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The Mediating Role of Learning Strategies in the Relationship between Cognitive Flexibility and Reflective Thinking among Pre-Service Teachers: A Path Analysis Approach

ABSTRACT

Reflective thinking is widely regarded as a fundamental element in teacher preparation, as it encourages self-awareness, informed decision-making, and sustained professional development. While the value of reflective thinking is well established, limited empirical research focuses on how cognitive flexibility contributes to its development. Additionally, the role of learning strategies as a potential mediator in this relationship remains underexplored—particularly within the context of pre-service teacher education. To address this gap, the present study examined whether learning strategies mediate the relationship between cognitive flexibility and reflective thinking among pre-service teachers. The researchers employed a descriptive research design and gathered data using simple random sampling from a sample of 450 pre-service teachers enrolled in bachelor of education programs across government and government-aided institutions in Punjab, India. Data collection involved the use of three validated instruments: the Reflective Thinking Scale, the Learning Strategies Scale and the Cognitive Flexibility Inventory. Correlation analysis indicated strong positive relationships among all three constructs, with cognitive flexibility showing the strongest association with reflective thinking ($r = .860$, $p < .001$). Further, multiple regression analysis revealed that both cognitive flexibility and learning strategies significantly predicted reflective thinking, together explaining 74.2% of the variance. Mediation analysis confirmed that learning strategies partially moderated the relationship between cognitive flexibility and reflective thinking. The findings underscore the significance of cognitive flexibility and strategic learning in enhancing reflective practice across diverse educational settings, informing instructional design and policy development.

KEYWORDS

reflective thinking, learning strategies, cognitive flexibility, pre-service teachers

INTRODUCTION

Reflective thinking is integral to teacher education, empowering pre-service teachers to become self-aware, responsive, and effective practitioners. Through reflection, pre-service teachers critically assess their instructional experiences, evaluate the impact of their teaching practices, and make informed decisions with the aim to enhance future pedagogical approaches (Gurol 2011; Pedro 2005). This process supports the development of professional judgment and adaptive expertise, enabling educators to navigate diverse classroom dynamics thoughtfully.

Despite its recognized importance, the cognitive and strategic factors contributing to the development of reflective capacity are not fully understood. Among these, cognitive flexibility and learning strategies are particularly pertinent. Cognitive flexibility involves the mental ability to shift perspectives, adapt thinking in response to novel information, and modify strategies when faced with changing circumstances (Fuchs, Benkova, Fishbein, and Fuchs 2023; Canas, Fajardo, and Salmeron 2006). This capacity is essential in dynamic educational contexts where teachers must interpret complex classroom interactions, accommodate individual student needs, and adapt to changing curricular or institutional demands (Huizinga, Smidts, and Ridderinkh 2014).

Equally important are the learning strategies employed to acquire, organize, and apply knowledge. These encompass a range of cognitive and metacognitive processes, including planning, monitoring, evaluating, and regulating one's own learning (Brandt 2000; Derry 2013). In teacher education, such strategies underpin self-regulated learning; they enable future educators to take ownership of their academic and professional development. Effective learning strategies have been linked to improved academic performance, deeper understanding, and enhanced ability to transfer knowledge across instructional contexts (Vovides Sanchez-Alonso, Mitropoulou, and Nickmans 2007; Yu, Fan, and Lin 2015). However, the mediating role of learning strategies in the relationship between cognitive flexibility and reflective thinking remains underexplored.

This study aims to investigate how learning strategies mediate the relationship between cognitive flexibility and reflective thinking among pre-service teachers. By examining this interplay, this research seeks to deepen our understanding of the cognitive and metacognitive processes that support reflective capacity, with the goal of informing and enhancing teacher preparation practices. Insights gained may guide the design of educational interventions that foster reflective, adaptable, and student-centered teaching.

