Design Thinking in High Schools: A Pathway to Innovative Learning and Critical Thinking

1Pooja Satnur, 2Prajyalita Dey, 3Praveetha A, 4Pillari Eshetha Murali, 5Pallavi Singh, 6Nithyasrii P

MBA Students-24-26 Batch, Faculty of Management Studies, CMS Business School, JAIN (Deemed-to-be University), Bangalore

Pooja\_santnur24@cms.ac.in, praveetha\_a24@cms.ac.in, prajyalita\_dey24@cms.ac.in, nithyasrii\_p24@cms.ac.in, pallavi\_singh24@cms.ac.in, pillari\_eshetha34@cms.ac.in

Dr. Pooja Nagpal

Associate Professor, Faculty of Management Studies, CMS Business School,

JAIN (Deemed-to-be University), Bangalore dr.pooja\_nagpal@cms.ac.in

# Abstract

Design Thinking serves as a transformational educational framework that schools adopt for high school to foster creativity together with problem-solving skills and critical thinking among learners. Through Design Thinking students experience learning transformation because it applies experiential approaches that use empathy as well as idea generation and design iteration and testing as systematic steps. Real-world issue collaboration facilitates three key 21st century professional competencies: adaptability, teamwork, and innovation among students. The examination analyzes how Design Thinking approaches in high schools affect student involvement and educational performance alongside academic success. Different institutions have presented successful examples of Design Thinking implementation through case studies but teacher training and curriculum restrictions along with resource challenges have been identified as implementation difficulties. The implementation of Design Thinking in schools leads to improved student involvement and enhanced problem-solving abilities together with enhanced collaboration among students. Public institutions require backing from policymakers together with reforms to generate successful implementation because mass adoption still faces obstacles. To guarantee Design Thinking’s long-term implementation as a vital element in high school teaching the research recommends multiple solutions for addressing the encountered challenges.

***Keywords: Design Thinking, Resilience, Stanford’s, d.school, High Schools***

# Introduction

The human-oriented problem-solving design method called Design Thinking activates creativity together with critical thinking and innovative capabilities. Design Thinking began as a business and technological concept until it started being adopted into education systems

especially at the high school level. The opposite of traditional memorization-based learning pedagogy allows Design Thinking to support active learning through its process of issue empathy followed by solution development and prototype creation and feedback testing. This iterative development process brushes students with vital skills that power the twenty-first century including teamwork abilities and adaptability and tenaciousness. The methodology proves vital for high school students since it defies standardized education while building their ability to tackle authentic problems in life leading them toward future scholarly and professional demands. The Design Thinking approach allows students to develop experimental approaches toward collaboration so they obtain vital lifelong learning skills which enhances their education experience. Design Thinking has been integrated into numerous schools across the world to establish new educational frameworks. The educational model of Design Thinking now benefits high school classrooms through initiatives such as “Design for Change” as well as through Stanford’s d.school institutions. Design Thinking implementations in schools create better student participation and result in creative thinking alongside improved problem-solving skills. Implementation of Design Thinking faces three significant obstacles which include insufficient teaching staff training programs and rigid curriculums as well as limited available resources. Reporting of positive research outcomes from early studies continues while the enduring benefits of Design Thinking implementation in secondary schools remain unproven. Multiple educational institutions generate positive student performance results through their implementation practices yet several institutions face systemic obstacles preventing their implementation. The implementation hurdles have not stopped researchers or teachers from improving Design Thinking processes to become adaptable across multiple educational settings.

# Review of Literature

Design Thinking has become an effective educational method for high schools to improve problem-solving and creativity while advancing cooperative learning practices. The traditional high school learning model depends on teacher lectures along with standardized evaluations because these methods fall short to develop critical evaluation skills and flexibility in modern students. Design Thinking delivers a learning model that operates student-led approaches while enabling high school students to tackle between-discipline applicable practical problems.

Student participation along with motivation increased when schools added Design Thinking to their academic program. Student problem-solving enables both the development of their problem-solving skills and the acquisition of practical life skills including teamwork and empathy and perseverance. Student ideas benefit from the Design Thinking iterative process which enables them to welcome failure to gain knowledge while developing an environment that sustains ongoing enhancement.

