

METHODOLOGY OF TEACHING INFORMATION TECHNOLOGY IN EDUCATION BASED ON PROJECT-BASED LEARNING ENVIRONMENT

Sadullayev Ibrat Shuxratovich

Doctoral student of Bukhara State University (PhD)., Bukhara, UZBEKISTAN

e-mail: ibratsadullayev@gmail.com

ABSTRACT

This article explores the methodology of teaching information technology (IT) in education through project-based learning (PBL). Project-Based Education (PBE) has gained traction as an effective pedagogical approach for teaching Information Technology (IT). Furthermore, the integration of PBE in IT education, highlighting its impact on student engagement, skill acquisition, and problem-solving abilities. The study examines how PBE aligns with the goals of IT education, its methodology in practice, and the outcomes in real classroom settings. Findings suggest that PBE fosters practical learning, encourages collaboration, and improves both technical and soft skills. The study aims to evaluate the effectiveness of PBL in enhancing students' technical skills, creativity, and problem-solving abilities.

Keywords: Information Technology (IT), Project-based learning (PBL), 21CLD Skills, eduScrum Methodology, Collaboration.

INTRODUCTION.

Information Technology (IT) education is a critical area of modern educational curricula, preparing students to thrive in a technology-driven world. Traditional teaching methods often fail to engage students in real-world problem solving, which is crucial for IT professionals. Project-Based Education (PBE) has emerged as an innovative teaching method that integrates theoretical knowledge with practical application, aligning well with the dynamic and hands-on nature of IT. PBE focuses on learning by doing, where students work on projects that simulate real-world problems. This study aims to investigate how PBE can be effectively implemented in IT education to enhance student engagement, foster critical thinking, and develop both technical and soft skills necessary for future IT professionals.

Project-based learning (PBL) is an instructional methodology that encourages students to learn and apply knowledge through engaging projects. In the context of IT education, PBL can bridge the gap between theoretical knowledge and practical application. This study investigates how PBL can be effectively integrated into IT curricula to improve student outcomes. Project-based learning (PBL) in information technology education fosters an engaging and effective learning environment by emphasizing real-world applications and collaborative problem-solving. This methodology enhances both student engagement and skill acquisition, making it particularly relevant in today's digital landscape.

The several reliable research works suggest that PBL is an effective methodology for teaching IT in education. The hands-on, collaborative nature of PBL helps students develop essential skills that are crucial for their future careers. The studies recommend incorporating PBL into IT curricula to enhance student engagement and learning outcomes.

LITERATURE REVIEW

Below is a literature review covering key aspects of project-based learning in IT education.

Integration of Technology: PBL encourages the use of digital tools, as demonstrated in studies where teachers improved their technology proficiency through projects supported by AI tools like ChatGPT (Jingqian, 2024).

Inclusivity and Accessibility: Research highlights the adaptability of PBL in inclusive education, ensuring diverse student needs are met while promoting active participation and achievement (Yersultanova et al., 2024).

STEM Education Alignment: PBL aligns well with STEM education, fostering interdisciplinary learning and enhancing students' problem-solving and teamwork skills, crucial for modern IT education (Yang et al., 2024).

Practical Application: Emphasizing real-world projects, PBL enhances students' practical skills and motivation, making learning more relevant and engaging (Han, 2023).

Effectiveness of ICT: The integration of information and communication technologies in PBL has demonstrated superior outcomes compared to traditional methods, confirming its relevance in 21st-century education (Chikurteva, 2023).

While PBL offers numerous advantages, some educators may face challenges in implementation, such as resource limitations or resistance to change from traditional teaching methods. Addressing these barriers is essential for maximizing the benefits of PBL in IT education.

METHODOLOGY

Below are some engaging IT project ideas for project-based learning (PBL) that can help students develop practical skills and deepen their understanding of information technology while integrating 21st Century Learning Design skills and the 6 RUBRICS criteria: Collaboration, Knowledge Construction, Self-Regulation, Real-World Problem Solving, Use of ICT for Learning, and Skilled Communication:

1. Create a Class Newsletter Using Microsoft Word

Objective: Teach students to format and design professional documents using Word, while working collaboratively.

Description: Students collaborate in groups to create a newsletter for a fictional event or school function. Each student is responsible for a section of the newsletter (e.g., event details, highlights, student interviews), and they must integrate images, tables, and proper formatting.

