

MODULARITY AND FLEXIBILITY IN THE DESIGN OF LANGUAPHONE LABS FOR DYNAMIC LEARNING PROCESS IN THE NEW UKRAINIAN SCHOOL**Kartel T. M.,**Candidate of Pedagogical Sci., Associate Professor,
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Abstract. This paper investigates how modular and flexible design solutions can be applied to languaphone laboratories, with an emphasis on optimizing spatial zoning, acoustics, and ergonomic arrangements. The study highlights the need for adaptive learning environments that accommodate diverse pedagogical approaches, technological integration, and dynamic interaction between students and teachers. The concept of modularity allows for scalable spaces that can be reconfigured based on group sizes, teaching formats, or specific activities, promoting both collaborative and individual learning. Flexibility in design ensures the seamless incorporation of modern educational technologies and supports future adaptations with minimal structural modifications. The research emphasizes the importance of spatial zoning, acoustics optimization, and ergonomic furniture solutions to enhance the effectiveness of language acquisition through immersive and interactive experiences. Furthermore, the study examines how adaptive learning environments contribute to inclusivity and student autonomy, reflecting the core values of the New Ukrainian School (NUS) reform.

Keywords: educational architecture, modularity, flexibility, language labs, adaptive design, collaborative spaces, ergonomic design, NUS.

Introduction. In the context of educational reforms under the New Ukrainian School (NUS) initiative, the role of learning environments in fostering student engagement, collaboration, and individual development has become increasingly significant. As educational paradigms shift from rigid instructional models toward dynamic and learner-centered processes, the architectural design of language laboratories must adapt to support evolving pedagogical needs. Language labs, in particular, require thoughtful design strategies that balance spatial functionality with the demands of modern technology, collaborative interaction, and individual practice.

The concepts of modularity and flexibility are central to the development of such environments. Modularity allows for the creation of multifunctional spaces by dividing the lab into components that can be easily reconfigured according to different teaching scenarios and group sizes. Flexibility, in turn, ensures that spaces remain responsive to emerging technologies and evolving educational practices, enabling future modifications without significant infrastructural changes. This dual approach not only aligns with the principles of sustainable architecture but also ensures that learning spaces can effectively serve both current and future educational needs.

Analysis of the recent research and publications. Recent studies emphasize the importance of modularity and flexibility in educational spaces to support dynamic and inclusive learning. Foksha S. highlights key design principles of the New Ukrainian School (NUS), focusing on creativity and adaptability [1]. Bulgakova, Kosenko, and Ostapyk analyze student furniture design, noting parental preferences for ergonomic and flexible solutions aligned with NUS goals [2]. International research also underscores the need for flexible architecture. Mirpadyab et al. and Todino et al. explore adaptive classrooms that accommodate diverse learning styles, fostering

inclusivity [3,4]. Saleem emphasizes that flexible design extends the functional lifespan of school buildings [5], while Dwinaya and Caromawati demonstrate how modular elements in language labs enhance both individual and group learning [6]. Mamun, Lawrie, and Wright's work on online learning modules aligns with the NUS philosophy by promoting self-directed learning [7]. Finally, Haidari's study on the design of Rugby School illustrates how flexibility enhances both academic and social experiences, serving as a model for modern educational environments [8]. These studies collectively affirm that modularity and flexibility are key to future-proofing educational spaces and aligning with global trends in pedagogy.

Statement of the objective. The dynamic educational environment of the New Ukrainian School (NUS) requires a paradigm shift in the design of learning spaces, particularly language laboratories, to support modern pedagogical practices. Traditional classroom environments, with their rigid layouts and static structures, fail to meet the evolving demands for student-centered, inquiry-based, and collaborative learning. Language labs, as specialized spaces for language acquisition, must be adaptable to various teaching methods – ranging from individual work to group activities—and accommodate both physical and digital learning tools. The challenge lies in integrating modularity and flexibility into these labs to foster a seamless transition between instructional strategies while maintaining functionality and ergonomic comfort.

