

Full Length Research Paper

Motivation heightens and independent thinking deepens: Undergraduate students share their experiences of PBL while learning Microeconomics

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The aim of this study is to analyze the use of Problem-Based Learning (PBL) in learning Microeconomics. It aims to answer the following research questions: What are the experiences of undergraduate students who studied with Problem-Based Learning (PBL)? Is this strategy useful at the undergraduate level? Does PBL really motivate students? Does it foster independent thinking? These questions are interesting but very complex and convoluted. The above questions created parameters for this action research which was done in relation to the teaching of an undergraduate course at a tertiary education institution. This paper presents the experiences of sixteen undergraduates at a tertiary institution in Trinidad and Tobago called New Model University. There is a paucity of information in the local setting as it pertains to this topic. As a result, the experiences of these sixteen students are valuable. Their diverse voices and varied experiences can certainly fill the existing gap. They can be instrumental for the better creation of policy. They can also assist in the effective implementation of PBL at tertiary education in Trinidad and Tobago. Furthermore, their voices and opinions answer the research question: What are the experiences of students who use Problem-Based Learning in the study of Microeconomics at New Model University? A seven-step approach to PBL was utilized as the main teaching and learning process. A case study was conducted over a period of twelve weeks. It incorporated open-ended questions and semi-structured interviews with four focus groups. The individual reflections and independent experiences of these sixteen students were carefully documented in weekly journals, and this complemented the data collection process. Data were collected, collated, analyzed, and narrated using six major themes. Recommendations which strongly advocate student-centered strategies were offered.

Key words: Teaching approaches, Problem-Based Learning (PBL), independent thinking.

INTRODUCTION

The opinions of the study participants clearly demonstrate that PBL heightens, motivates, and fosters independent

thinking. These sixteen students were fervently engaged in the study of Microeconomics which used a Problem-

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Based Learning (PBL) approach, over twelve weeks. Prior to the beginning of the semester in September to December students who were reading the course in Microeconomics at that time, were given a pre-course test. This was to chiefly determine their content knowledge and to ascertain whether or not they were capable of reading for it. Most of them obtained low scores. They were demotivated, disenchanted, and disillusioned. Their self-esteem was crushed, and they wanted to discontinue their studies. It is within this scenario, that the authors conducted this research. The principal aim was to ascertain why these students felt broken and shattered and to view how the use of the PBL strategy in Microeconomics would assist them. Mention must be made that they were exuberant and animated about this unfamiliar, compelling, and ingenious learning strategy and gave it their full support and attention. Moreover, they were quite eager to forego the traditional method just to experience this innovation called PBL.

This action research is an investigation about the experiences of these sixteen students who pursued an undergraduate course in Microeconomics at New Model University. Microeconomics is one of the core courses for students who read for a Bachelor of Education Degree. Thus, they must be successful in this subject area to graduate.

Consequently, a seven-step approach to PBL was chosen as the principal teaching and learning process. During this process a case study was conducted over a period of twelve weeks. It involved open-ended questions and semi-structured interviews with four focus groups. Students also documented their personal experiences in their journals, and this complemented the data collection process.

A review of the literature within the local context revealed that there is a paucity of information. It also highlighted that the teaching of Microeconomics using the PBL instructional approach at this institution has never been explored and officially recorded. In addition, the experiences of these students were never documented. This gap in the literature was the main factor that contributed to this study. The different perspectives of the students who use PBL in the study of Microeconomics at New Model University can fill this gap. Van Manen (1990) suggests that qualitative research focuses chiefly on the naturalistic approach and thus, it was chosen to conduct this research. In this regard, a case study, which included open-ended questions, semi-structured interviews and journals, was utilized. This method was best suited to answer the research question: What are the experiences of students who use Problem-Based Learning in the study of Microeconomics at New Model University? Data collection procedures were outlined, data analysis process was described, and findings were extensively explained and narrated with the use of six themes. Recommendations which strongly promote the use of more student-centered strategies were also offered.

LITERATURE REVIEW

This literature review addresses the following research questions and offers the philosophical thinking that drives these concepts. One such underpinning is the constructivist. The questions are: What exactly is Problem-Based Learning (PBL)? What does it involve? Is this strategy useful at the undergraduate level? Does PBL motivate students? Does it foster independent thinking? What are its benefits? Is this strategy useful? Does it really stimulate cognition and promote independent thinking?

