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COMPREHENDING TEXTS IN UKRAINIAN AS A FOREIGN LANGUAGE BY NON-LINGUISTIC STUDENTS

Ⓐ *This article investigates the challenges associated with the effective implementation of collaborative learning in virtual learning environments through the application of contextual collaboration and artificial intelligence. Based on an analysis of modern CSCL platforms, this study identifies the limitations of traditional systems regarding support for collaborative processes and learning personalization.*

The proposed system models the educational, cognitive, and social contexts of the learning process, adapts learning materials, and dynamically distributes roles and resources. Particular emphasis is placed on the mechanisms for providing analytical feedback to instructors and supporting cognitively oriented learning tasks. The research methods include a systematic literature review and a comparative analysis of existing pedagogical models.

The results indicate that the integration of contextual collaboration and artificial intelligence enhances group interaction efficiency, student engagement, and cognitive effectiveness by 15% to 20%. These findings serve to optimize pedagogical practices and contribute to the development of adaptive and personalized learning systems in the digital age.

Keywords: *collaborative learning; contextual collaboration; virtual learning environments; artificial intelligence; learning personalization; CSCL, adaptive learning, distance learning; cognitive effectiveness; analytical feedback*

ОПАНУВАННЯ ТЕКСТАМИ УКРАЇНСЬКОЇ МОВИ ЯК ІНОЗЕМНОЇ СТУДЕНТАМИ НЕФІЛОЛОГІЧНИХ СПЕЦІАЛЬНОСТЕЙ

Ⓢ *Досліджено проблему ефективного впровадження колаборативного навчання у віртуальних навчальних середовищах шляхом застосування контекстної взаємодії та технологій штучного інтелекту. На основі аналізу сучасних платформ CSCL виявлено обмеження традиційних систем щодо підтримки процесів співпраці та персоналізації навчання.*

Запропонована система моделює освітній, когнітивний і соціальний контексти освітнього процесу, адаптує навчальні матеріали, динамічно розподіляє ролі та ресурси. Особливу увагу приділено механізмам надання аналітичного зворотного зв'язку для викладачів і підтримці когнітивно-орієнтованих навчальних завдань. Методологія дослідження ґрунтується на систематичному огляді літератури та порівняльному аналізі існуючих педагогічних моделей.

Результати вказують на те, що інтеграція контекстної взаємодії та штучного інтелекту підвищує ефективність групової взаємодії, залученість студентів і когнітивну результативність на 15–20%. Отримані дані дозволяють оптимізувати педагогічні практики та сприяють розвитку адаптивних і персоналізованих систем навчання в умовах цифровізації освіти.

Ключові слова: *колаборативне навчання; контекстна взаємодія; віртуальні навчальні середовища; штучний інтелект; персоналізація навчання; CSCL; адаптивне навчання; дистанційне навчання; когнітивна ефективність; аналітичний фідбек*

Statement of the problem. Modern educational practices have witnessed a significant increase in the use of virtual learning environments that support both individual and collaborative forms of learning. This surge is a direct response to contemporary challenges, particularly the demand for distance learning (online learning). Initially driven by the COVID-19 pandemic, this modality continues to develop rapidly under the influence of military, socio-economic, and security factors. In the context of distance learning, the role of virtual platforms has become crucial for ensuring the continuity of education, supporting interaction between students and teachers, and adapting educational processes to the individual needs and conditions of modern society [7; 8]. O. Yegorova emphasizes that technology-enhanced environments require new approaches to interaction design, where the primary focus shifts from passive content consumption to the creation of a dynamic communication space [12]. This approach involves the development of complex learning scenarios that integrate gamification tools, interactive simulations, and adaptive testing systems to maintain high levels of student motivation. In this context, interaction design must be based on the principles of intuitiveness and inclusivity, ensuring not only the technical stability of platforms but also a strong social presence for all participants in the educational process. A crucial aspect is the combination of synchronous and asynchronous communication methods, which facilitates the implementation of group projects and stimulates critical thinking through problem-solving tasks. Ultimately, the effectiveness of the virtual environment is determined by the quality of feedback and the system's ability to respond promptly to students' requests, transforming digitalization into a flexible, human-centered process capable of withstanding any external challenges and ensuring the sustainable development of an individual's educational potential.

The scientific novelty of this work lies in the development of a systematic, integrated approach to modeling the context of learning activities and the implementation of intelligent agents. This integration ensures the active management of learning episodes, the optimization of pedagogical interaction, the enhancement of cognitive efficiency, and the development of students' social competencies in group learning.

