



Synergistic Effect of Learning Environments, and Familial Factors on Generation Z Learners' Academic Achievement in Science

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This descriptive-predictive study examined the interplay among learning environment factors (school, home, and community), familial factors (socioeconomic status and family relations), and academic achievement of 186 randomly selected Generation Z (Gen Z) learners. Factorial analysis demonstrated significant impacts of school and home learning environments on science academic achievement, while the community environment, in isolation, lacked significant effect. Interaction effects emphasized synergies between school and community, as well as school and home environments. However, there was an absence of a three-way interaction, suggesting limited combined impact. Analysis of data further unveiled a significant, large main effect of family relations on academic achievement, while economic and social status showed no significant impact. The interaction between family relations and social status was statistically significant which indicates a more substantial combined influence on science academic achievement than individual factors. Multiple linear regression analysis identified four significant predictors – positive family relations, higher family social status, and robust home, and community support – contributing to a model explaining 49.4% of variance in their science academic achievement. These results emphasize the importance of nurturing home and community environments, alongside fostering strong family relationships, as pivotal factors in Generation Z learners' academic pursuits.

Keywords: generation Z learners, supportive learning environment, academic achievement, home learning environment, learning

INTRODUCTION

As Generation Z learners start their educational journey, they encounter a huge cultural shift characterized by their intrinsic ties to the digital world and distinctive learning preferences. This transition poses a significant challenge for educators tasked with engaging these digital natives effectively. The discrepancy between learning environments and the hyper-connected world of Gen Z students highlight the pressing need to adapt learning environments to better suit their evolving needs. In the changing landscape of contemporary education, understanding the interplay between diverse

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learning environments and familial dynamics is paramount to unlocking the full academic potential of Generation Z learners, particularly in the field of science.

Generation Z, often referred to as Gen Z, constitutes a unique cohort characterized by their innate connection to the digital world. They are characterized by their digital nativity and reliance on technology (Vinh, 2020; Bakti, 2017). They are self-directed, with a preference for visual learning (Othman, 2019). These individuals have grown up in a world packed with a myriad of interconnected technologies and information sources, including social media platforms, the internet, laptops, iPhones, Wi-Fi, online games, and mobile phones that seem almost like extensions of themselves. Their existence is inseparable from the digital sphere, commonly referred to as the social media world, which serves as the backdrop to their lives. Gen Z learners are often recognized as the typical digital natives. As such, they exhibit a host of distinctive characteristics. They are adept multitaskers, constantly juggling multiple activities. Their minds operate at an instant pace, making them inherently impatient yet remarkably ambitious, and they quickly lose interest in the ordinary. These learners desire a measure of autonomy and authority over their experiences. They are not only intelligent but also highly achievement-oriented, often demonstrating a strong inclination toward collaborative and team-oriented endeavors. This generation is undeniably exceptional, and their immersion in technology provides a window into the complexities of their world (Robertson, 2018).

Nonetheless, it is essential to emphasize that the world of Gen Z learners is not inherently better or worse than that of previous generations; it is simply different. This distinction underscores the challenge faced by teachers, many of whom were themselves educated by non-Gen Z professors and may unconsciously create classroom environments not suited to this emerging generation. As Gen Z students step through the classroom door, they often encounter a culture shock, feeling under-stimulated compared to their hyper-connected world. This presents a significant dilemma for educators: how can they effectively engage with and compete for the attention of these digital natives? It raises questions about responsibility—whose role is it to address these evolving needs? Moreover, educators must consider how to adapt their learning environments to better align with the evolving demands and requirements of these new learners.

Undoubtedly, the effort to establish an optimal learning environment should not be the sole responsibility of the school. Instead, it should be a collaborative effort involving coordination between the school, the learner's home, the community, and society at large. In constructivist environments, research focuses on interactions not only within classrooms but also in the broader community, examining engagements with peers, friends, and experts (Graffam, 2003; Temli, 2016). This comprehensive approach ensures that the learning environment is seamlessly integrated into the broader fabric of the Gen Z's life and holistic development.