This research embodies a systematic, evidence-based inquiry into student learning and pedagogical practices. It emphasizes understanding how teaching affects learning and encourages educators to engage in critical reflection in order to improve educational outcomes (Hutchings 2000). Furthermore, the study adheres to Felten (2013), advocating for inquiry that is student-centered, contextually grounded, methodologically rigorous, and collaborative. Conducted within teacher education programs in Punjab, India, the research offers a geographically and culturally specific perspective on cultivating reflective thinking in diverse settings. By engaging pre-service teachers as active participants, the study embraces a collaborative approach, ensuring that their experiences and perspectives inform the research process. It also draws on cognitive psychology to contribute to the discourse on metacognition, self-regulated learning, and reflective practice in teacher education. While earlier research has often examined cognitive flexibility and learning strategies separately, their combined influence on reflective thinking remains underexplored. Using path analysis, this research provides empirical evidence on the mechanisms that support reflection and offers practical implications for teacher preparation programs.

Conducted within teacher education programs in Punjab, India, the study also presents a culturally grounded perspective on enhancing reflective capacity. By involving pre-service teachers as active participants, the research adopts a collaborative and contextually rich approach aligned with Felten's (2013) principles of student-centered and methodologically sound inquiry. These insights are relevant not only for teacher education but also for broader educational contexts that prioritize adaptability and reflective learning in the face of evolving challenges.

Thus, the study empirically examines the mediating role of learning strategies in the relationship between cognitive flexibility and reflective thinking. Grounded in a robust theoretical

framework and situated within a diverse educational setting, it offers actionable recommendations for designing interventions that cultivate reflective, adaptable, and student-centered educators

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Reflective thinking is a critical component in teacher education; it enables pre-service teachers to critically assess their instructional practices, consider alternative methodologies, and refine their pedagogical decisions. This reflective process fosters professional judgment, enhances problem-solving skills, and cultivates adaptive strategies suited to diverse classroom environments (Mallillin 2021; Wetzel, Arment, and Reed 2015). Engaging in reflection also promotes deeper learning and responsiveness to student's academic and emotional needs. Despite its acknowledged importance, empirical investigations into the cognitive and strategic mechanisms underpinning reflective thinking, particularly among pre-service teachers, remain limited (Choy, Yim, and Sehu 2019).

Cognitive flexibility is defined as the capacity to shift perspectives, adapt thinking in response to changing circumstances, and restructure knowledge in dynamic contexts and is a cognitive factor that may significantly contribute to reflective capacity (Dennis and Vander Wal 2010). In educational settings, cognitive flexibility supports teachers in adjusting instructional strategies, interpreting student feedback, and navigating uncertainties within classroom environments. Research indicates that educators exhibiting higher cognitive flexibility are more responsive to diverse learner needs and are better equipped to manage unexpected classroom challenges (Schwartz 2006). Furthermore, higher cognitive flexibility among teacher candidates has been associated with more innovative and student-centered teaching practices (Karagooz 2025). Drawing from Cognitive Flexibility Theory, learners capable of reorganizing and applying knowledge across varied contexts are better positioned to solve complex problems and engage in reflection. The theory emphasizes that flexible thinking enhances the ability to integrate new information and approach instructional problems from multiple angles, both of which are essential for reflective practice.

Swanson and Dewsbury (2024) found that the integration of weekly reflective surveys within a probationary program for first-year students significantly enhanced metacognitive skills and the use of effective learning strategies, contributing to improved academic outcomes. These findings highlight the value of structured reflective interventions, offering important implications for promoting reflective thinking in pre-service teacher education (Cox, Jongbloed, and Black 2022). In addition to cognitive adaptability, learning strategies, which encompass specific cognitive, metacognitive, and behavioral techniques employed to enhance learning, play a crucial role in supporting reflective thinking (Kuiper 2002). These strategies include goal setting, time management, self-monitoring, organization, and self-evaluation. Zimmerman's Self-Regulated Learning (SRL) Theory conceptualizes learning strategies as tools that learners use to direct their own learning, make adjustments, and reflect on their performance. Empirical studies have consistently demonstrated that pre-service teachers who engage in strategic learning behaviors exhibit higher academic achievement, greater self-awareness, and enhanced reflective capacity (Choy, Dinham, Yim, and Williams 2021; Rodman 2010). For instance, explicitly teaching learning strategies has been shown to improve pre-service teachers' ability to plan and reflect on instructional activities, thereby boosting their overall reflective competence (Michalsky 2021). Moreover, research suggests that learning strategies may mediate the relationship between cognitive traits and academic behaviors, highlighting their potential as a mediating factor in the relationship between cognitive flexibility and reflection (Heikkila and Lonka 2006).