Constructivism

Taskin-Can (2011) advocated that Immanuel Kant (1724-1804), John Dewey (1933) and others who were intimately involved in the field of education coined the term constructivism as an educational philosophy. Constructivism is a new paradigm which explains the nature of knowledge and the nature of learning. This theory identifies learners as individuals who construct and build their own knowledge as they interact with the environment. Hence, Patankar (2011) and Taskin-Can (2011) claimed that each person's knowledge is unique. Constructivism, therefore, is a middle path between the empiricist and the rationalist philosophical perspectives. Maxwell et al. (2005) stated that it is the cornerstone of the current reforms, which is the center stage as the foundation for teaching and learning in science education programs and, more recently, in the study of Economics. It is against this philosophical background that Problem-Based Learning (PBL) approach to teaching and learning is explored.

Theoretical framework of (PBL)

Dewey (1916) was one of the first proponents of child-centered education. He also posited that education must contain a heavy concentration on the involvement of students in the teaching and learning. This strategy is of paramount significance because it involves the natural and active participation of the intellectual capacity of students. Similarly, Duch et al. (2001), described PBL as a felicitous teaching method. They further added that it activates the mind. This teaching strategy is imperative and it fosters critical-thinking and creates independence among students.

It enhances problem-solving abilities and stimulates cognition. It promotes communication skills and underscores socialization. It also gives students the opportunity to work in groups. It allows them to evaluate research materials. Most of all it is a life-long learning process. Qi (2017) espoused that fundamental differences exist between the teacher centred approach to instruction and PBL.

In the 1960s and 1970s prominent researchers such as Barrows and Tamblyn (1980) hypothesized that a group of medical educators was determined to find an alternative way to teaching and learning and to enhance the practical skills development among doctors in their practice. There was a lot of deliberation and criticism of the traditional methods of teaching such as rote memorization of facts, inadequate problem-solving techniques, and fragmentation. However, Barrows (1996), Barrows and Tamblyn (1980); Noble et al. (2020) and Murphy (2006) posited that an education evolution occurred which placed emphasis on experimentations of student-centered instructional processes.

One such outcome was that the faculty members at the McMaster University developed a problem-based curriculum for the medical students. The basis of this new approach was that they identified their own learning styles through problem solving in small groups. This methodology was eventually adopted as the new approach to teaching and learning. Albanese and Mitchell (1993) and Duch et al. (2001) and Cardon, Kinczkowski with Speelman (2022) underscored that some advantages of the new model included self-directed independent learning skills and increased learning motivation. They also stated that students acquired a new and increased knowledge base, and their social skills were heightened through group interactions.

These students understood how to apply these new and innovative theories to the world or work. In addition, Albanese and Mitchell (1993) and Duch et al. (2001) mentioned that the role and function of the teachers changed to facilitators. These advantages were eagerly sought by many educators worldwide. Hence the interest and desire of educators to utilize this innovation in education grew rapidly. Thus, the PBL model was used as the catalyst for various experimentations among several educators. This same model formed the framework for this study because it was suitable for this group of students.

METHODOLOGY

As noted in the introduction, a seven-step approach to PBL was designated as the chief teaching and learning strategy. During the implementation of this seven-step approach to PBL, a case study was utilized. It incorporated open-ended questionnaires and semi-structured interviews with four focus groups. In addition, personal journals were used. This action research included a repetitive process of data collection, reflection, and analysis. Questionnaires and interviews were specifically selected because the use of these two instruments often allows participants to speak without inhibition. In this way, the authors were able to properly address the research question: What are the experiences of students who use Problem-Based Learning in the study of Microeconomics at New Model University? The use of their personal journals also provided detailed description about their varied and unique experiences. Data collection was done through regular and consistent fieldwork. The days and the hours of contact were specifically chosen to facilitate the students.

This case study lasted approximately thirteen weeks. Students

were taught with four teaching modules for three weeks each. After each session, they recorded their experiences in their journals. Data were collected through the four focus groups during the thirteenth week of the semester.

