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How Teacher Qualifications, Experience, Expectations, and Professional Development Affected Eighth-Grade Students' Science Achievement in Abu Dhabi: Insights from TIMSS 2019

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ABSTRACT

Education research has steadily expanded to explore how educator qualities, parental involvement, student attitudes, and social skills impact academic performance. This study focuses on these variables in the context of eighth-grade science teaching in the Abu Dhabi Emirate, aiming to identify their consistent effects on student achievement. Using a mixed-methods approach, combining quantitative analysis and qualitative insights, the research provided a comprehensive examination of the factors influencing educational outcomes in the region. The research findings highlight the significance of dynamic and continued parent participation in several forms, with home-related support, school-related activities, and public appointments.

Keywords: *Teacher Attributes, Qualities and Opportunities, Teacher Qualifications, and Teacher Experiences*

INTRODUCTION

Education structures worldwide are gradually increasing and identifying the multilayered landscape of student accomplishment that spreads outside the traditional academic measurement system to include complete growth and long-term educational support (Oliveira et al., 2021). In this research, the Abu Dhabi Emirate has boarded on informative improvements that raised growing morals and promoted a sympathetic and elevating knowledge atmosphere for their scholars. Moreover, essential to these developments are originalities that highlight the fundamental roles of educators, parental involvement, and students themselves in influential educational results in knowledge and beyond. Although educators value stances as a keystone of instructive efficiency, they manipulate theoretical development and individual growth between students. Additionally, in the Abu Dhabi Emirate, efforts to improve teacher value include employing and retaining highly trained teachers focused on subject knowledge and academic skills associated with modern educational performance (Alnaqbi & Sarah, 2022). Specialized growth plans are dynamic in deploying teachers with efficient instruction organizations, technical incorporation skills, and tactics to accommodate varied student requirements (Kaluyu & Ndiku, 2020).

Parental contribution is an additional essential influence on the educational journeys of students. In the Abu Dhabi Emirate, educational improvements identified parental involvement as essential to secondary knowledge and children's growth. Proactive parent visits contain numerous methods, such as joining events conducted in school and parent-teacher meetings to support study and develop optimistic defiance for teaching at home (Goodall & Montgomery, 2023). Similarly, research shows that once parents contribute to children's education, students can show innovative theoretical guidance, enhanced performance, and improved societal-emotional skills (Takizawa et al., 2023). Developing positive students' boldness to knowledge, inspiration, determination, and self-effectiveness opinions is also essential to instructive achievement. Fostering optimistic scholar defiance to science teaching is important in wider educational reorganizations of Abu Dhabi Emirate. A development attitude highlighting the trust that skill and capabilities will be established by determination and knowledge also encourages the promotion of flexibility and preparedness to hold problems among students. Moreover, the influence of variables such as teacher effectiveness, parent engagement, and student behavior extends beyond individual educational settings to inform broader policy decisions and educational outcomes in the Abu Dhabi Emirate (Dickson et al., 2019). Representatives are taxed with positioning prospectus outlines, instructional tactics, and valuation performances to endorse all-rounded students' growth and impartial knowledge chances. Although, highlighting evidence-related performance and constant improvement creativities confirms that instructive improvements in the country were receptive to developing societal requirements and worldwide educational movements (Yemini et al., 2019).

RELATED WORKS

Teacher Attributes and Expectations

Teacher qualities and opportunities were crucial in influential educational results, mainly in science (Kotuľáková, 2021). This section investigates the present literature to discover how features like teacher experiences, knowledge, and educational performance impact science students' accomplishments. By investigating numerous educations, we better comprehend the effect of these teacher-based variables and their suggestions for educational strategy and training.

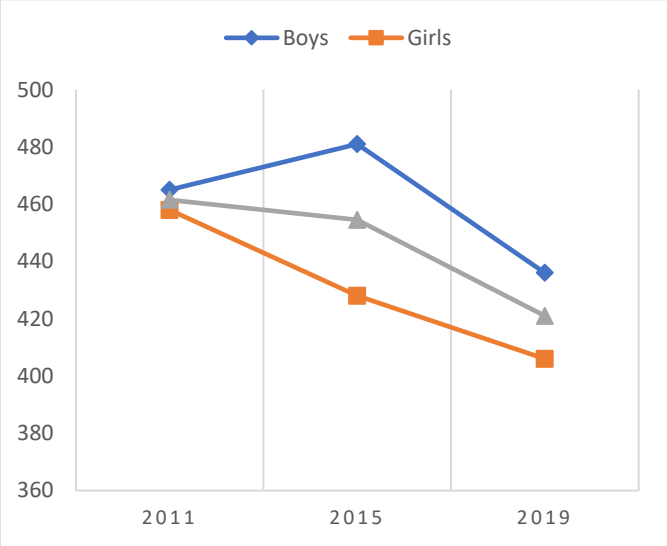

Figure 1. Differences in Average for Grade Eight Student Science Achievement Across Assessment Years in TTIMSS in Abu Dhabi schools, both girls and boys in the graph

