Stochastic Modelling and Computational Sciences

INTEGRATING EXPERIENTIAL LEARNING STRATEGIES INTO MATHEMATICS EDUCATION: ALIGNING WITH THE GOALS OF NEP 2020

Dr. Reeta Rana[1] and Ms. Rachna Desai[2]
[1]Program Coordinator - B.Sc. Data Science, S. K. College of Science and Commerce
[2]HOD, Department of Accounting & Finance
[2]skc. rachna@ gmail.com

ABSTRACT
The National Education Policy (NEP) 2020 in India heralds a transformative vision for education, emphasizing holistic development, critical thinking, and experiential learning. This paper explores the integration of experiential learning strategies into mathematics education and examines its alignment with the goals of NEP 2020. By reviewing literature, analysing educational practices, and considering policy implications, this research elucidates the benefits, challenges, and opportunities of incorporating experiential learning in mathematics instruction. Furthermore, it investigates how experiential learning resonates with the overarching objectives of NEP 2020, including promoting active learning, enhancing conceptual understanding, and fostering creativity and innovation.

Keywords: Experiential Learning, Mathematics Education, National Education Policy 2020, Holistic Development, Critical Thinking, Active Learning, Skill Development, Pedagogical Methods, Policy Implications.

1. INTRODUCTION
Experiential learning is a learning approach that emphasizes the direct engagement of learners with hands-on experiences, reflection, and application of knowledge gained from those experiences. It is rooted in the philosophy that individuals learn best when they actively participates in activities, reflect on their experiences, and apply their learning to real-world situations. Key components of experiential learning include:

- **Engagement:** Learners are actively involved in the learning process through first-hand experiences, rather than passive reception of information.
- **Reflection:** Learners reflect on their experiences, analyse what they have learned, and consider how their experiences relate to their existing knowledge and beliefs.
- **Application:** Learners apply their newfound knowledge and skills to solve problems, make decisions, or undertake tasks in practical settings.

Experiential learning can take various forms, including internships, fieldwork, simulations, experiments, projects, role-playing activities, and group discussions. It is often employed in educational settings to enhance critical thinking, problem-solving abilities, collaboration, and communication skills among learners. Moreover, experiential learning is valued for its ability to make learning more relevant, engaging, and memorable for students by connecting theoretical concepts to real-life contexts.

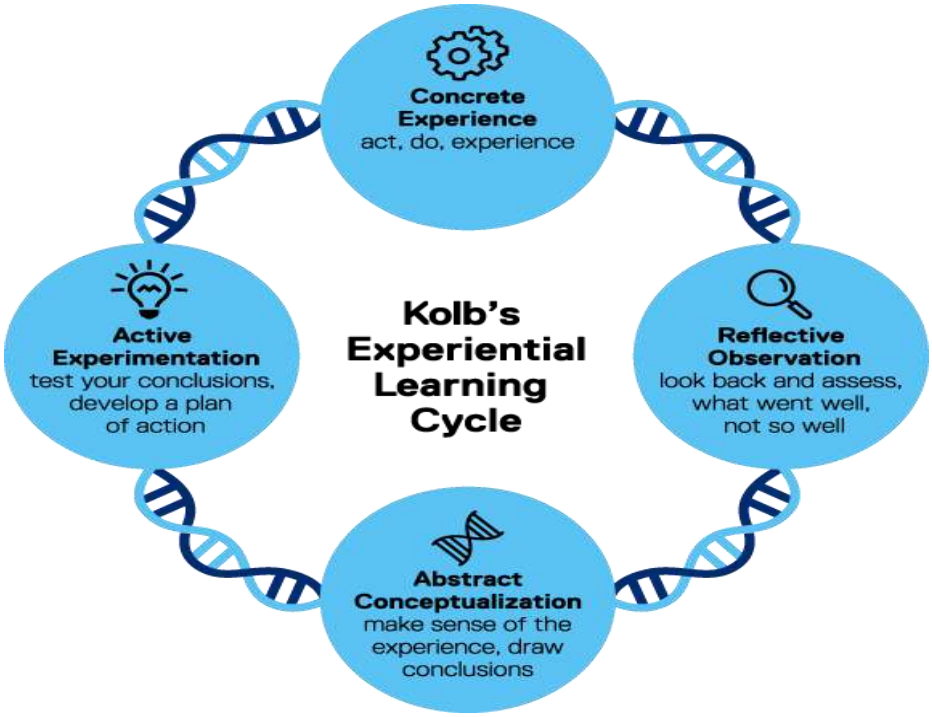

Figure1: Kolb's Experiential Learning Cycle

Image Courtesy: https://www.torontomu.ca/experiential-learning/faculty-staff/kolbs-el-cycle/

