Project-based learning in Higher Education: The Complication and Challenges

Preeti Singh[1], D.K. Sondhiya[2]
[1]Dept. of Physical Sciences, Rabindranath Tagore University, Bhopal (M.P.) India.
[2]Dept. of Applied Science, Govt. Polytechnic College, Sahibganj (Jharkhand) India.

ABSTRACT
Recently the Project-Based Learning (PBL) is very popular in Higher education and become the first choice of education policymakers. PBL is founded on cross-cutting "design principles" that frequently relate to what is taught, how it is taught, and how students should be evaluated in a PBL classroom. PBL design principles relay on the significance of the project as the primary mode of education and encourage the active participation of students in knowledge building. The concept of PBL in Higher Education Area's require engagement of student for more autonomous work. Under the supervision and support of instructor, students select and follow their own path of learning using creative thinking and invention and develop an authentic response to a real-world problem. PBL is consider as a process consisting of a sequence of demanding tasks and activities aims to solve real-world problems. PBL benefits students, educators, and businesses by creating ideal conditions for coping with the difficulties of today's changing society.

Keywords: Project-Based Learning, Curriculum Design and educational practice

I INTRODUCTION

Project-based education is referred to as method of teaching in which learner gain knowledge and skills by works on problem or challenge for an extended period of time. Many scholars regard PBL as a philosophy of teaching and learning rather than a specific educational technique [1]–[4]. William Heard Kilpatrick created the "project method," which is considered the first formalization of a PBL paradigm [5]. Kilpatrick defined "project method" as "an activity undertaken by students that really interested them" [6]. During the progressive education movement, Kilpatrick's ideas became widely known among teachers and administrators. Initially, PBL and other student-centered approaches faced strong resistance from academician, who lay emphasis on the significance of students gaining specialized topic knowledge in traditional subject areas [7] - [9]. Aside from that, PBL and other teaching approaches that stress deeper learning and the improvement of skills required for success in college, career, and civic life are gaining popularity [10] - [11]. There are several reasons for PBL and other deeper learning methodologies have gained popularity among higher education institute over the last decade.

Large numbers of students who have passed from high school and enroll in college do not pass the mathematics or English/language exams, particularly among low-income students. It is estimated that around 60% of community college students participate in remedial classes [12]. Thomas [1], proposed various primary driving forces which enable all stakeholders, who involved in learning process be tremendously engaged in investigative activities in different disciplines of study:

- Problem-based learning (PBL) projects helps students to understand fundamental concepts of problem under studied.
- Projects allow students to conduct constructive investigations.
- Projects are primarily driven by students.
- PBL projects should be realistic

PBL projects in higher education institute give an opportunity to the students to engage in more autonomous work. Self-regulated learning processes assume to be an effective procedure to engage digital-age learners in real world problem. PBL learning is regulated process that include number of composite tasks, which is based on complex problems, investigation activities, decision making, and the formation relevant outputs and presentations.

The objective of the present study is to define the basic concepts and objective of the project-based learning process and discuss the various issues that students and instructor faces during the implementation of PBL in higher education institutions.

II PROJECT-BASED LEARNING DESIGN PRINCIPLE

Thomas [1] observed that there was no commonly accepted set of activities that defined PBL, nor was there an agreed-upon distinction between PBL and other student-centered, inquiry-based approaches. PBL "design principles" define the key components of a PBL methodology. PBL design principles, with a focus on curriculum, instruction, and assessment are mentioned below.

(a) Curriculum Design Principles: The PBL approach can theoretically be implemented in any subject area. PBL design principles do not communicate specific disciplinary concepts and practices. Some PBL scholars set guidelines for questions and topics that a student should encounter and established the relationship between the PBL approach and other

curriculum and pedagogy featured in the course [13] – [17].

