



Challenges of Implementing Design-Based Learning (DBL) in Middle Stage Students

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ABSTRACT

A revolutionary instructional strategy, Design-Based Learning (DBL) encourages creativity, critical thinking, and practical problem-solving. Even though DBL is becoming more popular worldwide, there are still many obstacles to overcome before it can be implemented in India's middle-stage education system, including inflexible curricula, a lack of resources, inadequate teacher preparation, outdated assessment techniques, and institutional reluctance. Although experiential learning is emphasized in the National Education Policy (NEP) 2020, its practical implementation in the classroom is still constrained by institutional impediments. This review, which is based on descriptive analysis, focuses on literature from 2015 onward with a focus on pedagogy and implementation. It synthesizes findings from peer-reviewed journals, policy papers like NEP 2020 and SDG 4, and publications by organizations like UNESCO and the OECD. The necessity for design thinking training for teachers, the incorporation of multidisciplinary content, revised evaluation procedures that prioritize processes over outcomes, and infrastructure support to fill resource shortages are some of the major issues noted. Improving student involvement and inclusion requires differentiated instruction and tying



DBL projects to real-world situations. Coherent policies, community collaborations, and strategic investment are essential for long-term implementation. A fair, future-ready educational system that equips students to approach challenges in the real world with courage and creativity can be made possible by integrating DBL with the objectives of NEP 2020 and SDG 4.

Introduction:

Design-Based Learning (DBL) is a method of teaching that encourages students to actively generate knowledge via practical projects by incorporating design thinking and iterative problem solving into classroom settings. DBL encourages creativity, teamwork, and critical thinking and is based on constructivist and experiential learning theories (Sidawi et al., 2022). The use of DBL in school curriculum has drawn attention from all around the world in recent years, especially because of its ability to fulfill interdisciplinary learning demands and foster 21st-century skills.

Numerous researches have demonstrated how DBL improves learner motivation, engagement, and comprehension of difficult ideas (Lindfors & Hilmola, 2021; Wu et al., 2023). However, there are particular pedagogical and institutional difficulties when implementing DBL in middle-stage schooling (grades 6–8). Despite the effective implementation of DBL in STEM-focused secondary school and higher education, there is still a dearth of literature tailored specifically to middle-grade students, particularly in India. Age-appropriate DBL models that are culturally contextualized are still being developed (Mishra & Satish, 2023).

The National Education Policy 2020 (NEP 2020) in India promotes the incorporation of cutting-edge teaching techniques like DBL and places a strong emphasis on competency-based and experiential learning. However, especially at the middle level, shifting from traditional rote learning models to design-based approaches necessitates fundamental adjustments in curriculum design, teacher capacity building, and resource allocation.

There is a substantial research gap about the systemic, infrastructure, and cognitive hurdles to DBL among middle-stage students in India, despite the increased support for design thinking in education. The majority of research that is now accessible has concentrated on Western environments or advanced students, ignoring regional characteristics that affect the viability of DBL in Indian schools, such as big



class numbers, inadequate teacher preparation, strict evaluation procedures, and an overloaded curriculum (Rathod et al., 2024).

Objectives

Two main goals serve as the foundation for this review study:

1. To identify the key challenges of implementing Design-Based learning among middle-stage students.
2. Aligning these challenges with broader educational frameworks, such as NEP 2020 and SDG 4, offers pathways for effective integration.

Techniques

The descriptive research design used in this work is appropriate for conceptual exploration and the synthesis of current secondary source findings. Peer-reviewed journals, policy documents (NEP 2020, SDG 4 reports), educational frameworks on design thinking and experiential learning, studies from UNESCO, the OECD, and national academic institutions are just a few of the many sources of literature that this study draws from.

Selection Standards

In order to categorize difficulties and investigate ramifications for curriculum design, pedagogy, and educational justice, this study places a strong emphasis on synthesis and critical analysis.