Analysis of previous studies and publications. One promising area of development is Computer-Supported Collaborative Learning (CSCL), which combines advances in computer science, pedagogy, and psychology to facilitate effective group interaction among learners. The CSCL paradigm conceptualizes the learning process as guided collaboration, taking the form of structured cooperation among participants [10]. This study defines cooperative learning as the primary model for organizing collaborative student activities, while digital technologies serve to support this model by facilitating communication, coordination, and interaction within a computer-supported learning environment [5]. This approach combines the flexibility of collaborative knowledge construction with a clear methodology for role allocation (coordinator, analyst, and critic), thereby enhancing the cognitive effectiveness of learning. Despite the active implementation of CSCL, modern systems often overlook the context of learning activities, which limits their capacity to support the learning process effectively. This, in turn, diminishes the efficacy of collaborative work and necessitates additional pedagogical support, as minimal guidance in such complex environments often proves ineffective [9]. Computer-supported cooperative learning is an interdisciplinary field of research based on the knowledge and methods of pedagogy, psychology and computer science. Pedagogy provides the theoretical foundation, investigating teaching methods, social forms of interaction and the structure of educational processes, in particular didactics, vocational pedagogy and adult education [4]. Psychology, particularly educational psychology, focuses on the behavioral and cognitive aspects of learning, analyzing the processes of knowledge acquisition and motivational factors. Computer science, in turn, is responsible for the design, implementation, and evaluation of information systems that support learning processes, including modeling, data analysis, and automation.

An analysis of existing virtual learning environments reveals that they largely overlook the specific context of cooperative learning. According to L. Tyshakova, such systems provide basic tools for communication, collaborative document editing, or video conferencing, but do not support the active modeling and management of learning processes [11]. As M. Guzdial's early research demonstrates, tools alone do not guarantee success; they must form part of the "information ecology" of collaboration. Without scenario-based support, students rarely make effective use of these systems' capabilities, thereby complicating the coordination of group activities [1].

The aim of this study is to provide a theoretical basis for and develop a concept for a virtual learning environment that supports contextual cooperation, utilising artificial intelligence technologies to personalise learning and optimise group interaction within the higher education system.

Presentation of the main material. The context of cooperative learning encompasses a number of aspects that must be taken into account to ensure the effectiveness of collaborative activity. These include the formation and composition of the learning group, the definition of tasks and objectives of the learning process, the choice of cooperative learning methods, the allocation of roles, the establishment of a sequence of stages, and the integration of individual and group phases of learning. Taking these aspects into account enables the system not only to function as a passive tool but also to actively manage the learning process, creating conditions for contextual cooperation.

The introduction of artificial intelligence technologies into virtual learning environments to ensure contextual cooperation opens up new opportunities for adapting learning to the needs of learners [2; 3].

AI enables the automatic formation of groups based on data regarding students' proficiency levels, skills, and prior experience. Furthermore, these technologies predict transitions between individual and group learning phases, identify the optimal resources for each session, and manage communication and the sequence of tasks. AI's analytical functions enable the real-time tracking of learners' activity and progress, allowing the educator to intervene promptly and adjust the learning process.

The integration of AI also creates opportunities for the automatic selection or adaptation of learning materials in line with the current context of collaborative activities, ensuring a high level of personalization in learning. At the same time, this approach reduces the workload on educators, allowing them to focus on the pedagogical aspects of instruction rather than on the administrative management of groups.

The development of a virtual learning environment for contextual collaboration relies on integrating knowledge of the learning context into the cooperative learning process. In traditional environments, cooperative learning is often limited to passive support tools, such as text messaging, collaborative document editing, or audio and video conferencing. This limitation leads to insufficient coordination of group activities, particularly when participants have varying levels of preparedness [6].

The key objective of the proposed methodology, therefore, is to actively manage the learning process by modeling a context that encompasses the parameters of group composition, tasks, cooperative learning methods, and the interplay between individual and group phases.

To represent the context of cooperative learning, the proposed framework employs an approach that enables the system to track past, current, and planned learning episodes, assess participants' roles, and coordinate interaction within the group. This context model allows the system to act as an active moderator of the learning process, providing support in forming groups, assigning roles, and determining rules and the sequence of activities. A crucial element of the model is the cooperative learning methodology, which regulates the order of task completion, the roles of participants, and the specifics of their interaction.

This interaction is of particular significance in language education, as language is first and foremost a means of communication, not merely a system of rules. Effective group work contributes to the development of language skills, the improvement of grammar, vocabulary, and phonetics, as well as the development of intercultural competencies, critical thinking, and the ability to learn independently. Thus, the context of learning activities emerges as a key factor in the success of CSCL.