2. EXPERIENTIAL LEARNING STRATEGIES INTO MATHEMATICS

Here are several effective ways to incorporate experiential learning into mathematics instruction:

- **Hands-On Manipulatives:** Utilize physical objects and manipulatives to help students visualize abstract mathematical concepts.
- **Real-World Applications:** Connect mathematical concepts to real-world contexts and applications to make learning more relevant and meaningful for students.
- **Project-Based Learning (PBL):** Implement project-based learning activities that allow students to investigate mathematical phenomena, conduct experiments, and solve complex problems.
- **Mathematical Modelling:** Introduce mathematical modelling as a problem-solving approach where students create mathematical representations of real-world situations.
- **Technology-Enhanced Learning Tools:** Interactive whiteboards, graphing calculators, educational software, and online tutorials provide students with interactive learning experiences and immediate feedback on their mathematical explorations.

By incorporating experiential learning strategies into mathematics instruction, educators can create engaging and meaningful learning experiences that promote deep conceptual understanding, critical thinking skills, and lifelong mathematical proficiency among students.

3. OBJECTIVES

➢ **Research Query**

- What is the overview of NEP 2020 on mathematics?
- Why there is a need for changes in the education policy?

➢ **Main Objectives**

- To ascertain the significance impact of NEP in transforming Higher education in view of global parameters
- To determine the impact of experiential learning strategies on Mathematics in Higher education.

➢ **An Overview of NEP 2020 on Mathematics**

The National Education Policy (NEP) 2020 is a comprehensive framework aimed at reforming the education system in India. The policy highlights the importance of foundational learning in mathematics at the early stages of schooling. It emphasizes the need for conceptual understanding, problem-solving skills, and application-based learning rather than rote memorization of formulas and procedures.

Mathematics education plays a crucial role in fostering these skills as it involves logical reasoning, analysis, and problem-solving strategies. The policy encourages experiential and hands-on learning approaches. In mathematics, this could involve practical activities, mathematical modelling, experiments, and real-life problem-solving scenarios to make learning more engaging and relevant. In mathematics, technology tools such as graphing calculators, dynamic geometry software, and educational apps can enhance learning experiences, visualization, and understanding of abstract concepts.

The policy emphasizes the importance of continuous teacher training and professional development programs to enhance teaching practices in mathematics. Teachers need support and resources to adopt innovative pedagogies, integrate technology, and address diverse learning needs effectively. NEP 2020 proposes reforms in assessment practices to focus on holistic development, competency-based learning, and reducing exam stress. Assessment in mathematics should go beyond memorization and rote learning to evaluate students' conceptual understanding, problem-solving abilities, and application skills. The policy encourages research, innovation, and interdisciplinary collaboration in education.

In mathematics, this could involve research in pedagogy, curriculum development, educational technology, and addressing challenges in teaching and learning mathematics effectively. In summary, while NEP 2020 doesn't provide a specific section dedicated solely to mathematics, its principles and objectives have implications for mathematics education by promoting a more holistic, experiential, and inclusive approach to teaching and learning mathematics at all levels of education.

➢ **Need for Changes in the Education Policy**

There are several reasons why there is a need for changes in education policy:

- **Evolving Needs:** Society and the economy are constantly evolving. The skills and knowledge required for success in the modern world are different from those needed in the past. Education policy must adapt to ensure that students are prepared for the challenges and opportunities of the 21st century.
- **Globalization:** In an increasingly interconnected world, students need to be prepared to compete in a global marketplace. Education policy may need to emphasize international perspectives, cultural understanding, and language skills.
- **Research and Best Practices:** As our understanding of learning and pedagogy evolves, education policy should reflect the latest research and best practices in teaching and learning. This may involve revising curriculum standards, updating teacher training programs, and promoting evidence-based practices in schools.
- **Preparing for the Future Workforce:** The jobs of the future may require skills such as critical thinking, creativity, collaboration, and problem-solving. Education policy needs to emphasize these skills and prepare students for the changing demands of the workforce.