Findings and conversation

1. Teacher Readiness

In middle-stage educational settings, where pedagogical flexibility and creativity are crucial, teacher readiness is a fundamental pillar for the successful implementation of Design-Based Learning (DBL). However, a major obstacle in the Indian setting is the instructors' lack of preparedness to embrace and modify DBL approaches. This difficulty results from deficiencies in ongoing professional growth as well as pre-service training.

The majority of teacher education programs in India still place more emphasis on classroom management and material delivery than on cutting-edge pedagogical methods like DBL. As a result, many teachers



lack knowledge of the fundamental ideas of DBL, such as design thinking, iterative learning, and interdisciplinary integration (Kaur & Thakur, 2023). Teachers may find it difficult to transition from traditional didactic instruction to student-centered, inquiry-driven techniques if they lack this fundamental understanding.

Additionally, when design-based or experiential pedagogies are offered in India, in-service training programs rarely expose students to them. When they do, they are frequently generic, inadequately contextualized, or one-time interventions that lack the ongoing mentoring and practical experience that DBL demands (Rao & Deshmukh, 2024). In managing group dynamics, facilitating open-ended projects, and evaluating innovative, nonlinear learning results, teachers commonly feel a lack of confidence.

The sense of an increasing workload is associated with another aspect of teacher unpreparedness. Within the current time-bound and exam-oriented frameworks of Indian schools, many instructors find it challenging to handle the curricular design, resource duration, cross-disciplinary collaboration, and flexibility features required by DBL (Sharma & Iyer, 2023). This frequently leads to opposition to DBL, especially when there is a lack of institutional recognition and support.

Crucially, teacher readiness is a structural problem as well as a competence deficiency. DBL is further marginalized as a "extra" rather than a necessary activity due to its exclusion from official teaching standards, curriculum guidelines, and teacher eligibility exams (Verma & Joshi, 2024). Long-term investment in enhancing educators' DBL competency and intentional reform of teacher education policies are necessary to close this gap.

2. Limitations of the Curriculum

The curriculum's rigidity and density are two of the biggest obstacles to integrating Design-Based Learning (DBL) in middle-stage Indian education. Indian school curriculum are primarily textbook-driven, linear, and time-bound, especially when they are administered by state boards and central organizations like the CBSE and ICSE. These traits are in direct opposition to DBL's adaptable, investigative, and multidisciplinary character (Das & Narayanan, 2023).

In order to address real-world problems, DBL places a strong emphasis on open-ended research, iterative problem solving, and the integration of several academic areas. However, there are few cross-curricular connections and a heavy emphasis on topic coverage and board exam preparation in the traditional Indian curriculum, which is divided into discrete disciplines. Teachers find it challenging to create and carry out



comprehensive DBL experiences without deviating from the recommended curricula due to this compartmentalization (Mishra & Jha, 2022).

Furthermore, project-based learning is rarely given specific time or space in a schedule by curriculum developers. The rigorous timescales allotted to each topic period are incompatible with the prolonged engagement, group cooperation, and trial-and-error cycles that are frequently required for DBL activities. Teachers frequently deprioritize new methods like DBL because they feel driven to finish the syllabus within a set academic cycle (Sharma & Jain, 2023).

Furthermore, curricular overload restricts the depth to which ideas can be investigated and promotes learning at a superficial level. Deeper knowledge and skill development are two of the main goals DBL aims to foster, yet the pressure to "complete the portion" usually ignores these (Khatri & Rao, 2023). It is still challenging to effectively apply DBL in the majority of Indian schools without reforms that incorporate DBL-friendly structures, such as flexible modules, thematic units, or design labs.

Curriculum standards and DBL competencies like creativity, teamwork, and user-centered thinking are not aligned, which is another problem. The lack of instructional scaffolding for DBL in national and state curriculum frameworks leaves teachers and schools without a clear integration plan (Verma & Joshi, 2024). Because of this, DBL implementation attempts are frequently dispersed and motivated by individual initiatives rather than systemic support.