The primary aim of this research is to develop principles and guidelines for the modular and flexible design of language laboratories that align with the NUS framework. The following tasks have been identified: analyze educational design principles with a focus on modularity and flexibility, drawing insights from both local and international case studies; identify the needs and challenges in designing language labs for the NUS, including ergonomic, technological, and spatial requirements; explore the integration of modular elements that allow rapid reconfiguration of the space to support various learning formats (individual work, pair activities, group sessions).

Main material and results. Language laboratories play a crucial role in fostering language acquisition by providing a controlled environment that integrates both traditional and digital learning tools. In the context of the New Ukrainian School (NUS), which emphasizes student-centered learning, interdisciplinary approaches, and inclusive education, language labs must support various teaching styles and evolving pedagogies. These spaces are essential for the practical application of language skills, encouraging students to engage in real-time communication, collaborative activities, and self-directed learning.

The traditional design of educational spaces is often rigid, with fixed furniture and limited adaptability, which can hinder the dynamic learning processes promoted by the NUS. This highlights the need for spaces that can accommodate multiple configurations and allow for fluid transitions between different instructional modes – whether for individual learning, small group work, or larger collaborative sessions [1]. Therefore, the concept of modularity and flexibility in the architectural and interior design of language labs becomes essential in meeting the diverse needs of teachers and students. Modularity and flexibility are central concepts in contemporary educational design, particularly in the context of dynamic learning environments. Modularity refers to the division of space, furniture, or equipment into independent, standardized units that can be easily combined, reconfigured, or replaced. This principle enables the customization of spaces based on specific educational needs and promotes efficient use of available resources. In contrast, flexibility emphasizes the adaptability of physical environments to support multiple activities, pedagogical approaches, and evolving instructional methods. Together, these concepts ensure that learning environments remain responsive to both short-term and long-term changes in education [3].

The *modularity* of educational spaces reflects the need for both structural and functional efficiency. Structural modularity can include partition walls, modular furniture, and workstations that can be rearranged to accommodate various class sizes and instructional modes. Functionally, modularity allows teachers to quickly modify the space to align with specific lesson plans—whether for lectures, group activities, or individual assignments. In the context of language labs, modular units such as foldable desks, mobile whiteboards, and audiovisual equipment can be reassembled for different activities, supporting both interactive language practice and quiet, focused tasks [2-3].

Moreover, modular systems simplify maintenance and reduce operational costs by enabling the replacement of individual components without disrupting the entire space. This approach aligns with sustainable design principles by extending the life cycle of educational environments.

Flexibility refers to the ability of a space to support diverse teaching methods and accommodate shifts in instructional priorities. In the New Ukrainian School, flexibility is crucial to fostering learner autonomy, interdisciplinary learning, and collaborative problem-solving. Flexible spaces allow for seamless transitions between teacher-led instruction, group discussions, and individual study, reflecting the evolving nature of modern pedagogies [4]. In language labs, flexibility can manifest through the use of modular partitions that transform large rooms into smaller, soundproof areas for focused language practice. Similarly, mobile technology carts and wireless infrastructure enable students to access digital learning tools anywhere within the lab. This adaptability ensures that the space remains functional across different learning scenarios, from hybrid instruction to peer tutoring sessions [3,4,5].

Although modularity and flexibility are distinct concepts, they must complement one another in the design of effective learning environments. A modular language lab offers the structural components needed for quick reconfiguration, while flexibility ensures the adaptability of the space to pedagogical shifts and technological innovations [5]. For example, modular furniture can provide a foundation for a flexible layout, allowing teachers to arrange the space for diverse activities without structural constraints (fig. 1). However, excessive modularity without sufficient flexibility can result in a fragmented space that fails to support fluid learning processes.



Fig. 1. Duke school flexible classes, 2015. Durham. DTW Architects & Planners [12]

The design of language laboratories for the NUS requires careful alignment with the pedagogical goals, inclusive policies, and learner-centered principles of the reform. Language labs in this context must embody adaptability, inclusivity, and sustainability while supporting collaborative, self-directed, and inquiry-based learning. The following principles serve as the foundation for designing effective language labs that meet the specific needs of NUS [9].

