

# Toward the Application of the Problem-Based Learning Paradigm into the Instruction of Business Technology and Innovation

Maikel Leon-Espinosa

Department of Business Technology, Miami Herbert Business School, University of Miami, Florida, USA  
Email: mleon@miami.edu

**Abstract**—At the University of Miami Herbert Business School, Fundamentals of Business Technology & Innovation is an introductory course designed for those seeking a tech career, primarily motivated by the current wave of digital transformation in nearly every business sector and industry. Instructing these topics is challenging due to the complexity of the computer science fundamentals students should be familiar with; therefore, we have recently introduced a much more practical approach that aligns well with Gen Z's learning preferences. Problem-based learning is the primary instrument for engaging students and familiarizing them with daily situations at companies. These include but are not limited to structuring business problems that require a tech-based solution, the design of mobile apps and websites that satisfy the customer's demands in a friendly and intuitive way, and the documentation and reporting of such solutions. The response to this approach has been highly positive, with a well-noticed increase in student satisfaction and knowledge retention.

**Keywords**—business technology & innovation, problem-based learning

## I. INTRODUCTION

The University of Miami (UM) is a private research university in Coral Gables, Florida [1]. It was founded in 1925 and has a current enrollment of over 17,000 undergraduate and graduate students. The university offers over 180 majors and programs; it is organized into eleven schools and colleges, including the Leonard M. Miller School of Medicine, the Frost School of Music, the Herbert Business School, the School of Law, and many others. The university is known for its strong business, marine science, and meteorology programs, among others. It also has a well-regarded athletics program, with the Miami Hurricanes competing in NCAA Division I sports.

UM is strategically located in South Florida, a tech hub receiving international attention. Miami has been traditionally well-known for its clear water and white sandy beaches. Today, high-profile technological companies are moving their headquarters into the area due to our weather, multicultural surroundings, and tax

incentives. As a result, hundreds of students join Miami Herbert Business School (MHBS) every year to become business professionals with a strong orientation in the information technology field.

MHBS offers business undergraduate, graduate, and executive education programs, including undergraduate degrees in business administration and accounting and graduate degrees such as the Master of Business Administration (MBA) and Master of Professional Accounting (MPA).

MHBS is accredited by the Association to Advance Collegiate Schools of Business (AACSB). It is known for its strong finance, entrepreneurship, and real estate programs. It also has several research centers and initiatives on business sustainability and healthcare management. The school also has a formidable reputation for providing international business education, and many students could study abroad or participate in international business programs.

Business Technology (BTE) [2] is becoming a popular major for students in MHBS. It applies information technology to support and enhance a business's operations, decision-making, and strategic goals. This includes various tools, software, and systems companies use to manage and analyze data, automate processes, and communicate with customers, partners, and employees.

Some examples of BTE include:

- Customer Relationship Management (CRM) software, which businesses use to manage interactions with customers and prospects.
- Enterprise Resource Planning (ERP) systems, which integrate and manage a company's core business processes.
- Business Intelligence (BI) and analytics software allow businesses to analyze copious amounts of data and make better decisions.
- Supply Chain Management (SCM) systems help businesses manage the flow of goods and services from suppliers to customers.
- Collaboration and communication tools, such as email, instant messaging, and video conferencing software, so businesses can stay connected and work together more effectively.

BTE is a rapidly growing and evolving field, and technology is becoming increasingly crucial for businesses of all sizes and industries to remain competitive.

As a result, the student population nowadays is smaller than in traditional fields such as finance or accounting. This is another example of the fourth Industrial Revolution when students realized the importance of learning skills that guarantee a good-paying job.

BTE 210: Fundamentals of Business Technology and Innovation is a course designed to introduce students to the various technologies and tools businesses use to support and enhance their operations. The course focuses on specific areas of business technology, such as enterprise systems, business intelligence, and e-commerce, and how these technologies can drive innovation within a company.

These are some topics covered:

- The role of technology in today's business world.
- The impact of technology on organizational structure.
- The use of technology in different functional areas of business (e.g., finance, marketing, operations).
- The role of technology in driving innovation and creating a competitive advantage.
- The ethical and legal issues related to technology and innovation.