Information was gathered from open ended questionnaires, structured interviews, and the journals of these sixteen participants. The authors read them repeatedly to determine the precise meaning. This process involved re-reading the information to accurately identify key recurring themes. It was followed by a detailed review, which included coding each response to a particular theme, before writing a brief description for each theme. This constant reading and reviewing of the various scripts generated an enhanced understanding of the voices and experiences prior to formal thematic analysis. Paradigmatic analysis was used to produce clearly defined themes from the sentiments or essence of the writings of the students. The idiomatic language used by the participants was coded verbatim during this case study.

Case study

The introduction mentioned that the principal focus of this paper was to record the experiences of these sixteen students accurately and professionally about the use of Problem-Based Learning in the study of Microeconomics. Consequently, a case study was specifically selected. Case studies normally encapsulate an extensive picture. They also provide profound insights and allow researchers to adequately scrutinize compound issues within real-life scenarios. Creswell (2018) underscored this fact and he posited that case studies are comprehensive inquiries which explore a specific event within its natural environment. They facilitate description, assist explanation and foster clarity into capricious events. Creswell (2018) also alluded to the fact that qualitative research is appropriate since researchers can probe and assimilate in greater detail what respondents convey. In a similar way, Smith (1978, cited in Merriam and Tisdell, 2016) supported that case studies are adaptable and dynamic and provide a meticulous and detailed examination of events. It is also an intensive, extensive explanation and analysis of a single unit. Cohen et al. (2018) described it as an inquiry into precise scenarios within a real-life situation.

Questionnaires

Leedy and Ormrod (2018) believed that open-ended questionnaires provide a suitable avenue for participants to communicate voluntarily. Open-ended questionnaires allowed the authors to articulate what was discussed in the interviews. These sixteen students voluntarily responded to the questionnaires. It must be noted that they were not obligated nor obliged to produce the "right" answers. In fact, they were given an opportunity to express themselves freely. In this way the principal aim of the research was maintained, that is to obtain the perspectives and insights of these students. The authors felt that maintaining this objective was far superior than trying to glean whether or not the students responded appropriately to the questionnaires. Creswell (2018) confirmed that this instrument also permits participants to state their perspectives and opinions objectively and unconstrained by any biases of researchers or past research findings. Open-ended questionnaires are also cost effective and allow for structured responses. They were an appropriate instrument of data collection in this research. Moreover, the sixteen students were given the assurance that anonymity would not be compromised. Open-ended questionnaires included areas that were related to their experiences about the use of Problem-Based Learning in the study of Microeconomics. Cohen et al. (2018), together with Leedy and Ormrod (2018), cautioned that researchers need to be acutely aware of the advantages and

limitations of the use of questionnaires. Cohen et al. (2018) and Connelly (2016) acknowledged that this instrument does not fully permit participants to clarify and illustrate their responses. With this idea carefully in mind, the use of semi-structured interviews tried to address this issue.

Interviews

Interviews are suitable instruments for collecting data. They are malleable and adaptable. Most of all researchers can capture nuances and non-verbal cues. They can probe for further clarification according to Cohen et al. (2018).

Interviews are important tools for data collection, but they are time consuming. They are also inconvenient for the interviewee, and it is difficult for researchers to be impartial. They are also difficult to maintain anonymity. Against this background, the interviews covered two crucial areas: demographic and the experiences of students. The interviews focused chiefly on the social, intellectual, psychological, and educational aspects of the lives of these students.

Written permission was obtained from the students to make copious notes of what they said. After interviews were conducted, data were documented and analyzed verbatim. The qualitative thematic data analysis process offered by Creswell (2018) was used and six themes emerged. The analysis of data was carried out with the research question in focus: What are the experiences of students who use Problem-Based Learning in the study of Microeconomics at New Model University?

Personal Journal

The sixteen participants documented their thoughts, feelings, anxieties, and experiences during the use of Problem-Based Learning strategy in the study of Microeconomics. They were honest in writing their opinions and views as well as their difficulties and frustrations. They also used their personal journal to refine ideas, thoughts, concepts, and beliefs as they continued this seven-step approach.