The NUS promotes active learning through student-centered education, requiring language labs to move away from rigid, lecture-style arrangements. Instead, the design should facilitate mobility and collaboration, incorporating circular or semi-circular seating layouts, group work areas, and breakout zones for peer activities. Furniture should be modular and easy to reconfigure, enabling students to switch between group discussions, individual study, and interactive activities seamlessly (fig. 2). Such layouts support diverse learning styles, making the space conducive to both individual reflection and collaborative engagement [3] [6]. Inclusivity is a core element of NUS [9], ensuring equal learning opportunities for all students, including those with special educational needs. The language lab design must adhere to universal design principles, providing ergonomic furniture, sufficient lighting, and acoustic treatments for optimal sound clarity. Adjustable furniture, accessible technology interfaces, and clearly marked movement pathways ensure that the space accommodates students of various physical abilities. Acoustic zoning is also essential to minimize distractions for students with auditory processing difficulties [3]. The use of visual aids such as interactive screens and color-coded elements further enhances engagement for learners with diverse cognitive needs.

Language education in the 21st century requires a hybrid approach, combining digital tools with traditional learning methods. The lab should integrate both wireless and wired networks to support online learning platforms, virtual communication, and language software. At the same time, whiteboards, projectors, and printed materials remain essential for teacher-led activities and tactile learning experiences. The design should allow seamless switching between digital and analog tools, giving teachers and students the flexibility to choose the most appropriate methods for specific tasks [6]. A well-designed lab fosters media literacy and prepares students for digital communication while preserving the benefits of traditional learning strategies.

Language labs require careful attention to acoustic design to facilitate effective listening, speaking, and comprehension activities. Acoustic panels, sound-absorbing materials, and partition walls help reduce external noise and prevent sound interference between different zones within the lab. Zoning the space with soundproof areas ensures that students can practice pronunciation or engage in one-on-one speaking tasks without disturbing others [3]. The careful placement of microphones, speakers, and headsets further enhances the quality of auditory learning activities, ensuring clear and consistent sound transmission.

The NUS reform emphasizes the importance of flexibility in educational delivery, including the integration of hybrid and remote learning models [9]. Language labs should be equipped with video conferencing systems, interactive displays, and collaborative software to facilitate synchronous and asynchronous communication with remote participants. The layout must support both in-person and virtual interactions, so that all students, regardless of location, can actively engage in learning activities. Flexible workstations with access to digital devices allow students to participate in blended learning and develop digital competencies that are important for their future.

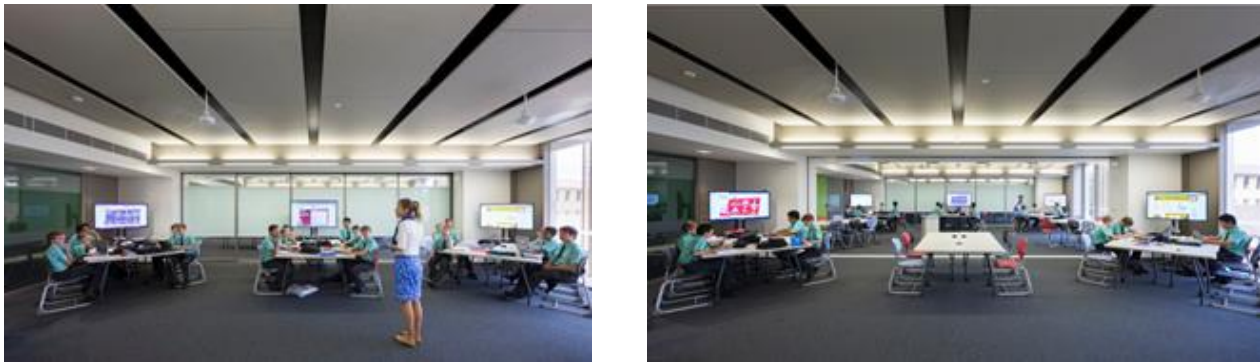


Fig. 2. The transformation of classes (getting smaller and larger). Toowong, Australia [13]