Teacher Qualifications and Science Achievement

Teacher experiences include teaching subject matter expertise (SME), which refers to a deep understanding and specialized knowledge in a specific area or field, making an individual highly skilled and proficient in that subject. SMEs are often relied upon for their expert insights, guidance, and documentation levels, all of which are critical determinants of instructional quality and effectiveness (Assem et al., 2023). Research has consistently shown a positive correlation between educators' academic backgrounds in science-related fields and student achievement in science. For example, research by Darling-Hammond et al. (2024) finds that educators with grades in related content areas habitually replace reflective theoretical thoughts among scholars associated with less dedicated training. The improvements highlight the location of subject-specific information and educational knowledge, confirming that science educators possess a strong theoretical foundation and assert dominance in

the field. By capitalizing on employment tactics that appeal to teachers with strong experiences in discipline sentences, instructive representatives will improve the excellence of discipline teaching and advance student results (Burroughs et al., 2019). Moreover, teacher guarantee helps as a standard for expert capability and instructional efficiency. Expert educators must establish proficiency in (SME) subject matter knowledge and educational skills over complicated valuations. Research shows that expert educators demonstrate greater instructional confidence and effectively apply research-based teaching methods to meet diverse learning needs (Goswami, 2021). Efforts from competent teachers ensure that practices and values contribute to a fair and consistent educational environment. Representatives can confirm that teachers endure abreast of instructive progressions and best perform in science teaching by endorsing constant, expert growth and presenting ways to guarantee regeneration tied to continuing knowledge and expert development. The integrated model (Figure 2) for science teacher development outlines a systematic approach that includes three main components: inputs, processes at the teacher level, and outputs. The inputs consist of teacher preparation, experience, and instruction, forming the foundation for effective teaching. At the process level, key factors such as confidence in teaching science, collaboration among educators, and strategies to engage students are emphasized. These are significant to the improvement of the teaching process. The end result of this model is science achievement, which measures the extent to which students can meet the desired levels of learning. This model shows the relationship between a teacher's growth and a student's achievement in science learning.

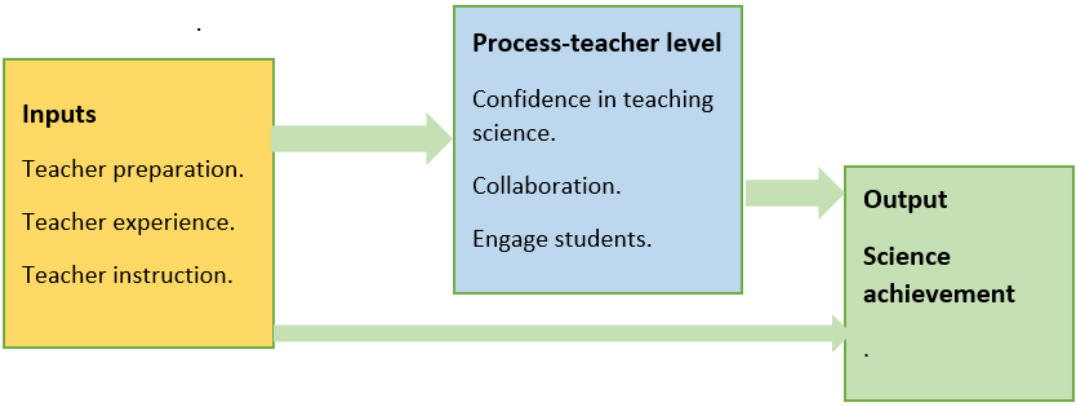

Figure 3. The integrated model for science teacher level

Experience and Pedagogical Practices

Teacher knowledge based on years of teaching experience and knowledge of the content taught directly impacts the quality of teaching and learning. Many teachers who have been in the profession for some time accumulate a collection of strategies, managerial approaches, and assessment procedures that enhance learning. A review

of related literature suggests that mentors and induction programs help first-year teachers develop these critical skills (Johnson, 2020). Furthermore, the mentorship programs launched and sustained at all the stages of educational professionals' careers enhance collaboration and professional development. Mentors are also used to help new teachers, and they share experience, knowledge, tactics, and materials that contribute to improving the teaching and learning process and creating a culture of practice (Dinham et al., 2021). Therefore, developing these arguments further, the following points may be helpful in elaborating more on the actual successful programs and the effects of these programs on the quality of teaching.

Educational performance includes the methods and instructional plans educators use to enable student knowledge. Effective teaching often combines inquiry-based knowledge, hands-on activities, and active participation to promote critical thinking and meaningful learning experiences (Munna & Kalam, 2021). Research emphasizes the enhancement of active knowledge surroundings by scholars, who are fortified to discover, question, and research under-informed and sympathetic educators (Donoghue & Hattie, 2021). The country supports advanced educational practices aligned with global educational frameworks such as STEM ("Science," "Technology," "Engineering," and "Mathematics").

