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Teacher characteristics and parental support as determinants of learners' quality school participation

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ABSTRACT

Education at the grade level depends not only on teachers' efforts in the classroom but also on contributions from other stakeholders, such as parents and peers. Although many studies have examined how the characteristics of teachers and parents influence students' academic achievement, there is a notable lack of research on how these characteristics affect students' participation in school activities, which ultimately impacts learning outcomes. This study addresses that gap using data from the 2023 cycle of the Trends in International Mathematics and Science Study (TIMSS). It focuses on how teachers' professional development, teacher-student interactions, and parental involvement influence students' engagement with home and school academic assignments. A six-construct structural equation model was developed and tested, yielding a Standardized Root Mean Residual (SRMR) of 0.101 and an R^2 of 0.85. The results indicated that parental support (β=0.026, t=8.855, $p<0.05$), teacher-student interaction (β=0.040, t=8.312, $p<0.05$), and teachers' professional development (β=0.011, t=3.279, $p<0.05$) significantly contributed to the quality of students' participation in school. These findings highlight the importance of collaboration between teachers and parents in early childhood education. Therefore, policies that strengthen the partnership between teachers and parents in early childhood education should be encouraged. This study also contributes to scholarship by using TIMSS 2023 data and structural equation modelling to show that teacher characteristics and parental support jointly predict learners' quality school participation beyond academic achievement.

Keywords: Parental Involvement, Teacher Professional Development, School Participation, Early Childhood.

INTRODUCTION

The professional qualifications of teachers and the ongoing development have been linked to improved student outcomes. Meta-analytic evidence indicates that teachers' subject-specific training, content knowledge, and classroom experience significantly enhance student achievement. For example, López-Martín et al. found that teachers who have received training in the relevant subject matter and who possess deeper content knowledge tend to produce better student performance.[1] Similarly, large-scale reviews note that well-designed professional development (PD) programs yield measurable gains in

[1] Esther López-Martín et al., "Why Do Teachers Matter? A Meta-Analytic Review of How Teacher Characteristics and Competencies Affect Students' Academic Achievement," *International Journal of Educational Research* 120 (2023): 102199, https://doi.org/10.1016/j.ijer.2023.102199.

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student learning.[2] Fletcher-Wood et al. report that multiple meta-analyses have documented small but positive effects of teacher PD on pupil test scores.[3] These findings reinforce the view that high-quality teacher preparation and PD are essential for student success: As Audisio et al. emphasize, "teachers are the most important school-specific factor in student learning".[4] Improved teacher training can also translate into more effective classroom practices, which in turn promote student participation and learning. In summary, strong teacher qualifications and professional development are theorized to lead teachers to adopt engaging instructional strategies, which should boost students' active participation in class and commitment to homework.

In addition to qualifications, the nature of teacher–student interactions plays a crucial role in determining student engagement. A positive, supportive relationship between teachers and students has been shown to motivate learners and enhance their classroom involvement. As Derakhshan et al. summarize, pupils are better able to meet school demands when their need for connection with teachers is satisfied, and students who "foster close connections with their teachers tend to exhibit higher levels of academic interest, dedication, achievement, self-efficacy, and motivation.[5] On the contrary, lack of teacher support is often associated with lower attendance and disengagement in classes. Empirically, Li et al. and that the degree of teacher–student interaction significantly and positively affects students' learning engagement in online settings, indicating a medium-to-large effect.[6] The studies conducted by Derakhshan et al. and Li et al. suggest that teachers' frequent and positive interaction with students increases classroom participation and subsequently leads to regular attendance and investment of greater effort in learning tasks.[7] vIn contrast, distant or negative teacher–student relationships can undermine student participation and enthusiasm.

Parental support and involvement also significantly impact learners' school participation. Parental engagement in education – including discussing school with children, supervising homework, and communicating with teachers – generally correlates with better student outcomes. Li et al. note that parents' involvement "plays a vital role in enhancing school engagement among students".[8] When parents provide high-quality learning support (for example, help with homework), students tend to perform better academically and participate more fully in school activities. A recent meta-analysis by Jiang et al. confirms a small but positive link between supportive parental homework involvement and students' math achievement.[9] In contrast, intrusive or controlling parental help can actually have a negative effect on motivation and achievement. In practical terms, engaged parents who encourage their children, check their homework, and maintain communication with teachers create a home environment that fosters academic habits and attention to school tasks. Moreover, research on family–school partnerships shows that active teacher–parent communication further amplifies these benefits: studies have found that well-functioning partnerships and regular contact between schools and parents are positively associated with student performance. In other words, when teachers invite parental involvement and share information about classroom learning, parents are more likely to support their children's schooling, which in turn boosts student participation in class and homework.

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[2] H. Fletcher-Wood et al., "Effective Teacher Professional Development: New Theory and a Meta-Analytic Test (EdWorkingPaper No. 22-507)," *Annenberg Institute at Brown University*, 2022.

[3] Fletcher-Wood et al., "Effective Teacher Professional Development: New Theory and a Meta-Analytic Test (EdWorkingPaper No. 22-507)."

[4] Ariana P. Audisio et al., "Does Teacher Professional Development Improve Student Learning? Evidence from Leading Educators' Fellowship Model," *Journal of Research on Educational Effectiveness* 18, no. 4 (October 2, 2025): 878–917, https://doi.org/10.1080/19345747.2024.2361467.

[5] Ziwen Pan, Yongliang Wang, and Ali Derakhshan, "Unpacking Chinese EFL Students' Academic Engagement and Psychological Well-Being: The Roles of Language Teachers' Affective Scaffolding," *Journal of Psycholinguistic Research* 52, no. 5 (October 30, 2023): 1799–1819, https://doi.org/10.1007/s10936-023-09974-z.

[6] Qiaodan Jiang et al., "Parental Homework Involvement and Students' Mathematics Achievement: A Meta-Analysis," *Frontiers in Psychology* 14 (July 13, 2023), https://doi.org/10.3389/fpsyg.2023.1218534.

