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Teachers' Pedagogical Content Knowledge and Students' Achievement: A Correlational study at the Elementary level

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Abstract

This quantitative study explored elementary school teachers' pedagogical knowledge and effects on grade 8 students' achievement. A teacher sample (N=100) rated competencies across inquiry-focused teaching, conceptual building, interaction practices, and peer collaboration promotion. A student sample (N=120) self-reported academic abilities, intrinsic motivation, help-seeking, and accountability. Findings reveal teachers highly endorse learner-centric strategies, although peer interaction promotion is less common. Meanwhile, significant gender disparities in self-perceived expertise emerge, favouring female over male educators across all facets measured. Additionally, teachers' knowledge positively—and significantly—correlates with student achievement overall and for both genders, highlighting the importance of professional enrichment. However, female students demonstrate greater confidence, drive, utilization of academic support, and ownership over learning than male counterparts. Recommendations include ongoing teacher training, targeted competency building for male students and teachers, leveraging gender peer collaboration similarities, and holistic female support amid widening divides. Sustaining instructional quality through empowering, equitable practices that nurture disadvantaged and gifted learners can spur systemic improvements. Ultimately, findings confirm the interrelations between teachers' multifaceted knowledge and student success.

Keywords: *Pedagogical Knowledge, Academic Achievement, Teacher Gender Differences, Student Gender Differences*

1. Introduction

Teachers need effective teaching methods and skills to achieve student learning goals (Shulman, 1986). Pedagogical content knowledge integrates subject expertise and instructional approaches. It involves understanding how to arrange and explain concepts for better teaching (Shulman, 1986). Although definitions vary, common ideas denote blending content and teaching knowledge, including learning difficulties related to topics (Lowery, 2002; Niess, 2005).

Quality instruction enables student success (Guerriero, 2014). For example, teachers with strong math skills positively impact achievement, especially in earlier grades (Kunter et al., 2011).

However, content knowledge alone does not suffice. Teachers also require abilities to address individual student needs through ongoing professional development (Blömeke & Delaney, 2012). Building student-teacher relationships and perspective-taking is vital but challenging amid high teacher attrition rates in some contexts (Blömeke & Delaney, 2012). Attracting motivated, academically strong teacher candidates through quality training is crucial.

While teachers traditionally held central instructional roles, modern educational philosophies increasingly emphasize student-centred learning for knowledge and skills building (Coetzer & Sitlington, 2014). Evaluating achievement involves test scores and qualitative measures like behaviour and values acquisition per learning goals. Research shows that teachers' pedagogical knowledge connects positively to student outcomes(Kunter et al., 2011). Applying effective teaching methods can enhance learning across student groups. However, pedagogical knowledge receives less attention in examining teacher quality than specialized expertise represented through concepts like mathematical connectivity issues (Acharya et al., 2017).

In conclusion, combining pedagogy and content knowledge enables impactful teaching (Guerriero, 2014). Teachers' grasp of learning theories promotes constructive thinking. While curriculum delivery is key, understanding student acquisition abilities is also does. Course-specific methods become increasingly beneficial in later schooling, although early teacher competence in subjects like math contributes significantly (Tella, 2008). Ultimately, quality instruction requires integrating knowledge areas to facilitate multilayered student achievement.

2. Research Objective

1. To explore the teachers' pedagogical content knowledge at the elementary level.
2. To find out 8th-grade students' achievements.
3. To find the effect of teachers' pedagogical content knowledge on 8th grade students' achievement.

3. Research Question

1. What are the elementary teachers' perspectives on pedagogical content knowledge based on gender?
2. What is the academic achievement of 8th-grade students?
3. What is the effect of pedagogical content knowledge on 8th-grade students' achievement?

4. Literature Review

Research shows pedagogical knowledge and activities that build conceptual understanding through discourse are vital for meaningful learning (Guerriero, 2014). Learning remains incomplete if only based on teachers' perspectives. Effective teaching requires blending subject matter scope, goals, learner interests, and capabilities. Pedagogy and content knowledge enable quality instruction and professional growth through multifaceted practices that represent the subject area.

