



COLLECTION OF SCIENTIFIC PAPERS



ISSUE
№29

1ST INTERNATIONAL SCIENTIFIC
AND PRACTICAL CONFERENCE

**PROGRESSIVE
APPROACHES
IN SCIENCE
AND ENGINEERING**

JULY 23-25, 2025
COPENHAGEN, DENMARK





INTERNATIONAL SCIENTIFIC UNITY

1st International Scientific and Practical Conference
**«Progressive Approaches in Science
and Engineering»**

Collection of Scientific Papers

July 23-25, 2025
Copenhagen, Denmark

UDC 001(08)

Progressive Approaches in Science and Engineering: Collection of Scientific Papers with Proceedings of the 1st International Scientific and Practical Conference. International Scientific Unity. July 23-25, 2025. Copenhagen, Denmark. 209 p.

ISBN 979-8-89704-979-0 (series)
DOI 10.70286/ISU-23.07.2025

The conference is included in the Academic Research Index ReserchBib International catalog of scientific conferences.

The collection of scientific papers presents the materials of the participants of the 1st International Scientific and Practical Conference "Progressive Approaches in Science and Engineering" (July 23-25, 2025. Copenhagen, Denmark).

The materials of the collection are presented in the author's edition and printed in the original language. The authors of the published materials bear full responsibility for the authenticity of the given facts, proper names, geographical names, quotations, economic and statistical data, industry terminology, and other information.

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ISBN 979-8-89704-979-0 (series)



INTERNATIONAL SCIENTIFIC UNITY

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Official site: <https://isu-conference.com/>

SECTION: FOOD TECHNOLOGIES

INNOVATIVE TRANSFORMATION OF SCHOOL NUTRITION IN THE CONTEXT OF INCLUSION: OPPORTUNITIES OF ELECTRONIC SYSTEMS

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Introduction. Ensuring high-quality, safe, and balanced nutrition is a fundamental task in the modern education system of Ukraine [1–15]. This issue gains particular importance in connection with the implementation of an inclusive approach [7, 12–14], which requires consideration of a wide range of physical, medical, and cultural needs of learners. The increasing number of children with food allergies, chronic diseases, and various forms of disabilities necessitates the prompt adaptation of nutrition to the individual characteristics of each student. In this context, traditional paper-based methods of organizing nutrition prove to be insufficiently effective – they are labor-intensive, slow, prone to errors, and do not provide an adequate level of transparency and adaptability.

Therefore, the introduction of digital solutions, such as «SUPiK 2» – the Food and Kitchen Management System [6], becomes a key stage in the transformation of public catering in the educational environment. This system ensures comprehensive automation of nutrition processes, taking into account modern challenges [13],

principles of inclusivity [16–21], and safety standards [1, 3, 8].

Relevance of the Topic. The need for digital transformation of public catering is clearly regulated by national normative documents. In particular, the Resolution of the Cabinet of Ministers of Ukraine № 305 dated March 24, 2021, establishes updated requirements for organizing nutrition in educational institutions, emphasizing the necessity to adhere to principles of balance, safety, and compliance with age-related physiological needs [1]. The Letter of the Ministry of Economy of Ukraine № 3304-04/46862-07 highlights the advisability of implementing automated solutions that simplify documentation processes, improve reporting quality, and increase parental awareness regarding their children's nutrition [2].

An important role in ensuring food safety is played by Order № 590 of the Ministry of Agrarian Policy and Food of Ukraine, which mandates educational institutions to implement the HACCP system – the foundation of modern product quality control at all stages [3]. Simultaneously, international standards, notably the Codex Alimentarius General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 4-2003), set requirements for adapting nutrition processes to the needs of vulnerable population groups, including children with special educational needs [4]. This creates a clear regulatory basis for the implementation of innovative IT solutions in the field of nutrition.

Aim and Objectives of the Study. The aim of this study is to evaluate the effectiveness of the «SUPiK 2» system in the context of improving the organization of inclusive nutrition in educational institutions. The primary focus is on examining the system's ability to provide flexibility, transparency, safety, and personalization of food services according to the individual needs of learners.

The objectives of the study include: analyzing the current regulatory and legal framework governing nutrition in education; characterizing the functionality of the «SUPiK 2» system; investigating practical case studies of its implementation; and determining the potential for scaling similar digital solutions to other sectors, such as healthcare and social institutions.

Methodology. This study employs an interdisciplinary approach combining regulatory and legal analysis, a systematic review of digital solutions, and case studies. Key Ukrainian legislative documents were analyzed, including Resolution № 305 [1], the Ministry of Economy Letter № 3304-04/46862-07 [2], and Order № 590 [3], as well as international food safety standards, specifically CAC/RCP 1-1969, Rev. 4-2003 [4].

The practical part presents the results of implementing the «SUPiK 2» system in educational institutions across various regions of Ukraine. The analysis was based on documentary reports, interviews with cafeteria staff, school administration, and feedback from parents.

Results and Discussion.

1. **Functional Capabilities of the «SUPiK 2» System.** The «SUPiK 2» system is a domestically developed solution designed to meet modern requirements for automating nutrition processes in educational settings. Its functionality covers menu planning, creation of technological cards, inventory management, budgeting, and report

generation. A key advantage is full integration with HACCP requirements and Resolution № 305 [1, 3].

An important feature is its adaptability to individual needs – the system allows the formation of menus for children with allergies, diabetes, food intolerances, and other conditions. The interface is intuitive and user-friendly, designed both for administrative staff and parents. The latter can access real-time information about meals, including their composition, caloric content, and presence of allergens.

