Science Education in Universities: Practical Impacts

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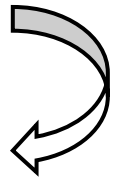
Science education

- Science education studies the inter-relationship between science as a discipline and the application of educational principles to its understanding, teaching and learning
- Science education is one of the most integral parts of today’s education, since it is responsible for creating scientifically literate citizens and promoting crucial 21st-century skills
- Science education solves and evaluates complex problems and therefore requires a growing understanding of scientific concepts

What provokes interest to science education?

- New global paradigm
- Addressing global challenges
- Transformation of economic sectors
- Need of new type qualitative knowledge
- Need of skilled labor force



Type of Science education in accordance with:

- Educational methods
- Level/degree of engagement
- Milieu of education
- Target/age groups

Role of universities - essential players in SE

- Fostering knowledge, innovation, and economic growth while linking science and society and applying innovative teaching models
- Providing key skills development
- Providing new generation labor force
- Functioning as a bridge between new knowledge and society’s needs

Innovative Teaching - element of science education

- Contemporary key teaching methods:
  - Inquiry-Based Learning
  - Competency-Based Learning
  - Problem-Based Learning
  - Project-Based Learning
  - Challenge-Based Learning

- Their aims: Bettering knowledge absorption, transfer and sharing; skill development

Inquiry-Based Learning

- Students investigate real-world problems – explore problematic topics; test ideas, and think creatively via:
  - **Fostering** essential skills and competencies
  - **Improved** analytical thinking and data processing
  - **Applying** research abilities **and inbuilt** them in the process of education
  - **Bettering** communicative ability

NB! IBL- Actively applied in Bulgarian universities

Competency-Based Learning

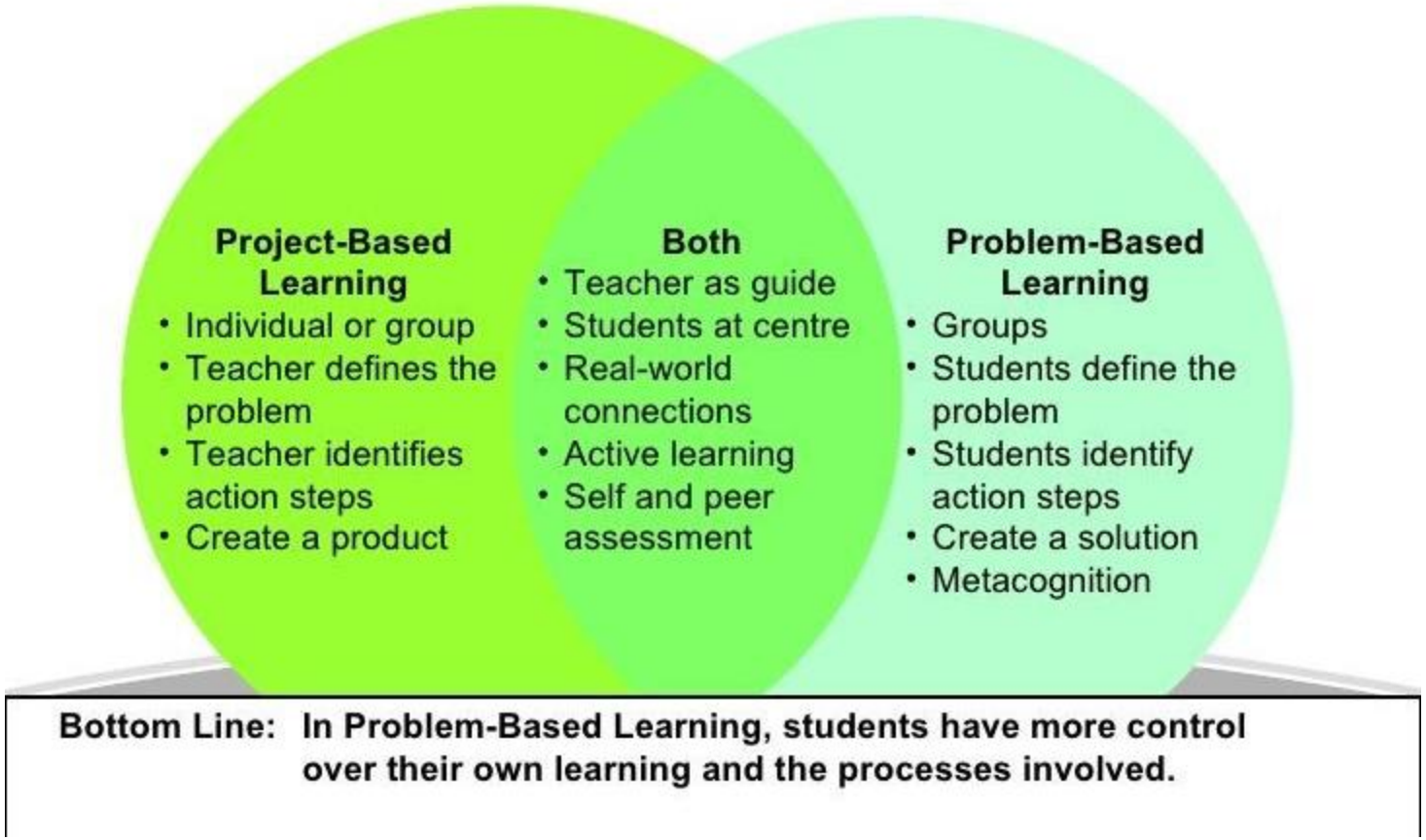
- Focus on deep understanding and practical application of knowledge
- Combine theoretical knowledge, practical skills, and professional attitudes
- Provide with cost-effective degree options, clearer learning outcomes, higher student engagement, and improved retention rates