Empirical studies have examined pedagogical influences on achievement using interviews, observations, and surveys (Baumert et al., 2010); (Chick et al., 2006). Findings suggest teachers should adopt innovative learner-centred technology integration strategies, with infrastructure support for development (Coetzer & Sitlington, 2014; Schofield, 2012). As contemporary literature emphasizes, content knowledge and pedagogy are critical(Blömeke& Delaney, 2012; Guerriero, 2014). Research summaries also indicate prospective teachers need broader fractions content and methods courses (Olanoff et al., 2014). Teachers' pedagogical knowledge positively correlates with student achievement (Kunter et al., 2011). Applying effective teaching methods can raise achievement. However, content knowledge alone does not suffice; skills to address individual learning needs are also vital, requiring ongoing professional development (Blömeke &

Delaney, 2012). Teacher practices like questioning and math skills impact outcomes, although student GPA shows little effect. Course-specific methods become increasingly beneficial in later schooling despite early-grade teacher subject competence significance.

Few studies have examined teachers' pedagogical content knowledge in Pakistan, although quality receives increasing attention. Findings suggest teachers hold contradictory or progressive views about mathematics knowledge applications in society (Amirali & Halai, 2010). Other research found secondary teachers emphasize critical thinking pedagogy in science subjects (Jamil & Muhammad, 2019; Jamil et al., 2021a, 2021b). Studies also reveal online and reflective teaching practices among teachers and teacher educators (Jamil et al., 2022; Saif et al., 2021).

5. Methodology

The present study employed a quantitative, non-experimental survey design to examine elementary school teachers' perspectives on pedagogical knowledge and academic achievement among elementary public school students. For the teacher sample, a self-developed 5-point Likert scale questionnaire was administered to 100 elementary teachers (N=100; 50 males, 50 females) selected via simple random sampling from the target population of 483 teachers across public schools in one Punjab district. This 20% sample met the 10% minimum threshold (Creswell & Poth, 2016). The 24-item instrument assessed perceived pedagogical knowledge across five subscales ($\alpha = 0.890$). Regarding the student sample, a self-developed 5-point Likert scale questionnaire was used to evaluate perceived achievement among 120 grade 8 public school students (60 males, 60 females) in the same Punjab district, representing 20% of this grade level (meeting the 10% standard per (Creswell, 2016 #23) The validated 20-item instrument assessed achievement across four dimensions ($\alpha = 0.843$). For both teacher and student data, SPSS 21 enabled analysis. Frequency distribution examined respondent opinions. Independent samples t-tests compared gender groups. To meet study objectives, descriptive and inferential statistics included means, standard deviations, regression, and t-tests. This dual sampling approach enabled the investigation of connections between teacher pedagogical knowledge and student academic achievement.

Table 1: Demographic Information of the respondents

Demographics		Frequency	Percent.
Gender	Male	50	50%
	Female	50	50%
	Total	100	100%
Academic Qualification	F.A	8	8%
	B.A	11	11%
	M.A	67	67%
	Any Other	14	14%
	Total	100	100%
Teaching Experience (Years)	1-10	54	54%
	11-20	24	24%
	21-30	16	16%
	31-40	6	6%
	Total	100	100

The table shows details about the 100 teacher participants. There was an equal number of 50 male (50%) and 50 female (50%) respondents. Most teachers were highly educated - 67 out of 100 (67%) had a master's degree. 11 (11%) had a Bachelor, 8 (8%) had an F.A., and 14 (14%)

had other qualifications. Over half the sample (54 out of 100, or 54%) were newer teachers with 1-10 years of experience. 24 (24%) had 11-20 years, 16 (16%) had 21-30 years, and only 6 (6%) were very experienced with 31-40 years of teaching. Overall, the participant group contained an equal number of highly qualified male and female teachers who were relatively new to the teaching profession.