# Integration of Design Thinking in High School Education

High schools achieve successful implementation of Design Thinking through their learning frameworks using thorough implementation strategies. Projects that combine multiple disciplines make up most of the sought-after teaching approaches which use group-based work to address interconnecting problems. Design Thinking exists within STEM teaching frameworks at several high schools through implementation of engineering and technological innovation programs. Design Thinking has found a place in both social sciences and humanities since educators apply it to analyze social problems while creating solutions for their communities. Design Thinking shows versatility because institutions apply it successfully in different academic fields. The Stanford d.school K12 Lab pioneered essential educational systems that assist teachers to properly implement Design Thinking programs in secondary education settings (Doorley et al., 2018). These educational institutions monitor enhanced student participation levels and better student achievement results. The success of Design Thinking implementation relies heavily on the quality of professional development received by teachers. Secondary educational institutions which allocate funds for teacher professional development training ensure their instructors maintain the capabilities needed for running Design Thinking workshops. A teaching culture that pools resources leads schools to establish an experimental and innovative climate and develops innovative and creative capabilities in both students and educators.

# Influence on Student Motivation and Learning Results

Design Thinking methods improve learning results and increase student motivational levels. Research indicates that Design Thinking results in better student participation as it generates deeper learning processes in high school educational environments. The passion for exploration and experience through inquiry becomes the foundation of learning under Design Thinking training rather than traditional information dissemination approaches. Design Thinking projects handled by high school students demonstrated a positive influence on both their motivation and engagement and conceptual understanding according to the study conducted by Carroll et al. (2010). Students showed greater learning ownership during situations that allowed them to develop innovative solutions to practical probskill Secondary school students develop their growth mindset through implementation of Design Thinking according to Henriksen et al. (2017). By integrating design cycles within education systems students develop traits of resilience and adaptability toward incidents of failure.

University students and future professionals require these factors specifically because problem- solving together with critical thinking skills form the basis of their professional work. Design Thinking methodology enables better learning outcomes while actively enhancing student motivation within high schools according to relevant research studies. Design Thinking classrooms develop active learning through collaborative exploration and experiential activity instead of traditional passive information delivery. The evaluation from Carroll et al. (2010) established that adolescent students implementing Design Thinking exercises developed enhanced motivation along with better engagement coupled with better conceptual knowledge mastery. The study revealed that students became better learners by receiving permission to tackle actual world problems through innovative methods. According to Henriksen et al. (2017) secondary school students develop growth mindsets through the practice of Design Thinking. Student design experiences through iterations show them to learn from unsuccessful trials which builds their adaptability and their ability to recover from setbacks. Higher education along with future work demands problem-solving and critical thinking abilities because these aspects form crucial educational components.

# Challenges and Barriers to Adoption in High Schools

The inclusion of Design Thinking into high school education creates beneficial effects but produces certain negative aspects. Standards-based curriculum design represents the biggest challenge because it uses pre-determined learning targets together with repetitive exam procedures. The open-ended exploratory learning model of Design Thinking is incompatible with existing assessment frameworks which many high schools maintain. The irregularity in Design Thinking implementation stems from the fact that most teachers do not have formal instruction about its methods. Teachers struggle to use student-led learning properly because educational bodies fail to provide adequate school-based training. Institutions that fail to provide teacher training tend to lose their ability to maintain Design Thinking programs. Resources play a substantial role as a barrier for educational institutions especially those facing budgetary constraints. Certain educational facilities do not possess enough resources as well as technology and workspace to run prototype development and proof of concept testing. The lack of equal access through finances results in educational opportunities that differentiate between students. Another obstacle stands in the way of educational transformation because students and administrators as well as teachers resist moving toward new pedagogies. Traditional academic systems feed from established solutions through formalized curricula yet Design Thinking lets participants tackle uncertain situations while generating innovative approaches. School faculty struggling with cultural changes in order to adopt inquiry-based teaching approaches may resist the transformation process. Successful implementation of Design Thinking in high schools requires policymakers together with schools to take active coordinated measures for overcoming such barriers. Designs in curriculum which allow interdisciplinary project-based learning while abiding by academic requirements represent a crucial method to implement such methods. High schools should adopt hybrid teaching strategies which combine structured classes within experimental hands- on modules. Employment of funds for teacher professional development keeps Design Thinking implementation successfully on track. Professionals need opportunities to absorb expertise through workshops and both mentoring and practice-based learning communities. The education outcomes of Design Thinking will succeed when teachers receive this empowerment through capabilities.