Problem-Based Learning

- Encourages independent and critical thinking
- Develops cognitive & analytical skills
- Improves team working behavior
- Raises learning motivation
- Stimulates students to work on complex challenges

NB! There is a mix-up in the understanding of problem-based and project-based approaches, which is why it is not very widespread in some universities

Problem-Based vs Project-Based Learning



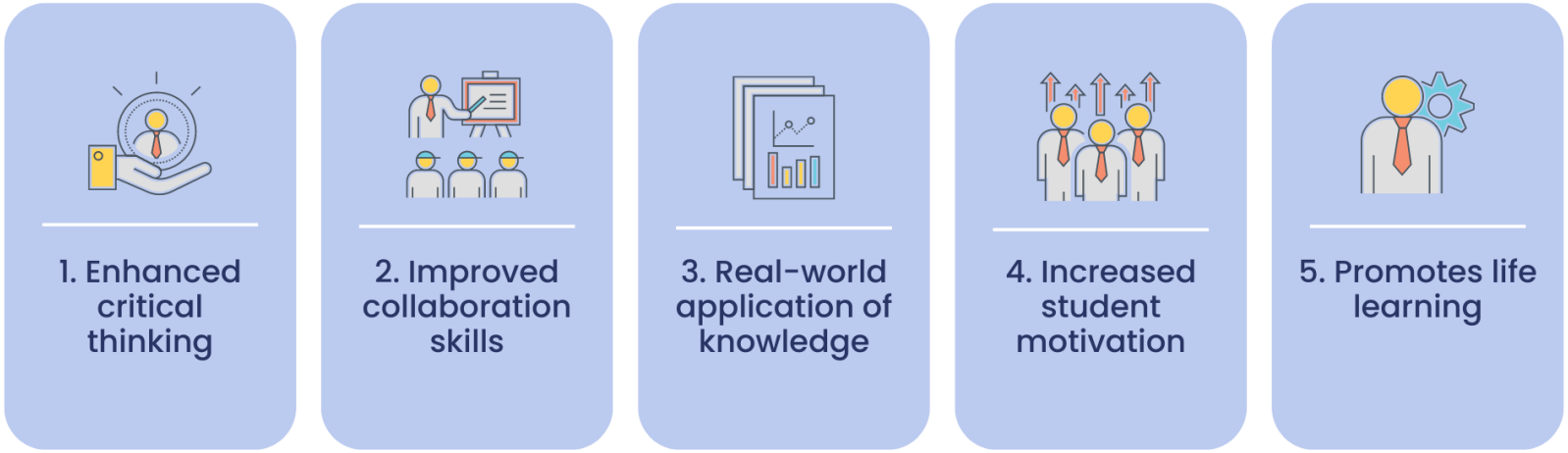
Project-Based Learning (PjBL)

- Provides active learning – students gain knowledge through hands-on projects and real-world applications
- Encourages problem-solving, decision-making, and creativity
- Promotes teamwork and communication through group activities
- Increases student interest and research inclusiveness
- Focuses on real-world challenges and tangible outcomes
- Develops independence and responsibility attitude in students