Continuous Professional Development

Constant professional development (CPD) is essential for equipping educators with the knowledge, support, and resources needed to face the developing requirements of 21st-century beginners. Constant professional development in the country aims to improve (SME) subject-matter expertise, participate in the laboratory, and develop comprehensive instructional performances provided to various scholar inhabitants. The study highlights the transformative impact of continuous professional development programs on educator effectiveness and student achievement. For example, a meta-analysis by McChesney & Aldridge (2019) found that well-designed professional development programs significantly improve teaching performance and academic outcomes. The country's investment in evidence-related CPD creativities, The Educational Development and Research Center (EDRC), Teaching for Understanding (TfU) Initiative, UAE Ministry of Education CPD Framework (Calonge et al., 2024) is personalized to the requirements of knowledge teachers, confirming that educators are prepared to distribute high-quality teaching that lies with worldwide educational values. The data illustrates (Table 1) the average science achievement scores of eighth-grade students in Abu Dhabi schools over three assessment years: 2011, 2015, and 2019. In 2011, the average score was 461, which decreased to 454 in 2015, indicating a decline of 7 points. By 2019, the average score dropped to 420, resulting in a total decline of 41 points from the initial measurement in 2011. This general trend presents a negative incremental change in student science achievement levels over the years, which calls for concern.

Table 2. Differences in Average for grade eight student Science Achievement Across Assessment Years IN TIMSS in Abu Dhabi schools.

Years	Achievement	CenterPoint	Differences Between Years		
			2011	2015	2019
2011	461	3.9	-	-7	-41
2015	454	5.6	-	-	-34
2019	420	3.6	-	-	-

Parental Involvement vs Support

Consequently, the literature reveals that parents are crucial to academic achievement in secondary students, especially in science education (Bhagavathula et al., 2021). This section examines various types of parental participation and their impact on students' science achievement. This analysis provides strategies and recommendations for educational practice and policies by looking at the different factors that enable parental engagement, from support at home to linkages at the school level (Tang, 2023).

Forms of Parental Involvement

Here, parental involvement refers to all the activities parents take to support their child in school. These actions can be categorized into three primary forms: There are three dimensions of involvement, namely home-based, school-based, and community-related involvement by Santos et al. (2023).

Home-Based Involvement: This type of participation implies that parents engage in the home context to facilitate children's learning. It covers guiding the child in the best environment to learn, ensuring that the child does his or her homework at the right time, and even engaging the child on academic issues such as homework or even working on a project with the child. Şengönül (2022) established that talking to parents and children about school affairs enhanced the student's attitude and performance in school. Parents can discuss science topics with children and encourage children to explore and engage in STEM activities. Thus, parents cultivate scientific attitudes and Brazilian children's interest in science.

School-Based Involvement: Parents in school operations collaborate with teachers and staff while participating in programs that seek to advance educational purposes (Smith et al., 2020). Participation may involve joining parent-teacher conferences, giving their time in the classroom, or joining parent-teacher associations (PTAs). Evident from research is the fact that taking part in school events strengthens the connection between home and school and has a positive effect on student achievements (Desimone, 1999). To promote their success, school-related policies strongly support the notion that parents and teachers should partner with secondary

students. To better the quality of education and increase community within schools, school leaders have the potential to create new communication channels and motivate parental participation in both policies and governance (Brotherson & Hoffman, 2020).

Community-Based Involvement: Engagement through this model increases the involvement of parents outside the school setting and includes their connection to community resources and activities. It involves participating in local educational curricula, attending related science events or clubs, and joining public bodies or commercial organizations committed to achieving educational goals. Analyses reveal that community engagement improves students' access to various educational resources and stresses the practical importance of science education in everyday settings (Reitsema et al., 2022). Through the use of community partnerships, schools can improve the educational experience for science students. Local industries, research institutions, and cultural organizations working together yield meaningful experiences, knowledge, and insights about science-related careers, as reflected by Zakopoulos et al. (2023).

Study on Parent-Child Science Activities: The study looks into the outcomes of parents participating in science activities with their kids at home. According to the study, families engaged in science experiments and talks regularly indicated their kids had a more substantial interest in science. Research states that A child with parents who encourage curiosity and exploration through hands-on science activities has demonstrated remarkable developments in comprehending scientific themes and a deepening passion for STEM fields.

Study on Community Engagement Programs: This form of engagement raises parental participation from just the school environment to incorporate participation with community assets and initiatives. It consists of participating in local educational pursuits, attending events or clubs emphasizing science, and teaming up with public organizations or private enterprises aiming for academic achievement. Analyses reveal that community engagement improves students' access to various educational resources and stresses the practical importance of science education in everyday settings. Through the use of community partnerships, schools can improve the educational experience for science students. Local partnerships between industries, research organizations, and cultural entities produce critical understanding, experiences, and insights about careers in science (Zakopoulos et al., 2023).

Influence on Science Education Outcomes

Academic Achievement: Research proves a positive connection between parent participation and theoretical achievement in science education. Parental provision, inspiration, and specialist care for homework achievement underwrite enhanced knowledge results and advanced academic concert (Fang et al., 2021). The country also

writes that independent parental meetings in science teaching are essential to improving student accomplishment and developing an ethos of academic superiority.

Socio-Emotional Development: Among academic accomplishments, parent participation plays a vital part in students' social-emotional development. Supportive parental relations improve students' confidence, incentive, and intelligence to belong in the school community (Fan, 2021). Dynamic activities in their children's educational path and parents offer demonstrative support and direction that are important for directing problems and developing flexibility in science teaching.