(b) Using driving questions to motivate learning: Many educators and academics underlined that the PBL should be inspired by a compelling question. Driving questions are at the heart of project-based science design approaches. According to Krajcik and Mamlok Naaman [18], a driving question is "a well-designed question that students and teachers elaborate, explore, and answer throughout a project". Krajcik and colleagues identified five criteria for high-quality driving questions [14, 18]:

- Practicable
- Worthwhile
- Contextualized
- Meaningful; and
- Ethical.
- Set significant learning goals:

Some PBL design concepts address PBL curricular material [1, 13, 14, 15, 19]. According to Larmer and Mergendoller [14], a well-designed PBL strategy teaches "students the important content standards, concepts, and in-depth understandings that are fundamental to school subject areas and academic disciplines." They also underlined the relevance of PBL, which focuses on "success skills" including critical thinking, self-regulation, and cooperation. According to Darling-Hammond and coworker [13], PBL project and other inquiry-based techniques should be designed to maximize the possibilities that students will understand the "big ideas specified in the learning goal". Other academics have emphasized the need for a PBL approach's subject matter or theme to be authentic and relevant to real-world concerns [1, 19]. Krajcik and Shin [14] emphasized the need of creating PBL curriculum connected with learning objectives that are consistent with national standards. They highlighted that learning goals are defined as "learning performances" that combine the discipline's "core ideas" with essential "disciplinary practices".

(i) Application of project for learning: Thomas [1] and Parker [16, 17] colleagues specifically addressed the question of how to situate the PBL project inside the larger curriculum. According to Thomas, projects should be "central, not peripheral to the curriculum". What clearly distinguishes PBL from other instructional methodologies is that projects are not the culmination of learning, but rather the process by which learning occurs.

(ii) Allocation of sufficient time for learning: The design concepts proposed by Thomas [1] and Parker [16, 17] colleagues necessitate that a PBL approach drive the curriculum and instruction of an entire course rather than simply a single, time-limited unit. With one exception, all other design ideas discussed are related to students performing in-depth or extended research, which clearly take a noteworthy quantity of time [19]. According to Ravitz [20], PBL instruction should "occur over an extended period". Most PBL enthusiasts would agree that a brief PBL project as part of a typical, teacher-directed course is not genuinely PBL. However, more figures about the time spent on a PBL project and the interaction between PBL and other instructional strategies within a course would be beneficial.

(iii) PBL Instructional Approaches: PBL necessitates considerable changes from traditional approaches of instruction. It comes as no surprise that the sets of design principles covered in the literature examine the topic of how students learn new skills and knowledge.

(iv) Encourage Knowledge Building: PBL is founded on constructivist theories of learning [20] - [21]. The design concepts describe the concept of PBL units, which include students in knowledge production, in-depth investigation, and the application of problem-solving and critical thinking abilities. According to Thomas [1], a PBL method must involve pupils in the "construction of knowledge". According to Darling-Hammond and colleagues [13], students should be encouraged to be "authors and producers of knowledge".

(v) Encourage Engagement of Student: Grant [19] and Parker et al. [16, 17] highlighted the idea that teachers should start a PBL approach by nurturing students' "need to know". Design principles emphasize a variety of tactics that teachers can employ to encourage student engagement from the start of a project. Krajcik and Shin [14] observed that the driving issue of a PBL approach promotes student participation in project activities.

(vi) Use Scaffolds to Guide Student Learning: A learning scaffold is defined as approach or resource that supports a learner in "accomplish more difficult tasks as compared to they are capable of completing on their own"[22]. Teachers, classmates, learning materials, and technology can all function as scaffolds. Scaffolds are increasingly used to facilitate student learning in project-based and design-based learning. [23]. Darling-Hammond et al. [13] advocated scaffolding as a key component of PBL. Grant [19] defines scaffolds as "student-teacher interactions and counselling, practice worksheets and guiding questions, job aides, and project templates." Krajcik and Shin [14] concluded that "while engaged in the practices of science, students are scaffolded with learning technologies that help them participate in activities normally beyond their ability". A major aspect of

scaffolding is that it must be suited to a student's present level of comprehension. To adjust a scaffold to a student's skill level or material understanding, a teacher must conduct ongoing assessments of the student [23]. Another important aspect of scaffolding is that it should disappear over time as students learn to use their new information or abilities independently [23].

(vii) **Encourage Student Choice:** According to Larmer and Mergendoller [15], students can provide feedback on their team responsibilities, assignments, questions, resources, and final output. Although fostering student choice and supporting student autonomy in the classroom are undoubtedly consistent with PBL's. Krajcik and Shin [14] highlighted the criteria of their project-based scientific approach, which revolve around student choice. PBL methods allow students to design their own driving questions, and their project-based science approach involves teachers and curriculum developers in designing the driving question, as well as students having the freedom to "explore solutions to their own related questions" in the entire project.