3. Limitations of the Assessment

The assessment concept behind Design-Based Learning (DBL) is fundamentally at odds with the assessment procedures used in middle-stage education in India, which are still mostly traditional, exam-centric, and summative. Formative, process-based assessments are necessary for DBL since it encourages students to participate in creative problem solving, teamwork, iterative prototyping, and reflection. However, time-bound written assessments, single-correct answer forms, and rote memorization are given priority in the prevalent grading systems used in Indian schools (Joshi & Menon, 2024).

The fundamental results of DBL, like design thinking, team collaboration, creativity, and resilience, are not captured by such traditional approaches. When it comes to creating rubrics or qualitative assessments for intricate projects, teachers frequently find themselves unprepared and unsupported. They are also hesitant to use this strategy because there are no established instruments or standards for evaluating DBL efforts (Sharma & Jain, 2023).



The board exam system is a significant systemic limitation that has a significant impact on middle school instruction. Schools and teachers prioritize subject completion and test preparation because the preparatory mindset starts early, even though board exams formally start later. As exploration and risk-taking are essential components of the DBL process, this limits their scope (Shukla & Banerjee, 2023).

Furthermore, it is challenging for teachers to provide individualized feedback, which is crucial for assisting students through iterative cycles of DBL, due to huge class numbers and limited time allotted to each subject. This results in implementation that is shallow and may be referred to as "project-based," but it lacks genuine assessment of the process and progress (Kaur & Thakur, 2023).

4. Readiness of Students

For Design-Based Learning (DBL) to be implemented successfully, children must be prepared, especially throughout the middle school years when they move from tangible to more abstract cognitive processes. However, a number of elements in the Indian educational system, such as exposure to inquiry-based learning, communication abilities, and socio emotional growth, influence students' readiness for DBL.

Many Indian students are used to passive learning settings where the teacher serves as the main source of knowledge and performance on tests and memorization are used to gauge success (Gautam & Lal, 2021). When confronted with open-ended projects, collaborative work, and iterative design cycles all essential components of DBL this training frequently results in resistance or misunderstanding (Iqbal & Singh, 2023). The ambiguity and nonlinearity of DBL assignments can be difficult for students, particularly if they are not scaffold adequately for their developmental level.

Furthermore, DBL requires higher-order abilities that are rarely prioritized in early education, such as empathy, creativity, critical thinking, and problem-solving skills. Further gaps in their capacity to participate in DBL meaningfully may result from students from underprivileged or resource-poor backgrounds not having the necessary fundamental exposure to hands-on, play-based, or maker-oriented activities (Rathod et al., 2024).

Another difficulty is communication difficulties and language proficiency. Due to the highly collaborative nature of DBL, students need to be able to express themselves clearly, listen intently, and participate in group discussions. Many Indian students may find these intimidating, especially first-generation students or those in bilingual classes (Khatri & Rao, 2023).



Students' mindsets are also influenced by sociocultural standards surrounding failure and correctness. DBL promotes nonlinear thinking, learning from mistakes, and trial & error. Exams and classroom culture, however, reinforce the mindset that many students are conditioned to avoid mistakes and look for the "right answer" (Ghosh & Pillai, 2023). In DBL contexts, this fear of being incorrect or criticized can stifle creativity and risk-taking.

It is crucial to gradually introduce DBL through developmentally appropriate activities, offer academic and emotional support, and foster classroom cultures that value experimentation and iterative learning in order to overcome these obstacles.

5. Infrastructure and Resource Limitations

In addition to significant physical and material assistance, pedagogical changes are necessary for the implementation of Design-Based Learning (DBL) in middle-stage classrooms in India. Unfortunately, the majority of Indian schools, particularly those in rural and low-income metropolitan areas, suffer from severe shortages of the digital, human, and physical resources required to successfully support DBL.