While these topics attract school students, we often find mixed opinions due to their complexity and how easily students lose engagement due to frustration and a lack of understanding.

Motivated by these reasons, the course included hands-on activities and assignments that allowed students to apply what they had learned to real-world scenarios, including case studies, group projects, and discussions. The course reinforces now how businesses can leverage technology to innovate and stay competitive.

The rest of the paper is organized as follows: Section II describes Problem-Based Learning (PBL) and how we use it to teach BTE 210. Section III compares the course results before and after the introduction of the learning approach. The Conclusion section summarizes our contribution and mentions future expectations in fine-tuning the course presentation.

## II. PROBLEM-BASED LEARNING

PBL is an educational approach emphasizing learning through solving complex, real-world problems [3]. In PBL, students are presented with a situation or scenario, and they work preferably in teams to research and find solutions to that problem. PBL is well-suited for technology courses, primarily focusing on problem-solving and critical thinking. In these classes, students work in small groups to research and solve real-world problems guided by the professor's selected course material. This approach allows students to apply what they have learned to real-world scenarios and encourages them to take ownership of their learning.

An example of a technology course that would benefit from a problem-based learning approach is a computer science course in which students work in teams to design

and develop a software application to solve a specific problem or meet a particular need. The student-centered approach promotes critical thinking, problem-solving, and collaboration.

Examples of PBL are found as follows:

- Medical education: In many medical schools, students are presented with patient cases and work in teams to diagnose and develop treatment plans.
- Engineering education: In engineering programs, students work on projects that simulate real-world engineering problems, such as designing a bridge or developing a new product.
- Business education: In business programs, students may work on case studies of companies, analyzing their strategies and recommending solutions to problems they face.
- Environmental education: In environmental studies, students may work on projects that involve researching and developing solutions to environmental problems such as pollution or habitat loss.

Students develop interdisciplinary problem-solving skills that promote reflection, self-regulation, knowledge retention, and success across varied curricular, co-curricular, and workplace contexts (Figs. 1 and 2 summarize the main stages of PBL).

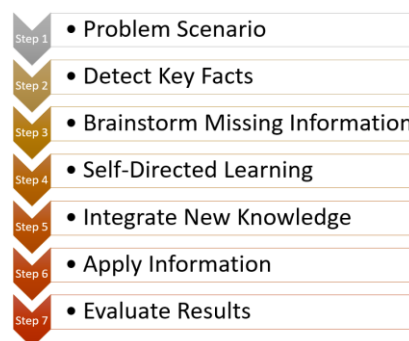


Fig. 1. Main steps in PBL.

Courses infused with PBL methods experience increased class attendance and information retention as students are engaged with the curriculum [4].

Students spend more time in the inquiry process, exploring compelling and relevant topics. Faculty are resources and facilitators of educational experiences as students work on activities to solve real-world problems.

PBL originated in the late 1960s at McMaster University's Faculty of Medicine in Hamilton, Canada. Dr. Howard Barrows sought to improve students' critical thinking and problem-solving skills. They developed PBL as an educational approach in which students work in teams to solve real-world medical problems. The students would research the problem, develop a diagnosis and treatment plan, and present their findings to the class.

After being first implemented at McMaster University in 1969, PBL quickly spread to other medical schools worldwide. Since then, PBL has been adapted and used in various fields, including engineering, business, and environmental studies. The approach has also been

employed in multiple levels of education, from primary to higher education.

Table I briefly summarizes a comparison of PBL versus traditional regular lectures. PBL can be seen as a response to conventional teaching methods focused on lecturing and

memorization, which would have been more effective in promoting deep understanding and problem-solving skills. PBL is considered a constructivist approach to learning, which emphasizes the role of the learner in constructing knowledge and experience.