The learning environment plays a pivotal role in individual development, with the added potential for learner involvement in shaping it, fostering empowerment, community building, and heightened interest and motivation. It encompasses the

psychological, social, cultural, and physical context where learning takes place, playing a role in shaping student motivation and success (Rusticus, 2023). Schools bear a fundamental responsibility in creating an educational setting that is open, nurturing, secure, amicable, and respectful. For the digital natives, incorporating technology in their learning process is an essential step and a significant consideration in incorporating digital technology into their classroom is the degree to which they embrace these technologies (Yeou, 2016; Mailizar & Johar, 2021; Peredrienko et al., 2020). Such an ideal environment significantly enhances overall well-being, open communication, and mirrors a positive school philosophy, ultimately rendering the institution an enticing, stimulating, and welcoming space (Phillips, 2014; Fatima et al., 2020; Melo, 2018).

In exploring the effects of school, home, and community learning environments, alongside familial factors on Gen Z learners' science academic achievement, it is crucial to acknowledge several potential research gaps that warrant attention. Firstly, while existing studies have examined these factors individually (Ghosh, 2020; Gartia, 2012; Behera & Makunja, 2013; Antonelli-Ponti et al., 2021), there remains an empirical gap in employing advanced statistical techniques to conduct factor analysis, thereby explaining the intricate interactions among these variables. Furthermore, despite the growing and recent literature on Gen Z characteristics and academic achievement (Sayekti, 2021; Simmons et al., 2022; Ichsan, 2023), there is still a dearth of research specifically focusing on this demographic group's academic achievement in science. Ensuring the inclusion of Gen Z students in research endeavors is imperative, yet there exists a gap in studies explicitly targeting this cohort within the context of science education. Lastly, geographic biases in research may limit the generalizability of findings, highlighting the need for studies conducted across diverse cultural and socioeconomic contexts. Addressing these gaps will not only enhance our understanding of the complex dynamics shaping Gen Z learners' academic achievement but also facilitate the development of interventions to support their educational endeavors.

Hence, this study aimed to examine how learning environments, family dynamics, and academic achievement in science are connected for a group of randomly selected Gen Z students at a private university in Northern Luzon, Philippines, utilizing advanced statistical methods to analyze the data and reveal detailed insights into these complex relationships. The study aims to deeply understand the factors affecting science academic achievement of Gen Z learners. It seeks to explore the interplay between learning environment factors (school, home, and community) and familial factors (socioeconomic status and family relations) on academic performance. Additionally, it investigates the specific effects of these environments on science academic achievement and identifies its significant predictors. These objectives offer a thorough understanding of how Gen Z students' academic outcomes are influenced by their learning environments, including both support from these environments and the impact of familial and socioeconomic factors.

Theoretical Framework

This study was drawn upon the ecological systems theory and socio-ecological model. These frameworks, rooted in the work of theorists like Urie Bronfenbrenner (1995), emphasize the intricate interactions between various environmental factors and individuals within their social contexts.

The Ecological Systems theory, developed by Bronfenbrenner, aims to understand human development by considering the interactions of individuals with interrelated systems in their environment (Crawford, 2020). It explains the development of students' sense of belonging to school through interactions between students and the school's ecological systems over time (Zaatari, & Maalouf, 2022). This theory posits that individuals are influenced by multiple interconnected systems, ranging from the immediate microsystem (individual's immediate environment) to the broader macrosystem (societal and cultural context). In this study, the focus on assessing support within learning environments (school, home, and community) aligns with the microsystem level, emphasizing the direct impact of these environments on Gen Z learners' academic performance.