Despite the recognition of cognitive flexibility and learning strategies as individual contributors to teacher development, few studies examine how these factors interact in order to promote reflective thinking. The majority of the existing literature often treats them in isolation, overlooking their potential interplay. Emerging findings suggest that cognitive flexibility may enable pre-service teachers to remain open to feedback and new information, while learning strategies provide the structure necessary to process, evaluate, and act on that information reflectively. For example, university students with higher cognitive flexibility utilize more varied and effective learning strategies, supporting deeper learning (Shetty 2014). This intersection of cognition and strategy holds significant implications for understanding how pre-service teachers develop reflective habits. Additionally, Spronken-Smith, Buissink-Smith, Bond, and Grigg (2015) highlighted that reflective thinking in graduate education is shaped by various orientations toward learning, including the emphasis on critical thinking, group work, and personal growth. These orientations contribute to transformative curricular experiences that foster the development of reflective practices and deeper learning, which are crucial for professional growth in graduate programs. Furthermore, Wojdak, Smith, Orndorf, and Ramirez (2024) highlight the integration of Universal Design for Learning (UDL) and active learning strategies in Open Educational Resources (OERs), emphasizing structured lesson design in order to enhance student engagement and outcomes. This aligns with the importance of reflective thinking and metacognitive practices in pre-service teacher education, where adaptive strategies foster flexibility and improve teaching effectiveness.

THEORETICAL FRAMEWORK

To address this gap, this study integrates Cognitive Flexibility Theory and Self-Regulated Learning Theory into a unified model. This model proposes that cognitive flexibility enhances the use of strategic learning behaviors, which in turn foster reflective thinking. This approach aligns with Pat Hutchings's taxonomy of the Scholarship of Teaching and Learning (SoTL), particularly the "theory-building" and "what works?" dimensions. The unified model seeks to both explain and enhance reflective thinking through the interaction of mental adaptability and self-directed learning behaviors within teacher education.

Furthermore, the study adheres to Peter Felten's principles of good SoTL practice by being student-centered, contextually grounded in Indian teacher education programs, and designed to produce actionable knowledge that can be shared with educators and policymakers. Employing a rigorous quantitative methodology and emphasizing collaboration with participants ensures that the findings are both relevant and practical.

Overall, this research aims to contribute to a nuanced understanding of how cognitive flexibility and learning strategies jointly influence the development of reflective thinking among pre-service teachers. By elucidating these relationships, the study seeks to inform the design of teacher education programs that effectively cultivate reflective, adaptive, and student-centered educators. Based on the above discussed findings, the authors propose the following hypotheses

H1: There is a positive relationship between cognitive flexibility, learning strategies, and reflective thinking among pre-service teachers.

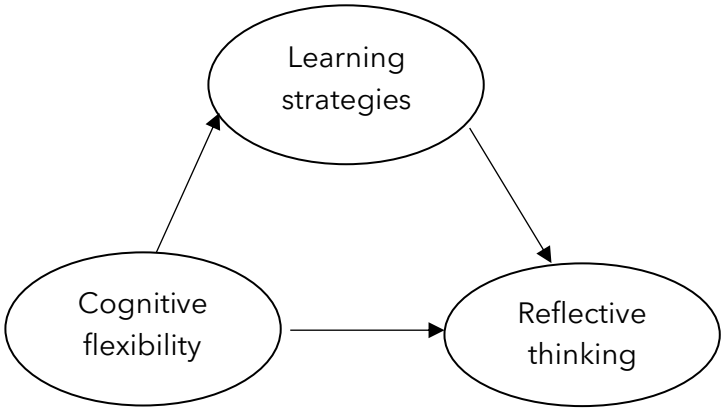
H2: Cognitive flexibility and learning strategies significantly predict reflective thinking among pre-service teachers.