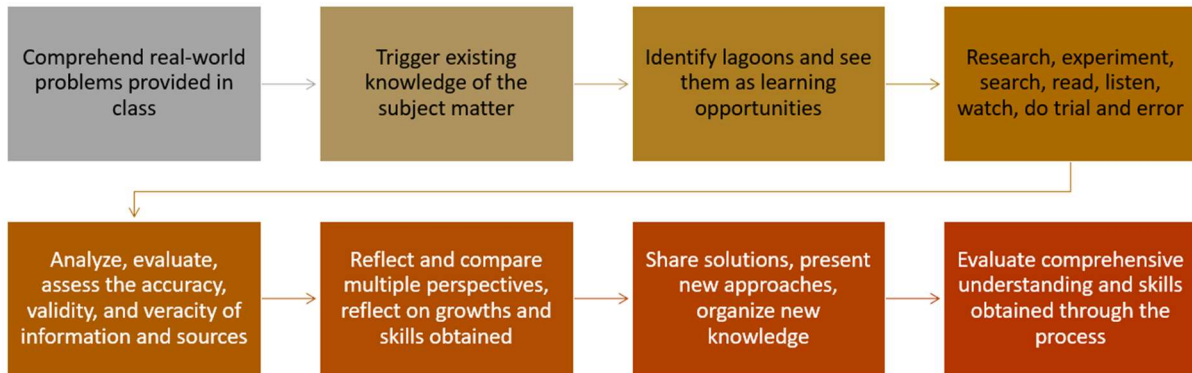


Fig. 2. The PBL model.

TABLE I. PBL VS. TRADITIONAL LECTURE METHODS

	PBL	Traditional Methods
<b>Learning approach</b>	Active and self-directed	Passive and teacher-directed
<b>Focus</b>	Real-world problem solving	Presentation of information
<b>Student engagement</b>	High	Low
<b>Role of teacher</b>	Facilitator and mentor	Lecturer and expert
<b>Group work</b>	Encouraged	Not emphasized
<b>Assessment</b>	Performance-based	Knowledge-based
<b>Transfer of learning</b>	Strong	Weak
<b>Suitability for tech-related subjects</b>	High	Low

### III. TOOLS TO FAST PLAN AND PROTOTYPE SOLUTIONS

Incorporating information technology tools into classes can be beneficial for engaging students by providing interactive and multimedia learning experiences, allowing for collaboration and communication among students and teachers, and providing access to a wealth of information and resources. However, it is essential to note that technology should be integrated thoughtfully and not simply used for the sake of using technology. The success of technology in the classroom depends on the specific tools used, how they are utilized, and the overall teaching approach.

In BTE 210, we defend the ability our students gain to express an idea and present it tangibly and how this could make a difference in taking one seriously. Many tools are available for the fast creation, documentation, and prototyping of business solutions. Next, we will discuss some of the means employed in the course where students see their ideas brought to life. They are listed in the sequence we utilize, but applying them that way is optional.

#### A. The Business Model Canvas

The Business Model Canvas is vital among all the tools used in class for students to assemble their business proposals based on tech solutions [5]. It is a visual tool that helps entrepreneurs and startups map out the critical elements of their business plans. It is a strategic management and entrepreneurial tool that helps develop new or document existing business models. The canvas is

divided into nine building blocks: customer segments, value proposition, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure.

As for teaching purposes, the Business Model Canvas can be used in numerous ways to help business students understand the critical elements of a successful business plan. Some ways to use it in the classroom include:

- Have students create their business model canvas for a hypothetical startup.
- Have students analyze existing companies' business models and compare them.
- Use the canvas as a framework for case studies, where students can analyze how different companies have applied the various building blocks of the canvas to their businesses.
- Use the canvas as a tool for developing a marketing strategy.
- Have students identify and evaluate the key elements of the business models used by technology companies.

Overall, the Business Model Canvas is a versatile tool that can help business students understand the critical elements of a successful business plan and how they can be applied to technology companies [6].