21CLD Skills

- ✓ **Collaboration:** Students must share responsibility and work together to produce a cohesive newsletter. Group members work together to complete the newsletter, sharing tasks.
- ✓ **Skilled Communication:** The newsletter requires well-structured content aimed at a target audience.
- ✓ **Knowledge Construction:** Students use research skills to find information to include in the newsletter.

2. Budget Planning Using Microsoft Excel

Objective: Introduce students to spreadsheet basics, formulas, and data visualization using Excel.

Description: Students create a personal or household budget using Excel. They input income and expenses, use formulas to calculate totals and averages, and create graphs to visualize the data. The project can be extended to include "what if" scenarios such as saving for a vacation or managing a sudden expense.

21CLD Skills

- ✓ **Knowledge Construction:** Students build knowledge by applying basic financial literacy and learning how to organize data.
- ✓ **Use of ICT for Learning:** Excel is used for calculations, creating charts, and organizing information.
- ✓ **Self-Regulation:** Students follow a step-by-step approach to building the budget, from data entry to analysis. Students must plan and complete the budget within set deadlines.

Design a Personal Website Using Google Sites

Objective: Teach students to create a basic website to showcase their interests or projects.

Description: Students build a simple website using Google Sites. The project includes creating multiple pages (e.g., home, about me, portfolio) and integrating text, images, and videos. Students will also collaborate by reviewing each other's sites and providing feedback for improvement.

21CLD Skills:

- ✓ **Collaboration:** Students work in pairs to provide constructive feedback on their websites.
- ✓ **ICT for Learning:** Students use Google Sites to develop digital literacy and basic web design skills.
- ✓ **Skilled Communication:** The website must clearly present information in a visually appealing way.
- ✓ **Use of ICT for Learning:** Google Sites is used as a tool to develop technical skills in web design.

Create a Group Presentation Using Google Slides

Objective: Introduce students to presentation design and real-time collaboration using Google Slides.

Description: In small groups, students research a topic (e.g., "The Importance of Internet Safety") and create a shared Google Slides presentation. Each group member is responsible for different sections, and they must collaborate in real time to ensure consistency in design and content. The presentation is delivered to the class, emphasizing clear communication and teamwork.

21CLD Skills:

- ✓ **Collaboration:** Students share responsibility for the presentation, working together to present as a team.
- ✓ **Skilled Communication:** They must communicate their findings clearly, both visually and orally.
- ✓ **Use of ICT for Learning:** Google Slides is used as a collaborative tool for learning and communication.

Create a Digital Survey and Analyze Results Using Google Forms and Sheets

Objective: Teach students how to create surveys, collect data, and analyze it using basic spreadsheet functions.

Description: Students design a simple survey on a topic of interest (e.g., "Favorite Technology Tools") using Google Forms. After collecting responses, they will analyze the data using Google Sheets, creating graphs and charts to visualize the results. The final project includes a short report summarizing their findings.

21CLD Skills:

- ✓ **Real-World Problem Solving:** Students design and conduct a survey that addresses real-world questions or needs.
- ✓ **Knowledge Construction:** Students learn how to collect, organize, and interpret data.

- ✓ **Use of ICT for Learning:** Google Forms is used for data collection, and Google Sheets for data analysis.

Collaborative Project Management Using Microsoft OneNote

Objective: Teach students to manage a small project and organize tasks using Microsoft OneNote.

Description: Students work in teams to plan an event (e.g., a class party or charity fundraiser) using Microsoft OneNote. They create shared notebooks for brainstorming, to-do lists, and task assignments. Each student is responsible for different parts of the event planning, and they must collaborate to ensure the project stays on track.

21CLD Skills:

- ✓ **Collaboration:** Teams work together using shared tools to plan and execute the project.
- ✓ **Self-Regulation:** Students manage their time and responsibilities to meet deadlines.
- ✓ **Use of ICT for Learning:** OneNote is used for organizing tasks, collaboration, and project management.

Create an Infographic Using Microsoft PowerPoint or Google Drawings

Objective: Teach students how to communicate information visually using basic design principles.

Description: Students create an infographic on a simple IT-related topic (e.g., "Top 5 Tips for Safe Internet Browsing") using Microsoft PowerPoint or Google Drawings. They must organize information clearly, use icons and visuals effectively, and ensure the infographic communicates the message concisely.