On the other hand, the Social-Ecological Model, which extends the ecological systems theory by incorporating a socio-ecological perspective, considers the interactions between individuals and their social context, emphasizing how various levels of influence (individual, interpersonal, organizational, community, and societal) collectively shape behavior and outcomes (Preiser et al., 2018). The study's exploration of the relationship between the supportiveness of learning environments and academic performance, as well as the investigation of associations with family relationships and socioeconomic status, reflects the social-ecological model's emphasis on the broader societal and contextual factors that influence academic outcomes.

METHOD

Research Design and Methods

This quantitative research employed a comprehensive approach to investigate the interplay between Gen Z learners' learning environment factors, familial factors, and their academic achievement in science. Utilizing both descriptive and predictive methods, the study sought to uncover how various aspects of Gen Z's school, home, and community environments, as well as socioeconomic status and family relations, influence and predict their performance in science. Descriptive analysis gauged the level of support provided by these environments, while factorial analysis revealed the individual and combined impacts of each factor on students' science achievement by examining the potential interactions among them. Moreover, regression analysis was conducted to delve deeper into these interactions, generating a predictive model for students' science academic achievement. This comprehensive approach aimed to provide significant insights into the intricate relationships shaping Gen Z learners' academic achievement.

Respondents and Locale

The respondents for this study comprised 186 Gen Z learners selected through random sampling from all six sections of Grade 10 in the academic high school of a private university located in Northern Luzon, Philippines. This sampling method ensured representation from various sections within the Grade 10 cohort which allows for a diverse and comprehensive analysis of Gen Z learners' characteristics and their learning environment, family dynamics, and academic achievement in science. The inclusion of learners from a specific educational institution in Northern Luzon provides a focused lens through which to examine the interplay between learning environments, familial factors, and science academic achievement within this regional setting, and academic institution. Additionally, focusing on Grade 10 students ensures a relatively homogenous group in terms of academic progression and developmental stage. This facilitates a more targeted investigation into the factors influencing their academic success. Prior to administering the questionnaires, parental consent was obtained. Letters, which included a study description and an informed consent form, were sent to the parents of the students. Those students who did not return the consent form or expressed a lack of interest were excluded from the study. Out of the 234 students selected at random, 186 agreed to become the respondents in the study. Instructions on how to respond to the items were provided to the participating students during the survey, ensuring accurate data collection. Data retrieval took place immediately after the administration.

Research Instruments

Three primary data gathering tools were utilized in this study. Each respondent completed the Personal Data Sheet (PDS) and the Supportive Learning Environment Questionnaire, both of which were adapted from the dissertation of Asuncion (2007). The science academic achievement of the learners was assessed using school documents. The two adapted questionnaires underwent content validation to ensure alignment within the research locale and respondents demographic. Additionally, internal validity and consistency were rigorously tested to uphold the reliability and accuracy of the instruments.

Personal Data Sheet. This served as a means for students to furnish essential personal and family-related information. This includes details such as their names and background information pertaining to familial relationships, economic and social status. Table 1 presents the compiled data concerning the learners, offering insights into their backgrounds.

Table 1
The generation Z learners' family profile

Students' Background	f	%
Family Relations		
Very Happy	51	27.4
Happy	42	22.6
Happy with some problems	65	34.9
Neither happy nor unhappy	23	12.4
With serious family problems	5	2.7
Economic Status		
Much Income	9	4.8
Very Sufficient	116	62.4
Just Enough Income	51	27.4
Little Income	10	5.4
Family's Social Status		
Respected/well known to everyone in town	14	7.5
Respected/well known to everyone in barangay	102	54.8
Respected/well known to most people in barangay	42	22.6
Respected by and known to most people in the neighborhood	19	10.2
Unknown or known only by a few in our neighborhood	9	4.8

The table shows that majority of the respondents have a happy family with some problems (34.9%) and more than one-fourth perceive a very happy family (27.4%). Five of the respondents had a family with serious problem. In terms of their family's economic status, the respondents have very sufficient means (62.4%), and more than one-fourth have just enough to support their basic family needs (27.4%). The family of most of the respondents (54.8%) is respected and well known to everyone in their neighborhood. Nine of the respondents perceived that their family is known by a few in their neighborhood.