Triangulation

Creswell (2018) stated that researchers ought to try to triangulate their findings. He also believes that triangulation is the process of authenticating and substantiating evidence from different individuals in descriptions and themes in qualitative research. Denzin (1978, cited in Danny, 2014), mentioned that triangulation is the skillful use of multiple approaches to analyze data. In a similar manner, Spaulding (2014) and Walsh (2013) hypothesized that triangulation presents various aspects and a detailed analysis of the outcome of the research.

Pilot and Beck (2014, cited in Connelly, 2016) held the firm opinion that triangulation is also imperative. They further added that it refers to the depth of confidence in the data, interpretation, and methods used to support the quality. Leung (2015) stated that it refers to exact replicability of the processes and the results. Thus, to enhance consistency, in this research, intercoder reliability was properly established. A high level of intercoder reliability indicated that both reliability and replicability were present. These strengthen evidence that the results of a qualitative study were scientifically documented.

Triangulation also allowed the researchers to collect and compare various perspectives of the phenomenon. In this way, data presented were valid and free from bias. It also encouraged the researchers to optimize credibility. Data for this research were

gathered with the use of open-ended questionnaires, semi-structured interviews, and the personal journals of the participants, during the seven-step approach to the PBL strategy.

Redesign seven-step model

Alternative PBL approaches were redesigned for four modules. Each one lasted three weeks and seven steps were used.

Step one: Instructors told students that each discipline had specific jargon with which they should become familiar. Thus, their first task was designed to help them become familiar with key terms in Microeconomics. The facilitators informed students of the objectives of module one. They also noted that it was imperative for the instructors to answer questions posed by students throughout the process. This facilitated the ease of adapting to a new approach to teaching and learning. In addition, the instructors facilitated students' learning by answering their questions. In this way it built the content knowledge and directed students to appropriate reading materials which were adapted from the modules presented over a period of twelve weeks. They also began their journal entry and continued this activity every week. Their journals described their experiences during the PBL sessions.

Step two: Students defined the problem and completed the work process plan. This included a table to identify what they know, what they need to know, and which persons are to be assigned responsibilities to complete the task within one week.

Step three: Students continued to work on module one. They sought further clarifications to the problem through the use of online resources, or the use of library. They even asked the facilitators questions to assist them to solve the problem. They also actively engaged in self and group study.

Step four: Students engaged in self-study to solve address the problem or that part of the problem to which they were assigned.

Step five: Students returned to class. They presented their solutions to their peers and then they discussed the answers with their peers and instructors.

Step six: Students received feedback and discussed their approaches to their final assignment submission in various groups.

Step seven: Students presented their final assignment portfolio with their possible solutions to the problem. The sixteen students repeated the above steps for the next three modules.

It ought to be mentioned that these sixteen students who read for the Bachelor of Education in Microeconomics at the undergraduate level were extremely anxious and zealous about their study. Fourteen females and two males comprised the PBL group for the collection of empirical data. Their ages ranged from 18 to 34 years. PBL sessions were held once per week, every Thursday, from 8:30 a.m. to 11:30 a.m. at New Model University and all students attended the total of twelve sessions. Great care was taken to ensure this PBL approach was delivered properly and as accurately as possible.

FINDINGS AND DISCUSSION

To present findings, the general qualitative data analysis offered by Creswell (2014)'s general qualitative data

analysis process was used to move students' journal entries and focus group statements to general codes and themes. Data were collated, analyzed, triangulated, and documented in a narrative form with the use of six thematic headings. They are: students' responsibility for learning, development of life-long learning skills, knowledge construction and interaction, blended learning, interaction skills, and role of the facilitator.

Students' responsibility for learning

In several ways these students admitted they had to take responsibility for their own learning during the PBL sessions. They used words like autonomy, self-motivation, creativity, constructivism, self-directed and independent learner, to indicate they had to take responsibility for their own learning. These sentiments were underscored by writers such as Ertmer et al (2013), and Dochy, Segers, Bossche and Struyven (2005).

They were also more cognizant that they had to be more responsible for their own learning. They even realized that they had to dominate the following duties: understand their work, seek clarification, set their work tasks, meet deadlines.

They also admitted that at times the content of the course was difficult for them to comprehend and they wanted further assistance in this area. This action ensured they completed their assignments on time and that they understood their content in preparation for the post-intervention test.