Table 2: Respondents (students) based on gender

Gender	Frequency	Percent (%)
Male	60	50%
Female	60	50%
Total	120	100%

In view of the above table, there were (N=, 50% Male) and (N=, 50% female respondents) representing the study sample.

Findings

Table 3 Analysis of Teachers' Pedagogical Practices

Indicator	**Statement**	**Mean**	**SD**
Pedagogical inquiry			
	Use instructional strategies based on student's prior knowledge	4.69	0.465
	Encourage knowledge through investigation and problem solving	4.52	0.611
	Focus on creation and exploration of new ideas	4.58	0.496
	Design lessons to engage students	4.52	0.559
	Clarify basic concepts	4.48	0.522
Pedagogical			
	Promote conceptual understanding	4.37	0.757
Propositional			
	Use A.V. aids for comprehension	4.34	0.655
Knowledge			
	Have a strong command of subject matter	4.46	0.717
Pedagogical			
Use daily examples for conceptual understanding		4.52	0.463
Content:			
Allow students to make predictions/hypotheses		4.30	0.759
Knowledge			
	Use varied strategies to involve students	4.35	0.757
Student Teacher			
	Allow students to reflect their viewpoints	4.42	0.669
Interaction			
	Accept constructive criticism from students	4.23	0.750
	Develop thinking through questioning	4.63	0.597
	Encourage problem-solving techniques	4.41	0.740
	Encourage active participation	4.55	0.557
	Remain calm and patient	4.43	0.685
	Encourage investigation skills	4.48	0.559
	Good listening skills	4.56	0.556
Student to Student			

Students respect each other	4.06	0.930
Interaction		
Students respect each other	4.06	0.930
Students share ideas with peers	4.01	0.882
Students participate in activities	4.25	0.687
Students engage in group discussions	3.90	0.959
Students describe prior knowledge to peers	3.87	0.981

Regarding pedagogy of inquiry, teachers strongly agreed (average rating over 4.50 out of 5) that they use students' prior knowledge to design lessons and facilitate creating and exploring new ideas. They also highly rated encouraging investigation, problem-solving, designing engaging activities, and clarifying concepts (average of around 4.50). For propositional knowledge, agreement was high but slightly less (averages from 4.37-4.46) that teachers promote understanding, use audio-visual aids, and have strong subject knowledge. On content knowledge, teachers again strongly agreed (4.52 average) that they use daily examples for concept building and agreed they let students make predictions and engage all students (averages 4.30-4.35). For student-teacher interaction, expressing viewpoints and building critical thinking via questioning had very high agreement (over 4.50). Other practices like encouraging participation, being patient, developing investigation skills, and displaying good listening were also rated highly (4.23-4.48). The lowest averages were for student-to-student interactions, although still moderately high (3.87-4.25). The highest means were participating in activities, respecting peers, and sharing ideas (4.01-4.25). Group discussions and describing prior knowledge to each other were slightly lower (3.87-3.90). Overall, teachers rated their inquiry-focused and student-centered practices very highly. However, peer interaction activities are currently less common.

Table 4: Mean and S.D. of Teachers' Pedagogical Knowledge

Factors		**All**	**Male**	**Female**
Overall				
	N	100	50	50
	Mean	104.93	101.42	108.44
	SD	8.890	9.287	6.949
1. Pedagogy of Inquiry				
	N	100	50	50
	Mean	22.79	22.42	23.16
	SD	1.578	1.458	1.621
2. Pedagogical Propositional Knowledge				
	N	100	50	50
	Mean	13.17	12.86	13.48
	SD	1.491	1.604	1.313
3. Pedagogical Content Knowledge				
	N	100	50	50
	Mean	13.17	12.58	13.76
	SD	1.767	2.091	1.117
4. Student-Teacher Interaction				
	N	100	50	50
	Mean	35.71	34.72	36.70
	SD	3.261	3.586	2.573
5. Student to Student Interaction				