Implications for Educational Practice and Policy

Active tactics for endorsing parental involvement in science teaching include concerted energies among schools, relations, and the public. The representatives improve parent contribution by endorsing alertness and developing clear interaction stations among home-based and school about the importance of science teaching in Abu Dhabi Emirate. This contains wits to teach parents about the advantages of supporting their kids' education in science teaching and the part they possessed in their academic achievement. Offering properties and care over factories, meetings, and informational conferences allows parents to have the information and time to be efficiently involved in their kids' science teaching. Generating warm school surroundings with comprehensive plans that are worth and inspire parental support strengthens this company. By developing partnerships with public investors, like local productions and social administrations, the country increases students' access to science-based resources, actions, and mentorship and inspires their educational knowledge. Parent and teacher teamwork is crucial in constructing a kind educational network where the participation of parents strengthens the quality of science teaching outcomes. Participation in these genuine parental appointment tactics is vital as educational enhancements occur to uphold fairness, inclusivity, and excellence in the education of all students.

Student Attitudes and Interpersonal Skills

Manufacturing findings on student defiance to knowledge and relational skills in the setting of science teaching reveal serious understandings of developing academic achievement and generating encouraging learning surroundings. However, student defiance, with growth attitude and inspiration, possessed an essential role in determining their educational results. A development mindset, branded by the belief that aptitudes can be advanced through overdetermination and commitment, has been powerfully connected to advanced academic accomplishment in science. The study underlines that students who method trials with flexibility and optimism are likelier to persist through problems and attain better outcomes in science teaching. Similarly, educational performances that substitute intrinsic inspiration, like encouraging curiosity, independence, and significance of satisfaction to students' lives,

subsidize meaningly to improving science education results. Moreover, social skills are vital for making a helpful and concerted education setting in science teaching. Actual statement skills allow students to clear ideas obviously, ask queries, and involve expressively in scientific thoughts. Teamwork skills, with cooperation and assistance, are dynamic for contributing to group plans, leading trials, and solving technical difficulties together. Students who own robust relational skills not only donate definitely to group dynamic services but also improve their own sympathetic of scientific ideas through peer communication and data division. Demonstrative directive, an extra dangerous aspect of relational skills, helps scholars achieve pressure, nervousness, and prevention that may arise throughout scientific knowledge actions. By education to control their feelings efficiently, scholars can continue to pay attention, make complete choices, and persevere in their technical investigations. Educators and instructors play a vital role in developing expressive rules by creating a caring and kind classroom where scholars feel content stating their opinions and sentiments without judgment.

Highlighting the significance of struggle and flexibility in education science themes can help scholars overcome trials and grow an optimistic attitude to technical examination. If any chance for scholars to discover their benefits, make selections, and attach scientific thoughts to actual applications improves intrinsic inspiration and raises profound educational appointments. Moreover, educating announcement and teamwork skills over communicating knowledge involvements, group plans, and noble mentoring plans reinforces the ability of students to work efficiently with others in technical surroundings. These cooperative actions encourage information division and problem-solving and prepare students for upcoming careers that need cooperation and collaboration in scientific study and invention. Emotional intellect training will be combined into science teaching to help students handle their feelings and emerge flexible in theoretical surroundings. Education plans like mindfulness performances, thoughtful journaling, and peer provision collections allow students to control their feelings, reduce pressure, and preserve an optimistic outlook on science education.

METHODOLOGY

This area states the method used for examining the factors determining scientific accomplishments of eighth-grade students in the Abu Dhabi Emirate during the assessment in TIMSS 2019 (Mullis et al., 2016). This report presents appropriate details concerning the methods used in the study, including the study design, sampling techniques, data collection techniques, and analysis procedures. The primary purpose concerns the confirmation of the studies' factuality and repeatability, as well as providing a clear structure, which defines the difficulties that influence scientific accomplishment in this case.

Study Participants

The sample in this quantitative study applies to eighth-grader students, teachers, and parents from various schools in Abu Dhabi (Rai & Beresford-Dey, 2023). The sampling criteria also consider diversity by pulling samples from different types of schools and demographic residences. This viewpoint integrates the different factors influencing science education and plays a central role in understanding the details of the subject under investigation. Through the broad coverage of different contexts in which education takes place in each state, the study intends to provide a comprehensive view of all factors that may affect science achievement.

Data Collection Methods

There is a need to explain that in the case of the present study, quantitative data collection involved the use of well-structured and validated assessments and questionnaires completed across the participating schools in Abu Dhabi Emirate in an organized manner. These forms of assessments aim at assessments are meant to offer strengths based on facts regarding the student's ability to grasp and apply concepts in science. In the study, direct tests and self-completion questionnaires are used, making it possible to make valid cross-group and cross-institution comparisons. This structured approach provides phenomenological validity and reliability in gauging science accomplishment for students across different learning abilities.

Data Analysis

As for the data collection procedures, the methods have been described in detail. However, a statistical data analysis approach is used to make the evaluation and presentation of the results smooth. Therefore, the measures for data analysis will include using descriptive statistics to describe the data collected and inferential statistics to test for the existence of differences and relationships in the collected datasets. These statistical methods will enable the determination of the effect that various factors like parental involvement and type of school have on the students' science achievement.

Significance of the Abu Dhabi Context

It is essential to point out that the sample included people from different areas of the Abu Dhabi Emirate because education in the region is quite different from that in other Middle Eastern countries. Abu Dhabi has a diverse population, and the education system is dynamic and fast-growing, capturing the Local Emirate values and beliefs and embracing international standards and learning how these factors give meaningful information not only at the local level of a country but also at the global level concerning science achievement. The research conclusion and recommendation of this study can help policymakers and educators from different countries to learn about the

academically significant practices and issues related to the delivery of science education in a multicultural classroom. This context-rich approach compliments the research and renders the findings more useful in other similar educational settings across the globe.

