Mathematics Teaching Competency of Secondary School Teachers with Reference to Competency-Based and Experiential Learning Practices under NEP 2020

Md. Murtuza[1], Dr. Laxmi Rani[2]
[1]*Research Scholar Department of Education, B.R.A.B.U,Muzaffarpur, –842001*
[2]*Associate Professor of Psychology, M.S.K.BCollege,B.R.A.B.U.Muzaffarpur*

***Abstract*—The National Education Policy (NEP) 2020 has inaugurated a fundamental paradigm shift in Indian school education by mandating competency-based education (CBE) and experiential learning asthecornerstonesofcurricularandpedagogicalpractice.InMathematicseducationatthesecondary level, this transition demands a qualitative transformation in teacher competency encompassing content knowledge, pedagogical skill and the capacity to design and deliver activity-based, inquiry-centered and real-world learning experiences. The present study examines and compares the mathematics teaching competency of secondary school teachers in Muzaffarpur Division, with specific reference to their preparedness for NEP 2020-aligned practices. Employing a descriptive-comparative survey design, 25 teachers each were sampled from government and private secondary schools (n = 50) through purposive-cum-random sampling. A standardized, self-constructed Mathematics Teaching Competency Rating Scale (MTCRS) with established validity and reliability (Cronbach α = 0.84) served as the primary instrument. Three research objectives and corresponding null hypotheses were formulated. Independent samples t-tests and Pearson's Product Moment Correlation were used for data analysis. Results reveal statistically significant differences between government and private school teachers across all competency dimensions: content knowledge, pedagogical skills, experiential learning integration and overall CBE competency. Private school teachers demonstrated significantly higher competency levels.**

***Index Terms*—Mathematics teaching competency, NEP 2020, competency-based education (CBE), experiential learning, secondary school teachers, Muzaffarpur, government vs. private schools.**

I. INTRODUCTION

Mathematics occupies a foundational and irreplaceable position in secondary school curricula worldwide. Beyond its disciplinary content, Mathematics education cultivates logical reasoning, quantitative literacy, spatial thinking and systematic problem-solving capacities that are indispensable in contemporary knowledge economies and democratic societies (Boaler, 2016; NCERT, 2006). Despite its acknowledged importance, Mathematics continues to be one of the subjects most associated with chronic under achievement, student anxiety and rote-learning orientations at the secondary level in India. Annual Status of Education Reports (ASER, 2019; 2022) has consistently documented alarming learning deficit levels in foundational numeracy and applied Mathematics across government schools in states including Bihar, Uttar Pradesh and Jharkhand.

These entrenched challenges have catalyzed significant shifts in national educational thinking, culminating in the landmark National Education Policy2020 (Government of India,2020). NEP2020 represents India's most comprehensive educational reform in three decades, departing decisively from content-heavy, examination-driven and textbook-centric curricula towards a system grounded in competency-based learning (CBL), critical thinking, creative problem-solving and real-world application. The policy explicitly advocates that education at every level should be oriented towards the holistic development of core competencies, life skills and experiential understanding rather than passive transmission and mechanical reproduction of facts and procedures.

For Mathematics specifically, NEP 2020 envisions a pedagogy where students construct mathematical understanding through exploration, discovery, manipulative-based instruction, project work,

mathematical modeling and contextualized problem-solving rather than through rote drill and algorithmic practice divorced from meaning (NCERT,2023;Sharma&Singh,2021).The realization of this vision depends critically on the competency and readiness of Mathematics teachers .A teacher's ability to design experiential tasks, facilitate inquiry-based and collaborative learning, apply varied formative assessment strategies and adapt instruction to diverse learner needs constitutes the real bridge between policy aspiration and classroom reality.

Muzaffarpur presents a microcosm of the broader challenges confronting Mathematics education in educationally disadvantaged regions of India. The division is characterized by significant socio-economic heterogeneity, a pronounced urban-rural divide and a sharply bifurcated school system government schools serving the majority of students from economically weaker sections and private schools catering primarily to urban and upper-middle-class families. Examining how secondary school Mathematics teachers in this context are equipped or unequipped—to meet the demands of NEP2020 is both timely and policy-relevant. The present study is accordingly designed to investigate and compare the mathematics teaching competency of government and private school teachers in Muzaffarpur Division across the key dimensions specified in the NEP 2020 framework.

II. OBJECTIVES OF THE STUDY

On the basis of the review of literature and relevant studies following objectives were set:

- To examine and compare the overall mathematics teaching competency of secondary school teachers in government and private schools of Muzaffarpur Division, with reference to NEP 2020 competency frameworks.
- To investigate and compare the extent of integration of experiential learning practices.
- To assess and compare the level of adoption of competency-based education (CBE) practices in mathematics teaching among government and private secondary school teachers of Muzaffarpur Division in mathematics classrooms of government and private secondary schools of Muzaffarpur Division.