#### B. Fluid UI

Another excellent tool introduced in the course is Fluid UI [7]. Users can create interactive wireframes, mockups, and prototypes for mobile apps and websites thanks to its

cloud computing approach (web-based). It offers a wide range of pre-built UI elements, such as buttons, forms, and icons, which can be easily customized and arranged to create a functional prototype. It also allows users to add interactive elements, such as linkages, animations, and gestures, to enhance the user experience of the prototype.

Regarding teaching purposes, FluidUI can help business students understand the basics of app design and user experience. Some ways to use it in the classroom include:

- Have students create a mobile app prototype using FluidUI to demonstrate their understanding of app design principles.
- Have students analyze existing apps and evaluate their design and user experience using Fluid UI.
- Use FluidUI to develop a mobile app marketing strategy.
- Have students compare different apps' designs and user experiences to understand the importance of user-centered design.
- Use FluidUI to create interactive wireframes and mockups of web pages and websites to learn about web design principles.

FluidUI is a valuable tool for teaching students about app design and user experience in a technology-driven business context. It allows them to create interactive prototypes and evaluate existing apps' design and user experience [8].

#### C. Wix

Next, we mention Wix, the web-based website builder that allows users to create professional-looking websites without prior coding knowledge [9]. As a website creation platform, it offers a wide range of templates, tools, and features for various website types, such as portfolios, online stores, and blogs. Wix also provides users with a drag-and-drop interface, making it easy to customize and design the website.

For teaching purposes, Wix can be used to help business students understand the basics of website design and development. Some ways to use it in the classroom include:

- Have students create a website for a hypothetical business or startup using Wix to demonstrate their understanding of website design principles.
- Have students analyze existing websites and evaluate their design and user experience using Wix.
- Use Wix as a tool for developing a website marketing strategy.
- Have students compare different websites' designs and user experiences to understand the importance of user-centered design.
- Use Wix to create interactive wireframes and mockups of web pages and websites to learn about web design principles.

Overall, Wix helps teach students about website design and development in a technology-driven business context. It allows them to create professional-looking websites without any prior coding knowledge and evaluate existing websites' design and user experience.

#### D. Kickstarter

Closing our list, we have Kickstarter, the crowdfunding platform that enables individuals and small businesses to raise funds for creative projects, including technology-related ones such as electronic devices, software, games, and more [10]. It allows people to post a project and set a funding goal, and then interested backers can pledge money to support the project. Kickstarter operates on an all-or-nothing funding model, which means that if a project does not meet its funding goal, it does not receive any funding.

As for teaching purposes, Kickstarter can be used to help business students understand the basics of crowdfunding and fundraising for a technology-related business. Some ways to use it in the classroom include:

- Have students create a crowdfunding campaign on Kickstarter for a hypothetical technology-related business or product.
- Have students analyze existing Kickstarter campaigns and evaluate their effectiveness in funding, marketing, and overall campaign strategy.
- Use Kickstarter to develop a fundraising strategy for a technology-related business.
- Have students compare the different funding models used by Kickstarter campaigns to understand the advantages and disadvantages of each model.
- Use Kickstarter as a case study to discuss the impact of crowdfunding on the technology industry.

Kickstarter is a valuable tool for teaching students about crowdfunding and fundraising in a technology-driven business context. It allows them to understand how to create a campaign, set a funding goal, and evaluate the effectiveness of a campaign.

#### IV. CONCLUSION

PBL has several advantages over traditional teaching methods for higher education courses, particularly in technology-oriented majors. PBL is an active and self-directed learning approach that focuses on real-world problem-solving. It is particularly suitable for technology-related subjects as it provides opportunities for hands-on and applied learning experiences. This approach results in higher student engagement and encourages group work, which can foster collaboration and teamwork skills that are essential for technology-related careers.

Additionally, PBL assessment is performance-based, resulting in a solid learning transfer and preparing students for the real world. The teacher acts as a facilitator and mentor rather than a lecturer and expert, which can help students develop problem-solving and critical-thinking skills. In contrast, traditional teaching methods, such as lectures, are often passive and teacher-directed, resulting in lower student engagement and weaker transfer of learning. Therefore, PBL is an effective teaching method for technology majors and should be considered an alternative to traditional teaching methods.

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