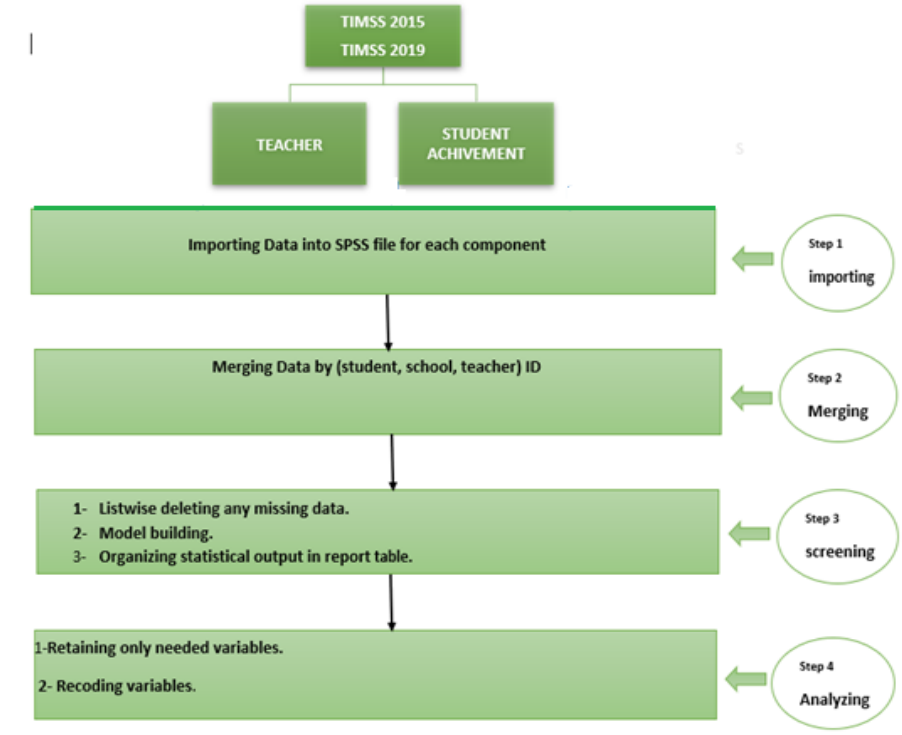

Figure 4. Researcher's proposed plan model on importing, merging, retaining, recording, and analyzing TIMSS 2019.

Regarding the study (Fig 3) institutionalized for the measurement of science achievement, the sampling targeted eight age-old students wishing to quantify the students' scientific performance in the various scientific areas utilizing constructed response scientific achievement tests. These assessments provide information on performance determinants and facilitate nested tracking of educational performance (Mao et al., 2021). Further, teachers' insights have added value in concerns with instructional implementation, professional development, and students' learning (Wagner and colleagues, 2019). Educator-targeted surveys provide information about teaching practices, educational approaches, and perceived effectiveness on learner accomplishment. Such an approach matches teacher characteristics with the variables reflecting students' learning progress and defines effective practices to promote higher educational performance. To collect the quantitative data, we used tests and questionnaires from Abu Dhabi students, teachers, and parents. The TIMSS 8th Grade Science Test has four categories of science achievement domain: biology at 35%, chemistry at 20%, physics at 25%, and earth science at 20%. Competency domains are

knowing (35), applying (35), and reasoning (30). Research question and hypothesis 6 focused on students' factual knowledge about science, self-organized learning experiences, and their relational competencies surveyed via questionnaires. These surveys gauged students' science enrollment interest, classroom climate, academic teaching/learning methods, and co-curricular activities. Teamwork and interpersonal communication skills were also assessed to determine the effect on science achievement.

Conveyance instruments included structured questionnaires developed by the authors distributed to 74 teachers, which captured various aspects of teacher practice, such as professional experience and beliefs about student motivation (Margot & Kettler, 2019). Those asked were about education level, teaching certification/waiver, and years of teaching experience. The surveys also focused on development activities practice, other teaching practices, and the use of technology in the learning and teaching of science. To address the research question, scores on teachers' derived expectations for student performance and perceived student motivation were compared to attempt to document the relation between these elements and student science performance. Questionnaires used with parents also formed a cross-sectional part of the data collection process as they gave information on parent's practice of involvement in their children's education. In these surveys, the following areas of inquiry were made concerning parents in school: activity involvement, support encouragement at home and contact with teachers and principals. Assessment questions referred to the extent and type of parents' participation in things related to the child's studies or education. The surveys also focused on parents' perceptions of science and their active involvement in creating a home environment conducive to learning. They examined the level and type of parental engagement designed to elucidate further how to extend the partnership between the family and the school to complement student learning in science. As a result of rigorous data collection and analysis, this study aims to improve educational interventions and increase students' performance in science.