Overall, changes in education policy are essential to ensure that our education system remains relevant, effective, and equitable in preparing students for success in the modern world.

4. FRAME WORK

H_1: NEP is transforming higher education in view of global parameters.

H_2: NEP will have positive impact of experiential learning strategies on Mathematics in higher education.

H_3: Experiential Learning Strategies affects Global Parameters and vice-versa.

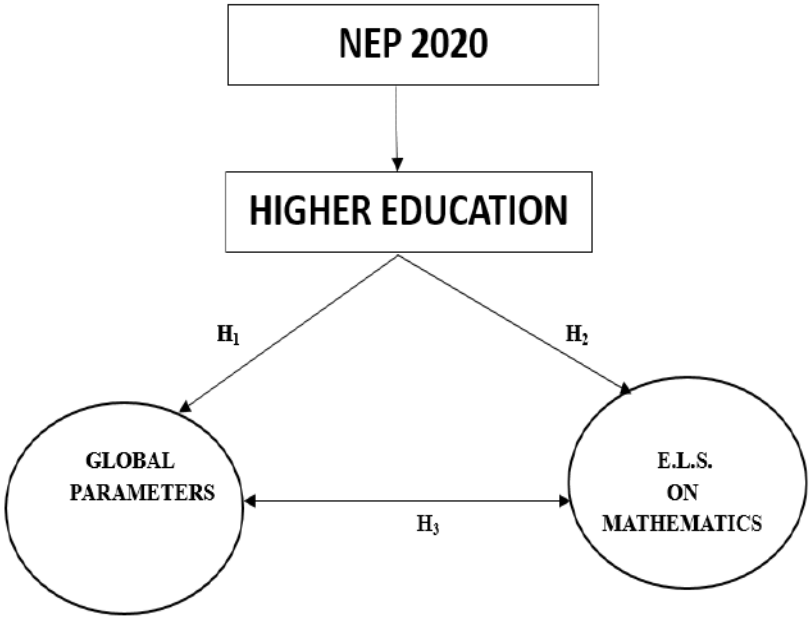

Figure 2: Proposed Research Model

5. RESEARCH METHODOLOGY

- This research employs both primary and secondary data sources. Primary data was obtained through a questionnaire distributed via Google Forms to respondents, resulting in a sample size of 208 teachers and faculty members from higher education institutions. The data underwent a three-stage analysis process, including demographic analysis, descriptive analysis utilizing mean scores, and inferential analysis using SPSS software.
- Secondary data was sourced from the NEP 2020 by the Ministry of Human Resource Development, utilizing convenience sampling as the method of sampling.

6. RESULTS

- **Reliability:** The summary statistics of formal survey are shown in Table. For reliability evaluation, I utilized Cronbach's alpha. The Cronbach's alpha reliability of all variables are more than 0.7 (α>0.7), which indicates all the scales demonstrate good reliability.

The Table 1 shows the demographic data of respondents' in view of gender, discipline, qualification, years of experience and designation respectively.

Table1: Demographic Profile of the Respondents

Sr. No.	Variable	Number of Respondents	Percentage
1.	**Gender**		
	Male	98	47%
	Female	110	53%
2.	**Discipline**		
	Arts	44	21%

	Science	96	46%
	Commerce	68	33%
3.	**Qualification**		
	Graduate	37	17%
	Post-graduate	116	55%
	Ph.D.	55	26%
4.	**Years of Experience**		
	0-5 Years	42	20%
	5-10 Years	98	47%
	More than 10 Years	68	32%
5.	**Designation**		
	Assistant Professor	84	40%
	Associate Professor	82	39%
	Professor	42	20%

Table 2 shows the opinions of the respondent's w.r.t the need for changes in the Education Policy. The high positive percentage clearly depict that the NEP will improve life skills, education standard, optimum use of technology, education system flexible and research culture.