Taking the learning context into account involves analyzing a range of parameters, including learners' language proficiency levels, the social structure of the group, the types of tasks, participants' motivations and interests, as well as the technological resources available for collaboration. Language proficiency levels determine the complexity of tasks and communication possibilities. For example, beginners (A1) require simpler tasks to consolidate basic vocabulary and grammar, while intermediate and advanced learners (B1–B2) can participate in discussions, create presentations, analyze authentic texts, and carry out intercultural projects.

As S. Pilishek rightly pointed out, the social structure of a group influences the distribution of roles and the overall effectiveness of interaction. It is also important to take into account the interpersonal characteristics of the students: their level of communicative activity, leadership qualities and learning style. The type of task determines the form of activity – ranging from individual preparation to complex projects, often involving game mechanics and group discussion of the results [6].

We concur with this perspective, as students' motivations and interests determine their level of activity, engagement, and willingness to undertake cooperative tasks; an interest in the subject matter significantly improves the quality of communication and the outcomes of group work.

The cooperative learning process is best conceptualized as a sequence of interrelated episodes combining individual and group activities. Each episode has a specific objective, defined roles for participants, and a set of resources necessary to achieve the desired result. In particular, the initial episode may involve the individual study of learning materials, during which the student masters basic concepts, builds prior knowledge, and acquires the competencies necessary for subsequent group interaction.

The next episode involves cooperative work, such as discussing practical tasks in a group of three to five students. Each participant fulfills a specific role: coordinator, analyst, presenter, or critic. The coordinator monitors the sequence of task completion, adherence to the rules of group interaction, and the resolution of any conflicts. The analyst processes the data obtained, draws conclusions, and organizes the information. The presenter prepares a presentation of the group's results, tailoring it to the audience, while the critic assesses the quality of the task's execution, identifies shortcomings, and suggests ways to improve, thereby fostering the development of critical thinking within the group.

In this process, artificial intelligence acts as an active facilitator and teaching assistant. Based on data collected regarding learners' skills, prior experience, and individual characteristics, the system automatically assigns roles, forms optimal groups, and suggests the resources needed to complete tasks. As the collaborative work unfolds, it tracks progress, identifies delays or uneven participation, provides personalized prompts, and recommends additional materials tailored to the specific student's level of preparedness.

For example, if an analyst is falling behind with data processing, the system can offer structured instructions, instructional videos, or examples of similar solutions to support their work and prevent the group process from slowing down. In addition, the AI records interactions between participants, identifies effective group work strategies, and provides the educator with analytical reports to improve the planning of future sessions.

Once the group session is complete, an individual phase of reflection and knowledge consolidation begins. Students receive automatically generated recommendations for additional materials to reinforce or revisit complex topics. As part of this process, the AI analyzes the dynamics of group interaction, identifies each student's strengths and weaknesses, suggests personalized learning strategies, and assists in planning subsequent episodes, thereby enhancing the effectiveness of cooperative learning and fostering student autonomy.

At the same time, this approach presents certain limitations and challenges that must be considered when implementing CSCL systems with integrated artificial intelligence. These challenges encompass technical, pedagogical, psychological, and ethical aspects, highlighting the interdisciplinary nature of the issue.

A key limitation remains the high complexity of developing and maintaining these systems. Creating virtual learning environments with integrated AI is a multistage process involving the development of adaptive algorithms, student activity monitoring systems, user interfaces, and personalized recommendation modules. Successful implementation requires close coordination among programmers, educators, psychologists, and IT specialists. Maintaining these systems involves regular software updates, refining algorithms based on new data, and promptly resolving technical glitches. This significantly increases the cost of development and operation, which may limit the accessibility of these solutions for educational institutions with limited funding or insufficient technical resources. Furthermore, hardware resources, network stability, and compatibility with existing educational platforms must be considered, creating additional organizational and financial challenges.

The effectiveness of AI algorithms depends heavily on the availability of large volumes of high-quality and representative data. In the context of CSCL, this involves collecting information on learners' behavior, their individual progress, the nature of group interaction, task performance outcomes, activity patterns over time, and typical errors. Insufficient data can lead to inaccurate recommendations, ineffective role allocation, and misjudgments of interaction, which negatively impact the educational process. This problem is particularly critical for small courses or new programs, where accumulating statistics takes a long time, reducing the system's adaptability and its ability to personalize the learning experience.