(viii) **Collaborative Learning:** Assessment is an important part of PBL project, which provides distinct nature of the academic material and learning process in the PBL context. Although assessments fail to capture the cognitive and no cognitive outcomes, produce by deeper learning approaches. The standardized achievement assessments “No Child Left Behind” seen insufficient for measuring the learning and "higher-order skills" that PBL is intended to foster [24]. However, it is becoming increasingly clear that assessment plays an important role in student learning.

(ix) **Make a Product That Answers the Driving Question:** Krajcik and Shin [14] described the type of evaluation product that students must develop. They stated that the assessment must include the construction of a tangible product that addresses the driving topic of the unit or curriculum and serves as a physical reflection of student learning (an artifact).

(x) **Offer Chances for Student Reflection and Teacher Feedback:** Many researchers emphasized the value of giving students time for self-assessment, reflection, and feedback [13, 14, 15 & 19]. Darling-Hammond and coworkers [13] promoted that time will be allotted for "students to reflect deeply on the work they are doing and how it relates to larger concepts specified in the learning goal". Larmer and Mergendoller [15] discovered that "throughout a project, students—and the teacher—should reflect on what they're learning, how they're learning, and why they're learning."

(xi) **Present Products to Authentic Public Audiences:** Darling-Hammond et al. [13], Larmer and Mergendoller [15], and Ravitz [20] advocate the value of students presenting their work to a public audience. According to Darling Hammond and colleagues [13], the audience "can be highly motivating for students". Krajcik and Shin [14] proposed that when artifacts are made public, they can inspire students and provide possibilities for feedback. The public audience idea is also linked to Parker and colleagues' [17] and Thomas' [1] emphasis on project work that is authentic and relevant to the real world.

III OBJECTIVES OF PROJECT-BASED LEARNING PROCESSES

Main objective of PBL based learning is to increase enthusiasm, training skills like creative thinking and social skills among the students, which help them in their future in a global economy. Bell [25] advocated the approach which is driven by the students and facilitated by the instructor to learning includes core pillars such as question-driven learning, student-chosen research, collaborative work, and authentic projects to solve real-world problems. Projects expose students to and familiarize them with the discipline's fundamental concepts. Students are taught to look outside the box when researching problem-related environments with question with open end. Projects promote an interdisciplinary approach. The distinctiveness of PBL provides students with greater flexibility while also transforming teachers' roles. In PBL based learning instructor serve as facilitators, overcoming the restrictions of typical classroom settings. The strategy enables academics to use many tools and combine them to increase student interest and motivation. According to Boss and Krauss [26] implementation of PBL transforms instructor into enduring learners. They are obliged to perform further exploration guidance from business professionals.

IV THE BENEFITS OF PROJECT-BASED LEARNING

Benefits of PBL learning were documented even before the 21st century. Dewey proposed that "learning by doing has a significant effect in molding pupils' learning [27]. Technical and engineering education has been use the PBL paradigm from last decades. It becomes a popular strategy across a many disciplines. Furthermore, various research studies reveal that implementing PBL produces actual improvements in learning-teaching learning environment. According to Boss and Krauss [26], PBL develop new pattern of thinking among the students, they learn to how to get profit from the knowledge of the group and

importance of collaborative work. In PBL learning differs from peer-to-peer collaboration among pupils. The PBL promote collaborative work among the like-minded individuals and leads to the growth of the community of practice. Instructors can work together to reduce inaccessibility of resource through more widespread network within the outside world, better time and resource management, improve compatibility the technology and promoting necessary changes in a systematic manner. PBL projects involve real-world problems, allowing businesses to better identify and communicate business demands. Companies can impact the teaching-learning process by identifying current gaps in education and launching internships to develop talent for their own requirements.

V CHALLENGES FOR TEACHERS AND LEARNERS

A number of researchers identified current problems/difficulties when using the PBL technique, which could include the following issues [28] - [30]:

(a) Implementation of PBL is difficult to plan and implementation because project is focuses on science based projects and conducted by whose instructor who have no prior expertise or knowledge regarding the methods.