21CLD Skills:

- ✓ **Skilled Communication:** Students must organize information visually to communicate their message effectively.
- ✓ **Knowledge Construction:** They research the topic and synthesize it into an easy-to-understand format.
- ✓ **Use of ICT for Learning:** PowerPoint or Google Drawings is used as a tool for visual communication.

ANALYSIS AND RESULTS.

The project method enhances teaching by fostering independent learning, creativity, problem-solving, and social competencies in students, making it effective for teaching information technology in educational settings (Chaldanbaeva, 2023).

Enhancing project-based learning in STEM education with integrated technology and coding improves learning experiences, promotes computational thinking, problem-solving, and creativity. Collaborative coding projects enhance interdisciplinary learning and comprehension. Online resources and self-paced learning platforms enable learning outside the classroom. To effectively implement this approach, educators need resources, professional development, and technical support systems. Furthermore, fostering a culture of innovation and experimentation within the classroom encourages students to take risks and explore new ideas, ultimately leading to deeper engagement and understanding. This holistic approach not only prepares students for future careers in STEM fields but also cultivates essential life skills such as teamwork, adaptability, and critical thinking (Kurniawan, 2024).

PBL is a high-quality teaching methodology used in education (Song, 2023). The paper evaluates how project-based learning (PBL) supports learners in all education levels and integrates emerging education technology to enhance the PBL process.

Collaborative work in teaching IT as a project can be highly effective and rewarding. Here are some strategies to facilitate collaboration among students:

Defining Clear Roles and Responsibilities

Assigning specific roles to each team member based on their strengths and interests. For example:

- **Project Manager:** Oversees the project timeline and ensures tasks are completed on schedule.
- **Lead Developer:** Takes charge of the coding and technical implementation.
- **UI/UX Designer:** Focuses on the design and user experience aspects.
- **Quality Assurance:** Tests the project for bugs and ensures it meets quality standards.
- **Documentation Specialist:** Maintains project documentation and reports.

Use Collaboration Tools

Leveraging tools that facilitate communication and project management:

- **Microsoft Teams:** For real-time communication, file sharing, and video conferencing.
- **GitHub:** For version control and collaborative coding.
- **Trello or Asana:** For task management and tracking progress.
- **OneNote:** For collaborative note-taking and brainstorming.

Regular Meetings and Check-ins

Scheduling regular meetings to discuss progress, address challenges, and plan next steps. Daily stand-ups or weekly check-ins can help keep everyone aligned and accountable.

Set Milestones and Deadlines

Breaking the project into smaller tasks with specific milestones and deadlines. This helps in managing the workload and ensures steady progress.

Encourage Peer Reviews

Implementing a peer review process where team members review each other's work. This not only improves the quality of the project but also fosters a collaborative learning environment.

Foster Open Communication

Creating an environment where students feel comfortable sharing ideas, asking questions, and providing feedback. Encourage active listening and respect for diverse perspectives.

Utilize eduScrum Methodology

eduScrum is an adaptation of the Scrum framework for educational settings. It emphasizes teamwork, iterative progress, and continuous improvement. Here's how to implement it:

- **Sprint Planning:** Defining the project goals and plan the tasks for the sprint (a set period, usually 1-2 weeks).
- **Daily Stand-ups:** Short daily meetings to discuss what was done, what will be done, and any obstacles.
- **Sprint Review:** At the end of each sprint, reviewing the progress and demonstrating the completed work.
- **Sprint Retrospective:** Reflecting on the sprint to identify what went well and what can be improved.

Provide Resources and Support

Ensuring students have access to the necessary resources, such as software, hardware, and learning materials. Offering guidance and support when needed, but also encourage independent problem-solving.

By implementing these strategies, students can effectively collaborate in teaching IT as a project, enhancing their learning experience and achieving better outcomes. The integration of PBL into IT curricula has consistently demonstrated significant improvements in student outcomes, including heightened technical proficiency, innovative thinking, and collaborative

skills. The collaborative nature of PBL effectively fosters teamwork and communication, thoroughly preparing students for the dynamic and interdisciplinary nature of the IT industry.

These methods provide the following to the educational process.