Table 2: Responses in view of the need for changes in the Education Policy

Sr. No.	Particulars	Positive Response (%)	Negative Response (%)	Neutral
EP1	The NEP enhance life skills to meet industry requirement.	69%	39%	25%
EP2	The NEP will improve education standard.	70%	15%	29%
EP3	In NEP there will be optimum use of technology	20%	35%	44%
EP4	The multiple entry and exit options for students will make education system flexible.	68%	18%	12%
EP5	NEP will increase research culture in INDIA.	41%	37%	21%

From the Table 3 we can understand, The high mean range among the dimensions clearly depict that the NEP will improve the education system in India with the overall mean score at 2.530 which is clearly reflective and indicative of the same. Most are of the opinion that it is a positive step towards improvement in the education system of India mean value of 2.09. It is also reflective of the opinion that it will enable overall enhance life skills to meet industry requirement of our students (mean = 2.19) and the multiple entry and exit options will make education system more flexible (mean = 2.14). On the scale Statistics, the mean is 12.65, standard deviation is 5.4 and Cronbach's Alpha is 0.854.

Table 3: Mean Value and Standard Deviation score of the need for changes in the Education Policy

Item Statistics			
	Mean	**Std. Deviation**	**N**
EP1	2.19	1.347	208
EP2	2.09	1.242	208
EP3	3.25	1.257	208
EP4	2.14	1.420	208

EP5	2.98	1.511	208

- **Internal Consistency of the Theoretical Model:** The internal consistency of a theoretical model refers to the coherence and logical alignment of its components, assumptions, and propositions within the framework of the model itself.

Table 4 shows the opinions of the respondent's w.r.t the NEP in transforming higher education in view of global parameters. The high positive percentage clearly describe that the NEP will align with global standards, ensures higher education institutions remain competitive on a global scale, will promote interdisciplinary studies, will stop people to go abroad for studies and job and will also attract foreign universities to India.

Table 4: Responses towards NEP in transforming higher education in view of global parameters

Sr. No.	Particulars	Positive Response (%)	Negative Response (%)	Neutral
GP1	NEP address the need for alignment with global standards and best practices in higher education.	68%	18%	12%
GP2	NEP ensure that Indian higher education institutions remain competitive on a global scale.	68%	19%	12%
GP3	NEP promote interdisciplinary studies and curriculum flexibility to meet the evolving demands of global industries and academia.	67%	18%	13%
GP4	The implementation of the NEP it is expected that less people will move abroad for studies and job.	74%	11%	13%
GP5	NEP to attract foreign students and faculty, fostering a diverse and inclusive academic environment.	41%	37%	21%

Table 5 shows the opinions of the respondent's w.r.t experiential learning strategies which have impact on understanding of mathematical concepts, good quality creative and critical thinking, problem-solving skills etc.

Table 5: Responses towards to determine the impact of experiential learning strategies on Mathematics in higher education

Sr. No.	Particulars	Positive Response (%)	Negative Response (%)	Neutral
MHE1	Experiential learning strategies have impacted your understanding of mathematical concepts	74%	11%	13%
MHE2	Experiential learning strategies on Mathematics develops good quality creative and critical thinking in individuals.	68%	18%	12%
MHE3	Experiential learning activities enhanced your problem-solving skills in mathematics	67%	18%	13%
MHE4	Experiential learning activities have contributed to your interest in pursuing further studies or careers related to mathematics.	69%	18%	12%
MHE5	Experiential learning strategies increase your engagement and motivation to learn mathematics.	68%	19%	12%

Table 6 illustrates the transformative impact of the NEP on higher education within global contexts. The data reveals that the NEP is poised to enhance the adoption of global standards and best practices, as indicated by a

mean score of 2.09, underscoring its significant influence. There is a prevailing sentiment that Indian higher education institutions can maintain competitiveness on a global scale, with a mean value of 2.14. Furthermore, there is optimism regarding the NEP's potential to facilitate interdisciplinary studies and offer curriculum flexibility to align with the evolving needs of global industries and academia, reflected by a mean score of 2.06. Moreover, there is anticipation that fewer individuals will seek education and employment opportunities abroad (mean = 1.88), potentially stemming brain drain. The NEP is also anticipated to attract foreign students and faculty, fostering a diverse and inclusive academic environment, as evidenced by its notably high mean score of 2.98 across the aforementioned aspects. In terms of statistical analysis, the data presents a mean of 11.15, a standard deviation of 1.511, and a Cronbach's Alpha value of 0.905, surpassing the threshold of 0.7 and indicating high significance.