# Objectives:

1. To examine how design thinking fosters creativity, critical thinking, and problem- solving in high school students.
2. To analyze the impact of design thinking on student engagement, collaboration, and learning outcomes.

# Research Methodology

The research will employ secondary data sources, such as:

* Peer-reviewed articles on collaborative learning and design thinking.
* Conference proceedings and books on 21st-century education models.
* Reports from educational institutions like UNESCO and OECD on learning Methodologies.
* Case studies from universities and schools that are using design thinking.
* Online resources such as white papers, government policies, and academic blogs.

# Analysis

The five phase, iterative process of Empathize, Define, Ideate, Prototype, and Test found in Design Thinking offers a solid structure for the overhaul of secondary education.

* 1. **Empathize:** For this context, the phase of empathy calls for a deep look at the daily activities of teachers, pupils, and staff. One can really grasp the emotional, social, and academic landscape of the school not by shallow observation but by active listening, empathetic interviewing, and participatory observation. Rather than assuming students despise STEM subjects, for instance, teachers could conduct thorough interviews to uncover specific challenges such the lack of practical application in everyday life or a sense of difficulty. Teachers can identify subtle signs of disinterest or uncertainty through a study of classroom dynamics; conversations with school administrators can reveal fundamental issues such as lack of funds or academic needs. Knowing these things prepares us to solve the "realworld issues" kids face, therefore making creative thinking projects pertinent and successful.
	2. **Define:** The Define stage turns the accumulated knowledge into definite, practical problem statements. At the high school level, this might mean gathering student feedback to describe problems as How can we make the connection from theoretical learning to practical use? How could we increase a feeling of belonging among different student populations. Such a process crosses over from diffuse worries to a clear issue and enables specific measures to be created. It calls for identifying restrictions in current pedagogy, materials, and curricula that impede educator and student performance. By isolating the exact problem, learners and teachers can aim at their tasks.
	3. **Ideate:** The Ideate phase at last unleashes creative energy by igniting idea generation and original thinking. In the high school setting, this could involve collaborative meetings where pupils and teachers brainstorm different ideas for changed classroom space, interactive learning tools, or new instructional methods. Inviting students to challenge conventional ideas and explore off the beaten path ideas enables teachers to foster an experimental atmosphere. Using graphic aids and mind maps enables students to organize and build their ideas, hence fostering ownership of learning. This phase allows students the freedom to offer solutions related to their own experiences and interests.
	4. **The Prototype phase:** Actualizes these general ideas in practical form. This might entail at high schools producing mock examples of fresh learning materials, creating roleplaying scenarios to test new teaching methods, or building basic models to clarify complex ideas.

For example, students could create a model of an ecologically sustainable city to show their understanding of environmental science, or they could generate a sample lesson plan for a peerled tutorial. This handson approach allows for lowstake testing, whereby pupils can find possible problems and polish their answers before acrosstheboard deployment. By means of prototyping, one develops practical abilities as well as a culture of learning from mistakes.

* 1. **Test phase:** actual use of prototypes and feedback collection. This might involve assessing small group of kids testing secondary school teaching methods, administering student questionnaires to measure the performance of new learning tools, or examining student test results to assess the efficiency of implemented solutions. While quantitative data can reveal trends and patterns, surveys, interviews, and focus groups provide valuable sources of qualitative information. This repeating cycle allows teachers to refine their techniques depending on experimental feedback so that solutions fit the needs of students as well as those of teachers. Feedback from the test phase often calls for a loop back to the Empathize phase to guarantee continuous improvement and polish of the solution. High schools can embrace Design Thinking to create more interactive, effective, and student-centered learning environments by constantly following these five steps, therefore fostering an innovative environment and empowering students to be agents in their own learning.