H3: Learning strategies mediates the relationship between cognitive flexibility and reflective thinking in pre-service teachers.

Based on the existing literature and theoretical underpinnings, the study proposes a conceptual model where cognitive flexibility influences reflective thinking both directly and indirectly

through learning strategies. Drawing upon Cognitive Flexibility Theory (Spiro, Vispoel, Schmitz, Samarapungavan, and Boerger 1987) and Self-Regulated Learning Theory (Zimmerman 2002), the model suggests that pre-service teachers with higher cognitive flexibility are more likely to use effective learning strategies, which in turn promote reflective thinking. This integrated approach aligns with Hutchings's (2000) taxonomy of SoTL, particularly addressing the questions of "What is?" and "Theory-building." It also adheres to Felten's (2013) principles of contextually grounded and methodologically sound educational inquiry.

Figure 1. Theoretical model



METHODOLOGY AND SAMPLING TECHNIQUE

The study used a descriptive research method to investigate the mediating role of learning strategies in the relationship between cognitive flexibility and reflective thinking among pre-service teachers.

The authors structured the methodology to address the following research objectives:

1. To examine the relationship between cognitive flexibility, learning strategies, and reflective thinking among pre-service teachers.
2. To determine the predictive roles of cognitive flexibility and learning strategies in influencing reflective thinking in a population of pre-service teachers.
3. To investigate the mediating role of learning strategies in the relationship between cognitive flexibility and reflective thinking among pre-service teachers.

The sample consisted of 450 prospective teachers enrolled in a bachelor of education (BEd) program at government and government-aided colleges in Punjab, India. The authors used a simple random sampling technique to ensure equal representation and minimize selection bias. They recruited participants through direct communication with colleges, and willing respondents were encouraged to participate, ensuring a diverse sample that reflected the region's demographic and educational background.

Data collection commenced after the researchers fully informed participants about the study's objectives, procedures, and confidentiality measures. All participants provided informed consent to ensure voluntary participation, and the authors used the collected data exclusively for research purposes. Participants completed the survey online via Google Forms, resulting in 300 valid responses from a total of 500 sent. The researchers used various research tools in the study, including the Reflective Thinking Practice Scale (Kember et al. 2000), the Learning Strategies Scale (Cunha, Duarte, and Cruz 2015), and the Cognitive Flexibility Inventory (Dennis et al. 2010). The authors strictly

followed ethical guidelines. All collected data securely stored and accessible only to the research team. The researchers assured participants of their right to withdraw from the study at any stage without any negative consequences.

Table 1. Demographic profile of participants

Variables	Options	Number	Percentage
Gender	Male	182	40%
	Female	268	60%
Age	18–22 years	196	43%
	23–26 years	254	57%
Locale	Rural	236	52%
	Urban	214	48%

As shown in the table, the majority (60%) identified as female prospective teachers, while 40% identified as male. The age distribution indicates that 43% of participants were aged 18 and 22 years old, whereas 57% were between 23 and 26 years old. Regarding geographic background, 52% of prospective teachers resided in rural areas, while 48% belonged to urban regions. This sample represents prospective teachers from diverse socio-economic backgrounds in Punjab, India, reflecting both rural and urban educational settings. The demographic composition provides insights into the representation of gender, age, and locale in teacher education programs within the region.

MEASURES

The research tools divided data into two sections: demographic information and key variables. The first section collected information on participant's locale, age, and gender. The second section assessed three variables: learning strategies, cognitive flexibility, and reflective thinking.

To measure learning strategies, the researchers employed the Learning Strategies Scale (Cunha et al. 2015). This 44-item scale, designed on a 5-point Likert scale ranging from (0 = Not at All to 4 = Always), evaluates three sub-dimensions: motivational strategies, cognitive strategies, and meta-cognitive strategies. The scale demonstrated strong test-retest reliability with a correlation coefficient of .83.

The Cognitive Flexibility Inventory measured cognitive flexibility (Dennis et al. 2010). This 20-item scale follows a 7-point Likert scale format (1 = Strongly Disagree to 7 = Strongly Agree) and assesses two dimensions: alternative and control. The CFI demonstrated strong test-retest reliability with a correlation coefficient of 0.81.