Table 6: Internal Consistency of the Theoretical Model

Variable	Indicator	Mean	Standard Deviation	Cronbach's Alpha
Global Parameters	GP1	2.09	1.357	--------
	GP2	2.14	1.420	--------
	GP3	2.06	1.323	--------
	GP4	1.88	1.160	---------
	GP5	**2.98**	**1.511**	----------
	Scale Statistics	**11.15**	**5.785**	**0.905**
Experiential Learning Strategies on Mathematics	MHE1	1.88	1.160	--------
	MHE2	2.09	1.357	--------
	MHE3	2.06	1.323	--------
	MHE4	**2.19**	**1.347**	---------
	MHE5	2.14	1.420	----------
	Scale Statistics	**10.36**	**6.224**	**0.967**

Regarding the impact of experiential learning strategies on Mathematics within higher education, the data indicates that these strategies have not significantly affected one's comprehension of mathematical concepts (mean = 1.88). However, they do foster high-quality creative and critical thinking skills in individuals (mean = 2.09), enhance problem-solving abilities in mathematics (mean = 2.06), and notably increase interest in pursuing further studies or careers related to mathematics (mean = 2.19), which stands out as the highest mean among all factors. Additionally, experiential learning strategies improve engagement and motivation to learn mathematics (mean = 2.14). In terms of statistical analysis, the data presents a mean of 10.36, a standard deviation of 6.224, and a Cronbach's Alpha value of 0.967, which significantly exceeds the 0.7 threshold, indicating strong internal consistency.

- **Correlation between Experiential Learning Strategies and Global Parameters**

Experiential learning strategies indeed have a reciprocal relationship with global parameters. As educational methodologies evolve to incorporate experiential learning, they reflect and respond to the demands of a rapidly changing global landscape. Experiential learning emphasizes practical, hands-on experiences that enable learners to engage directly with real-world challenges and contexts.

Table 7: Correlation between Experiential Learning Strategies and Global Parameters

		GP1	GP2	GP3	GP4	GP5
MHE1	Pearson Correlation	.808**	.802**	.751**	1.000**	.290**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
MHE2	Pearson Correlation	1.000**	.983**	.939**	.808**	.432**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
MHE3	Pearson Correlation	.939**	.926**	1.000**	.751**	.378**

	Sig. (2-tailed)	.000	.000	.000	.000	.000
MHE4	Pearson Correlation	.900**	.879**	.836**	.701**	.415**
	Sig. (2-tailed)	.000	.000	.000	.000	.000
MHE5	Pearson Correlation	.983**	1.000**	.926**	.802**	.416**
	Sig. (2-tailed)	.000	.000	.000	.000	.000

On one hand, global parameters such as technological advancements, economic shifts, cultural diversification, and environmental concerns influence the design and implementation of experiential learning strategies. Educators often integrate global perspectives, cross-cultural experiences, and emerging trends into experiential learning frameworks to prepare students for the complexities of a globalized world.

7. FINDINGS

Table 8: Results of Model

Hypothesis	Structural Relationship	Standardized Coefficient β	t-value	Sig.	Result
H1: NEP is transforming higher education in view of global parameters.	NEP→ Global Parameters	0.944	-4.819	0.000	Accepted
H2: NEP will have positive impact of experiential learning strategies on Mathematics in higher education.	NEP → E.L.S on Mathematics	0.913	-6.571	0.000	Accepted
H3: Experiential Learning Strategies affects Global Parameters and vice-versa.	E.L.S ↔ Global Parameters	0.969	9.430	0.000	Accepted

- According to the policy, higher education will take on a new vision and infrastructure with big, thriving, multidisciplinary institutions that are well-resourced and strive for excellence.
- The strategy offers a liberal education with a broad focus through flexible yet comprehensive curriculum, innovative course combinations, integrated vocational education, and various points of entry and exit.

➢ **Effect of NEP on Mathematics:** The NEP acknowledges the use of mathematical expertise to establish the nation as a "Vishwaguru." All of these technologies that are necessary in today's world, such as data analysis, artificial intelligence, and machine learning, are believed to have had their foundation in mathematics. Under the direction of NEP-2020, it appears that Indian mathematics and the most recent educational system will "Rock" in the future. Each of these policy's notions functions as a keystone for a developing nation.

8. CONCLUSION

Upon investigating the necessity of experiential learning in light of NEP 2020, the researcher discovered numerous beneficial benefits. The study looked into a number of crucial areas for experiential learning in real classroom settings, which can undoubtedly support students' growth in creativity, critical thinking, interaction with real-world events, and concept comprehension.

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