеціалізованій моделі UDL Math, яка базується на шести стратегічних елементах: підтримувальному середовищі, значущості завдань для життя, фокусуванні на основних ідеях предмета, мультимодальності, зворотному зв'язку та розвитку метапізнання. Конкретизовано вимоги до структури, змісту та формату математичних підручників відповідно до цієї моделі. Умови проєктування підкріплені прикладами з діючого українського підручника з алгебри для дев'ятого класу, де структурно-методичні рішення UDL Math вже успішно реалізовані та довели свою ефективність.

Ключові слова: універсальний дизайн навчання; UDL; UDL Math; підручник з математики; підручникотворення; самостійне навчання; кризові умови; війна; риштування у підручниках.