СЕКЦІЯ: ОСВІТНІ СТРАТЕГІЇ ПІДГОТОВКИ ФАХІВЦІВ ІТ-ГАЛУЗІ

THE ROLE OF DIGITAL TOOLS IN THE ORGANIZATION OF AGILE-ORIENTED LEARNING FOR FUTURE IT SPECIALISTS

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The training of future IT specialists in higher education institutions is taking place in the context of rapid technological change, the spread of team-based work formats, and the growing role of Agile approaches in professional practice. Under these conditions, the educational process should reflect not only the content of professional training but also the organizational and technological features of real IT practice, in which digital tools for planning, communication, coordination of collaborative work, and monitoring of results play an important role. Agile-oriented learning has significant potential in this regard; however, its effective implementation requires appropriate digital support.

At the same time, in the training of future IT specialists, digital tools are often used unsystematically, and their selection is determined mainly by the availability or popularity of particular services rather than by didactic appropriateness. Therefore, there is a need to examine the didactic potential of digital tools and the specific features of their use in Agile-oriented learning for future IT specialists.

The analysis of scholarly sources shows that the use of digital tools in the training of future IT specialists is examined through several interrelated areas. Researchers primarily focus on the role of digital interaction and collaborative online learning in higher education. In particular, A. Bach and F. Thiel [1] highlight the relationship between the quality of digital interaction, learning outcomes, and student satisfaction, while H. Donelan and K. Kear [4] emphasize the need for a pedagogically sound selection of tools to support online.

Another area of research concerns digital tools in project-based and engineering education. P. Canales-Ronda and C. Aragonés-Jericó justify the use of Agile approaches and digital tools in the training of students in technical and IT fields, viewing them as means of organizing teamwork, coordinating roles, and tracking progress. Similar conclusions are presented in studies on the educational potential of GitHub for IT students, where its value for developing professionally relevant digital collaboration skills is emphasized [3].

A further important area relates to learning analytics and digital environments for collaboration. F. Ouyang and L. Zhang [5] show that digital tools can support not only task

completion, but also the monitoring of student activity, the analysis of individual contributions, and the provision of feedback. In the context of Agile and adaptive learning, N. Bergaoui and S. Ayachi Ghannouchi [2] stress the importance of digitally documenting and improving the learning process.

Thus, current research confirms the significant potential of digital tools for supporting collaboration, project-based learning, communication, monitoring, and reflection in higher education. At the same time, their systematization in the context of Agile-oriented training of future IT specialists, as well as the criteria for their selection and methodological features of use, remain insufficiently explored.

The analysis of scholarly sources and our own experience in organizing Agile-oriented learning made it possible to identify the main functions of digital tools in the training of future IT specialists: *communicative, coordinative, organizational and planning, monitoring, documentation, and reflective-analytical*. This makes it possible to consider digital tools not as a set of separate services, but as means of supporting specific educational tasks within the logic of Agile-oriented learning. At the same time, the analysis of practices in foreign and Ukrainian higher education institutions shows the stable use of LMS platforms and digital environments for interaction, as well as the expediency of taking into account tools widespread in professional IT practice, in particular the Microsoft 365 ecosystem.

The synthesis of scholarly sources and Agile-oriented learning practice made it possible to classify digital tools according to their functional role in the training of future IT specialists. This approach allows them to be considered not as separate services, but as means of supporting specific stages and types of learning activity. The classification of digital tools is presented in Table 1.

Table 1

Classification of Digital Tools for Agile-Oriented Training of Future IT Specialists

Category of digital tools	Functional purpose	Examples
Educational digital environments	Support the organization of the educational process, provide access to learning materials, assignments, assessment, and communication	Moodle, Microsoft Teams, Google Classroom, Canvas, Blackboard
Communication tools	Enable task discussion, consultations, and synchronous as well as asynchronous interaction	Microsoft Teams, Slack, Discord, Zoom, Google Meet, Telegram, Mattermost
Task management tools	Support sprint planning, task assignment and control, and workflow visualization	Trello, Jira, Asana, ClickUp, Monday.com, Microsoft Planner, YouTrack
Collaborative development and version control tools	Enable collaborative coding, change tracking, code review, and version control	GitHub, GitLab, Bitbucket, Azure DevOps
Documentation and knowledge management tools	Support the documentation of requirements, decisions, instructions, artifacts, and team	Google Docs, Google Drive, OneDrive, OneNote, Notion, Confluence, Coda, Miro