N	100	50	50
Mean	20.09	18.84	21.34
SD	3.373	3.378	2.413

The table shows the average (mean) and standard deviation (S.D.) scores for teachers' ratings of their pedagogical knowledge. The entire sample of 100 teachers, the mean or average rating was 104.93 out of 120 total possible points. Looking specifically at gender, male teachers (N=50) had a lower average rating of 101.42. Female teachers (N=50) rated themselves higher, with a mean score of 108.44. So, overall, teachers viewed themselves as having moderately high levels of pedagogical knowledge, scoring 87 out of 120 possible points on average (104.93/120 = 87%). An interesting difference emerged where female teachers rated their pedagogical knowledge over 7 points higher on average than their male counterparts. The standard deviation numbers reflect how much scores varied around these mean values.

Table 5: Comparison of Teachers' Pedagogical Knowledge based on gender

Gender	N	Mean	SD	Df	T	P
Over All						
Male	50	101.42	9.827	98	-4.280	.000
Female	50	108.44	6.949			
1. Pedagogy of Inquiry						
Male	50	22.42	1.458	98	-2.400	.018
Female	50	23.16	1.621			
2. Pedagogical Propositional Knowledge						
Male	50	12.86	1.604	98	-2.115	.037
Female	50	13.48	1.313			
3. Pedagogical Content Knowledge						
Male	50	12.58	2.091	98	-3.520	.001
Female	50	13.76	1.117			
4. Student-Teacher Interaction						
Male	50	34.72	3.586	98	-3.172	.002
Female	50	36.70	2.573			
5. Student to Student Interaction						
Male	50	18.84	3.738	98	-3.973	.000

Female	50	21.34	2.413

$p<0.05$

Overall, female teachers (M=108.44, SD=6.949) rated themselves significantly higher on pedagogical knowledge than male teachers (M=101.42, SD=9.827), t(98)= -4.280, p<.001. This significant difference held across all five dimensions measured. Specifically, females scored higher on the pedagogy of inquiry (p=.018), propositional knowledge (p=.037), content knowledge (p=.001), student-teacher interaction (p=.002), and student-to-student interaction (p<.001). The largest gender gaps emerged for pedagogical content knowledge and student-peer interactions. However, teachers still viewed themselves as more knowledgeable even in dimensions with smaller disparities like propositional knowledge.

Table 6: Analysis of students' achievement

Indicator	Statement	Mean	SD
Ability:			
	I feel confident that I can pass my studies with my teachers' support.	4.73	0.444
	I receive encouragement on my hard in my studies from my teachers	4.72	0.471
	I receive encouragement from my friends on my performance.	4.12	1.486
	I am encouraged by at least one of my parents on my abilities	4.60	0.614
Desire for learning			
	I show complete interest in learning	4.37	0.777
	I show a keen interest in the subject I take	4.39	0.823
	I show interest in solving problems in lesson	4.00	0.830
	I show interest in the topic being taught	4.54	0.685
	I concentrate on my academic work.	4.52	0.745
Learning from others			
	Iparticipate in classroom discussion	3.88	1.094
	I participate in group work	4.07	1.059
	I ask a question if I am unable to understand the concept	4.24	1.004
	I try to learn from others who are better than me in studies	4.33	0.726
	I get help from my teachers during study	4.50	0.926
	I pay attention to my teachers' lessons to understand what is being taught	4.44	0.742
Responsibilitiesfor learning			
	I take my studies as personal responsibilities	4.57	0.576
	I struggle to gather information on the topic so that I can master them	4.13	0.809
	I do my homework regularly	4.31	0.924
	I always participate in class activities	4.05	1.151
	I do not feel hesitation in asking questions regarding lesson	4.39	0.759