Lastly, to assess the participant's reflective thinking, the researchers used the Reflective Thinking Scale by Kember et al. (2000). This 16-item scale is rated on 5-point Likert scale ranges from (5 = Definitely Agree to 1 = Definitely Disagree). It evaluates four key dimensions: habitual action, understanding, reflection, and critical reflection. The reflective thinking scale exhibited good internal reliability, with Cronbach's alpha values ranging from .74 to .84.

ANALYSIS

The collected data underwent a comprehensive statistical analysis using a combination of descriptive statistics measures, such as mean, standard deviation, and minimum and maximum values, to summarize the dataset as presented in Table 2. To examine the relationship among variables, the researchers used Pearson's correlation coefficient, and the correlation matrix is presented in Table 3. To evaluate the predictive power of independent variables on the dependent variable, the researchers performed multiple regression analysis, and results are presented in Table 4. Additionally, mediation analysis assessed the indirect effects of mediating variables on the relationships between predictors and the outcome variable. These techniques ensured a thorough understanding of the data. All statistical techniques were performed using SPSS (Statistical Package for the Social Sciences) version 26 and AMOS (Analysis of Moment Structures) version 24, ensuring rigorous and reliable results.

Table 2. Descriptive statistics of the data

	Reflective thinking	**Cognitive flexibility**	**Learning strategies**
Mean	65.55	67.47	71.23
SD	12.591	16.652	23.889
Minimum	25	28	31
Maximum	82	132	140

The descriptive statistics in Table 2 provide insight into the distribution of scores for reflective thinking, cognitive flexibility, and learning strategies among pre-service teachers. The mean score for reflective thinking was 65.55 (SD = 12.59), indicating a generally high level of reflection. Cognitive flexibility had a mean of 67.47 (SD = 16.65), reflecting a moderate to high ability among participants to adapt their thinking across contexts. Learning strategies showed the highest mean at 71.23 (SD = 23.89), suggesting that participants made frequent use of various strategies to regulate and enhance their learning. The range of scores further highlights the variability within the sample; reflective thinking scores ranged from 25 to 82, cognitive flexibility from 28 to 132, and learning strategies from 31 to 140. These findings demonstrate substantial individual differences across the three constructs, underscoring the importance of tailored interventions to support reflective and adaptive teaching practices in teacher education.

Table 3. Correlation analysis of the variables

Variables	Cognitive flexibility	Learning strategies	Reflective thinking
Cognitive flexibility	1	.751**	.860**
		.000	.000
Learning strategies	.751**	1	.680**
	.000		.000
Reflective thinking	.860**	.680**	1
	.000	.000	

The Pearson correlation coefficients presented in Table 3 indicated statistically significant and positive relationships among all three variables under study. Cognitive flexibility showed a strong, positive correlation with reflective thinking ($r = .860$, $p < .001$), suggesting that higher levels of cognitive flexibility are associated with greater reflective thinking. Similarly, cognitive flexibility was positively correlated with learning strategies ($r = .751$, $p < .001$), indicating that individuals who are more cognitively flexible tend to use learning strategies more frequently. Learning strategies were also positively correlated with reflective thinking ($r = .680$, $p < .001$), implying that greater use of learning strategies is associated with higher levels of reflection. Therefore, the first hypothesis which states that, "There is a positive relationship between cognitive flexibility, reflective thinking, and learning strategies among pre-service teachers" is supported.