2. Practical Implementation of the «SUPiK 2» System. Currently, «SUPiK 2» has been actively implemented in over 850 educational institutions across Ukraine, confirming its scalability and practical effectiveness. In large urban schools, the system optimizes menu planning processes (Figure 1), taking into account seasonality, nutritional norms, and budget constraints. In kindergartens, it facilitates flexible nutrition tailored to children with special dietary needs (Figure 2) [13].

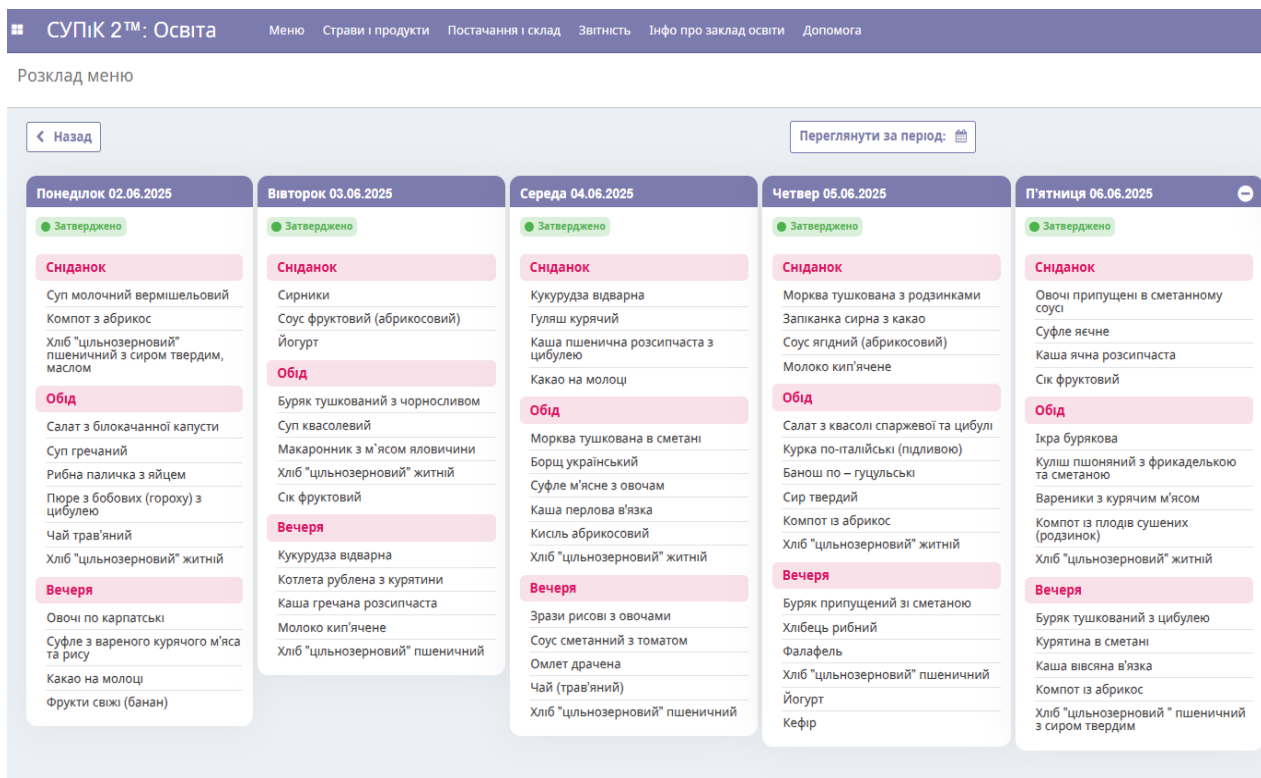


Figure 1. Example of a weekly three-meal menu in an educational institution using the «SUPiK 2» system

A particularly valuable feature is the individualization of meals in inclusive educational institutions, where personalized menus help avoid dietary risks. This creates a foundation for implementing the principle of «barrier-free nutrition», ensuring equal opportunities for all learners [4, 5, 13].

СУPiK 2™: Освіта Меню Страви і продукти Постачання і склад Звітність Інфо про заклад освіти Допомога

Розклад меню / Серeda 11.06.2025

Редагувати Дія

Серeda 11.06.2025

Сніданок **Обід** Вечеря

Продукти на меню Друк

Меню Меню-вимога обід

Тип дітей	Кількість дітей	Додатково дітей	Повна назва страви
3-4 р	2	0	Ікра бурякова (80, 100, 80)
4-6 (7) р	7	0	Суп український з галушками (150/15, 205/20, 150/15)
Проба з'ДО	2	0	М'ясо відварене в кисло-солодкому соусі (27/23, 36/31, 27/23)
			Каша ячна в'язка (82, 103, 82)
			Фрукти свіжі (банан) (60, 80, 0)
			Чай (трав'яний) (150, 180, 150)
			Хліб "цільнозерновий" житний (30, 30, 0)

Figure 2. Example of a lunch menu for different age groups of consumers in an educational institution using the «SUPiK 2» system

3. Improving Transparency and Quality. The implementation of the «SUPiK 2» system has a positive impact on the transparency, quality, and trust in food service processes. Through electronic reporting, both school administration and parents gain full access to data on food procurement, preparation, and consumption. Compliance with nutritional and safety standards is ensured via automated process control, including product write-offs using the FIFO (first-in, first-out) method, which reduces waste and increases the freshness of food products [3, 5].

Conclusions. The «SUPiK 2» system is an effective digital tool for modernizing food provision in the context of inclusive education. It ensures automation, compliance with food safety standards, adaptability to individual needs, and high transparency of processes. Its implementation contributes to improved food quality and increased trust among parents, staff, and government bodies. Given its successful application in the educational sector, the system demonstrates strong potential for further use in hospitals, social care institutions, and other facilities where personalized nutrition is essential.

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