NB! Common in Bulgarian universities, fostering essential future-ready skills

Project-Based Learning Benefits

BENEFITS OF PROJECT-BASED LEARNING



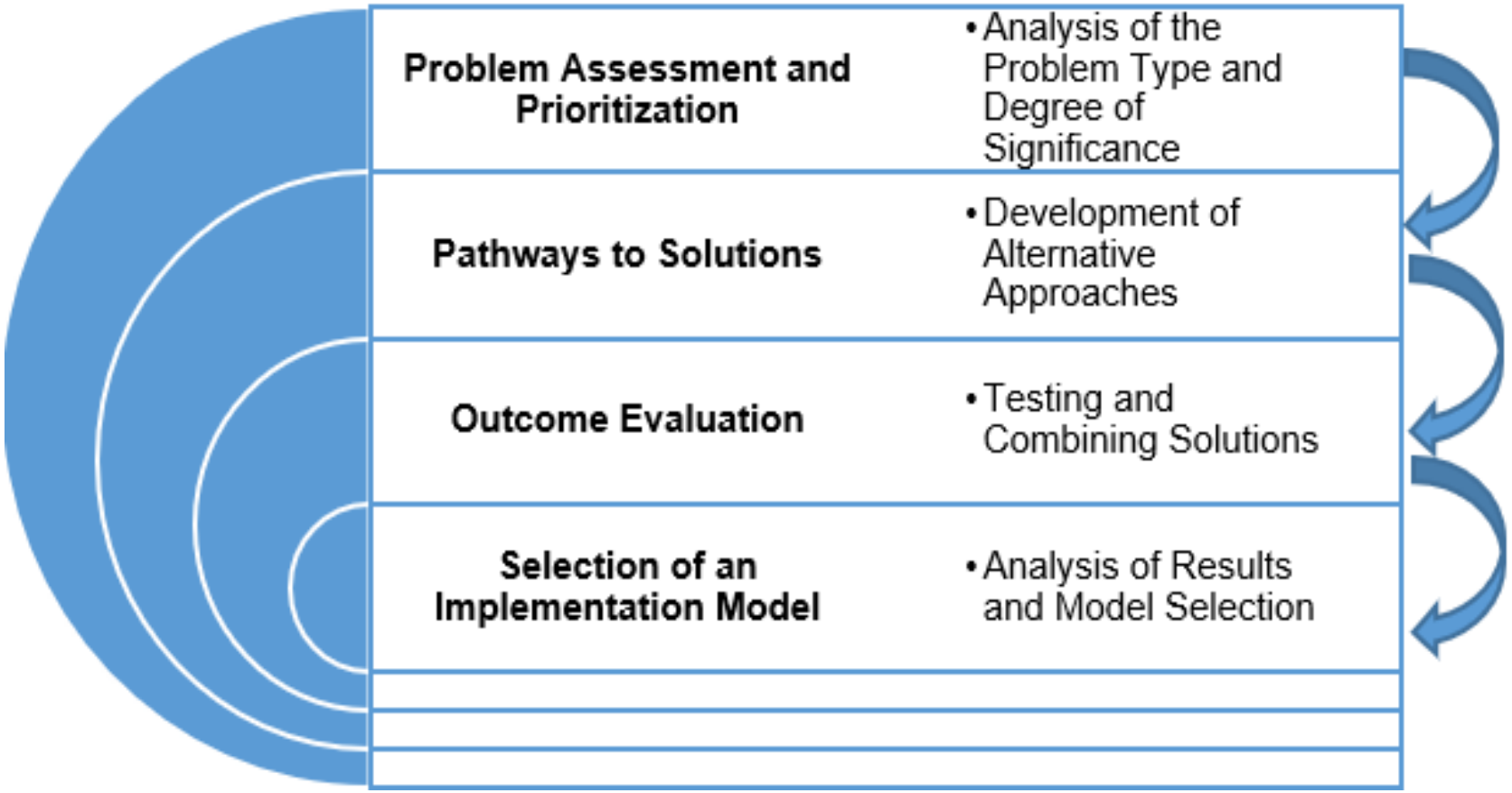
Approach to our research

- Main task –study the effectiveness of science-based education and students perceptions
  - Mixed-methods approach - literature review; observations; interviews; data processing
- Instrument:
  - In-depth interviews conducted with 19 students from Sofia University (2022–2024); who carried out targeted projects
    - Students project ideas, evaluated by an expert jury
    - Monitoring of project progress and results assessment
- Outcome - completed courses approved by academic departments and shared on an e-learning platform for broader accessibility
  - Broader interest of these courses has been facilitated
  - Feedback has been collected and analyzed

Case Study Context

- Lecturers and students develop knowledge through bottom-up project initiatives
- Student initiatives help universities adopt new research and teaching methods and implement them
- Students and researchers collaborate aiming to create modern course materials and thus improve their skills
- Focus on problem-solving issue

Model for problem assessment and prioritization



Results

There is a growing interest among students in applying for and participating in such projects

Findings and results:

- Most projects were in ICT aria, knowledge management, and smart communication
- Project results were incorporated into Sofia University courses, making them more relevant and accessible
- Courses were uploaded on the university website and YouTube as well
- Some universities adopted and appreciated the courses through various communication channels

In summary

- The study processed and analyzed all projects results
- Competitions encourage students to propose and implement solutions, integrating their ideas into university curricula
- Interviews with students and mentors show high satisfaction and growing interest in science-based education

Conclusions I

- Innovative teaching methods provide students with relevant skills for the modern job market
- PjBL enables students and scholars:
  - to promote project culture
  - to co work in new courses developing or updating existing ones
  - to address given society and business challenges

Conclusions II

- Student participation helps refine; improve and update courses, making learning more flexible and pertinent while also encouraging involvement in other project initiatives
- Tackling the resistance from some academic staff to new teaching methods; more efforts are needed to expand inclusive collaboration between students and lecturers
- Expanding the scope of science education at the department level

Thank you!

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