The table shows students' ratings of their academic abilities, intrinsic motivation to learn, collaboration with others, and responsibility for learning. Each statement was rated on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree). Overall, ratings are high across all areas. It suggests teachers view students positively in terms of confidence, drive, teamwork, and accountability. The top-rated statement (4.73) was that students feel confident passing studies with teacher support. Encouragement from teachers (4.72) and parents (4.60) regarding abilities also scored very high. So teachers see students as having good self-belief and motivational support. Statements on students' inherent interest in learning, like solving problems (4.00), topics

taught (4.54), and concentrating well (4.52), were agreed with. So, students seem curious and engaged during lessons. Areas around learning from others, like class participation (3.88), group work (4.07), and asking questions (4.24), were moderately positive. Seeking help from capable peers (4.33) and teachers (4.50) scored higher. So, independent interactions could improve, but students collaborate and leverage support. Finally, taking ownership of studies (4.57), comprehending concepts (4.13), doing homework (4.31), participating in activities (4.05), and asking questions without hesitation (4.39) were positively rated.

Table 7: Mean and SD of Students' Achievement

Factors		**All**	**Male**	**Female**
Overall				
	N	120	60	60
	Mean	86.90	84.92	88.88
	SD	8.383	7.552	8.759
Ability				
	N	120	60	60
	Mean	18.17	17.85	18.48
	SD	1.751	1.840	1.610
Desire for Learning				
	N	120	60	60
	Mean	21.82	21.43	22.20
	SD	2.443	2.324	2.516
Learning from Others				
	N	120	60	60
	Mean	25.47	25.07	25.87
	SD	3.251	3.161	3.316
ResponsibilitiesforLearning				
	N	120	60	60
	Mean	21.45	20.57	22.33
	SD	2.615	2.324	2.608

This table shows average student achievement scores and standard deviation by gender. It also breaks down scores across four areas - abilities, desire to learn, learning from others, and taking responsibility. The total achievement average is 86.90 for all students. Females scored higher (88.88) than males (84.92) by 3.96 points. Moderate standard deviations around 8 mean there is variation among students. Specifically for self-confidence in abilities, females again show higher averages (18.48) than males (17.85). As this impacts motivation and success, targeted encouragement for males is important.

Similarly, females display greater interest in learning based on higher scores (22.20 vs 21.43). Building intrinsic motivation in male students could help address this gap. Males also utilize peer and teacher support less than females, scoring lower (25.07 vs 25.87). Equipping males to leverage social learning opportunities may benefit them. The biggest gap is in taking responsibility. Females show far greater accountability (22.33) than males (20.57). Developing disciplined work habits among male students is critical.

Table 8: Comparison of Students' Achievement based on gender

Gender	**N**	**Mean**	**SD**	**Df**	**T**	**p**

Overall						
Male	60	84.92	7.552	118	-2.657	.009
Female	60	88.88	8.759			
Ability						
Male	60	17.85	1.840	118	-2.007	.047
Emale	60	18.48	1.610			
Desire for Learning						
Male	60	21.43	2.324	118	-1.734	.086
Female	60	22.20	2.516			
Learning from Others						
Male	60	25.07	3.162	118	-1.352	.179
Female	60	25.87	3.316			
Responsibilities for Learning						
Male	60	20.57	2.324	118	-3.917	.000
Female	60	22.33	2.608			

This table statistically compares achievement differences between males and females across overall performance and the four sub-areas. Independent t-tests analyzed mean scores. Overall, females significantly outscored males (88.88 vs 84.92), t(118)= -2.657, p=.009. This gap seems largely due to differences in taking responsibility. In abilities, females again scored significantly higher (18.48 vs 17.85), t(118)= -2.007, p=.047. It aligns with earlier findings that targeted male self-efficacy support is important. Females show greater motivation to learn than males (22.20 vs. 21.43) at a level approaching significance, t(118)=-1.734, p=.086. So, boosting drive remains a priority. No significant differences emerged around utilizing interpersonal learning opportunities. This suggests comparative strengths for males in collaborating. The biggest performance divide is in responsibilities - females vastly outscored males (22.33 vs. 20.57), t(118)=3.917, p<.001. Hence, building male accountability, self-regulation, and work habits is key.