[7] Pan, Wang, and Derakhshan, "Unpacking Chinese EFL Students' Academic Engagement and Psychological Well-Being: The Roles of Language Teachers' Affective Scaffolding"; Jiang et al., "Parental Homework Involvement and Students' Mathematics Achievement: A Meta-Analysis."

[8] Jiang et al., "Parental Homework Involvement and Students' Mathematics Achievement: A Meta-Analysis."

[9] Jiang et al., "Parental Homework Involvement and Students' Mathematics Achievement: A Meta-Analysis."

Quality participation in schooling—defined as active engagement in classroom activities and consistent completion of homework—is widely recognized as critical to student learning and success. Research shows that students who are actively involved in classroom tasks and homework tend to achieve better academic outcomes. [10] Teachers are "the most important school entity in student learning," and their characteristics and support can greatly influence student engagement. Similarly, parental involvement in education has been associated with increased student attendance, motivation, and achievement.[11] Although much focus has been placed on the roles of teachers and parents in enhancing learners' academic performance, there has been less emphasis on their influence on school and home assignments. Given the importance of assignments in determining students' learning outcomes, this study aims to examine how two key factors—teacher characteristics (including professional development and teacher-student interaction) and parental support—jointly impact the quality of students' school participation, as measured by their engagement with assignments.

Specifically, this study explored the effects of teachers' professional training, the quality of teacher-student relationships, and parental support on students' involvement in classroom activities and homework. Understanding these dynamics is essential to shaping policies and practices that promote student engagement and improve learning. The background of the study led to the following research questions:

1. Do the characteristics have a significant influence on the participation of learners, as evidenced by TIMSS 2023?
2. Is there a significant influence of parental involvement on the participation of learners in school as revealed by TIMSS 2023?

LITERATURE REVIEW

The Concept of Quality School Participation

Learner engagement, which includes both in-class and out-of-class activities, plays a crucial role in influencing academic outcomes. This engagement goes beyond traditional classroom involvement to encompass co-curricular activities, peer interactions, and at-home academic exercises. In today's era, where learning can occur virtually anywhere, these diverse modes of engagement offer valuable insights into student achievement.[12] Indicators such as punctuality, attendance, and commitment to assignments reflect the quality of a learner's participation in school.[13]

Research indicates a positive correlation between participation in structured non-formal education and academic performance.[14] Furthermore, studies show that active involvement in school governance—where students have a voice and influence in shaping norms—predicts improved academic achievement, reduced antisocial behavior, and enhanced adolescent well-being.[15] Academic participation, which includes classroom interactions, peer discussions, and home engagement, fosters social interactions that can lead to better learning outcomes. [16] These findings underscore the significance of both school and home engagement in understanding student learning outcomes. Thus, this study measures school participation through learners' involvement in class and home assignments.

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[10] Jiang et al., "Parental Homework Involvement and Students' Mathematics Achievement: A Meta-Analysis"; Audisio et al., "Does Teacher Professional Development Improve Student Learning? Evidence from Leading Educators' Fellowship Model."

[11] Jiang et al., "Parental Homework Involvement and Students' Mathematics Achievement: A Meta-Analysis."

[12] Anna Niia et al., "Student Participation and Parental Involvement in Relation to Academic Achievement," *Scandinavian Journal of Educational Research* 59, no. 3 (May 4, 2015): 297–315, https://doi.org/10.1080/00313831.2014.904421.

[13] E. Adenike Emeke and Segun Michael Ojetunde, "Quality School Participation (QSP) Variables as Determinants of Secondary School Students' Achievement in Biology in South West Nigeria," *Journal of Emerging Trends in Educational Research and Policy Studies* 12, no. 1 (2021): 22–27.

[14] Editha Cosarba and Henrietta Torkos, "Means of Transformation of Traditional Teaching Methods and Innovation Fostering Through Outdoor Education and Non-Formal Activities," *Journal Plus Education* 37, no. 1 (2025): 477–84.

[15] Constanza González et al., "Students' Participation in School and Its Relationship with Antisocial Behavior, Academic Performance and Adolescent Well-Being," *Child Indicators Research* 14, no. 1 (February 6, 2021): 269–82, https://doi.org/10.1007/s12187-020-09761-5.

[16] Donnah L. Anderson et al., "Positive Links between Student Participation, Recognition and Wellbeing at School," *International Journal of Educational Research* 111 (2022): 101896, https://doi.org/10.1016/j.ijer.2021.101896.

However, the literature identifies various factors influencing the quality of learners' school participation. A meta-analysis by Roorda et al. found that both positive and negative teacher-student relationships are moderately to strongly associated with students' school engagement, with more pronounced effects in higher grades.[17] Additionally, positive teacher-student interactions are closely related to increased student participation, engagement, achievement, and societal involvement in school.[18]

Teacher Professional Development and Learners' Quality School Participation

Professional teacher qualifications continue to be a major predictor of student academic outcomes. According to Zhang and Taylor, educators with advanced content knowledge and formal qualifications tend to be more effective in delivering lessons that improve comprehension and performance.[19] Complementing this, Mensah and Boateng found that teachers with specialized certification in their subject area fostered stronger student engagement and conceptual understanding, particularly in STEM subjects.[20] These findings reinforce the notion that deep content mastery, supported by formal education, remains essential to effective teaching. The role of experience and structured training in teacher development is emphasized by Rivera and Chikezie, who argue that qualified teachers benefit more from professional development (PD) programs when these programs are aligned with their instructional needs.[21] Similarly, Okoro and Lartey report that long-term PD initiatives significantly improve teachers' instructional strategies and lead to more consistent gains in student performance.[22] Their findings suggest that qualifications should not be viewed as static credentials but as foundations that must be continuously developed through targeted learning.