(b) In PBL, students may struggle with self-directed learning, especially for difficult and real-world assignments. Such as the work of initiating inquiries, managing time, conducting direct investigations, and successfully implementing new technology. The effectiveness of PBL as an instructional strategy is dependent on the inclusion of a number of supports to help students learn [1]. Edelson et al. [29] largely use an inquiry-based learning strategy in their studies. Some of the challenges that arise with inquiry-based learning may appear almost identical when employing the PBL method, as detailed below.

- Encourage students to engage in major learning activities. PBL requires a higher level of motivation from learners than traditional educational activities. To encourage learning, motivation must arise from a real interest in the investigation, its discoveries, and their implications.
- To engage the students in PBL project, it necessary to tell them how the assignments, comprehend the goals, and how the evaluate the findings. They know the scientific research processes, like data collection and analysis. It can be complicated and often required a level of precision and attention that students do not encounter in their daily lives. If pupils fail to learn these approaches, they will be fails to conclude investigations results.
- Forming research questions, developing a plan for data collection and analysis and interpreting data require deep scientific understanding. If students lack this information and the opportunity to gain it, they will be fails to carry out meaningful
- Organizing and managing complex tasks is essential for pupils to reach their final objective. An investigation requires proper activity planning and organization, as well as resource and work product management. Students are rarely expected to manage lengthy, complex procedures as part of typical teaching activities. Students who are unable to plan their work and manage a lengthy process are unable to participate in PBL.
- PBL technologies and activities must be relevant to the learning environment. Meeting environmental constraints is a critical design consideration that must be balanced with learning objectives when building curriculum and technology [29]. Mapes [32] would explore many of the same difficulties that occur when using the PBL technique in educational practice, including that both students and teachers confront a significantly more sophisticated set of challenges in PBL experiences that are not associated with the use of more prescriptive courses.

VI CONCLUSION

Project-based learning is a student-centered approach that expands opportunities for all stakeholders in a learning environment. Projects are considered as curriculums that include a diverse set of tools and aspects essential for effective specialized instruction. The PBL is based on close collaboration between a group of students, educational and research institutions, and commercial entities. Project-Based Learning provides students with authentic and culturally sensitive learning opportunities that are both expressive and relevant to their lives. With teacher guidance and support, students choose and follow their own path to learning through research and inquiry, and, using creative thinking and invention, develop an authentic response to a real-world problem. PBL learning is sometimes viewed as a managed process, with projects consisting of a sequence of demanding tasks and activities targeted at solving real-world problems. PBL benefits students, instructors, and businesses alike by creating ideal conditions for coping with the difficulties of today's changing society.

REFERENCES

[1] Thomas, J. W. (2000). A review of research on project-based learning. San Rafael, CA: The Autodesk Foundation. Markham, 2012;

[2] Markham, 2012;

[3] Belland, B. R., Glazewski, K. D., and Ertmer, P. A. (2009). Inclusion and problem-based learning: Roles of students in a mixed-ability group. RMLE Online: Research in Middle Level Education, 32(9), 1-19.

[4] Mapes, 2009 et al.).

[5] Peterson, B. W. (2012). Uncovering the progressive past: The origins of project based learning. UnBoxed: A Journal of Adult Learning in Schools, 8. Retrieved from http://gse.hightechhigh.org/unboxed/issue8/uncovering_the_progressive_past/. Accessed on September 22, 2017.

[6] Ravitch, D. (2000). Left back: A century of failed school reforms. New York, NY: Simon and Schuster.

[7] Kirschner, P. A., Sweller, J., and Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. Educational Psycholo-gist, 41(2), 75-86.

[8] Loveless, T. (2013). The banality of deeper learning. The Brookings Institution. Re-trieved from www.brookings.edu.

[9] Lee, D., Huh, Y., and Reigeluth, C. M. (2015). Collaboration, intragroup conflict, and social skills in project-based learning. Instructional Science 43, 561-590.

[10] Huberman, M., Bitter, C., Anthony, J., and O'Day, J. (2014). The shape of deeper learn-ing: Strategies, structures, and cultures in deeper learning network high schools. Washington, DC: American Institutes for Research.

