СЕКЦІЯ: СТРАТЕГІЇ РОЗВИТКУ СЕРЕДОВИЩА ЦИФРОВОГО НАВЧАННЯ

USING VR TECHNOLOGIES IN THE STUDY OF SPATIAL GEOMETRY: PROJECT WITH THE IDEA-EAST-HUB

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The project of implementing virtual reality (VR) technologies for the study of spatial geometry involved the development of a series of VR applications focused on various topics of spatial geometry. Each application was designed to visualize and manipulate certain geometric bodies, such as polyhedra, bodies of rotation, etc [1]. Within the apps, exercises were created to build, rotate, move, and transform spatial figures in the VR environment. To increase student engagement, gamification elements such as achievements and difficulty levels are integrated.

An important component of the project is the built-in system of instructions and learning resources. It provides interactive instructions, tips, access to text materials, video tutorials, and other resources.

It also provides the ability to call a virtual assistant for help in VR. To improve the understanding of basic concepts in VR applications, visualization of volumes, surface areas, and vectors has been implemented. Students will be able to visualize the internal spaces of shapes for better perception, as well as observe vectors, coordinate axes, and coordinate systems in VR space.

To successfully implement a project to introduce virtual reality (VR) technologies in the study of spatial geometry, it is necessary to develop a detailed implementation plan and provide appropriate software and hardware resources. Here is an indicative project plan with the necessary software and hardware resources [2]:

1. Formation of the project team:

Project manager;

VR application developers (Unity, Unreal Engine, etc.);

Specialists in 3D modelling (Blender, 3ds Max, Maya);

Teachers and methodologists in geometry.

2. Planning and designing VR applications:

Tools for creating diagrams, flowcharts (Lucidchart, Draw.io);

Tools for project planning (Trello, Asana).

3. Development of VR applications:

VR application development environments (Unity, Unreal Engine);

Tools for 3D modelling (Blender, 3ds Max, Maya);

Libraries and frameworks for VR (SteamVR, Oculus SDK, ARCore/ARKit).

4. Create educational resources and materials:

Video editors (Adobe Premiere, DaVinci Resolve);

Tools for creating animations and video presentations (After Effects, Vyond);

Editors for creating text materials (Microsoft Office, Google Docs).

5. Testing and debugging VR applications:

Tools for testing and debugging (Unity Test Tools, Unreal Insights);

Cloud platforms for testing applications (AWS Device Farm, BrowserStack);

6. Deployment and distribution:

Platforms for distribution of VR applications (Steam, Oculus Store, Viveport);

Cloud services or local servers for application hosting.

7. Hardware:

VR headsets (Oculus Rift, HTC Vive, Windows Mixed Reality);

Powerful computers for the development and testing of VR applications;

Additional peripherals (controllers, motion trackers).

8. Training and support:

Systems for online training (Zoom, Google Meet);

Platforms for creating interactive instructions (Camtasia, Articulate Storyline);

User support channels (forums, chats, knowledge bases).

Difficulties in implementing the project

Accessibility and compatibility of technologies: Limited access to VR technology for students or schools due to high costs can make adoption difficult. Additionally, compatibility issues with existing hardware or software can be a significant barrier.

Technical challenges: Reliability of VR systems, including potential software bugs or hardware failures, can interfere with the learning experience. Maintenance and troubleshooting may require additional resources and expertise.

Problems with user experience: Poorly designed VR experiences can lead to user discomfort, including motion sickness and eye strain. Providing a high-quality, user-friendly interface is critical to effective learning.

Quality of learning content: Developing high quality VR learning content that accurately represents spatial geometry concepts can require significant resources and expertise in both subject matter and VR design.

Equity and inclusivity: There may be disparities in access to the technology based on socioeconomic status, location, or disability. This can lead to unequal educational opportunities.

Integration into pedagogy: Effective integration of VR into the existing curriculum requires careful planning and alignment with educational goals, which can be challenging for teachers who are not familiar with the technology.

Resistance to change: Inertia in educational institutions and reluctance of staff or students to adopt new technologies can slow or derail a project.

Funding and budget constraints: Securing sufficient funding for the purchase, implementation, and maintenance of VR technology and training programmes can be a significant obstacle.

The project also provides for the integration of interactive measurement and analysis tools. There will be built-in tools for measuring edge lengths, face areas, angles, etc. Users will be able to cut shapes to analyze their internal structure, compare and overlay different geometric objects.

To encourage collaboration and teamwork, the project will include a multiplayer mode in which several students will be able to enter the same VR environment at the same time, complete tasks together, discuss them, and collaborate in real time using the functions of joint editing and manipulation of virtual objects.

In terms of accessibility, the project provides support for various VR headsets and smartphones with customizable controls. VR applications can be used both in the classroom under the guidance of a teacher and for independent and for self-study at home.

On the basis of the TNPU STEM Center, an adaptive interface has been implemented for the project to ensure ease of use for students of all ages.

In general, the implementation of this project will create an immersive and interactive learning environment for the study of spatial geometry, increase visibility, student engagement, and facilitate the learning of complex spatial concepts.

References

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ЦИФРОВІ ОСВІТНІ ТЕХНОЛОГІЇ У ФАХОВІЙ ПІДГОТОВЦІ МАЙБУТНІХ УЧИТЕЛІВ

Васютіна Тетяна Миколаївна
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Загальновідомо, що цифровізація освіти є одним із чинників, який зумовлює модернізацію освітнього середовища у закладах освіти різних рівнів, сприяє удосконаленню змісту, методів, технологій навчання, наповнення матеріальної бази сучасними технічними засобами, включення нових освітніх компонентів у програми підготовки майбутніх учителів. У цьому зв’язку, вибір студентами дисциплін, пов’язаних із цифровими застосунками, формує їхні індивідуальні траєкторії професійного становлення та забезпечує формування в них загальних