The Supportive Learning Environment Questionnaire. The tool comprises three components: the School Learning Environment, which measures the level of support from school learning environments (Cronbach's alpha: 0.851), and the Supportive Home (Cronbach's alpha: 0.824), and Community Learning Environment (Cronbach's alpha: 0.793), which measure the level of support perceived by students from their home and community, respectively. Mean scores were used to determine the level of support given by each learning environment. The ratings were interpreted as follows: mean score 3.26 – 4.00: very supportive environment; 2.51 – 3.25: supportive environment; 1.76 – 2.50: fairly supportive environment; and 1.00 – 1.75: poorly supportive environment.

Science Academic Performance. The academic performance of the learners was analyzed based on their final grade in the subject. The levels of proficiency utilized to interpret the levels of performance of the respondents were based from the Department of Education Order No. 73 s. 2012. These levels of proficiency were the following: Beginning level or "B" (74% and below), Developing level or "D" (75-79%), Approaching Proficiency or "AP" (80-84%), Proficient or "P" (85-89%), and, Advanced or "A" (90% and above).

Table 2 presents the frequency and percentage distribution of learners' achievement levels. The majority of students fell within the developing level (47.3%), while 32.8% approached proficiency, 12.4% achieved proficiency, 4.8% attained an advanced level, and only 2.7% were classified in the beginning level.

Table 2

Level of academic achievement of the generation Z learners

Level of Performance	Frequency	Percent
Beginning Level	5	2.7
Developing Level	88	47.3
Approaching Proficiency	61	32.8
Proficient	23	12.4
Advanced Level	9	4.8

Treatment of Data

After gathering the necessary data, responses were coded and processed in accordance with the guidelines provided by the instrument's author. Subsequently, the responses were summarized and analyzed using statistical analysis software and spreadsheet applications to compute frequencies, percentages, means, standard deviations, and several inferential tests. Frequency counts and percentage values were employed to establish the family profile and academic achievement levels of Gen Z learners. Meanwhile, means and standard deviations were used to evaluate the support level within the Gen Z learners' environment. Statistical assumption tests were conducted to ensure data quality. The results of the one-sample Kolmogorov-Smirnov test indicated a normal score distribution, allowing for the use of parametric tests in the analysis. All inferential tests were carried out with a confidence level of 95.0%.

To assess whether the selected factors, including family relationships, economic status, and social status, collectively influence the academic performance of Gen Z learners, a Factorial Analysis of Variance (factorial ANOVA) was employed. The assumption of homogeneity was verified through Levene's test ($p > 0.05$). Additionally, the same statistical approach was utilized to examine the academic achievement of Gen Z learners in relation to supportive learning environments in schools, homes and communities. Furthermore, simultaneous multiple linear regression analysis was applied to determine the extent of variance in students' academic achievement that could be explained by a linear combination of various predictors.

FINDINGS

Level of Support of the Generation Z Learners' Environment

Descriptive statistics was used to determine the level of support of the different learning environments of the Gen Z learners. Table 3 provides an overview of the perceived level of support in various learning environments among learners which includes the school, home, and community settings.

Table 3

Generation Z learners' level of the environment support from school, home and community

Learning Environment	Mean	SD	Qualitative Description
School	2.768	0.329	Supportive Environment
Home	3.001	0.411	Supportive Environment
Community	2.701	0.397	Supportive Environment
Overall Environment	2.853	0.236	Supportive Environment

Based on the results, Gen Z learners perceive all three learning environments as supportive. These results indicate that the surveyed Gen Z feel well-supported in their educational institutions, within their families, and within their broader communities. Such positive perceptions of support can have a significant impact on their overall learning experiences and academic achievements.