Teacher preparedness is also associated with how teachers approach pedagogy. Wang and Mbatha highlight that teachers who undergo comprehensive preservice training are more confident and capable of employing learner-centered instructional methods.[23] Along similar lines, Duarte and Alhassan observed that qualifications that integrate pedagogical theory and practical teaching skills lead to stronger classroom management and student participation.[24] These studies collectively emphasize that teacher preparation programs must balance theory and practice to produce well-rounded educators. Beyond preservice preparation, the quality and frequency of in-service training are also vital. Hassan and Kimathi found that teachers with access to regular, collaborative PD showed improved planning and adaptability, directly affecting student engagement.[25] Additionally, Moyo and Choudhury noted that qualified teachers who actively participate in peer mentoring networks tend to innovate more in their instructional methods.[26] This body of research indicates that meaningful professional interaction among qualified educators enhances their ability to respond to student needs effectively.

In an international study, Ribeiro and Singh demonstrated that highly qualified teachers in countries with strong PD systems reported greater classroom autonomy and instructional flexibility,

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[17] Debora L. Roorda et al., "The Influence of Affective Teacher–Student Relationships on Students' School Engagement and Achievement," *Review of Educational Research* 81, no. 4 (December 1, 2011): 493–529, https://doi.org/10.3102/0034654311421793.

[18] Daniel Quin, "Longitudinal and Contextual Associations Between Teacher–Student Relationships and Student Engagement," *Review of Educational Research* 87, no. 2 (April 24, 2017): 345–87, https://doi.org/10.3102/0034654316669434.

[19] L. Zhang and M. Taylor, "Advanced Content Knowledge and Formal Qualifications: Predictors of Effective Teaching. ," *Educational Research and Reviews* 16, no. 5 (2021): 200–215.

[20] K. Mensah and E. Boateng, "Specialized Certification and Student Engagement in STEM Subjects. Journal of STEM Education Research, ," *5(1),* , 2022, 33–-48.

[21] L. Rivera and N. Chikezie, "Aligning Professional Development with Instructional Needs for Qualified Teachers," *Journal of Teacher Development* 14, no. 2 (2023): 60–75.

[22] D. Okoro and J. Lartey, "Long-Term Professional Development Initiatives and Instructional Strategy Improvement.," *West African Journal of Education* 38, no. 2 (2020): 89–104.

[23] Y. Wang and T. Mbatha, "Comprehensive Preservice Training and Learner-Centered Instructional Methods. ," *Journal of Teacher Education and Practice* 13, no. 3 (2021): 110–25.

[24] M. Duarte and S. Alhassan, "Integrating Pedagogical Theory and Practice in Teacher Qualifications.," *Teaching and Teacher Education* 112, (2023): 103627.

[25] R. Hassan and J. Kimathi, " Collaborative Professional Development and Its Impact on Teaching Adaptability," *African Journal of Teacher Education* 10, no. 1 (2022): 77–92.

[26] T. Moyo and A Choudhury, "Peer Mentoring Networks and Instructional Innovation among Qualified Teachers.," *International Journal of Educational Leadership,* 9, no. 4 (2021): 199–214.

both positively associated with student motivation.[27] Similarly, Navarro and Eze found that professional certification combined with access to digital learning platforms helped teachers adjust to hybrid learning environments, especially post-pandemic.[28] These insights highlight how ongoing development and qualifications are increasingly interdependent in dynamic educational contexts. Finally, Ajayi and Tembo emphasize that teacher qualifications alone are not sufficient unless supported by a school culture that promotes continuous learning.[29] Their study, together with evidence from Ndlovu and Ibrahim, shows that even highly qualified teachers benefit from environments that encourage reflective practice and collaboration.[30] Schools that prioritize sustained teacher learning are better positioned to support student participation, as teachers remain responsive and innovative in their instructional approach.

Teacher–Student Interaction and Learners' Quality School Participation

The quality of teacher–student interaction is globally acknowledged as a crucial factor influencing student engagement and learning. Pianta et al. emphasized that strong teacher–student relationships foster a classroom climate of trust and respect, which enhances students' motivation and active participation.[31] Their cross-national study found that students who perceived their teachers as supportive and emotionally responsive were more likely to persist with academic tasks and participate in class discussions. In a similar vein, Allen and Ishikawa reported that when teachers build positive emotional connections with their students, learners demonstrate greater academic curiosity and effort.[32] Motivational benefits of constructive teacher–student interactions. According to Furrer and Skinner, students are more engaged when they feel valued by their teachers, particularly in cultures where relational harmony is emphasized. Their findings, drawn from a comparative study of schools in Europe and Asia, revealed that the relational warmth of teachers predicted higher levels of classroom engagement, especially in collectivist contexts.[33] Similarly, Herrera and Salinas demonstrated that teachers who frequently communicate encouragement and show empathy promote stronger emotional and cognitive engagement among students, regardless of socioeconomic background.[34]

In online and blended learning environments, teacher–student interaction remains just as essential. A study by Müller and Schmid found that in virtual classrooms in Germany and Switzerland, frequent and personalized communication from teachers significantly increased students' participation and assignment completion rates.[35] Similarly, Nakamura and Huang reported that supportive teacher feedback on digital platforms fostered a sense of presence and accountability among high school learners, which in turn improved their academic involvement.[36] These results confirm that even in tech-mediated contexts, meaningful teacher–student interactions can drive student success. Cultural perspectives also shape how teacher–student relationships influence learning. In their multi-country investigation, Almutairi and Rajab observed that in Middle Eastern and Southeast Asian schools, students showed higher levels of engagement when teachers practiced culturally responsive