The dynamic nature of the NUS reform requires that language labs be designed with future scalability in mind. The space should accommodate changes in curriculum, student numbers, and technological advancements. Modular components, such as mobile furniture and adjustable partitions, allow the lab to evolve in response to new educational demands. Technological infrastructure should be designed to support upgrades without major renovations, ensuring that the lab remains relevant as technology and pedagogy continue to advance. Scalability ensures that the investment in language labs delivers long-term value, supporting educational innovation over time.

The integration of advanced technology is a key component in the design of language laboratories aligned with the goals of the New Ukrainian School. Modern educational environments must accommodate diverse teaching methods, including hybrid, collaborative, and self-directed learning. In language labs, technology serves not only as a tool for instruction but also as a medium to foster active participation, collaboration, and personalized learning [8].

Hybrid learning, which combines face-to-face and remote education, demands a robust technological infrastructure (fig. 3). Language labs must be equipped with reliable internet connections, video conferencing systems, and digital collaboration platforms that support synchronous and asynchronous interactions. Interactive displays, smartboards, and projectors should be integrated to facilitate seamless communication between in-person and online participants

[10]. Additionally, the placement of microphones and cameras must ensure clear audio-visual input for remote learners, creating an immersive experience comparable to in-class participation. To support hybrid models effectively, the design should incorporate multiple workstations with access to computers, tablets, or other digital devices. These devices should be connected to centralized systems that enable both teachers and students to share content easily across physical and virtual platforms. Cloud-based software can further enhance the continuity of learning by providing access to resources, assignments, and recorded lessons anytime and from any location. This ensures that students who are unable to attend physically can remain engaged in the learning process [11].

With the increasing reliance on digital platforms and cloud-based tools, it is essential to address data security and privacy concerns. Language labs must comply with national and international regulations on data protection, ensuring that student information is safeguarded. Teachers and administrators should be trained in best practices for digital security, including the responsible use of passwords, encryption, and access controls.



Fig.3. Technical support of language labs. Brisbane Boys College, 2014. Australia. Wilson Architects [13]

Ergonomic design is essential to ensure that students can engage comfortably with language-learning activities over extended periods. Workstations, seating, and equipment must be designed with attention to body mechanics, posture, and movement [1,2]. Adjustable chairs, desks with height regulation, and appropriately positioned monitors reduce physical strain, preventing fatigue and maintaining students' focus. Spatial arrangement plays a crucial role in ergonomics. Workspaces should be configured to promote easy movement while maintaining sufficient proximity for collaborative work. Thoughtful placement of computers, keyboards, and audio devices ensures that students can engage with learning tools without discomfort. In addition, lighting design must support both natural and artificial sources, reducing eye strain and improving concentration. Air quality, temperature regulation, and acoustics are also key ergonomic factors. Language labs should be ventilated adequately to maintain comfort during long sessions, and acoustic treatments must minimize noise interference. By creating an environment conducive to well-being, ergonomic design directly contributes to improved cognitive performance and student engagement. Modular furniture allows educators to reconfigure layouts quickly to accommodate different group sizes or individual work preferences [4].

In addition to ergonomics, inclusivity, and accessibility, language labs must promote student well-being by fostering a positive and supportive learning environment. Comfortable and adaptable seating arrangements, access to natural light, and quiet spaces for relaxation contribute to a sense of well-being. Creating areas for individual reflection and group collaboration supports mental health and encourages self-regulated learning. Educators and students should also be involved in the design process, ensuring that the space reflects their needs and preferences [9].

Conclusions. The design of language labs for the New Ukrainian School (NUS) requires a thoughtful balance of modularity, flexibility, and technological integration, aligned with the evolving dynamics of modern education. These spaces must not only facilitate collaborative and

hybrid learning but also address critical aspects such as ergonomics, inclusivity, and accessibility to ensure equitable participation for all students.