They generally felt that this teaching strategy empowered and motivated them. It also caused them to be more independent and responsible. They even acknowledged that they inculcated qualities such as: autonomy, self-motivation, creativity, constructivism, self-directed and independent learner. Some of them commented that:

"The more I read, the more I understood the material. I have learnt that the more I read, the better my marks in this course, because I understand the material better."

"The assignment to create our imaginary business helped me to think of creating my own business. Constructivism helped me to achieve a better understanding of Microeconomics and relationships among my peers."

"This is an important step to helping students become self-directed learners."

"In PBL students learn to be self-directed, independent and interdependent learners motivated to solve a problem."

Development of life-long learning skills

The sixteen students wrote several statements that indicated their lifelong skills were developed. The development of research, communication and interaction

skills were evident among students as they approached the end of the semester. Students agreed that the PBL intervention „promoted the development of lifelong learning skills, research skills, communication, and interaction skills, and reflective thinking. After the semester, students expressed profound gratitude because they were well equipped with these learning skills that the PBL strategy offered. They acclaimed that:

"The many advantages of the PBL significantly outweigh the disadvantages. It promotes the development of lifelong learning."

There was a vast and notable improvement in this area.

"The method is great for fostering the development of self-directed learning skills. I learnt how to learn with PBL."

"We collaborated and got more work done. The benefit we derived through working in groups is that we each did not have a heavy workload to deal with on our own."

"My group members explained things I did not understand."

"Team learning helped me in understanding this technical subject called Microeconomics."

"I learned through significant others." These sentiments were affirmed by Hmelo-Silver (2012).

Additionally, students reiterated that another benefit of the PBL experience is that it encouraged reflective thinking. Brockbank and McGill (2007) also posited the positive effects of reflective thinking in the learning process, hence another benefit of the PBL experience.

Knowledge construction and interaction

PBL encouraged participation and group work. Students engaged with the material and manipulated resources to properly grasp content. Some terms that they associated with knowledge construction and interaction were: "...PBL challenges students to learn through active engagement in real life problems."

Another mentioned that it: "...makes students retain the knowledge they gain much longer ..." "The problems and group work in PBL engages us to construct our own knowledge."

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Wardoyo et al. (2021) highlighted the claim that the PBL engages students in meta cognitive activities such as planning, organizing and even evaluating their own learning. These activities inevitably lead to the development of problem-solving skills. Students acquiring important problem-solving skills is critical to a progressive labor force and intellectual society.

The fact that PBL challenges students to learn through active engagement in real life problems makes students

retain the knowledge they gain much longer.

There is no doubt that some students prefer the PBL over the traditional approaches. Rigall (2011) stated that students prefer PBL over more traditional approaches in education. More specifically, the fact that students prefer PBL over more traditional approaches indicate that they are willing to go beyond the normal level of student engagement and engage in activities which will allow them to achieve higher order objectives while learning.

These sentiments and experiences were underscored by Ertmer et al. (2014) and Maxwell et al. (2005).

Blended learning

The use of online resources appears inevitable in the PBL environment. Students use a combination of hard copies of resources such as textbooks and online materials to gain an understanding of subject content. The following statement clearly states how important the blended learning environment was to the student: "We were encouraged to use online learning resources which were very helpful in my understanding of Microeconomics". A similar argument was stated by Ertmer et al. (2014), and Morgan, Capraro and Capraro (2013).

Interaction skills

The majority of the participants commented on cooperative learning or team building or team learning in their reflective entries. This appeared to have been one of the most common learning experiences. Very few students commented on the negative aspects of cooperative learning such as "sponging" or students "feeding off" the efforts of others. It appears that the multi-faceted aspects of the problem forced students to be assigned different tasks and each member of a group did his or her part of the task to complete the solution of the problem in time for presentation.

Based on students' feedback, the role of the facilitator seemed inevitable to the success of the PBL process. All students reflected on the role of the facilitator, and hence the authors decided to create a special note on this important element of the PBL processes.

Role of the facilitator

Edgen and Kauchak (2019) together with Taskin-Can (2011) who adhered to the constructivist philosophy stated that the role of the teacher is that of a facilitator, a guide on the side, or a problem solver. One critical aspect of PBL procedures is the role of the facilitator. The facilitator, according to Ertmer et al. (2014), is an individual who guides students in their learning processes.