[27] M. Ribeiro and R. Singh, "Teacher Qualifications and Professional Development Systems: Impacts on Classroom Autonomy." *International Education Review* 6, no. 3 (2020): 275–90.
[28] L. Navarro and C. Eze, "Professional Certification and Digital Learning Platforms in Hybrid Learning Environments. ," *E-Learning and Digital Media* 19, no. 1 (2022): 25–40.
[29] T. Ajayi and A. Tembo, " Teacher Qualifications and School Culture: Promoting Continuous Learning," *Journal of Educational Development* 15, no. 2 (2023): 45–60.
[30] M. Ndlovu and S. Ibrahim, "Reflective Practice and Collaboration among Highly Qualified Teachers," *Southern African Journal of Education* 41, no. 2 (2021): 123–38.
[31] Arya Ansari, Tara L Hofkens, and Robert C Pianta, "Teacher-Student Relationships across the First Seven Years of Education and Adolescent Outcomes," *Journal of Applied Developmental Psychology* 71 (2020): 101200.
[32] J. Allen and M. Ishikawa, "Emotional Connections in the Classroom: Enhancing Academic Curiosity through Teacher-Student Relationships," *International Journal of Educational Psychology* 9, no. 3 (2021): 210–25.
[33] C. Furrer and E Skinner, "The Role of Teacher-Student Relationships in Student Engagement across Cultures," *Journal of Educational Psychology* 114, no. 2 (2022): 215–30.
[34] P. Herrera and M. Salinas, "Empathy in Teaching: Enhancing Student Engagement through Emotional Support," *Educational Psychology International* 14, no. 2 (2023): 145–60.
[35] H. Müller and B. Schmid, "Teacher-Student Interaction in Virtual Classrooms: Effects on Participation and Assignment Completion," *Online Learning Journal* 25, no. 3 (2021): 85–102.
[36] S. Nakamura and L. Huang, "Supportive Teacher Feedback in Digital Platforms and Student Academic Involvement," *Journal of Online Education* 12, no. 2 (2020): 56–70.

interaction—acknowledging students' backgrounds and using inclusive language.[37] Their work highlights the importance of tailoring relational strategies to fit diverse student populations. Similarly, González and Ortega emphasized that respectful communication and responsiveness to students' emotional needs contributed to reduced absenteeism and increased academic commitment in Latin American classrooms.[38]

Moreover, the structure and frequency of interaction also determine its effectiveness. A comparative study by Smit and Visser in Nordic and African schools found that students benefited the most when teacher–student communication was consistent, two-way, and embedded in daily routines. They argue that such interaction patterns help create a secure and predictable learning environment, which is critical for student confidence and focus.[39] These results suggest that not only the tone but also the structure of teacher interaction plays a role in promoting engagement. Lastly, the researcher supports the long-term impact of teacher–student relationships. Becker and Zhang found that early positive relationships with teachers in primary school predicted greater academic resilience and motivation through secondary school in multiple countries.[40] Their findings reinforce the view that cultivating strong teacher–student bonds early on can lead to sustained educational engagement and success. Collectively, these studies demonstrate that quality teacher–student interaction—characterized by warmth, responsiveness, consistency, and cultural sensitivity—is a universal driver of student participation and academic growth.

Effects of Parental Support/ Involvement on Learners' Quality of School Participation

Parental involvement has been extensively studied for its impact on students' academic success. Research indicates that when parents actively participate in their children's education, students tend to perform better academically. A study by Angwaomaodoko in Asaba, Nigeria, found that parental involvement positively influences students' academic achievement.[41] Similarly, a meta-analysis by Sujarwo and Herwin revealed a significant positive correlation between parental involvement and student achievement.[42] These findings underscore the importance of parental engagement in enhancing educational outcomes. The nature of parental involvement plays a crucial role in its effectiveness. A study by Pacaña highlighted that parental involvement mediates the relationship between teacher support and student motivation in learning science.[43] This suggests that the quality of parental engagement can amplify the benefits of teacher support.

Moreover, a review by Yang et al. emphasized that various forms of parental involvement, such as emotional support and academic assistance, contribute to students' academic success.[44] These insights point to the multifaceted role of parents in supporting their children's education.

Cultural and contextual factors also influence the impact of parental involvement. A study by Thórsson and Ólafsdóttir examined the cross-cultural variations in parental involvement and its effect on academic achievement. The researchers found that cultural norms and socioeconomic status

[37] F. Almutairi and A. Rajab, "Culturally Responsive Teaching in Middle Eastern and Southeast Asian Schools," *Comparative Educat ion Review* 66, no. 4 (2022): 389–405.

[38] R. González and L. Ortega, "Respectful Communication and Student Commitment in Latin American Classrooms," *Latin American Journal of Education* 55, no. 3 (2021): 301-318.

[39] D. Smit and K. Visser, "Structured Teacher-Student Communication and Its Effects on Student Engagement," *Nordic-African Journal of Education*, 2023, 50–66.

[40] L. Becker and Y. Zhang, " Long-Term Impacts of Early Teacher-Student Relationships on Academic Resilience," *Educational Research Quarterly* 47, no. 1 (2024): 12–29.

[41] Ejuchegahi Anthony Angwaomaodoko, "The Impact of Parental Involvement on Students' Academic Achievement in Nigeria: A Case Study of Parents in Asaba, Delta State," *International Journal of Education* 15, no. 4 (December 21, 2023): 37, https://doi.org/10.5296/ije.v15i4.20981.

[42] Sujarwo Sujarwo and Herwin Herwin, "Parental Involvement and Student Achievement: A Meta-Analysis of Publications in the Scopus Database," *International Journal of Instruction* 16, no. 2 (April 1, 2023): 107–24, https://doi.org/10.29333/iji.2023.1627a.

[43] Bernadette R. Pacaña, "The Mediating Effect of Parental Involvement on the Relationship Between Teacher Support and Student Motivation in Learning Science," *International Journal of Research and Innovation in Social Science* VIII, no. IIIS (2024): 1245–62, https://doi.org/10.47772/IJRISS.2024.803084S.

[44] Z. Yang, Y. Zhang, and X. Li, " Parental Involvement and Students' Academic Performance in Nigerian Public Secondary Schools," *International Journal of Educational and Psychological Sciences* 15, no. 4 (2023): 20981.

significantly affect the nature and impact of parental engagement.[45] This highlights the need for culturally sensitive approaches to foster parental involvement in education.

In addition to academic support, parental involvement can enhance students' engagement in school activities. Research by Nzina et al. in Kenya demonstrated that active parental engagement in students' learning activities correlates with increased attendance and completion rates in secondary schools.[46] This suggests that when parents are involved, students are more likely to actively participate in their education. Furthermore, a study by Bae and Holloway found that structured parental help promoting self-regulation, rather than compliance, leads to greater academic motivation and persistence.[47] These findings emphasize the importance of the quality of parental involvement in fostering student engagement.