Hypotheses of the Study:

The following null hypotheses were formulated and tested at the 0.05level of significance:

- There would be no statistically significant difference in the overall mathematics teaching competency between secondary school teachers of government and private schools in Muzaffarpur Division.
- There would be no statistically significant difference in the adoption of competency-based education (CBE) practices between mathematics teachers of government and private secondary schools in Muzaffarpur Division.
- There would be no statistically significant difference in the integration of experiential learning practices in mathematics teaching between government and private secondary school teachers in Muzaffarpur Division.

III. METHODOLOGY

Research Design:

The present study employed a descriptive-comparative survey design, which is appropriate for systematically examining and comparing characteristics of two naturally occurring groups without experimental manipulation. This design is particularly suited to educational research scenarios where the investigator seeks to describe the existing state of a phenomenon and compare it across groups defined by a categorical variable in this case, school management type (government vs. private).

Sample and Sampling Technique

The target population comprised all secondary school Mathematics teachers (teaching Classes IX and X) employed in recognised secondary schools in Muzaffarpur Division, during the academicyear2023–24. Employing a purposive-cum-random sampling strategy, four government and five private secondary schools were selected from urban, semi-urban and rural zones of the division to ensure geographic representativeness. From each selected school, five Mathematics teachers were taken through simple random sampling, yielding a final sample of 50 teachers.

Research Instruments

A mathematics Teaching Competency Rating Scale

(MTCRS) was developed by the investigators, grounded in the NCTE (2010) National Curriculum Framework for Teacher Education, the NCF 2005 Mathematics pedagogy guidelines (NCERT, 2006) and the specific competency dimensions articulated in NEP 2020 (GoI, 2020

All three hypotheses were rejected at $p < 0.05$. H_o1 (Overall Teaching Competency) yielded $t = 3.64$, substantially exceeding the critical value, confirming a significant difference in overall mathematics teaching competency favouring private school teachers. H_o2 was rejected ($t = 3.03, p=0.004$), establishing significant differences in CBE adoption. $H_o3$was also rejected ($t=3.51$, $p<0.001$), confirming that private school teachers integrate experiential learning practices to a significantly greater extent.The effect sizes for all three comparisons were large (Cohen's $d > 0.8$), indicating practical as well as statistical significance.

Strong and statistically significant positive correlations were found among all competency dimensions. The highest correlation was found between Pedagogical Skills and Overall CBE Competency ($r = .83$, $p < 0.01$), followed by Experiential Learning and Overall CBE Competency ($r = .81$, $p < 0.01$) and Experiential Learning and Pedagogical Skills ($r= .72$, $p < 0.01$). The lowest—though still substantial—correlation was between Content Knowledge and Experiential Learning ($r = .57$, $p < 0.01$). These findings confirm that mathematics teaching competency is not a unidimensional construct; its constituent dimensions are deeply interdependent. Teachers who demonstrate strong content knowledge are more likely to employ sophisticated pedagogical strategies and in turn, more capable of designing and delivering experiential learning activities.

IV. DISCUSSION

The findings of this study converge with and substantively extend the existing empirical literature on mathematics teaching competency and NEP2020readiness in Indian secondary schools. The statistically significant and practically large differences observed between government and private school teachers across all competency dimensions are consistent with the findings of Sharma and Singh (2021), Aggarwal and Bansal (2022) and Gupta (2023), who similarly reported higher CBE readiness among private school teachers. The present study provides additional specificity by locating these differences within the Muzaffarpur Division context and by employing a purpose-built instrument calibrated to NEP 2020 competency requirements.

The particularly alarming finding of below-average government school teacher competency in Experiential Learning ($M = 2.96$) corroborates the observations of Jha and Mishra (2022) regarding the state of activity-based mathematics teaching in Bihar's government school system. It reflects a structural deficit rooted not simply in teacher unwillingness but in the absence of enabling conditions: manipulative kits and project materials, supportive school leadership, reduced administrative burdens and access to professional development focused on experiential methodologies. This finding underscores that NEP2020's experiential learning vision faces serious implementation barriers in the government school sector that cannot be addressed through curriculum revision alone.