DBL depends on flexible classroom settings that may facilitate experimentation, hands-on learning, and iterative design, as well as collaborative workspaces, digital tool access, and prototype supplies. High student-teacher ratios, inflexible seating arrangements, limited access to technology, and an excessive dependence on blackboard-based instruction, however, characterize the reality of many Indian classrooms (Shukla & Banerjee, 2023).

Inequality in infrastructure is crucial. The great majority of government schools lack basic lab equipment, reliable energy, and Internet connectivity, whereas certain private and prestigious metropolitan schools might have access to maker spaces, smart classrooms, and 3D printers (Rathod et al., 2024). Integration of DBL is significantly hampered by the digital divide, particularly when technology-enhanced learning settings are used.

Additionally, DBL needs materials like cardboard, sensors, craft supplies, and recyclables, as well as time flexibility. Allocating class time or funds to such open-ended work is frequently not prioritized in schools with tight schedules and constrained budgets (Desai & Kumar, 2023). Lack of tools, storage space, and maintenance assistance all necessary to continue design-based work are additional limitations faced by educators.



DBL implementation is irregular and reliant on outside financing and project-based interventions since institutional financial constraints frequently prohibit investments in teacher training, tools, and multidisciplinary resources. DBL hazards are diminished to sporadic, optional activities in the absence of systemic integration into school planning and financial requirements (Ghosh & Pillai, 2023).

Furthermore, there is a gap between vision and execution because legislative frameworks like the National Education legislative (NEP) 2020 promote experiential learning but lack explicit implementation instructions and funding allocations for DBL-specific infrastructure (Verma & Joshi, 2024).

6. Institutional Opposition

One of the more subtle but pervasive obstacles to the successful implementation of Design-Based Learning (DBL) in middle-stage education in India is institutional resistance. The sustained adoption of DBL methods is frequently hampered by the absence of organizational support and system-level alignment, notwithstanding the individual enthusiasm of instructors and students.

In general, Indian school systems especially public ones are exam-driven, hierarchical, and compliance-focused. Innovation is usually treated cautiously or even skeptically in these institutions, especially when it goes against established conventions regarding the completion of the syllabus, standardized testing, and instructor authority (Saxena & Gopal, 2023). DBL is frequently seen as being incompatible with institutional aims since it requires adaptability, experimentation, and student autonomy.

The lack of DBL in official policy implementation tools including teacher evaluation standards, school development plans, and institutional accountability metrics is another important element fueling resistance. Schools are rarely encouraged or directed to implement such ideals in the classroom, despite the fact that policy papers like NEP 2020 support experiential and holistic learning (Verma & Joshi, 2024). As a result, DBL is frequently seen as an elective enrichment activity rather than a fundamental teaching strategy.

Administrators and school leaders are also essential. Many may not prioritize or support DBL activities because they are not familiar with design thinking or interdisciplinary innovation frameworks. Individual instructors' efforts frequently stay isolated and fleeting without their support (Rao & Deshmukh, 2024). Furthermore, there is still little opportunity for instructional experimentation because the administrative focus is still firmly skewed toward exam performance.



Logistical and bureaucratic obstacles such as strict scheduling, tight budgets, outdated infrastructure, and centralized decision-making further contribute to institutional stagnation. All of these elements work together to create a culture that is risk averse and discourages deviance from the norm (Iqbal & Singh, 2023).

Institutional culture needs to change to embrace innovation, accept failure, and encourage cooperation throughout departments and disciplines if DBL is to become systematic. Leadership development, policy integration, and a supportive environment that enables all stakeholders not just educators to take part in creating meaningful learning experiences are necessary for this shift.

Implications

Critical systemic, pedagogical, and infrastructure issues are brought to light by the review of the difficulties in implementing Design-Based Learning (DBL) in middle-stage students. These issues directly affect curriculum reform, teacher preparation, policy, and school leadership in the Indian educational system.