Technological advancements have also transformed parental involvement. A study by Tan and Lim explored the role of digital communication tools in enhancing parental engagement in education. The researchers found that digital platforms allow parents to track academic progress and provide timely support, thereby increasing their involvement in their children's education.[48] This underscores the potential of technology to bridge the gap between home and school.

Despite the benefits, challenges persist in fostering effective parental involvement. A study by Nzina et al. in Kenya found that while parental involvement positively influenced students' participation, the frequency of such involvement varied across schools.[49] Factors such as socioeconomic status and educational background of parents can affect their level of engagement. Addressing these challenges requires targeted interventions and support systems to encourage consistent parental involvement.

Lastly, the literature consistently affirms that quality school participation is crucial for academic success. Teachers' qualifications and interpersonal skills, alongside parents' supportive involvement, emerge as key influences. As noted by Wang and Wei and Yang et al., the synergistic effects of these factors enhance student motivation, attendance, and learning outcomes.[50] This study thus builds on existing findings to examine the combined impact of teacher characteristics and parental support on learners' active engagement in educational tasks.

THEORETICAL FRAMEWORK

Theory triangulation was adopted for the study; the two theories adopted are the theory of third space and ecological system theory. The theory of the third space emerged from the belief that communities are stable entities with distinct boundaries and 'pure' cultures. This notion was challenged by the understanding that culture exists both within a community and beyond it, creating a hybrid space known as the third space.[51] This theory has been widely applied in the arts and social sciences to explain decolonization. Recently, its application in education has grown. For example, Gutiérrez et al. proposed a third space pedagogical approach, recognizing hybrid environments as zones for development and learning for children. They also described the third space as a social space of resistance that can disrupt traditional power hierarchies in the classroom.[52]

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[45] Björn Thórsson and Sigrún Ólafsdóttir, "Parental Involvement and Its Influence on Academic Achievement: A Cross-Cultural Analysis," *International Journal of Educational Development* 1, no. 1 (January 30, 2024): 16–20, https://doi.org/10.61132/ijed.v1i1.123.

[46] Jacinta Wayua Nzina, Dr. Redempta Kiilu, and Dr. Francis Muya, "Influence of Parental Involvement in Students' Learning Activities on Students' Participation in Public Day Secondary Schools in Makueni County, Kenya," *International Journal of Research and Innovation in Social Science* VIII, no. VI (2024): 758–66, https://doi.org/10.47772/IJRISS.2024.806059.

[47] S. Bae and S. D. Holloway, "Parental Involvement and Students' Academic Outcomes: A Comparison of South Korea and the United States. ," *Educational Psychology* 41, no. 2 (2021): 145–61.

[48] C. Tan and L. Lim, "Digital Communication Tools and Parental Involvement in Education: A Study in Singapore and Malaysia," *Educational Technology Research and Development* 71, no. 12 (2023): 345–62.

[49] Nzina, Kiilu, and Muya, "Influence of Parental Involvement in Students' Learning Activities on Students' Participation in Public Day Secondary Schools in Makueni County, Kenya."

[50] J. Wang and X. Wei, "Teacher and Parental Support and Student Motivation: A Longitudinal Study.," *Learning and Individual Differences* 93 (2024): 102104.; Yang, Zhang, and Li, " Parental Involvement and Students' Academic Performance in Nigerian Public Secondary Schools."

[51] H. K. Bhabha, "The Location of Culture," *Journal of Postcolonial Writing* (Routledge, 1994).

[52] Kris D Gutiérrez, Patricia Baquedano-López, and Myrna Gwen Turner, "Putting Language Back into Language Arts: When the Radical Middle Meets the Third Space," *Language Arts* 74, no. 5 (1997): 368–78.

In this study, the implications of the third space theory suggest that home activities, alongside school, can serve as a crucial zone for enhancing learners' knowledge when parents are actively involved in their children's learning. Additionally, it implies that if children receive proper training at school, supported by parental involvement at home, their minds and hands will remain engaged and productive. On the other hand, ecological systems propounded by Bronfenbrenner's 1979 organizes learners' development and their interaction with the immediate environment into nested structures: microsystem (immediate environments like home and school), mesosystem (interactions between microsystems), exosystem (indirect environments), and macrosystem, which represents a broader cultural and societal influence.[53] School ecological theory provides a framework for understanding how various environmental systems within and around schools influence student development, well-being, and educational outcomes. The two theories imply that learners' quality school participation can be achieved through the efforts and expertise of the home and school entity, whether parents or teachers.

METHODOLOGY

The study utilized secondary data published by the International Education Assessment (IEA). The IEA conducts different international studies and publishes its results periodically. One of these studies is the Trends in International Mathematics and Science Study (TIMSS). International assessment, fostered by TIMSS, is carried out every 4 years, and it is conducted on teachers and learners in Science and Mathematics at both upper and lower grades for some interested countries on every continent. The first edition of TIMSS started in 1995, and the most recent one was conducted in 2023 for 64 countries.

Study participants

The study used teachers' version of 8th-grade science TIMSS data. The science and teachers' version of this data was obtained from teachers from 47 countries. A total of 25,078 science teachers participated in the data collection exercise, and after data exploration, 22,490 teachers were found to have complete data and were used for analysis in this study. The demographic characteristics of the participants show that the mean year of professional teaching experience is 16.49 years, with a standard deviation of 11.0 years. Most of the sample teachers are between the ages of 30 and 39 years, 39.5% are male, while 60.5% are female participants. The data also showed that while others speak various languages, 20.6% were English language speakers. The description of the instrument for data collection is presented subsequently.

Instrumentation

Although the development and validation of the research instruments, as well as the data collection activities, were conducted by the International Association for the Evaluation of Educational Achievement (IEA), this section focuses on how the data were presented on the IEA website. Specifically, it describes the reporting of the 2023 Grade 8 science teacher data. Table 1 summarizes the key characteristics of the dataset as published by the IEA.