The strong inter-correlations among competency dimensions carry important implications for professional development programme design. They confirm that content knowledge, pedagogical skill and experiential learning capacity are not separable silos but constitute a unified professional knowledge system consistent with Ball et al.'s (2008) MKT framework and Mishra and Koehler's (2006) TPACK model. Any professional development intervention that targets only one dimension in isolation is therefore unlikely to yield substantive improvements in mathematics teaching quality

Holistic, integrated in-service programmes that simultaneously develop teachers' subject-matter depth, pedagogical repertoire and experiential facilitation skills are most likely to produce meaningful impact.

The findings also raise broader questions about equity in the implementation of NEP 2020. If the transformation envisioned by the policy is only realised in private schools serving privileged populations, while government schools serving economically disadvantaged students remain trapped in conventional, low-quality instructional modes, the policy risks deepening rather than reducing educational inequality. This equity dimension makes the competency gap documented in this study not

merely an academic finding but a matter of urgent social justice concern.

V. CONCLUSION

NEP 2020 articulates an ambitious, pedagogically sound and equity-oriented blueprint for transforming Mathematics education in India. Its success, however, depends fundamentally on the competency and readiness of the teachers entrusted with its implementation. The present study, conducted across government and private secondary schools in Muzaffarpur Division, a region emblematic of the broader challenges confronting Mathematics education in rural and semi-urban India demonstrates that a significant practically large competency gap exists between government and private school Mathematics teachers, particularly in the dimensions of experiential learning integration and overall CBE competency. All the hypotheses were rejected and the strong inter-correlations among competency dimensions confirm the holistic, integrated nature of effective mathematics teaching competency. These findings call for a convergence of policy will institutional investment and sustained professional development action to ensure that the transformative vision of NEP 2020 is equitably realised across all school types and socio-economic contexts leaving no teacher and ultimately no learner, behind.

REFERENCES

[1] Aggarwal, S., & Bansal, R. (2022). NEP 2020 readiness among school teachers: A comparative study of government and private schools in urban India. Indian Journal of Teacher Education, 14(1), 33–52.

[2] ASER Centre. (2019). Annual Status of Education Report (Rural) 2019. Pratham Education Foundation.

[3] ASER Centre. (2022). Annual Status of Education Report (Rural) 2022. Pratham Education Foundation.

[4] Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? Journal of Teacher Education, 59(5), 389–407. https://doi.org/10.1177/0022487108324554

[5] Boaler, J. (2016). Mathematical mindsets: Unleashing students' potential through creative math, inspiring messages, and innovative teaching. Jossey-Bass.

[6] Desai, P., & Mehta, S. (2021). Teacher competency in competency-based education and its relationship to student achievement in mathematics: A study of CBSE schools. Journal of Educational Research and Evaluation, 5(2), 88–102.

[7] Dewey, J. (1938). Experience and education. Macmillan.

[8] Furner, J. M., & Kumar, D. D. (2007). The mathematics and science integration argument: A stand for teacher education. Eurasia Journal of Mathematics, Science and Technology Education, 3(3), 185–189.

[9] Government of India. (2020). National Education Policy 2020. Ministry of Education.

[10] Gupta, R. (2023). NEP 2020 and mathematics pedagogy: A gap analysis of urban and rural secondary school teachers in Bihar. Indian Educational Review, 61(1), 45–62.

[11] Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. American Educational Research Journal, 42(2), 371–406.

[12] Jha, A., & Mishra, P. (2022). Activity-based mathematics teaching competency of secondary school teachers in Bihar: An empirical study. Journal of Educational Research and Practice, 12(3), 211–228.

[13] Kalaivani, M., & Rajendran, V. (2020). Experiential learning competency and student achievement in higher-order mathematical thinking. Educational Sciences: Theory & Practice, 20(4), 78–94.

[14] Kingdon, G. G. (2017). The private schooling phenomenon in India: A review. Journal of Development Studies, 53(10), 1605–1624.

[15] Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Prentice Hall.

[16] Kumar, K. (2010). Quality of education at the time of independence: A critical assessment. Social Scientist, 38(7/8), 3–22.

[17] Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017–1054.

[18] National Council of Educational Research and Training. (2006). National Curriculum Framework 2005.
[19] National Council of Educational Research and Training. (2023). National Curriculum Framework for School Education 2023.
[20] National Council for Teacher Education. (2010). National Curriculum Framework for Teacher Education.
[21] Schwartz, R. (2016). Competency-based education: Helping more students succeed. Voices in Education, Harvard Kennedy School. Retrieved from https://www.hks.harvard.edu/faculty-research/policy-topics/education/competency-based-education
[22] Sharma, V., & Singh, M. (2021). Competency-based education under NEP 2020: Challenges and prospects for teacher preparation in India. Contemporary Education Dialogue, 18(2), 145–168.
[23] Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1–22.