Category of digital tools	Functional purpose	Examples
	knowledge	
Monitoring, assessment, and reflection tools	Support activity tracking, task monitoring, testing, surveys, feedback, and reflection	Moodle Gradebook, Google Forms, Microsoft Forms, Kahoot!, Quizizz, Mentimeter
Software development tools	Support coding, building, CI/CD, and work within development environments	Visual Studio, Visual Studio Code, IntelliJ IDEA, PyCharm, Eclipse, Android Studio, Xcode, Docker, Jenkins, GitHub Actions
Software testing tools	Support test design, automation, API and UI testing, and defect tracking	TestRail, Zephyr, Xray, Postman, Swagger, Selenium, Cypress, Playwright, JMeter, SoapUI, BrowserStack
Business analysis tools	Support requirements elicitation and structuring, process modeling, and prototyping	Jira, Confluence, Miro, Lucidchart, Draw.io, Bizagi Modeler, Figma, Balsamiq, Notion
IT product and project management tools	Support roadmap planning, backlog management, prioritization, and team coordination	Jira, Trello, Asana, ClickUp, Monday.com, Productboard, Azure DevOps, Notion

The proposed classification shows that digital tools perform not an auxiliary but a system-forming role in Agile-oriented learning, as they support team interaction, sprint planning, collaborative development, documentation, monitoring, and reflection on results. Their pedagogically grounded selection makes it possible to bring the educational process closer to real IT team practice and to create conditions for developing future IT specialists' experience of professional interaction in a digital environment.

Digital tools play a system-forming role in the organization of Agile-oriented learning for future IT specialists, as they support the key processes of team-based, project-based, and professionally oriented activity. Their classification according to functional role provides a basis for the pedagogically sound selection of tools and for improving the effectiveness of training. A promising direction for further research is the development of a methodology for their integrated use in the educational process.

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РОЗРОБКА КОМП'ЮТЕРНОЇ ГРИ ЖАНРУ FIRST PERSON SHOOTER ЗАСОБАМИ РУШІЯ GODOT ENGINE

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Жанр шутерів від першої особи (First Person Shooter, FPS) є одним із найпопулярніших та найдовговічніших у індустрії відеоігор. Починаючи з класичних ігор на кшталт Wolfenstein 3D та DOOM у 1990-х роках, жанр набув масштабного розвитку і сьогодні охоплює мільярди гравців по всьому світу. Ключовою ознакою жанру є занурення гравця в ігровий світ через перспективу від першої особи, що разом із реакційними механіками стрільби та динамічним переміщенням формує унікальний досвід взаємодії [1]. Актуальність дослідження визначається зростаючим попитом на фахівців із розробки тривимірних ігор та необхідністю систематизації підходів до реалізації ключових механік FPS-жанру засобами сучасних вільних ігрових рушіїв.

Вибір рушія Godot Engine версії 4.6+ обумовлений відкритим вихідним кодом, ліцензією MIT, відсутністю роялті, підтримкою тривимірної графіки на базі Vulkan-рендерера та вбудованою мовою GDScript з Python-подібним синтаксисом. Порівняно з Unity та Unreal Engine, Godot забезпечує значно нижчий поріг входу без фінансових зобов'язань, що робить його привабливою платформою для навчальних та дослідницьких проєктів [2]. Вузлова архітектура рушія, що базується на ієрархії сцен та вузлів (Nodes), природно відображає компонентний підхід до проєктування ігрових об'єктів і добре узгоджується з патернами, характерними для тривимірних шутерів.

Метою дослідження є розробка прототипу FPS-гри засобами рушія Godot Engine 4.6+ з реалізацією базових механік жанру: системи керування персонажем, механіки застосування вогнепальної зброї, реєстрації пошкоджень та набору QOL (Quality of Life) елементів, що підвищують занурення у ігровий процес.

Центральним архітектурним рішенням є реалізація системи керування персонажем через скінченний автомат станів (Finite State Machine). FSM дозволяє чітко розмежувати поведінку персонажа залежно від контексту: стан спокою, ходьби,