Table 4 shows the percent and frequency distribution on how students perceive their learning environment.

Table 4

Frequency distribution on the level of environment support

Learning Environment	Poorly Supportive		Fairly Supportive		Supportive Environment		Very Supportive	
	f	%	f	%	f	%	f	%
School	0	0	15	8.1	166	89.2	5	2.7
Home	0	0	19	10.2	144	77.4	23	12.4
Community	0	0	77	41.4	93	50.0	16	8.6
Overall Environment	0	0	23	12.4	140	75.2	23	12.4

Notably, none of the students assessed their school, home and community environments as poorly supportive. The majority of students, approximately 89.2% for the school environment, 77.4% for home, 50% for community, and 75.2% for their overall environment, perceived these settings as supportive. These findings underscore that a significant proportion of Gen Z students consider their school, home and community environments to be either supportive or very supportive, with the school environment particularly standing out in this regard. These results suggest an overall positive evaluation of the supportiveness of the learning environments among the surveyed students. It indicates that Gen Z learners feel supported not only by their families in their academic pursuits but also within their broader communities, including friends, peers, neighbors, the Church and other members of society.

Generation Z learners' academic achievement as a function of their learning environments and family relations, economic and social status

Factorial ANOVA was used to examine the potential main and interactive effects of school, home, and community supportive learning environments on the academic performance of Gen Z learners. The assumptions of independence, homogeneity of variances, and normal distribution of the dependent variable were met. The results presented in Table 5 shows the effect of different learning environments (school, home, and community) on the academic achievement of the Gen Z learners.

Table 5

Factorial analysis of variance for generation Z learners' academic achievement as a function of school, home and community supportive learning environments

Variable and Source	df	MS	F	p	η^2
School Learning Environment	2	86.385	11.690	<0.001	.120
Home Learning Environment	2	234.048	31.671	<0.001	.269
Community Learning Environment	2	9.630	1.303	0.274	.015
School*Community Learning Environments	3	47.749	6.461	<0.001	.101
School*Home Learning Environments	1	120.960	16.368	<0.001	.087
Home*Community Learning Environments	3	30.799	4.168	0.007	.068
School*Home*Community Learning Environments	0	-	-	-	.000
Error	172	7.390			

Note: $\eta^2=.01$, small effect; $\eta^2=.06$, medium effect; $\eta^2=.14$, large effect.

Adjusted R Squared = .603

The main effects reveal that the school learning environment has a significant influence on academic achievement ($F(2,172) = 11.690, p < 0.001$), with a medium effect size ($\eta^2 = 0.120$). Similarly, the home learning environment significantly affects academic achievement ($F(2,172) = 31.671, p < 0.001$), with a large effect size ($\eta^2 = 0.269$). However, the community learning environment does not exhibit a significant main effect ($F(2,172) = 1.303, p = 0.274$), suggesting that it may not independently impact students' academic achievement.

Interaction effects are observed between school and community learning environments ($F(3,172) = 6.461, p < 0.001, \eta^2 = 0.101$) and school and home learning environments ($F(1,172) = 16.368, p < 0.001, \eta^2 = 0.087$). Additionally, an interaction effect is found between home and community learning environments ($F(3,172) = 4.168, p = 0.007, \eta^2 = 0.068$). However, the result of the three-way interaction effect analysis (school-home-community learning environments) suggests the absence of an interaction among the 3 factors. The adjusted R-squared of 0.603 signifies that 60.3% of the variance in academic achievement is explained by the model. Overall, school and home learning environments significantly contribute to academic achievement, and their interactions further enhance their impact, while the community learning environment shows limited direct influence.

Similarly, factorial ANOVA was used to examine the potential main and interactive effects of family relationships, economic, and social status on the academic performance of Gen Z learners. All assumptions were checked and met before results were interpreted.