FINDINGS AND ANALYSIS

Regression Analysis for 2015

The researcher has performed a multivariate regression analysis to regulate the relationship between dependent variable science attainment scores of students (BSSSCI01, BSSSCI02, BSSSCI03, BSSSCI04, and BSSSCI05) and other independent variables like teacher attributes and expectations, parental involvement and support, student attitudes and interpersonal skills, teacher perceptions of school environment and safety, frequency of teaching inspiration and fulfillment, teaching tasks and agreements, teaching methods and practices, tasks impacting teaching efficiency, communicating teaching tactics in science, science instructional tactics, technology addition in science education, science homework appointment and valuation, science assessment strategies, and science professional development.

Dependent Variables: BSSSCI01, BSSSCI02, BSSSCI03, BSSSCI04, and BSSSCI05

Table 3. Model Summary

R	R-Square	Adjusted R-Square	Std. Error of the Estimate
0.559	0.331	0.315	92.813

The value of R (Table 4) represents the numerous correlation constants, and it can be measured as a measurement of the quality of the calculation for a reliant variable. There is a relationship between student science attainment scores and teacher's teaching strategies, science homework assessment, science professional development, teaching tasks, parental support, teacher's perceptions about student protection, and teacher's degree of achievement in realizing the school's curriculum. The summary of the model gives an overview of the statistical results of behaviors under study that are concerning one another. Covariance R = 0.559 and implies a moderate positive correlation between the variables. An acceptable or moderate level of fit is observed as per the R-squared or coefficient of determination value of 0.331 for the present model, which means that only 33.1 percent of the variance of the result is explained by the model. The adjusted R-squared value of 0.315 was due to the number of predictors that exhibited a lesser yet meaningful correlation. The standard error of the estimate is 92.813, which depicts the degree of variations of observed values concerning the regression line to evaluate prediction accuracy. Such statistics extenuate the need for additional research to identify variables affecting science achievement in Abu Dhabi schools.

Measurement Model: PLS-SEM for 2015

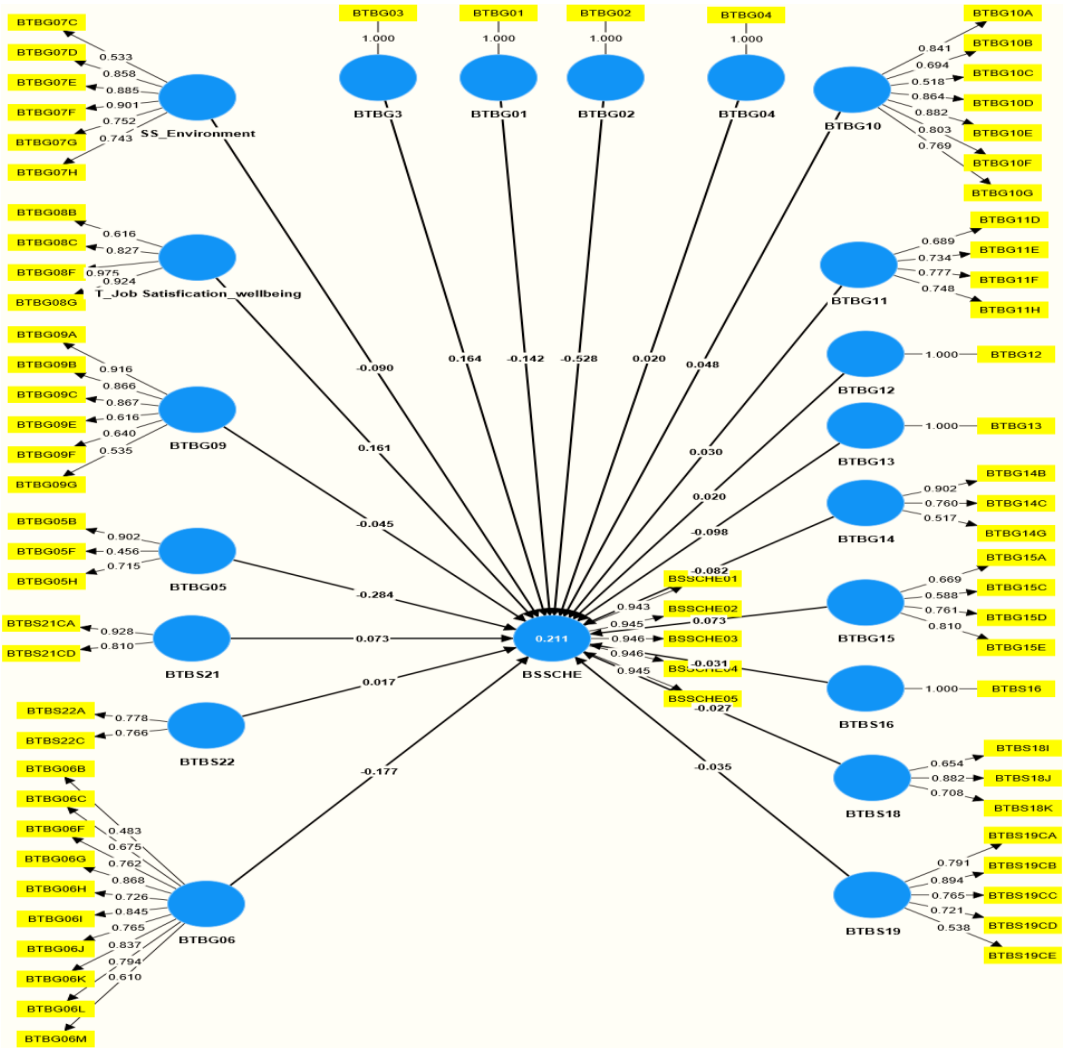

Figure 5. Partial Least Squares Structural Equation Modelling (PLS-SEM) techniques