Table 4. Regression analysis of the data

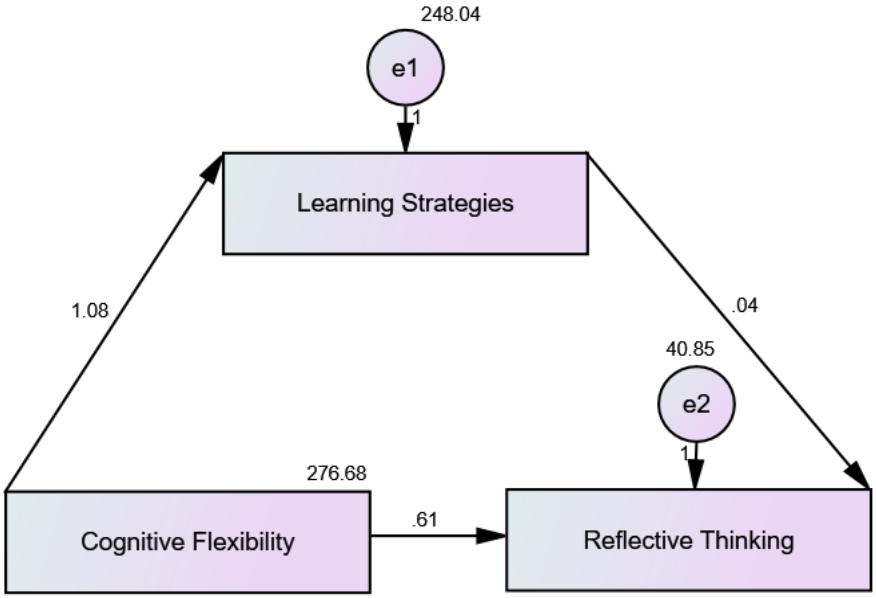
Variables	Unstandardized coefficients		Standardized coefficients	t	p
	B	Std. Error	Beta		
(Constant)	21.751	1.263		17.220	.000
Cognitive flexibility	.606	.028	.801	22.003	.000
Learning strategies	.041	.019	.078	2.138	.033

$R = .86$ $R^2 = .742$ Adjusted $R^2 = .741$ $F = 642.063$. $p = .000$

The results of the multiple regression analysis presented in Table 4 revealed that both cognitive flexibility and learning strategies significantly predicted reflective thinking among pre-service teachers. The overall model was statistically significant, $F(2, 447) = 642.06$, $p < .001$, and accounted for approximately 74.2% of the variance in reflective thinking ($R^2 = .742$, Adjusted $R^2 = .741$).

Cognitive flexibility emerged as the strongest predictor (β = .801, $p < .001$), indicating that as cognitive flexibility increases, so does reflective thinking. Learning strategies also made a statistically significant but smaller contribution to the model (β = .078, $p = .033$), suggesting that the use of effective learning strategies also plays a role, though to a lesser extent, in enhancing reflective thinking. These findings support the hypothesized model. They demonstrate the importance of both cognitive adaptability and strategic learning processes in fostering reflective thinking practices among pre-service teachers, supporting H2.

Figure 2. Path diagram showing direct and indirect effects



Source: AMOS output (9)

The path analysis, as presented in Figure 2, revealed that cognitive flexibility significantly influences reflective thinking, both directly and indirectly, with learning strategies serving as a mediating variable. The direct effect of cognitive flexibility on reflective thinking was substantial (β = .61), suggesting that pre-service teachers with higher cognitive flexibility engage more in reflective thinking. Additionally, cognitive flexibility strongly impacted learning strategies (β = 1.08), which in turn had a small but meaningful effect on reflective thinking (β = .04). The total effect of cognitive flexibility on reflective thinking, calculated as the sum of the direct and indirect effects (β = .6532), highlighted the combined influence of cognitive adaptability and learning strategies on reflective thinking. This finding supports hypothesis (H3), which proposed that learning strategies mediate the relationship between cognitive flexibility and reflective thinking. The results of the path analysis led to the approval of H3, emphasizing the critical role of both cognitive flexibility and strategic learning in fostering reflective thinking among future educators.

Table 5. Regression weights: (Default model)

Variables	Estimate	SE	CR	*P*
Learning Strategies ← Cognitive Flexibility	1.078	.045	24.120	***
Reflective Thinking ← Learning Strategies	.041	.019	2.142	.032
Reflective Thinking ← Cognitive Flexibility	.606	.027	22.052	***

Table 5 presents the regression weights for the default model. The relationship between cognitive flexibility and learning strategies was statistically significant, with an estimate of 1.078 (SE = .045) and a critical ratio (CR) of 24.120, indicating a strong effect ($p < .001$). Similarly, the effect of learning strategies on reflective thinking was statistically significant (β = .041, S.E. = .019, CR = 2.142, $p = .032$), suggesting that learning strategies positively influence reflective thinking, albeit with a smaller magnitude. The direct effect of cognitive flexibility on reflective thinking was also highly significant (β = .606, SE = .027, CR = 22.052, $p < .001$), demonstrating a strong relationship between these variables. These results highlight the important roles of cognitive flexibility and learning strategies for fostering reflective thinking.