Table 6

Factorial analysis of variance for Generation Z learners' academic achievement as a function of family relations, economic and social status

Variable and Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	η^2
Family Relations	4	151.407	14.809	.000*	.268
Economic Status	2	6.562	.642	.528	.008
Social Status	3	11.262	1.102	.350	.020
Family Relations*Economic Status	4	8.467	.828	.509	.020
Family Relations*Social Status	5	40.785	3.989	.002*	.110
Economic Status*Social Status	2	9.089	.889	.413	.011
Family Relations*Economic Status*Social Status	1	.200	.020	.889	.000
Error	162	10.224			

Note: $\eta^2=.01$, small effect; $\eta^2=.06$, medium effect; $\eta^2=.14$, large effect. * Significant at $p<.005$
R Squared = .519 (Adjusted R Squared = .451)

Table 6 indicate a statistically significant main effect of family relations on Gen Z's academic achievement, with a relatively large effect size, at $F(4,162)=14.809$, $p<.005$, $\eta^2=.268$. This suggests that different levels of family relations have a significant impact on academic performance among Gen Z learners. The results for economic and social status show no statistically significant effect on academic achievement. The effect size is very small, indicating that these two factors do not play significant main effect to students' academic achievement.

However, the interaction between family relations and social status is statistically significant and has a moderate effect size, at $F(5,162)= 40.785$, $p<.005$, $\eta^2=.110$, which indicates that the combination of these factors plays a more significant role in influencing academic achievement compared to the individual factors. Other interaction effects were found not statistically significant. The results from the factorial ANOVA suggest that family relations, particularly in combination with social status, have a significant effect on the academic achievement of Gen Z learners. Economic status and the other interaction effects do not appear to significantly influence their academic performance.

A simultaneous multiple linear regression analysis was conducted to determine the optimal linear combination of predictor variables that could account for the variances in the academic achievement of Gen Z students. The assumption of nonmulticollinearity among predictors was assumed with Variance Inflation Factor (VIF) values lower than 5, as per the criteria outlined by Ringle et al. (2015). Table 7 presents the results of the analysis, showing the collective impact of various predictor variables on academic achievement among the Gen Z learners.

Table 7
Simultaneous multiple regression analysis summary for academic achievement and predictor variables (N=186)

Variable	B	SE B	β	<i>t</i>	<i>p</i>
Family relations	1.363	.237	.341	5.747	<.001*
Economic Status	-.153	.427	-.023	-.357	.722
Social Status	.844	.267	.186	3.160	.002*
School Environment	-.573	.814	-.044	-.703	.483
Home Environment	4.376	.593	.417	7.382	<.001*
Community Environment	3.028	.633	.278	4.786	<.001*
(Constant)	52.695	2.942			

Note: Adjusted $R^2 = .494$; $F(6,185) = 31.074, p < 0.001$

The beta coefficients (β) indicate the standardized effect of each predictor on the dependent variable. Notably, family relations ($\beta = 0.341, p < .001$), social status ($\beta = 0.186, p = .002$), home environment ($\beta = 0.417, p < .001$), and community environment ($\beta = 0.278, p < .001$) appear to be statistically significant predictors of Gen Z's academic achievement. These results imply that the students reporting positive family relations, higher social status, and favorable home and community environments are more likely to achieve higher academic performance. Conversely, economic status and school environment do not significantly contribute to predicting academic achievement in this model. The overall model is statistically significant ($F(6,185) = 31.074, p < .001$), with an adjusted R-squared of 0.494, which indicates that 49.4% of the variance in students' academic achievement is explained by the combination of these predictor variables. These findings highlight the importance of familial, social, and environmental factors in influencing academic achievement, providing significant insights for educators, policymakers, and researchers interested in understanding the multifaceted determinants of academic success.