Generally, (Fig 6) the majority of the pointers display considerable outer loadings, representing that they are dependable valuations of their respective structures. Indicators with lower loadings may need to be carefully examined or revised to confirm that they precisely represent their structures. Indicators with advanced outer loadings, often above 0.7, show they are well associated with the construct they intend to measure. The concepts characterized by these indicators exhibit robust measures, as shown by their high loads ranging from 0.726 to 0.868. However, the measure BTBG06M has a low loading, indicating that it may have condensed reliability.

Table 5. Construct reliability and validity

	Cronbach's alpha	***Composite reliability (rho_c)***	***Average variance extracted (AVE)***
BSSCHE	0.970	0.977	0.893
BTBG05	0.618	0.746	0.511

BTBG06	0.908	0.924	0.555
BTBG09	0.908	0.884	0.569
BTBG10	0.902	0.912	0.603
BTBG11	0.732	0.827	0.545
BTBG14	0.662	0.779	0.553
BTBG15	0.676	0.802	0.507
BTBS18	0.649	0.796	0.569
BTBS19	0.848	0.863	0.564
BTBS21	0.695	0.862	0.758
BTBS22	0.321	0.747	0.596
SS_ Environment	0.892	0.906	0.622
T_ Job Satisfaction_ wellbeing	0.893	0.908	0.717

The research (Table 6) used Partial Least Squares Structural Equation Modelling (PLS-SEM) to measure the reliability and validity of the hypotheses included in the study. The outcomes showed that the BSSCHE construct had high internal consistency, with a Cronbach's alpha of 0.970 and composite reliability (rho_c) of 0.977. The average variance extracted (AVE) was 0.893, indicating that the construct explained a significant proportion of the variance in the observed variables. The BTBG05 construct demonstrated satisfactory reliability with a modest level of internal consistency, as evidenced by the values of Cronbach's alpha and composite reliability. The average variance extracted (AVE) value beat the criterion of 0.50, indicating a satisfactory level of convergent validity. The BTBG06 construct confirmed strong reliability and robust convergent validity, with Cronbach's alpha coefficients of 0.908 and composite reliability of 0.924. The average variance extracted (AVE) was 0.555, indicating that its pointers clarified 55.5% of the alteration in the construct. The BTBG09 concept demonstrated high reliability and acceptable convergent cogency, with Cronbach's alpha and composite reliability values indicating strong internal consistency. Overall, most concepts demonstrate satisfactory to outstanding stages of reliability and validity, but they need to strengthen their pointers for improved internal consistency and dimension accuracy.

Multi Collinearity Statistics VIF

Multicollinearity and Common Method Bias Assessment

Multicollinearity refers to a bias that manifests in a regression model when there is a significant correlation between two or more exogenous variables (Block, Miller, & Wagner, 2014). Overstated regression estimates, like R2 and Beta coefficients, are often the consequence of multicollinearity and can affect the study's ultimate conclusion and result (Hair, Black, Babin, Anderson, & Tatham, 2010). The collinearity evaluation can be implemented to identify this problem when the variance inflation factor (VIF) value

for each variable is greater than 5. (Hair, Hult, Ringle, & Sarstedt, 2014). The valuation of each independent latent variable in the research model for collinearity and shared method bias is provided. No issues with multicollinearity or standard method bias were discovered. The nonexistence of collinearity and common technique bias in the research is explained by the VIFs of all the constructs being less than the thresholds of 3.3 for common method bias and 5 for multicollinearity.

Table 7. Variance inflation factor (VIF) value

	VIF	**Collinearity Problem** VIF>5	**Common Method Bias Problem** VIF >3.3
BTBG01 -> BSSCHE	2.798	No	No
BTBG02 -> BSSCHE	1.448	No	No
BTBG04 -> BSSCHE	1.145	No	No
BTBG05 -> BSSCHE	1.221	No	No
BTBG06 -> BSSCHE	2.230	No	No
BTBG09 -> BSSCHE	1.569	No	No
BTBG10 -> BSSCHE	1.747	No	No
BTBG11 -> BSSCHE	1.283	No	No
BTBG12 -> BSSCHE	1.177	No	No
BTBG13 -> BSSCHE	1.432	No	No
BTBG14 -> BSSCHE	1.310	No	No
BTBG15 -> BSSCHE	1.778	No	No
BTBG3 -> BSSCHE	2.627	No	No
BTBS16 -> BSSCHE	1.222	No	No
BTBS18 -> BSSCHE	1.238	No	No
BTBS19 -> BSSCHE	1.209	No	No
BTBS21 -> BSSCHE	1.294	No	No
BTBS22 -> BSSCHE	1.221	No	No
SS_ Environment -> BSSCHE	2.537	No	No
T_Job Satisfaction _wellbeing -> BSSCHE	1.318	No	No