Rethinking Teacher Preparation: Both pre-service and in-service teacher education programs urgently need to incorporate design thinking, multidisciplinary facilitation, and reflective practice. In addition to teaching DBL material, teachers must be prepared to help students develop the creativity, teamwork, and problem-solving abilities that are essential to the DBL approach. In light of this change, India's teacher training programs need to be redesigned to be more immersive, practical, and in line with actual classroom procedures.

Realigning the curriculum and assessments: DBL cannot flourish in circumstances that are rigidly syllabus-driven. A compelling argument for changing the curriculum to accommodate flexibility, the integration of theme projects, and real-world inquiry is presented in this review. Similarly, formative competency-based assessments that acknowledge processes, revisions, and innovation must replace standardized testing in assessment methods. This calls for a systemic investment in rubrics and portfolio-based evaluations that emphasize the results of design thinking.

Equity in Infrastructure and Access: One important issue is the need to make sure that the adoption of DBL does not worsen already-existing socioeconomic or urban-rural imbalances. To ensure that every student has an equal opportunity to participate in DBL experiences, schools in under-resourced locations



need to make targeted investments in learning environments, resources, digital access, and teacher support.

Leadership and Institutional Culture: To promote an innovative culture, school leaders must take a revolutionary approach. Allocating time and resources to DBL activities, fostering teacher cooperation, and establishing safe places for experimentation all depend on supportive leadership. DBL risks are reduced to isolated pilot programs with little chance of sustainability in the absence of administrative buy-ins.

Mechanisms for Policy Coherence and Implementation: Although national policies like NEP 2020 support experiential learning, this research finds a discrepancy between the intention of the policies and their actual implementation at the local level. For DBL to become widely accepted in India's educational system, there must be clear guidelines, regional implementation models, and strong monitoring systems.

Alignment with the Sustainable Development Goals (SDGs): DBL is in line with SDG 4: Quality Education, especially with regard to its focus on inclusive, equitable, and creative learning opportunities. Achieving the 2030 education targets will depend on the system's capacity to provide skill-based, future-ready, and socially relevant education, which will be improved by addressing the issues that have been highlighted.

Suggestions

Focusing on problem-solving, creativity, teamwork, and practical applications, Design-Based Learning (DBL) has become a popular and successful teaching strategy, especially for middle school pupils. However, there are a number of difficulties with putting DBL into practice in a middle school setting. These difficulties can include problems with curriculum limitations, teacher and student readiness, and resource availability. To overcome these obstacles and guarantee the effective integration of DBL, a number of suggestions can be given.

1. Training for Teachers and Professional Development

Lack of teacher preparation is one of the main obstacles to DBL implementation. Teachers must adopt a new teaching approach that encourages student-driven inquiry and exploration in order to implement DBL. To oversee design-based procedures, encourage teamwork, and assist students in resolving challenging issues, teachers particularly those in middle school frequently require extra training.



Teachers should have access to extensive professional development programs funded by school districts and educational establishments. The main goal of these programs should be to give educators the tools they need to organize, lead, and evaluate DBL activities. Both the academic underpinnings of DBL and real-world, hands-on experience should be incorporated into training. In order to ensure that the activities in project-based classrooms are both difficult and doable by students, teachers should also be taught a variety of management techniques.

2. Flexibility and Integration of the Curriculum

Existing curricula's inflexible structure is a common obstacle to DBL adoption. Standardized testing and memorization are frequently given priority in traditional teaching paradigms, which leaves little opportunity for the adaptability and creativity needed for DBL. The implementation of DBL seems to be a disruptive shift in middle schools, where curricula are frequently strictly regulated.

School systems ought to think about updating their curricula to include design-based projects and trans disciplinary learning. In areas like science, technology, engineering, art, and mathematics (STEAM), this would enable students to interact with real-world issues. In order to ensure that these projects satisfy academic standards and provide the creative flexibility that DBL encourages, educators can also search for chances to match DBL activities with current learning objectives.