- Better success with project-based learning method
- Confirms advantages for 21st century education goals
- Highlights increased engagement and critical thinking skills among students

DISCUSSION

The project-based learning not only fosters individual skills but also enhances collaborative learning experiences among students. By engaging in group projects, learners are encouraged to communicate effectively and work together towards common goals, thereby developing their social competencies further. This teamwork aspect is crucial as it mirrors real-world scenarios where collaboration is often key to success. Additionally, the teacher's role transitions from a traditional instructor to that of a facilitator or guide, enabling students to take ownership of their learning while still receiving necessary support. As a result, this approach cultivates an environment ripe for innovation and critical thinking, essential traits for navigating the complexities of modern society. This shift not only empowers students but also fosters a sense of responsibility and accountability, encouraging them to contribute meaningfully to their learning community (Taukebayeva, 2023).

Furthermore, incorporating project-based learning (PBL) not only boosts student engagement and critical thinking, but also nurtures important collaboration skills. Working in teams to solve real-world problems helps students improve their communication and understanding of diverse viewpoints, essential abilities for success in today's interconnected world. Moreover, the use of blended PBL methods has been proven to significantly enhance students' critical thinking skills, as shown by research indicating a notable increase in performance measures after such interventions. This transition to hands-on learning environments helps students prepare not only academically but also socially, providing them with the necessary tools to tackle complex challenges in their future careers (Sadullayev, 2024).

CONCLUSION

Project-based learning (PBL) revolutionizes the teaching of information technology (IT) in education. Through engaging students in hands-on projects, PBL effortlessly bridges the gap between theoretical knowledge and practical application, enhancing technical skills and cultivating creativity, critical thinking, and problem-solving abilities. To harness the full potential of PBL, institutions must provide unwavering guidance, ample resources, and continuous support. Furthermore, industry partnerships can elevate the learning experience by presenting real-world challenges and invaluable insights. By embracing PBL, educational institutions can establish a more engaging and impactful learning environment, effectively equipping students with the essential skills and knowledge for their future careers in IT.

In conclusion, project-based learning stands as a formidable methodology for teaching IT, driving active learning, and empowering students with the indispensable competencies needed to thrive in the ever-evolving field of information technology.

REFERENCES

1. Jingqian, J. (2024). Project-Based Teacher Technology Learning a Case Study of ChatGPT Application. *International Journal of Innovative Science and Research Technology*, 624–630. <https://doi.org/10.38124/ijisrt/ijisrt24jul637>

2. Aitkul, Yersultanova., N., Karelkhan., Liza, Naviy., Nurgul, Nurmukhanbetova., S., Murzina. (2024). Project-based teaching of computer science in inclusive education using digital technologies. *Naukovij visnik Užgorods'kogo universitetu. Seria Fizika*, <https://doi.org/10.54919/physics/56.2024.147xt4>
3. Huansong, Yang., Qian, Zhang., Shen, Mengting. (2024). The Practice and Research of Junior High School Information Technology Project-Based Learning Based on STEM Education Concept. *International journal of technology in education and science*, <https://doi.org/10.46328/ijtes.537>
4. Tong, Han. (2023). The Application Status and Path of Project Teaching in Computer Teaching. *Advances in computer and communication*. <https://doi.org/10.26855/acc.2023.06.002>
5. Ava, Chikurteva. (2023). ICT for Integrating the Project-Based Learning Method in Bulgarian Education. <https://doi.org/10.1109/et59121.2023.10278743>
6. Nurgul, Chaldanbaeva. (2023). 6. Project method of learning in organizations of additional education. *Alatoo academic studies*, <https://doi.org/10.17015/aas.2023.232.17>
7. Kurniawan, Arif, Maspul. (2024). 7. Enhancing Project-Based Learning in STEM Education with Integrated Technology and Coding. <https://doi.org/10.61971/jisit.v1i1.20>
8. Song, Y. (2023). Analysis on Existing Project-Based Learning Application in Various Education Levels and Technology- Integrated Project-Based Learning. *Lecture Notes in Education Psychology and Public Media*, 2, 447–454. <https://doi.org/10.54254/2753-7048/2/2022325>
9. Taukebayeva, R. The Method of Project as a Way of Organizing and Activating the Students' self-work. A. Âsauî Atyndağy Halykaralyk Qazaq-Turik Universitetinîñ Habarşysy. <https://doi.org/10.47526/2023-1/2664-0686.19>
10. Shuxratovich, Sadullayev Ibrat. "Project-Based Learning in Higher Education: enhancing student engagement and outcomes." *Conferencea* (2024): 3-9.