By adopting modular design principles, language labs become adaptable environments that support diverse teaching strategies, group configurations, and individual learning paths. Flexibility in layout and functionality ensures that these spaces can evolve in response to new educational practices and the shifting needs of learners and educators. The integration of technology plays a pivotal role in enhancing both in-person and remote instruction, fostering interactive learning experiences through digital tools. Ergonomic considerations, together with the principles of inclusivity and accessibility, ensure that the physical environment is comfortable, supportive, and free from barriers. Design elements such as flexible furniture, assistive technologies, and accessible workstations promote engagement and well-being, allowing students of all abilities to thrive.

In conclusion, the language labs designed under the framework of the New Ukrainian School serve as an exemplary model of future-oriented educational spaces. They reflect a commitment to student-centered learning, adaptability, and inclusivity, aligning with broader educational reforms aimed at preparing students for the challenges of the 21st century. As education continues to evolve, these flexible, technology-enhanced spaces will remain central to fostering meaningful and effective language learning experiences

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МОДУЛЬНІСТЬ ТА ГНУЧКІСТЬ ДИЗАЙНУ ЛІНГАФОННИХ КАБІНЕТІВ ДЛЯ ДИНАМІЧНОГО НАВЧАЛЬНОГО ПРОЦЕСУ В НОВІЙ УКРАЇНСЬКІЙ ШКОЛІ

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Одеська державна академія будівництва та архітектури

Анотація. Реформа «Нова українська школа» (НУШ) ставить перед освітніми закладами нові виклики щодо створення гнучких, інноваційних середовищ, які відповідають потребам сучасного навчання. В умовах динамічних змін освітніх методик особливого значення набуває модульність та гнучкість у проектуванні спеціалізованих навчальних просторів, зокрема лінгафонних кабінетів. Вони покликані забезпечити інтеграцію інноваційних технологій, адаптацію під різні формати роботи та сприяти інклюзивності.

У статті досліджується застосування модульних та гнучких дизайнерських рішень у проектуванні лінгафонних кабінетів з акцентом на оптимізацію просторового зонування, акустичних характеристик і ергономічних рішень. Метою дослідження є виявлення ефективних підходів до проектування адаптивних навчальних середовищ, що відповідають потребам різних педагогічних підходів і сприяють динамічній взаємодії між учнями та вчителями. Концепція модульності дозволяє створювати простори, які можуть бути легко змінені відповідно до розміру груп, навчального формату або специфіки занять, що сприяє як груповому, так і індивідуальному навчанню. Завдяки масштабованості простори можна адаптувати до різних сценаріїв використання, що є важливим для забезпечення ефективного навчального процесу. Гнучкість у проектуванні забезпечує безперешкодне впровадження сучасних освітніх технологій та дозволяє швидко адаптувати простір під майбутні потреби з мінімальними структурними змінами. У статті наголошується на необхідності інтеграції мультимедійних засобів, що сприяють як очному, так і дистанційному навчанню. Особливу увагу приділено зонуванню простору, оптимізації акустики та використанню ергономічних меблів для покращення якості навчального процесу. Такі рішення сприяють створенню сприятливого середовища, в якому учні отримують інтерактивний досвід опанування іноземної мови.

Дослідження також розглядає, як адаптивні навчальні середовища підтримують інклюзивність та сприяють розвитку автономії учнів, що відображає основні цінності реформи Нової української школи, спрямованої на розвиток особистості та інтеграцію всіх учасників освітнього процесу. Стаття підкреслює важливість створення лінгафонних кабінетів, орієнтованих на майбутнє, які поєднують модульність, гнучкість, технології та інклюзивність. Такі простори сприятимуть формуванню ефективного навчального середовища та відповідають викликам сучасної освіти.

Ключові слова: освітні заклади, дизайн класу, модульність, гнучкість простору, лінгафонні кабінети, адаптивний дизайн, ергономічний дизайн, НУШ.