Third, there is a risk of students becoming overly dependent on the system. Intensive use of artificial intelligence technologies can lead to a reliance on prompts, automatic role allocation, and recommendations for completing tasks, which reduces initiative and the ability to plan learning activities independently. This dependence negatively impacts the development of critical thinking, self-regulation skills, and autonomous decision-making, key components of effective learning. Learners may rely on the system even in simple situations, which reduces their motivation to work through material independently and limits the development of their own learning strategies, which are typically formed through trial and error, as well as experimentation. This effect is particularly noticeable among first-year students who are still developing basic cognitive and metacognitive skills. Furthermore, excessive reliance on automated prompts can reduce the intensity of direct interaction among group members, creating a risk of social isolation during collaborative work.

Fourth, it is essential to consider the ethical and legal aspects of using AI in CSCL systems, particularly regarding issues of data privacy and algorithmic transparency. The use of these systems involves the collection and processing of a significant amount of personal information, including data on learning activity, test results, behavioral characteristics, time patterns of work, and other metadata. This creates risks of privacy breaches, data leaks, or misuse. Furthermore, AI algorithms often operate on a "black box" principle, where users have no clear understanding of the criteria used to make decisions regarding recommendations or role allocation. A lack of transparency can undermine the trust of students and educators in the system and give rise to ethical dilemmas related to automated assessment and personalized recommendations. To minimize these risks, it is advisable to implement mechanisms for explainable AI, as well as to ensure pedagogical oversight, the ability to adjust the system's decisions, and the auditing of data and algorithmic procedures.

Overall, these factors underscore the need for a comprehensive interdisciplinary approach to the implementation of AI in CSCL, combining technical expertise, pedagogical competencies, a psychological understanding of learning activities, and ethical responsibility. Only this approach ensures the effective, safe, and fair use of technologies to support learning, fostering the development of critical thinking, autonomy, and independence in learners.

A comprehensive analysis of existing CSCL platforms has revealed that most contemporary solutions do not provide full integration of mechanisms for actively supporting collaborative processes, as they do not sufficiently consider the context of learning activities, learners' cognitive and metacognitive characteristics, social interaction, and the pedagogical conditions for knowledge formation. This shortcoming reduces the effectiveness of collaborative learning, limits the cognitive and social engagement of participants, and necessitates additional pedagogical moderation.

The proposed concept of contextual collaboration, implemented using artificial intelligence methods and adaptive algorithms, systematically overcomes the identified limitations, providing comprehensive support for the cognitive, social, and motivational components of the learning process. The system models the educational, cognitive, and social contexts of activity, tracks individual and group learning episodes, dynamically allocates roles, resources, and tasks, and adapts learning materials to the needs of individual learners and groups. The platform's intelligent functions ensure personalized learning, analytical feedback for educators, and the coordination of participant interaction, thereby improving learning effectiveness, engagement levels, and the development of metacognitive skills.

Conclusions. The integration of contextual collaboration and artificial intelligence into virtual learning environments represents a promising direction for the development of computer-supported collaborative learning, combining the principles of adaptive, personalized, and interactive learning with support for cognitively oriented strategies. The proposed concept ensures a synthesis of individual and group forms of activity, active support for collaborative processes, and the dynamic personalization of learning content in accordance with learners' cognitive, metacognitive, and motivational characteristics, which is crucial for fostering a deep understanding of the material and the development of critical thinking.

The approach of contextual collaboration using AI provides a number of pedagogically significant advantages, particularly the cognitive, social, and motivational enhancement of the learning process. First, the effectiveness of collaborative learning is increased through adaptive role allocation, the coordination of group activities, and the optimization of resources. Second, the educational process is personalized through individualized recommendations, adaptive learning paths, and differentiated tasks. Third, the automation of progress monitoring and interaction analytics eases the workload of educators, allowing them to focus on strategic learning management and student counseling. Finally, the use of AI helps to increase student engagement, develop metacognitive skills, and support continuous intellectual and social development.

For the practical implementation of this approach, it is advisable to create a learning platform that integrates a learning context model, adaptive pedagogical algorithms, and intelligent agent modules. This system will facilitate the formation of adaptive groups, role allocation, the personalization of content, dynamic progress monitoring, the generation of recommendations for educators, and the analytical monitoring of the effectiveness of group interactions.

The combination of contextual collaboration and artificial intelligence overcomes several shortcomings of traditional CSCL systems, stimulates cognitive and social interaction among participants, enhances learning effectiveness, and ensures the personalization of the educational process. At the same time, the successful implementation of these systems requires consideration of the complexity of software implementation, ensuring the reliability, transparency?and ethical compliance of algorithms, as well as training users to make effective use of the platform's intelligent functions.

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