3. Technology and Resource Access

Not every middle school classroom has access to the specific tools and technology needed for effective DBL. The efficacy of DBL projects can be significantly hampered by a lack of resources, including design tools, prototyping materials, or even simple hardware like PCs.

Districts and schools ought to spend money on the tools required to assist DBL. This entails giving people access to digital tools for design and prototyping as well as resources for practical tasks like making digital content or building models. Schools can also look into joint ventures with nearby companies, academic institutions, and civic associations that could provide resources or experience. Additionally, when cutting-edge technology is not available, instructors should be trained to adopt free or open-source alternatives.

4. Support for Students and Distinction



Students in middle school frequently exhibit differing aptitudes and levels of interest in design and problem-solving exercises. While some students might perform exceptionally well on DBL assignments, others might find the technical components of the projects or the self-directed nature of the learning process difficult.

DBL should be differentiated to accommodate different learning styles, aptitudes, and interests in order to meet the varied demands of middle school pupils. By delivering direction at various points during the design process and decomposing difficult assignments into digestible steps, educators can offer scaffold support. Peer mentorship, in which more assured students assist their colleagues in navigating the process, can also be a successful tactic. All students can stay interested and involved if there are flexible opportunities for them to exhibit their creativity through written reports, digital media, or physical models.

5. Methods of Assessment

Exams and quizzes are the main focus of traditional assessments, which are inappropriate for assessing DBL learning outcomes. Teachers must use alternate modes of evaluation that acknowledge both the process and the final product because DBL projects are collaborative and open-ended.

Teachers should examine students' progress during the design process using formative evaluations. These consist of peer evaluations, reflections, and check-ins that emphasize critical thinking, collaboration, and problem-solving techniques. It is possible to create rubrics to evaluate both individual and group work. Teachers can also give feedback that inspires students to consider how their work relates to practical applications, reflect on their design processes, and pinpoint opportunities for development.

6. Creating an Environment That Encourages Collaboration

Collaboration is one of DBL's main tenets, yet many middle scholars are not used to teamwork or may find interpersonal dynamics difficult. If students are unable to work together effectively or handle disagreement in teams, DBL may not be as beneficial.

Teachers ought to create an environment in the classroom that encourages cooperation and teamwork. This entails establishing precise guidelines for group projects, imparting communication skills, and scheduling team-building exercises. It's critical that teachers help students manage group dynamics and that students comprehend their roles and responsibilities within a group. Students will acquire critical



social-emotional skills including empathy, communication, and conflict resolution in addition to design abilities by creating a collaborative environment.

7. Taking on Real-World Issues

DBL's focus on real-world issue resolution is one of its key characteristics. Without the right background, middle school pupils could find it difficult to relate abstract ideas to real-world uses.

Instructors must look for ways to relate DBL projects to contemporary problems that middle school pupils may relate to. These include problems with the local community, sustainability of the environment, or technological and innovative concerns. Students can obtain important insights and discover the importance of their work by collaborating with professionals from a variety of sectors, such as local engineers, artists, or entrepreneurs. Additionally, field excursions or online conversations with experts can broaden their knowledge and encourage them to consider the potential effects of their designs on society.

Conclusion

By encouraging creativity, teamwork, and practical problem-solving, Design-Based Learning (DBL) has the potential to revolutionize middle school education. However, a number of issues, including inadequate resources, inflexible curricula, teacher readiness, and misaligned assessments, make it difficult to implement effectively. A multidimensional strategy is needed to address these issues, including funding professional development, guaranteeing access to required resources, incorporating DBL into adaptable curriculum frameworks, and encouraging varied learning settings. DBL may be made a sustainable component of the educational environment by coordinating these initiatives with NEP 2020 and SDG 4. DBL can provide students with the abilities they need to thrive in a world driven by innovation by removing these obstacles.

Conflict of interest

Regarding the content, authorship, and publishing of this review, the authors state that they have no conflicts of interest.

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