Table 8. Hypothesis testing

	Beta	**SD**	**T value**	**P values**	
BTBG01 -> BSSCHE	-0.142	0.020	7.093	0.000	Accepted
BTBG02 -> BSSCHE	-0.528	0.033	15.780	0.000	Accepted
BTBG04 -> BSSCHE	0.020	0.012	1.616	0.106	Rejected
BTBG05 -> BSSCHE	-0.284	0.038	7.505	0.000	Accepted
BTBG06 -> BSSCHE	-0.177	0.018	10.064	0.000	Accepted

BTBG09 -> BSSCHE	-0.045	0.017	2.709	0.007	Accepted
BTBG10 -> BSSCHE	0.048	0.015	3.262	0.001	Accepted
BTBG11 -> BSSCHE	0.030	0.014	2.139	0.032	Accepted
BTBG12 -> BSSCHE	0.020	0.013	1.471	0.141	Rejected
BTBG13 -> BSSCHE	-0.098	0.014	7.034	0.000	Accepted
BTBG14 -> BSSCHE	-0.082	0.013	6.260	0.000	Accepted
BTBG15 -> BSSCHE	0.073	0.017	4.370	0.000	Accepted
BTBG3 -> BSSCHE	0.164	0.020	8.156	0.000	Accepted
BTBS16 -> BSSCHE	-0.031	0.013	2.414	0.016	Accepted
BTBS18 -> BSSCHE	-0.027	0.014	1.953	0.051	Rejected
BTBS19 -> BSSCHE	-0.035	0.021	1.647	0.100	Rejected
BTBS21 -> BSSCHE	0.073	0.013	5.791	0.000	Accepted
BTBS22 -> BSSCHE	0.017	0.016	1.065	0.287	Rejected
SS_ Environment -> BSSCHE	-0.090	0.018	5.029	0.000	Accepted
T_ Job Satisfaction_ wellbeing -> BSSCHE	0.161	0.016	10.294	0.000	Accepted

The study reveals (Table 9,10) that the independent variables in the model version for approximately 21.1% of the variability observed in the dependent variable (BSSCHE). The adjusted R-square is slightly lower at 0.208. The beta coefficients for several independent variables, like BTBG01, BTBG02, BTBG05, BTBG06, BTBG09, BTBG10, BTBG11, BTBG13, BTBG14, BTBG15, BTBG3, BTBS16, SS_ environment, and T_ Job Satisfaction_ wellbeing, are statistically significant ($p < 0.05$), indicating important associations between these variables and BSSCHE. Moreover, the beta coefficients for BTBG04, BTBG12, BTBS18, BTBS19, and BTBS22 are not statistically significant ($p > 0.05$). The research concludes that some factors suggestively influence BSSCHE while others do not. These results provide an appreciated understanding of the factors prompting BSSCHE and could be used to inform decision-making processes.

CONCLUSION

In conclusion, according to the findings recorded in this study, teacher-related factors are very influential in determining the performance of eighth-grade students in science in the Abu Dhabi Emirate. Teacher qualification, experience, and constant professional development (CPD) were significant predictors of student performance. Teachers of high caliber and experience and with access to professional development show better teachers' practices that foster a learning environment. That is why the indicated authors focus on the necessity of organized programs for CPD and mentorship, as well as the sources related to enhancing teachers' influence in the classroom, as the teachers have to be ready to successfully face changes in the process.

As was observed, it became clear that parental involvement was another crucial area that impacted the learners and their performance. Parental involvement, whether indirect home support activity related to school and community, all combine to produce higher levels of student achievement science. This engagement assists the students and fosters parental participation, supported by the principle that it enhanced home-school relations, making the students study hard and improve their performance.

Hence, parental involvement has to be enhanced at schools in Abu Dhabi by introducing appropriate parental involvement, which aims to cater to the needs of parents in a multicultural society. These could involve workshops to help parents support science learning at home, encourage science-packed family activities, and encourage school partnerships with different organizational bodies to ensure parental involvement.

Also, the research shows that students' attitudes and interpersonal skills significantly influence learning outcomes. Perceived control over learning and high interpersonal skills work hand in hand with positive attitudes towards learning and are therefore crucial in the student's interest and achievement in science. Thus, cultivating student attitudes to a growth mindset and resilience is crucial. These aspects of the attributes and the effective behaviors should be of concern to the teachers and parents to enhance an effective learning environment. Therefore, it was concluded for this study that attracting quality teachers for qualifications and their professional development, parental engagement, and developing positive student attitudes can be considered helpful intervention strategies to raise science standards to the level preferred by eighth-grade students in Abu Dhabi. Hence, by fulfilling specific recommendations in these areas, all the stakeholders are in a position to contribute to enhancing the education system and the results in learning science and in the general academic performance of the learners as they prepare for future challenges.

FUTURE RECOMMENDATIONS

To advance future research, the properties of long-term effects of teacher-related factors on students' outcomes after eighth grade should be revealed. Knowledge of how these factors influence students' academic achievements in higher learning institutions and their career choices in Stem careers would be helpful in policy making and practice regarding education. However, further research could investigate the impact of new and developed types of continuous professional development programs that integrate new competencies and teaching practices and how they perform in various learning environments. Parent participation strategies should be continually developed and responsive to the context of various community settings. Continued studies into the most accurate form of parental appointment in different socio-economic circumstances might help direct contentious intercessory that capitalize on student performance.

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