DISCUSSION

The study aimed to assess the level of support in the learning environments of Gen Z learners and examine the relationship between these environments and academic achievement in science. The results provide important insights into the role of various factors in shaping Gen Z students' academic achievement. The findings indicate that Gen Z students perceive their school, home, and community environments as generally supportive. This positive perception is evident from the mean scores, with school, home and community environments falling into the supportive environment category. This implies that these students feel well-supported in both their educational institutions and personal lives, which can have a significant impact on their overall learning experiences.

The results from factorial analysis of variance (factorial ANOVA) in Table 6 provide insights into the role and dynamics of learning environments and their impact on the science academic achievement of Gen Z learners. The significant main effects observed for both the school and home learning environments, highlights their critical roles in shaping academic outcomes. These environments, with medium and large effect sizes,

respectively, highlight their influence on student achievement. On the contrary, the non-significant main effect of the community learning environment suggests that, in isolation, it may not be a predominant factor affecting academic success. The identified interaction effects further explain the interplay among various learning environments. Notably, the interactions between school and community, as well as school and home learning environments, reveal synergistic effects, emphasizing the combined influence of these factors on academic achievement of the Gen Z students. Additionally, the interaction effect between home and community learning environments suggests that these two settings may complement each other. However, the absence of a three-way interaction involving school, home, and community environments indicate that their combined impact may not extend beyond their individual contributions. The high adjusted R-squared value indicates that a substantial portion (60.3%) of the variance in academic achievement is accounted for by the model.

The findings from the factorial analysis emphasize the importance of cultivating supportive school and home learning environments and recognizing the potential synergies between them. While the community environment may not independently influence academic achievement, its interaction with other environments implies that a holistic understanding of learning environments is important for enhancing the academic success of Gen Z students.

Further analysis of familial factors identifies a statistically significant main effect of family relations on Gen Z's academic achievement. This large effect size, demonstrated by the computed value of partial eta-squared, suggests that variations in family relations contribute significantly to the observed differences in the students' academic performance. This highlights the importance of family dynamics in shaping the educational outcomes of Gen Z students. This result finds support from the study of Gómez and Morales (2024) who found that fostering positive and empathic parental interactions, especially with mothers, is crucial for improving the academic outcomes of students.

Contrastingly, the results indicate that economic and social status alone do not exhibit a statistically significant main effect on academic achievement. With their small effect size, these factors, independently, do not play a significant role in influencing Gen Z learners' academic performance. These findings challenge conventional assumptions about the direct impact of socio-economic factors on educational outcomes. One surprising result from the study is the statistically significant interaction between family relations and social status. The combined influence of supportive family relationships and a favorable social status is shown to have a more significant effect on the Gen Z's academic achievement, compared than either factor alone. This finding calls for a refined understanding of the synergistic effects of familial and societal support structures.

While some studies have found no significant relationship between family socio-economic status and academic achievement (Gobena, 2018; Olofinniyi, 2021; Pettigrew, 2009; Singh et al., 2014), others have suggested that this relationship is more complex and may be influenced by other factors (Ghosh, 2020; Waal et al., 2020).

These literatures suggest that while economic status may play a role in academic achievement, it is not the sole determinant.

The simultaneous multiple linear regression analysis (MLRA) identifies four variables as statistically significant predictors of academic achievement: positive family relations, higher family social status, and strong support from home and community environments. Economic status and school environment did not contribute to the significant predictors in this model, which challenges conventional assumptions about the direct impact of economic factors on academic achievement. The results also revealed that the school learning environment, though important, may not be as influential in isolation. The findings lead to the call for collaborative efforts among schools, families, and communities to create an organized support system for the Gen Z learners. The results of this study support Pettigrew's (2009) findings showing that socioeconomic status has no significant relationship with academic performance, where economically disadvantaged and economically capable students did not differ significantly.

Furthermore, the research findings align with existing literature on parental engagement in schools, emphasizing its dual role in promoting student well-being and academic achievement. Parental involvement in school activities has a lasting impact on academic success, as demonstrated by Pasion's study (2010). Additionally, research reinforces the positive link between parental engagement and a child's social and emotional development (Harahap et al., 2022; Ratningsih et al, 2021).