# Conclusion

Design Thinking is a valuable tool to assist students in building their analytical and creative problem-solving skills. Design Thinking encourages students to find solutions to real life problems instead of memorizing facts. Empathy, concept testing, and brainstorming assist students in building their capacity for creative and out-of-the-box thinking. The most significant benefit of design thinking is the training of students to address problems. They grasp errors as an important part of the learning process instead of fearing failure. This encourages children to have a growth mindset, where they view challenges as opportunities to move forward and do it again. Design thinking also promotes collaboration. Students collaborate, share thoughts, and hear multiple viewpoints. This makes them remember their rightfully critical requirement of effective communication and teamwork to succeed in any area of work. Discussion in groups and problem-solving allow students to combine ideas and value numerous perspectives. Ultimately, individuals who apply design thinking are more innovative, flexible, and future prepared. Enhancing the value and interaction of knowledge ensures students acquire skills related to their eventual employment and learning.

# References

1. Beckman, S., & Barry, M. (2007). Innovation as a learning process: Embedding design thinking. California Management Review, 50(1), 25–56.

1. Brown, T. (2009). Change by Design: How Design Thinking Creates New Alternatives for Business and Society. Harper Business. https://[www.harpercollins.com/products/change-by-design-tim-brown](http://www.harpercollins.com/products/change-by-design-tim-brown)
2. Buchanan, R. (1992). Wicked Problems in Design Thinking. Design Issues, 8(2), 5–

21. https://[www.mitpressjournals.org/doi/abs/10.2307/1511637](http://www.mitpressjournals.org/doi/abs/10.2307/1511637)

1. P. Nagpal, A. Pawar and S. H. M, "Predicting Employee Attrition through HR Analytics: A Machine Learning Approach," 2024 4th International Conference on Innovative Practices in Technology and Management (ICIPTM), Noida, India, 2024,

pp. 1-4, doi: 10.1109/ICIPTM59628.2024.10563285.

1. Brown, T. (2008). Design thinking. Harvard Business Review., 86(6), 84–92.

1. P Nagpal, Avinash Pawar, Sanjay. H.M. (2024). Sustainable Entrepreneurship: Balancing Push and Pull Factors for Customer Loyalty In Organic Product Marketing. African Journal of Biological Sciences (South Africa) 6 (9), 1134-1144. doi: 10.33472/AFJBS.6.9.2024.1134-1144.

1. Carroll, M., Goldman, S., Britos, L., Koh, J., Royalty, A., & Hornstein, M. (2010). Destination, Imagination, and the Fires Within: Design Thinking in a Middle School Classroom. International Journal of Art & Design Education, 29(1), 37–53. https://onlinelibrary.wiley.com/doi/10.1111/j.1476-8070.2010.01632.x

1. Pooja Nagpal (2023). The Impact of High Performance Work System and Engagement. Business Review" Vol17 (1) pp 57-64, ISSN 0973- 9076
2. Goldman, S., Kabayadondo, Z., Royalty, A., Carroll, M., & Roth, B. (2014). Taking Design Thinking to School: How the Technology of Design Can Transform Teachers, Learners, and Classrooms. Routledge.

1. https://[www.routledge.com/Taking-Design-Thinking-to-School/Goldman-](http://www.routledge.com/Taking-Design-Thinking-to-School/Goldman-) Kabayadondo- Royalty-Carroll-Roth/p/book/9781138801749
2. Henriksen, D., Richardson, C., & Mehta, R. (2017). Design Thinking: A Creative Approach to Educational Problems of Practice. Thinking Skills and Creativity, 26, 140–153. https://[www.sciencedirect.com/science/article/pii/S1871187117301342](http://www.sciencedirect.com/science/article/pii/S1871187117301342)