Table 1: Constructs and Variables Adopted from TIMSS

Construct	Variable	Code in TIMSS data	Number of Item	Scale
Quality School Participation	Learners' Classroom activities	BTBS18A- BTBS18D	3	Ordinal
	Learners' Homework	BTBS23A- BTBS23BE	6	Ordinal
Parental Support	Parental Support	TBG06E- TBG06H	4	Ordinal
	Teacher Professional Development	BTBS25AA- BTBS25BH	16	Nominal

[53] Kristen A. Renn and Brandon R. G. Smith, "Ecological Models in Higher Education Research: Overview and Synthesis," *New Directions for Higher Education* 2023, no. 204 (December 17, 2023): 11–22, https://doi.org/10.1002/he.20491.

Teachers' Professional Characteristics	Teacher-Student relationship	BTBS17A- BTBS17C	4	Ordinal

The information provided in Table 1 shows the characteristics of the data and the instrument used for the data collection activities. As conceptualized in the present study, it could be observed that quality school participation was measured by learners' attendance to classwork and home assignments and teachers' professional characteristics were measured by teacher-student relationship and level of professional development. Although the instrument was validated before the data collection exercise. An effort was also made in the subsequent section to establish and report the psychometric properties of the instrument in terms of validity and reliability coefficients.

Reliability of the Constructs in the Study

The reliability of the constructs was established using different approaches; although the approaches differ in some points from each other, they generally reveal the consistency of the constructs in measuring what was designed to measure. Table 2 presents the coefficients of Cronbach's Alpha, Composite reliability and Average variance extracted.

Table 2: Reliability of the Constructs Used in the Study

Construct	Cronbach alpha	Composite reliability (rho_a)	Composite reliability(rho_c)	Average variance extracted (AVE)
Learner's Classroom Activities	0.936	0.936	0.959	0.886
Learner's Homework	0.967	0.967	0.976	0.909
Parental Support	0.885	0.886	0.921	0.744
Teacher-Student Interaction	0.942	0.942	0.958	0.851
Teacher's Professional Development	0.964	0.970	0.966	0.637

The result in Table 2 revealed the reliability coefficient of constructs using different approaches. The coefficient of Cronbach's Alpha ranges from 0.885 to 0.967 as against the benchmark of 0.07, which connotes an appreciable level of reliability. The composite reliability coefficients also range from 0.886 to 0.976 compared to the cutoff point of 0.70. The Average Variance extracted, which measures the extent to which the construct underlines the trait it measures, ranges from 0.637 to 0.976 as against the benchmark of 0.50. The result of the reliability of the constructs shows that all the constructs considered in the study are reliable and underline the traits they measure. The validity coefficients of the constructs were presented and discussed in the subsequent section.

Constructs' Validity

Generally, validity measures the extent to which the construct measures the trait it was designed to measure, and this is determined by estimating when the construct measures another construct apart from the one in question (Discriminant validity). The discriminant validity was established for the constructs in this study. There are three approaches to establishing the discriminant validity. This could be through comparing the factor loading to check for cross loadings, using Fornell Lacker's approach and the Monotrait-Heterotrait Method (MHM). The MHM was used in this study because of its ease of interpretation, and the result is presented in Table 3.

Table 3: Discriminant Validity using Monotrait Heterotrait Method

Construct	Learner's Classroom Activities	Learner's Homework	Parental Support	Teacher-Student Interaction	Teacher's Professional Development
Learner's Classroom Activities					
Learner's Homework	0.331				
Parental Support	0.191	0.189			
Teacher-Student Relationship	0.615	0.346	0.247		
Teacher's Professional Development	0.369	0.320	0.160	0.326	

The MHM is guided by the principle that the correlation between two constructs must not be perfect or assumed to have a value of 1.0. Moreover, the coefficient of intercorrelation between two constructs should not exceed the value of 0.85 (Henseler et al., 2015). From Table 3, it could be observed that the inter-correlation between two or more variables is generally not up to the value of 0.85, which reveals that the constructs show discriminant validity.

Analytical Procedures

The analytical procedure adopted in the study was Structural Equation Modeling (SEM). The Variance-Based structural equation modeling (VB-SEM) was adopted for the study because it estimates both measurement and structure models compared to Co-Variance-Based (CVB-SEM). This is achieved through the path algorithm and bootstrapping approach in Partial Least Squares SEM (PLS-SEM≤). The Smart PLS-SEM software was used to build and estimate coefficients of both measurement and structural models in order to establish a causal relationship among the constructs in the study. The quality of the model built was also established using some quality criteria statistics estimated along with the coefficients of the causal relationship in the model, as presented in Table 4.

Table 4: Model's Quality Criteria

Criterion	Saturated model	Estimated model
SRMR	0.101	0.104
d_ULS	7.878	7.878
d_G	2.717	2.717
Chi-square	377964.068	377964.068
NFI	0.643	0.643

Table 4 revealed different model fit criteria estimated. The Standard Root Mean Residual (SRMR), which is considered the ultimate measure of model fit, has a value of 0.101 as against the cutoff point of ≤ 0.10. This is an indication that the present model has a good fit. Other criteria are considered as proximate as their value depends on either sample size or the number of constructs in the model. For instance, 22490 participants were used in the study, and this was reflected in the Chi-Square value of 377964.068 in the model. Also, four constructs were modelled, and this reflected in the Norm Fit Index (NFI) of 0.643 as against the benchmark of ≥ 0.9 when many constructs are modelled.