[11] Scardamalia, M., Bransford, J., Kozma, B., and Quellmalz, E. (2012). New assessments and environments for knowledge building. In P. Griffin, B. McGaw, and E. Care (Eds.), Assessment and teaching of 21st century skills (pp. 231-300). Dordrecht, The Netherlands: Springer.

[12] Bailey, T., Jeong, D. W., and Cho, S-W. (2010). Referral, enrollment and completion in developmental education sequences in community colleges. Economics of Educa-tion Review, 29(2), 255-270.

[13] Darling-Hammond, L., Barron, B., Pearson, P. D., Schoenfeld, A. H., Stage, E. K., Zimmerman, T. D., Cervetti, G. N., and Tilson, J. L. (2008). Powerful learning:

[14] Krajcik, J. S., and Shin, N. (2014). Project-based learning. In R. K. Sawyer (Ed.), The Cambridge handbook of the learning sciences (2nd ed.) (pp. 275-297). New York, NY: Cambridge University Press.

[15] Larmer, J., and Mergendoller, J. R. (2015). Gold standard PBL: Essential project design elements. Buck Institute for Education. Retrieved from www.bie.org.

[16] Parker, W. C., Mosborg, S., Bransford, J., Vye, N., Wilkerson, J., and Abbott, R. (2011). Rethinking advanced high school coursework: Tackling the depth/breadth tension in the AP US government and politics course. Journal of Curriculum Studies, 43(4), 533-559.

[17] Parker, W. C., Lo, J., Yeo, A. J., Valencia, S. W., Nguyen, D., Abbott, R. D., Nolen, S. B., Bransford, J. D., and Vye, N. J. (2013). Beyond breadth-speed-test: Toward deeper knowing and engagement in an advanced placement course. American Ed-ucational Research Journal, 50(6), 1424-1459

[18] Krajcik, J. S., and Mamlok-Naaman, R. (2006). Using driving questions to motivate and sustain student interest in learning science. In K. Tobin (Ed.), Teaching and learn-ing science: A handbook (pp. 317-327) Westport, CT: Praeger.

[19] Grant, M. M. (2002). Getting a grip on project-based learning: Theory, cases and recom-mendations. Meridian: A Middle School Computer Technologies Journal,

[20] Ravitz, J. (2010). Beyond changing culture in small high schools: Reform models and changing instruction with project-based learning. Peabody Journal of Education, 85(3), 290-312.

[21] Pellegrino, J. W., and Hilton, M. L. (Eds.). (2012). Education for life and work: Develop-ing transferable knowledge and skills in the 21st century. Washington, DC: Na-tional Academies Press.

[22] Singer, J., Marx, R. W., Krajcik, J., and Chambers, J. C. (2000). Constructing extended inquiry projects: Curriculum materials for science education reform. Educational Psychologist, 35(3), 165-178

[23] Puntambekar, S., and Hubscher, R. (2005). Tools for scaffolding students in a complex learning environment: What have we gained and what have we missed? Educa-tional Psychologist, 40(1), 1-12.Conley and Darling-Hammond, 2013

[24] Conley, D. T., and Darling-Hammond, L. (2013). Creating systems of assessment for deeper learning. Stanford, CA: Stanford University, Stanford Center for Oppor-tunity Policy in Education.

[25] Bell S 2014 Project-Based Learning for the 21st Century: Skills for the Future The Clearing House: A Journal of Educational Strategies 83(2) 39-43

[26] Boss S, Krauss J 2007 Reinventing project-based learning: your field guide to real-world projects in the digital age

[27] Dewey, J. (1938). Experience and Education. Toronto: Collier-MacMillan Canada Ltd.

[28] Edelson, D.C. (1999) Addressing the Challenges of Inquiry-Based Learning through Technology and Curriculum Design The Journal of the Learning Sciences 8(3-4) 391-450

[29] Lidón, L, Rebollar, R, Møller, C. (2011) A collaborative learning environment Innovations in Education and Teaching 48(3).

[30] Mapes, M.R. (2009) Effects and Challenges of Project-Based Learning: A Review https://www.nmu.edu/sites/DrupalEducation/files/UserFiles/ Files/Pre-Drupal/SiteSections/Students/GradPapers/Projects/JunakMapes_Michele_MP.pd