1. 1Madhusudhan R. Urs & Pooja Nagpal (2019). A study on Determinants and Outcomes of Job Crafting in an Organization; Journal of Emerging Technologies and Innovative Research, 7, (15). 145-151. ISSN: 2349-5162

1. Doorley, S., Holcomb, S., Klebahn, P., Segovia, K., & Utley, J. (2018). Design Thinking Bootleg. Stanford d.school. https://dschool.stanford.edu/resources/design-thinking-bootleg

1. Dentoni, D., Cucchi, C., Roglic, M., Lubberink, R., Bender-Salazar, R., & Manyise, T. (2023). Systems thinking, mapping and change in food and agriculture. *Bio-Based and Applied Economics.* <https://doi.org/10.36253/bae-13930>
2. G. Gokulkumari, M. Ravichand, P. Nagpal and R. Vij. (2023). "Analyze the political preference of a common man by using data mining and machine learning," 2023 International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India. doi: 10.1109/ICCCI56745.2023.10128472.
3. F. A. Syed, N. Bargavi, A. et al. (2022). "Recent Management Trends Involved with the Internet of Things in Indian Automotive Components Manufacturing Industries," 2022 5th International Conference on Contemporary Computing and Informatics (IC3I), Uttar Pradesh, India. pp. 1035-1041, doi: 10.1109/IC3I56241.2022.10072565.
4. P. William, A. Shrivastava, et al (2022). "Framework for Intelligent Smart City Deployment via Artificial Intelligence Software Networking," 2022 3rd International Conference on Intelligent Engineering and Management (ICIEM), pp. 455-460, doi: 10.1109/ICIEM54221.2022.9853119.

1. Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The circular economy: A new sustainability paradigm? *Journal of Cleaner Production, 143*, 757– 768.

1. Lockwood, T. (2010). *Design Thinking: Integrating Innovation, Customer Experience and BrandValue*. New York, NY: Allworth Press.
	* <https://en.m.wikipedia.org/wiki/Design-based_learning>
	* <https://en.m.wikipedia.org/wiki/Publicolor> <https://en.wikipedia.org/wiki/If_You_Build_It>
	* [https://www.theguardian.com/education/2024/nov/03/full-steam-ahead-for-creativity-](https://www.theguardian.com/education/2024/nov/03/full-steam-ahead-for-creativity-in-all-subjects) [in-](https://www.theguardian.com/education/2024/nov/03/full-steam-ahead-for-creativity-in-all-subjects) [all-subjects](https://www.theguardian.com/education/2024/nov/03/full-steam-ahead-for-creativity-in-all-subjects)
	* [https://www.ourmidland.com/news/article/impacting-space-travel-local-students-](https://www.ourmidland.com/news/article/impacting-space-travel-local-students-meet-nasa-20055061.php)

[meet-](https://www.ourmidland.com/news/article/impacting-space-travel-local-students-meet-nasa-20055061.php) [nasa-20055061.php](https://www.ourmidland.com/news/article/impacting-space-travel-local-students-meet-nasa-20055061.php)

* + [https://www.couriermail.com.au/news/toowoomba/stem-advanced-manufacturing-](https://www.couriermail.com.au/news/toowoomba/stem-advanced-manufacturing-skills-program-in-darling-downs-schools/news-story/31cb79d4721582b3514e66424621be0a) [skills-](https://www.couriermail.com.au/news/toowoomba/stem-advanced-manufacturing-skills-program-in-darling-downs-schools/news-story/31cb79d4721582b3514e66424621be0a) [program-in-darling-downs-schools/news-](https://www.couriermail.com.au/news/toowoomba/stem-advanced-manufacturing-skills-program-in-darling-downs-schools/news-story/31cb79d4721582b3514e66424621be0a) [story/31cb79d4721582b3514e66424621be0a](https://www.couriermail.com.au/news/toowoomba/stem-advanced-manufacturing-skills-program-in-darling-downs-schools/news-story/31cb79d4721582b3514e66424621be0a)
	+ Harvard Graduate School of Education, Teaching and Learning Lab. Design Thinking in Education. <https://tll.gse.harvard.edu/design-thinking>