Table 9: Overall Effect of Teachers' Pedagogical Knowledge and Students' Achievement

Respondents	N	R	Sig (2 tailed)

Overall	220	0.528**	0.000

This table presents correlation analysis results examining the relationship between teachers' perceived pedagogical knowledge and students' academic achievement scores. The sample size included ratings from 100 teachers and matching achievement data for 120 students they taught, for a total N of 220 respondent pairings. A moderately strong positive correlation of 0.528 was found between teacher knowledge and student performance. This relationship was highly statistically significant with $p<0.001$. In other words, as teachers' knowledge of instructional methods and practices increases, so does their students' academic achievement. The better grasp teachers have of educational concepts and techniques, the higher their learners tend to score on measures of success. While correlation does not imply causation, this moderately high correlation coefficient provides empirical evidence suggesting teachers' pedagogical competencies play a pivotal role in determining classroom and student outcomes. As teachers become more skilled at applying multi-dimensional knowledge to inform teaching, a trickle-down effect may occur, leading to improved student comprehension, skill-building, and assessment performance. The study indicates developing teacher pedagogical capacity should translate to tangible learning and development gains for students. As such, ongoing enrichment of practitioners' knowledge base emerges as a promising avenue for enhancing academic attainment and growth schoolwide.

Table 10: Effect of Teachers' Pedagogical Knowledge on Students' Achievement on a gender basis

Respondents	N	R	Sig (2-tailed)
Male	110	0.515**	0.000
Female	110	0.538**	0.000

This table separately presents correlation coefficients examining the relationship between teachers' self-perceived pedagogical knowledge and their male and female students' academic achievement levels. The sample size included matched ratings from 50 male teachers paired with 60 male students' performance scores (N=110), and 50 female teachers matched to 60 female students' data (N=110).

Results reveal positive correlations between teacher knowledge and student achievement for both genders. The male student correlation of 0.515 was moderately strong, while the female student correlation of 0.538 was similar. Importantly, both groups' correlations were statistically significant ($p<0.001$). It means clear linkages exist between teacher competencies and learning outcomes regardless of gender. As teachers become more knowledgeable of instructional best practices, their male and female students demonstrate higher academic performance. The relationships appear nearly equal in magnitude across genders. Ongoing pedagogical development should continue to be emphasized for practitioners of both genders. Since competency levels relate tightly to actual ability, motivation, collaboration, and accountability gains among male and female pupils, investing in teacher growth promises to enrich learning schoolwide.

6. Conclusions

This study aimed to explore elementary school teachers' pedagogical knowledge and effects on student achievement. Findings reveal teachers rate their competencies highly, but female

practitioners view themselves as more knowledgeable across areas. Additionally, teacher knowledge positively—and significantly—relates to student performance, although ability and motivational gaps favour girls. Overall, inquiry-focused, learner-centric practices elicit high endorsement from teachers. However, peer interaction promotion seems less common currently. It represents an area for growth, considering the benefits of collaborative learning, especially for struggling male students. Positively, both male and female teachers' self-perceived expertise strongly correlates with respective boys' and girls' learning outcomes. Hence, ongoing professional enrichment could enact systemic improvements. Significant knowledge gaps emerge favouring female over male teachers across all dimensions, including utilizing inquiry-based strategies that leverage student backgrounds for meaning-making. Enabling learner voice and critical thinking development also score highly, reflecting global shifts toward participatory models. However, slightly lower propositional knowledge ratings warrant consideration regarding relating instruction to diverse perspectives. Quality teaching requires applying specialized expertise while resonating with pupils' realities, interests, and needs.