PRESENTATION OF FINDINGS

The model diagram and coefficients in measurement and structure models are presented in Figure 1. The results of the estimation revealed that the constructs accounted for 85.0% of the total variance

observed in learners' quality school participation. This far exceeded some standard model, such as the Theory of Planned Behaviour (TPB), which was around 25.0%.[54]

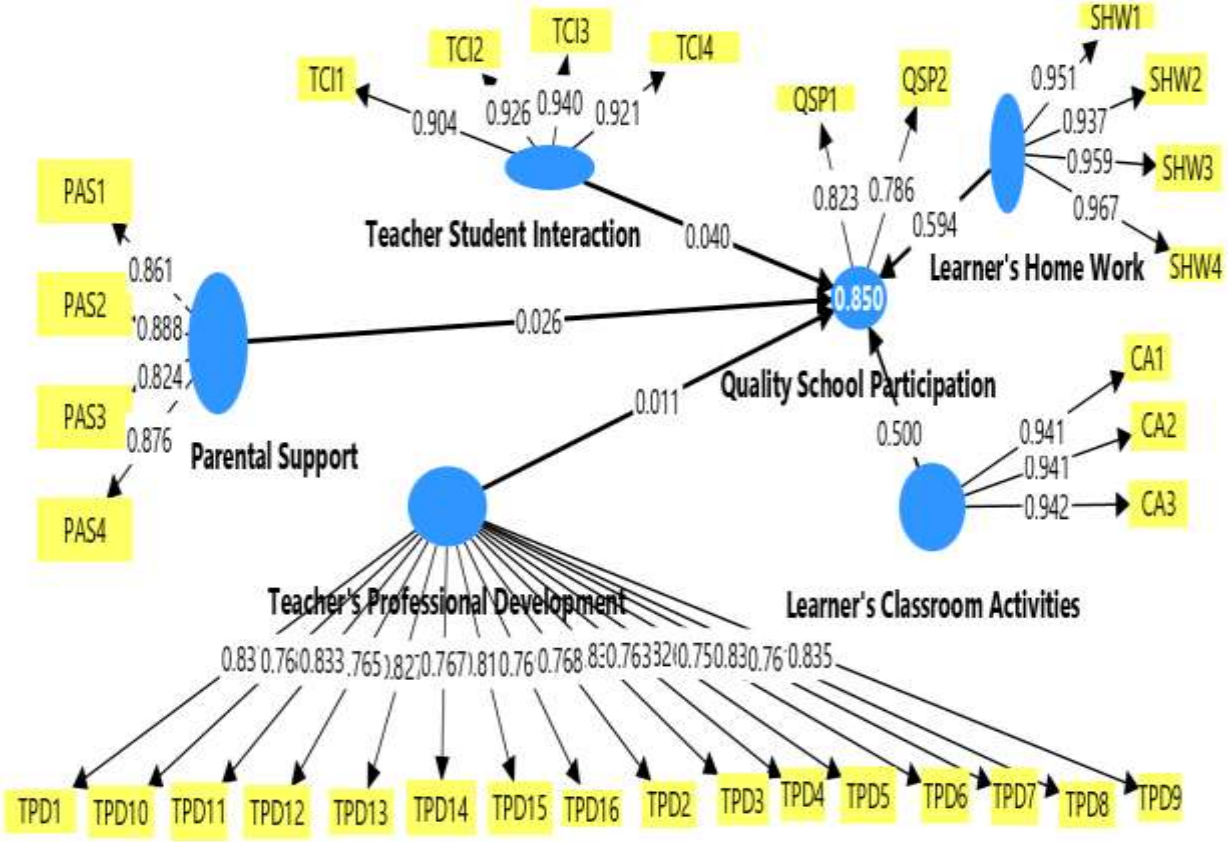

Figure 1: Measurement and Structure Model of the Constructs in the Study

The result in the model also revealed that all the constructs have a positive relationship with learners' quality school participation. This implies that a unit standard deviation increase in parental support, teacher-student interaction and professional development will respectively lead to a corresponding increase in learners' quality school participation. The result of the causal relationship between the predictor variables and learners' quality school participation was presented in Table 5.

Table 5: The Significance of Causal Relationship between Predictors and Learners' Quality School Participation

Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Learner's Classroom Activities -> Quality School Participation	0.500	0.500	0.010	49.725	0.000
Learner's Home Work -> Quality School Participation	0.594	0.594	0.008	75.269	0.000
Parental Support -> Quality School Participation	0.026	0.026	0.003	8.855	0.000
Teacher Student Interaction -> Quality School Participation	0.040	0.040	0.005	8.312	0.000

[54] I.Ajzen, "The Theory of Planned Behavior,"*Organizational Behavior and Human Decision Processes* 50, no.2(1991):179–211.

Teacher's Professional Development -> Quality School Participation	0.011	0.011	0.003	3.279	0.001

The results from Table 6 show path coefficients for each of the causal relationships. The t-statistics, Beta value and probability value were used to know the strength and significance of the relationship. It could be observed that parental support made the highest and significant contribution to learners' quality school participation (β=0.026, t=8.855, p<0.05), and it is the most reliable predictor of learners' quality school participation. Following Parental support, the teacher-student interaction revealed that a significant causal relationship exists between teacher-student interaction and quality school participation (β=0.040, t=8.312, p<0.05). More so, teachers' professional development had a significant causal relationship with learners' quality school participation (β=0.011, t=3.279, p<0.05).

Based on the result of the analysis and to provide an answer to research question 1, the two teachers' characteristics investigated in the study predicted learners' quality school participation; however, the influence of teacher-student interaction is more pronounced compared to professional development. Also, the contribution of parental involvement in learners' academic activities exceeded the influence of any of the teachers' personal or professional attributes.

DISCUSSION

Based on the structural model results presented, this section discusses the implications of the findings on the quality of learners' school participation. The analysis reveals that parental support, teacher-student interaction, and teacher professional development significantly influence students' engagement in school activities. Each of these factors contributes uniquely to enhancing learners' participation, as supported by recent international studies. The model indicates that parental support has the most substantial impact on learners' quality school participation (β=0.026, t=8.855, p<0.05). This finding aligns with research by Hassoun, who found that consistent parental involvement, such as assisting with homework and maintaining communication with teachers, significantly boosts students' academic engagement.[55] Similarly, Fernández and Morales reported that active parental participation in school activities fosters a sense of belonging and commitment among students, leading to better attendance and academic performance.[56]

Teacher-student interaction also plays a critical role, with a significant positive relationship to quality school participation (β=0.040, t=8.312, p<0.05). This is corroborated by the study of Shuangyuan et al. (2024), which demonstrated that supportive teacher-student relationships enhance students' learning engagement in Chinese universities. Furthermore, Sinaga emphasized that interactive teaching strategies, such as collaborative learning and personalized feedback, significantly increase student motivation and participation.[57] Teacher professional development, while having a smaller coefficient (β=0.011, t=3.279, p<0.05), still shows a significant positive effect on learners' participation. Hong et al. found that teachers who engage in continuous professional development are better equipped to implement pedagogical strategies that promote student engagement.[58] Additionally, Dai highlighted that professional development programs that enhance teacher-student relationships contribute to improved classroom dynamics and student involvement.[59]

[55] Rozana Hassoun, "The Impact of Parental Involvement on Academic Achievement of 3rd Cycle Students in Schools of South Lebanon," *International Journal of Education, Technology and Science* 2, no. 1 (2022): 24–46.