DISCUSSION

The results of this study revealed strong positive relationships among learning strategies, cognitive flexibility, and reflective thinking for pre-service teachers in Punjab. Most notably, cognitive flexibility demonstrated a very strong correlation with reflective thinking ($r = .860$, $p < .001$). The researchers expected this finding, as previous research has consistently demonstrated that individuals who are more cognitively flexible tend to be more reflective learners (Orakci 2021). Cognitive flexibility enables learners to consider alternative perspectives and adjust their thought processes, which is essential in reflective thinking, a skill critical for professional growth in teacher education.

This is consistent with Cognitive Flexibility Theory (Spiro et al. 1987), which posits that individuals with high cognitive flexibility are better able to restructure knowledge and apply it to unfamiliar or dynamic contexts. In the context of Punjab's diverse classrooms, which require teachers to address multilingualism, socioeconomic disparities, and inclusive education needs, such adaptability is essential. Thus, teacher preparation programs in Punjab must intentionally cultivate cognitive flexibility as a foundational component of reflective teaching practice.

Furthermore, cognitive flexibility was also positively associated with learning strategies ($r = .751$, $p < .001$), and reflective thinking strongly linked to learning strategies ($r = .680$, $p < .001$). The authors anticipated these findings, as prior studies (Korocko 2020; Phan 2009) have emphasized that flexible and strategic learners are more capable of engaging in deeper learning processes. In the context of Punjab, where teacher training programs are gradually integrating technology-enhanced and student-centered pedagogies, the emphasis on adaptive learning strategies becomes increasingly relevant. Pre-service teachers who adopt metacognitive and self-regulated learning strategies are more likely to critically assess and refine their teaching practices.

This study's results are further corroborated by Spronken-Smith et al. (2015) who emphasized that reflective thinking is nurtured through learner centered environments that incorporate collaborative learning, problem-solving, and personal development. In Punjab's BEd programs, efforts to shift from lecture-based instruction to participatory methods like practicum teaching, peer observation, and microteaching provide critical opportunities for reflection and growth.

Support also comes from recent research highlighting the role of structured pedagogical interventions in enhancing reflective capacity. For instance, Wojdak et al. (2024) discuss how structured lesson planning and Universal Design for Learning (UDL) frameworks promote metacognitive engagement, which is a core component of both cognitive flexibility and reflective thinking. Similarly, Swanson et al. (2024) found that regular reflective surveys helped students track their cognitive processes—an approach that could be integrated into Punjab's teacher education programs to foster intentional reflection.

The regression analysis revealed that both cognitive flexibility and learning strategies significantly predict reflective thinking; these variables are not just correlated but play an active role in shaping reflective capacity. This finding aligns with studies by Aydogmus and Senturk (2023) and Phan (2008), which found that flexible cognitive styles and strategic learning habits enhance educational outcomes. Within the educational landscape of Punjab, this has significant implications, since many pre-service teachers come from rural or underserved regions where exposure to diverse pedagogical approaches may be limited. Strengthening these skills during teacher training can help bridge that gap and promote more adaptive, reflective educators.

Moreover, the mediation analysis showed that cognitive flexibility mediates the relationship between learning strategies and reflective thinking, suggesting that strategic learners become more reflective through the development of flexible thinking skills. This supports Gokce and Güner's (2024) framework, which emphasizes that flexible cognition acts as a bridge between strategy use and deep reflection. In Punjab, where pre-service teachers are often navigating rigid curricula and exam-centric systems, fostering this bridge may transform surface-level learning into meaningful pedagogical insight.