Statistically, girls significantly outperform boys academically by nearly 4 points, largely attributable to differences in ownership over learning. Specifically, female students demonstrate greater ability confidence, intrinsic motivation, help-seeking tendencies, and self-regulation than their male peers, according to teacher perceptions. Gender similarities in peer collaboration represent a strength. Equipping struggling male students with targeted competency-building while holistically supporting girls could improve parity. Ultimately, this study confirms the interrelations between teachers' multifaceted knowledge and student achievement. While delivery mechanisms matter, understanding learner acquisition processes is equally instrumental. Sustaining instructional quality via practitioner enrichment and empowering, equitable practices that nurture disadvantaged and high-achieving youth remains vital for systemic gains. Findings highlight teachers' pedagogical expertise as pivotal for enacting positive cascading learning effects. Recommendations include ongoing teacher training and nuanced support strategies for male and female pupils.

7. Discussions

The present study reveals several notable findings regarding elementary school teachers' pedagogical knowledge and effects on student achievement. Overall, teachers rate their competencies highly across facets like inquiry-focused teaching, conceptual building, interaction practices, and peer collaboration promotion (Jamil et al., 2022). However, significant gender differences emerge, favouring female practitioners. Furthermore, teachers' self-perceived knowledge is positively associated with students' performance, although ability and motivational gaps surface between male and female pupils. Female teachers are more knowledgeable than male teachers across all five knowledge dimensions measured, including using inquiry-based strategies that leverage prior understanding to scaffold learning (Baviskar 1 et al., 2009). Enabling student questioning and critical thinking development also elicits high ratings, aligning with literature on empowering learner voice and agency ((Cook-Sather, 2009). Constructing meaning from students' lived realities could explain lower propositional knowledge ratings. As Olanoff et al. (2014)discuss, quality pedagogy requires teachers to relate instruction to pupils' interests and perspectives. Overall, learner-centric practices receive high endorsement, reflecting global shifts from teacher-driven delivery toward participatory models (Schweisfurth, 2015). However, student-to-student interaction ratings currently indicate less peer collaboration. Equipping students, especially struggling male pupils, with cooperative skills can enrich achievement as learners teach and support one another (Gillies, 2016). Positively, teachers'

knowledge correlates significantly with student performance, highlighting the need for sustained professional enrichment (Kleickmann et al., 2013). This link persists across male and female pupils, although ability and motivational gaps favouring girls require addressing via targeted scaffolding. Specifically, male students demonstrate lower confidence, intrinsic drive, help-seeking, and accountability ((Severiens& Ten Dam, 2012). Gender similarities in peer learning represent a strength to leverage. Cultivating self-efficacy and responsibility could improve boys' outcomes (Lietaert et al., 2015). Additionally, while girls outperform boys academically, the impact on subjective well-being remains concerning (Ireson et al., 2022).Promoting motivational attitudes, resilience skills, and personalized support amid widening achievement gaps can enable holistic development (Vantieghem et al., 2014).Ultimately, findings confirm the instrumental role of teachers' specialized knowledge in promoting multifaceted student gains (Darling-Hammond, 2017).Sustaining instructional quality through ongoing enrichment of teachers' expertise promises to enact systemic improvements. However, equitable, empowering practices that nurture both male and female learners warrant emphasis.

8. Recommendations

1. Ongoing professional development for teachers should be arranged to enrich pedagogical knowledge across inquiry-based teaching, conceptual building, collaboration strategies, and peer collaboration promotion.
2. Targeted training programs to develop male teachers' capabilities are affirmed to address knowledge gaps associated with female colleagues.
3. Providing students, especially struggling male students, with cooperative skills through peer learning opportunities, group work, and team projects can influence fundamental gender similarities to improve capability.
4. Supporting high-achieving female students holistically by focusing on well-being facets like flexibility, perception-taking, and managing expectations is key amid widening achievement divides.
5. Moving forward, school cultures and policies must emphasize empowering, equitable practices that build up both disadvantaged and gifted learners.

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