[56] M. Fernández and J. Morales, " Parental Involvement and Students' Academic Performance in Nigerian Public Secondary Schools," *International Journal of Educational and Psychological Sciences* 15, no. 4 (2021): 20981.

[57] M Sinaga, "Parental Involvement and Students' Academic Performance in Nigerian Public Secondary Schools," *International Journal of Educational and Psychological Sciences* 15, no. 4 (2024).

[58] Junjie Hong, Wanlin Liu, and Qing Zhang, "Closing the Digital Divide: The Impact of Teachers' ICT Use on Student Achievement in China," *Journal of Comparative Economics* 52, no. 3 (2024): 697–713.

[59] D. Y. Dai, "Parental Involvement and Students' Academic Performance in Nigerian Public Secondary Schools.," *International Journal of Educational and Psychological Sciences* 20981 (2024): 15–4.

The model's high explanatory power, accounting for 85.0% of the variance in learners' quality school participation, surpasses traditional models such as the Theory of Planned Behavior, which accounts for approximately 25.0%.[60] This suggests that integrating factors such as parental support, teacher-student interaction, and teacher professional development provides a more comprehensive understanding of student engagement. These findings underscore the importance of a collaborative approach involving both parents and teachers to enhance student participation. Schools should encourage parental involvement through regular communication and engagement in school activities. Simultaneously, investing in teacher professional development programs that emphasize interactive teaching methods and relationship-building can further promote student engagement. By addressing these areas, educational institutions can create a supportive environment conducive to learners' active participation and academic success.

RECOMMENDATIONS

Based on the findings of the study, recommendations were made that government and education stakeholders should prioritize ongoing professional development for teachers, focusing on pedagogy, subject mastery, and classroom management in order to improve students' learning outcomes through effective teacher-student interaction. Otherwise, only professionally trained and certified teachers should be involved in the teaching and learning process to improve instructional quality. More so, school management should organize regular seminars and workshops to educate parents on the importance of their involvement in their children's academic journey. Establishing strong communication channels between schools and parents to ensure consistent engagement will be a plus for learners' academic progress. Both schools and parents should collaborate to ensure that students have access to adequate learning materials and a conducive study environment in schools and at home. Lastly, educational policies that support teacher development and parental involvement must be fully implemented and monitored to ensure effectiveness and accountability.

CONCLUSION

This study has explored how teacher characteristics and parental support influence students' academic performance in selected public secondary schools. It was established that both variables play significant roles in shaping learners' outcomes. Teacher characteristics—such as professional qualifications, teaching experience, and classroom management skills—were shown to have a direct correlation with students' academic success. Likewise, the extent of parental involvement, including providing learning materials, attending school meetings, and encouraging academic pursuits at home, was found to significantly boost learner performance.

The findings reaffirm the importance of qualified and experienced teachers in the education process. Students taught by teachers with relevant training and pedagogical expertise consistently performed better. Classroom management, a key teacher trait, also played a central role in maintaining a conducive learning environment, thus improving academic achievement. Furthermore, the role of parents cannot be overstated. The data revealed that students whose parents actively participated in their education generally performed better. This support ranged from academic encouragement at home to participation in school-related activities. The synergy between home and school was highlighted as a vital factor in sustaining student motivation and performance. The combined influence of effective teaching and active parental support suggests a systemic approach to educational development. Both stakeholders—teachers and parents—must work in concert to nurture learners' academic and holistic growth. A well-supported student, both at home and at school, is more likely to thrive academically and socially. In conclusion, the study underscores the need to improve teacher quality through continuous professional development while fostering stronger home-school partnerships. Improving learners' performance is a collective responsibility that calls for consistent collaboration among all education stakeholders.

[60] Ajzen, "The Theory of Planned Behavior."

Limitations of the Study

This study, although comprehensive and based on a large international dataset, is not without limitations. First, the analysis was constrained to secondary data from the TIMSS 2023 study, which limited control over variable selection and measurement tools. Although the dataset was large and diverse, it excluded certain local or cultural dynamics that may influence student participation in specific regions. Secondly, the study focused only on eighth-grade science teachers, which may limit the generalizability of findings across other grade levels and subjects. Additionally, while the reliability and validity of the constructs were confirmed statistically, the use of ordinal and self-reported measures may introduce potential biases or underreporting. Another limitation lies in the cross-sectional nature of the data, which restricts the ability to make causal inferences or observe long-term impacts of the variables examined. Finally, some nuanced interpersonal or institutional dynamics—such as school leadership influence—were not captured, which could have provided further insight into the student engagement process.

Suggestions for Further Studies

To build on the findings of this research, future studies could consider several directions. Longitudinal studies are needed to assess the long-term effects of teacher development and parental involvement on learners' academic trajectories. Moreover, expanding the research to include other grade levels and subjects would offer a more holistic understanding of these determinants across the educational system. Comparative studies between countries or regions could also provide insight into how cultural and policy differences influence the effectiveness of teacher and parental roles. Additionally, mixed-method approaches involving interviews, focus groups, and classroom observations could uncover deeper qualitative insights that are not captured in quantitative surveys. Future research should also explore the role of school leadership and digital literacy among both teachers and parents in mediating student participation outcomes. Lastly, intervention-based studies that test the effectiveness of specific teacher training programs or parental engagement strategies could offer practical, evidence-based recommendations for policymakers and practitioners.

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