PRACTICAL IMPLICATIONS

These findings underscore the urgent need for teacher education reform in Punjab that prioritize cognitive adaptability and reflective practice. This is particularly crucial, given the high levels of stress and burnout reported among Indian teachers, as highlighted in policy reviews such as the National Education Policy (NEP), 2020. The policy review emphasizes emotional resilience, reflective capacity, and adaptive strategies as core professional competencies. Therefore, embedding reflective journals, metacognitive feedback sessions, and flexible teaching simulations into BEd curricula could significantly enhance teacher preparedness in the region.

The findings of this study demonstrate that cognitive flexibility and effective learning strategies play a key role in developing reflective thinking among pre-service teachers. These insights lead to several practical recommendations for improving teaching and learning in various educational settings.

Firstly, teacher education programs should include activities that develop flexible thinking and reflective skills. For example, using real-life teaching scenarios, case-based learning, and guided self-assessment tasks can help future teachers think in different ways and reflect deeply on their experiences. Training should also help pre-service teachers use learning strategies like setting goals, planning, and monitoring progress.

Secondly, in universities and colleges, educators can design courses that combine critical thinking tasks, open-ended projects, and interdisciplinary learning. Structured reflection tools, such as learning journals, peer discussions, and feedback sessions, can support the development of metacognitive and reflective abilities. These practices help students connect theory with personal experience, encouraging deeper understanding.

Thirdly, school teachers can introduce flexible thinking by giving students open-ended questions, problem-solving activities, and group discussions. Helping students reflect on their learning through tools like daily reflection prompts or classroom journals builds important lifelong learning skills. Teachers can also guide students in using strategies like planning tasks and reviewing understanding regularly.

Additionally, in adult learning environments, programs should include opportunities for learners to relate new knowledge to past experiences. Adult learners benefit from flexible learning approaches that respect diverse backgrounds and life experiences. Facilitators can encourage reflective thinking by using real-world problems and providing time for learners to pause, reflect, and adjust how they think.

Finally, online educators can promote flexible thinking and reflection by integrating self-paced modules, interactive learning tasks, and reflection checkpoints. Learning management systems can include features like self-assessment quizzes, discussion boards, and weekly reflective surveys. These tools help learners monitor their progress, set goals, and reflect on how they are learning, even in a virtual setting.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

While the findings of this study offer important insights, certain limitations must be acknowledged. First, the research used a descriptive and correlational design, which limits the ability to make causal claims. Future studies could adopt longitudinal or experimental designs to better understand how cognitive flexibility and learning strategies influence reflective thinking over time. Although the sample size was adequate and diverse across institutions, it was restricted to pre-service teachers in Punjab, which may limit the generalizability of these findings. Future research could replicate this study in different cultural, educational, or policy contexts, including for K–12 educators, in-service teachers, or adult learners in global classrooms, to assess the broader applicability of these results. Lastly, while this study focused on learning strategies as a mediator, other potential moderators such as motivation, emotional intelligence, or teaching experience should be explored in order to gain a more comprehensive understanding of what influences reflective thinking in educational environments.

CONCLUSION

This study makes three key contributions to the *Teaching & Learning Inquiry's* mission. First, it deepens our understanding of how reflective thinking, a cornerstone of effective teaching and learning, can be cultivated through the interplay of cognitive flexibility and learning strategies. Second, it offers an empirically grounded perspective on how fostering adaptive thinking and metacognitive skills can strengthen teacher education programs, and these insights hold relevance across higher education, K–12 schools, adult education, and online environments. Finally, it advances the kind of interdisciplinary inquiry that SoTL values by bridging psychological theory, educational research, and practical pedagogy.

For educators and institutions, the findings emphasize the importance of cultivating what might be termed "reflective adaptability," the capacity to think critically, flexibly, and strategically in dynamic learning environments. Rather than focusing solely on content delivery, this study suggests that supporting learners in developing both flexible mindsets and effective strategies for learning can lead to deeper, more transformative educational experiences. This approach—rooted in reflection and adaptability—can help teachers and learners navigate diverse and changing educational contexts with insight and resilience.

AUTHOR BIOGRAPHY

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