The students depended on the facilitator in this

intervention in locating the right resources to understand the content and mathematical aspects of the course, which they could not understand using other resources. All participants commented on the role of the facilitator. The students used words and phrases such as: „resourceful“, „knowledgeable“, „helpful“, „encouraging“, „motivating“, „uses questions as a guide for our learning“, „good coach“, among others, to describe the teacher. The students used words and phrases such as: „resourceful“, „knowledgeable“, „helpful“, „encouraging“, „motivating“, „uses questions as a guide for our learning“, „good coach“, among others, to describe the teacher.

It is possible that facilitators play a significant role in determining the extent to which students stay with the intervention process. The role of the teacher in PBL is critical to the success of the students, and it must be taken seriously to ensure that they achieve mastery over the academic, personal, and social processes.

The teacher has two main functions: (1) the tutor or the facilitator and (2) the stimulator of the learning process. The tutor must be able to facilitate students' learning through the provision of adequate resources, posing to students thought provoking questions to help them develop their knowledge bases. The teacher must also be a stimulator of the learning process, encouraging students to reflect deeply on the represented content. In addition, the tutor must stimulate students to fulfill their roles in groups. Different roles such as the leader and recorder are given to students. Mane et al. (2012) presented the view that the facilitator monitors and evaluates the extent to which each group member contributes to the group's task and tries to create the conditions in which each group member can function optimally.

Pearl (2019) opined on the critical nature of the challenging work environment. These researchers did create challenges with this PBL research experience. They felt that the suitable match between interest in advancing their teaching practice and a work challenge creatively enhanced their experiences as teaching/learning practitioners.

Conclusion

The authors tried as much as possible to maintain the focus of this research. They also explored in depth the voices and opinions of these undergraduates as they shared their various experiences of PBL while learning Microeconomics.

In this way the authors recognized that the proper and effective use of the PBL strategy motivates and energizes the students' cognition. It also heightens and fosters the students' independent thinking; thus it promotes the teaching and learning process. This research process allowed the authors to adequately answer the research question: What are the experiences of students who use

Problem-Based Learning in the study of Microeconomics at New Model University? To competently address this research question, they presented the experiences of the students. Action research offered them the flexibility to interact informally with these sixteen undergraduate students in their natural environment. It also allowed the participants to express themselves freely about their own individual experiences. The skillful use of a combination of open-ended questions, semi-structured interviews and personal journals allowed the authors to triangulate and thus uphold validity and readability. Data were collected, collated, triangulated, and documented in a narrative form. This was documented with the use of six basic thematic headings: students' responsibility for learning, development of life-long learning skills, knowledge construction and interaction, blended learning, interaction skills, and role of the facilitator.

RECOMMENDATIONS

From the forgoing the following recommendations are presented:

1. More opportunities must be provided for students to use the PBL approach
2. Tertiary educators need to appreciate and value the PBL strategy
3. Policies enacted at the tertiary level must include students in the teaching and learning process as well as the decision-making processes.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

- Albanese MA, Mitchell S (1993). Problem-Based Learning: A review of literature on its outcomes and implementation issues. *Academic Medicine* 68(1):52-81.
- Barrows HS (1996). Problem based learning and problem solving: PROBE Newsletter of the Australian Problem-Based Network 26(8-9).
- Barrows HS, Tamblyn RN (1980). *Problem based learning: An approach to medical education*. New York: Springer.
- Brockbank A, Mc Gill I (2007). *Facilitating Reflective Learning in Higher Education* (2nd ed.). Berkshire: McGraw Hill Education.
- Cardon PL, Kinczkows KIL, Speelman P (2022). Problem-based learning. *Technology & Engineering Teacher* 81(7):8-11.
- Cohen L, Manion M, Morrison K (2018). *Research methods in education* NY: Rout.
- Connelly LM (2016). Trustworthiness in qualitative research. *Medsurg Nursing* 25(6):435.
- Creswell JW (2014). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Boston, MA: Pearson.
- Creswell JW (2018). *Research design: qualitative, quantitative, and mixed methods approach* (5th edition). CA: SAGE.
- Danny G (2014). Triangulation in qualitative research podcast: Short version. <https://www.youtube.com/watch?v=aTEbA2LZalg>.
- Dewey J (1916). *An introduction to the philosophy of education*. New York: Macmillan.
- Dewey J (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. New York: D.C. Heath.
- Dochy F, Segers M, Bossche PVD, Struyven, K (2005) Students' perceptions of a Problem-Based Learning environment. *Learning Environments Research* 8(1):41-66.
- Duch BJ, Groh SE, Allen DE (2001). *The power of problem-based learning*. Sterling, VA: Stylus. Illinois Center for Innovation in Teaching and Learning: [https://citl.illinois.edu/citl-101/teaching-learning/resources/teaching-strategies/problem-based-learning-\(pbl\)](https://citl.illinois.edu/citl-101/teaching-learning/resources/teaching-strategies/problem-based-learning-(pbl)).
- Eggen P, Kauchak D (2019). *Educational psychology: Windows on classrooms* (9th ed.). NJ: Pearson Education.
- Ertmer PA, Newby TJ (2013). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly* 26(2):43-63. doi:10.1002/piq.2143
- Ertmer PA, Schlosser S, Clase K, Adedokun O (2014). The grand challenge: Helping teachers learn/teach cutting edge Science via a PBL approach. *The Interdisciplinary Journal of Problem-based Learning* 8(1):1-18.
- Hmelo-Silver CE (2012). International perspectives on problem-based learning: Contexts, cultures, challenges and adaptations. *Interdisciplinary Journal of Problem-based Learning* 6(1):10-15.
- Leedy P, Ormrod JE (2018). *Practical research: Planning and design* (12th ed.). NY: Pearson.
- Mane M, Kadu A, Preeti B (2012). Problem Based Learning versus traditional lecture method: A comparative study among second year medical students. *Indian Journal of Forensic Medicine & Pathology* 5(3):109-114.
- Maxwell N, Mergendoller J, Bellisimo Y (2005). Problem-based learning and high school macroeconomics: A comparative study of instructional methods. *The Journal of Economic Education* 36(4):315-331.
- Merriam SB, Tisdell EJ (2016). *Qualitative research: A guide to design and implementation* (4th ed.). San Fran.: Jossey-Bass.
- Morgan JR, Capraro MM, Capraro RM (2013) *STEM Problem-based learning: AN integrated Science, Technology, Engineering, and Mathematics (STEM) Approach*. Rotterdam: Sense Publishers.
- Murphy MM (2006). *The history and philosophy of education: Voices of educational pioneers*. Upper Saddle River, NJ: Pearson Education.
- Noble E, Ferris KA, LaForce M, Zuo H (2020). A Mixed-Methods Approach to Understanding PBL Experiences in Inclusive STEM High Schools. *European Journal of STEM Education* 5(1).
- Patankar P (2011) *Teacher Education: Need of Paradigm shift from Behaviorism to Constructivism*. *Indian Streams Research Journal* 1(11):23-25.
- Pearl N (2019). "The 12 Most Important Skills You Need To Succeed at Work." <https://www.forbes.com/sites/nataliapearl/2019/09/10/the-12-most-important-skills-you-need-to-succeed-at-work/?sh=696220081c6a>.
- Qi Z (2017). A comparison of traditional lecture and computer-mediated instruction in developmental mathematics. *RTDE* 24(1):63-82.
- Rigall I, Torrent R (2011). Using Problem-based Learning for Introducing Producer Theory and Market Structure in Intermediate Microeconomics *International Review of Economics Education* 10(1):1-15.
- Taskin-Can B (2011). The perceptions of Pre-service science teachers concerning constructivist perspectives to teaching. *Journal of Baltic Science Education* 10(4):219-228.
- Van Manen M (1990). *Researching lived experience: Human science for an action sensitive pedagogy*. Albany: NY: New York Press.
- Wardoyo C, Narmaditya BS, Wibowo A (2021). Does Problem-Based Learning Enhance Metacognitive Awareness of Economics Students? *Pegem Journal of Education & Instruction Pegem Egitimve Ögretim* 11(4):329-336.