The findings of this study also corroborate earlier research, demonstrating the complex web of factors that impact a child's academic achievements. Effective parenting significantly impacts a child's academic performance. The need for caring parents is needed by these Z generations (Satrio et al., 2020). Maintaining open communication and clear expectations between parents and children not only nurtures a supportive home environment but also instills a deep appreciation for education, modeling achievement-oriented behaviors. In the school setting, parents are encouraged to engage actively. School climate is an essential ingredient of student well-being and academic success (Goulet & Morizot, 2023). The community and neighborhood in which a child resides have direct and indirect effects on their development and prospects. As parents, it is imperative to establish and seek out an environment that positively influences the growth and development of their children (Wahyuni et al., 2023). These factors can influence school culture, teaching methods, and access to resources, affecting educational outcomes. Moreover, as emphasized by Baars et al. (2022), it is significant that various system aspects, such as administrative or structural elements, align with pedagogical and spatial changes in education. It underscores the need for a comprehensive approach that integrates psychological, social, and physical dimensions when designing and implementing new learning environments. It stresses the importance of involving relevant stakeholders in discussions at various levels of the educational system to ensure effective design and implementation of these changes.

Emphasis on the synergistic effects of parental support, a quality home learning environment, positive relationships between parents and educators, and a conducive

school learning environment on academic achievement was deemed significant. Additionally, the importance of harmonizing the roles of home, school, and the community to support holistic learning and development must not be neglected. The interdependence of these learning environments is crucial in shaping a child's academic pursuits and overall development, highlighting the vital role of collaboration and supportive environments in fostering success beyond the classroom.

IMPLICATIONS

Parents should be made aware of the influence of a supportive home environment, and strong family relationships in the academic performance of their children. Likewise, the community environment should be made conducive to learning to be able to boost and enhance students' academic performance. All other stakeholders must be made aware of their impact on the academic performance of the learners. Similarly, the school should provide opportunities for family members to bond with their children and to reflect about their relationship with their children such as a conduct of a family day in school. Moreover, the guidance and counselling office should be active in developing good and positive relationship among peers to maintain a positive and supportive environment for each learner. The findings of the present study and various researches highlight the positive influence of family involvement on academic success, especially during the formative years. Parental participation in school-based activities fosters social and emotional adjustment and indirectly affects outcomes as children mature. A nurturing home learning environment catering the changing needs of the present generations of learners, not only enhances the learning experience but also shapes a child's standards, aspirations, and passion for learning. Exposure to modern, technology-enhanced educational resources both within and outside the home contributes significantly to a child's intellectual and social growth. Open, flexible, and adaptive classroom spaces and learning environments promote a partnership between students and teachers, encouraging shared responsibility for the learning process (Trask et al., 2023).

Moreover, the findings of the study emphasize the multifaceted nature of Gen Z students' educational experiences and achievements. While supportive home and community environments and positive family relationships play a significant role in academic performance, the school environment may require further examination to identify specific areas for improvement. Additionally, interventions aimed at fostering supportive environments and positive family relations can be developed by relevant authorities to enhance Gen Z students' academic performance and overall well-being. Focusing on fostering positive family relationships and recognizing the influence of social status may be significant in designing interventions aimed at enhancing academic outcomes for Gen Z students. Collaborative efforts involving families, educators, and communities may be more effective than isolated initiatives. Policy implications arising from this research may involve a re-evaluation of existing educational policies to incorporate a more holistic approach. Acknowledging the interconnectedness of family and social dynamics in shaping academic achievement may inform the development of policies that better cater to the diverse needs of Gen Z learners.

While this study provides significant insights, it is essential to acknowledge its limitations and encourage further research. Exploring the intricacies of family relations, considering cultural variations, and examining other potential contextual factors could contribute to a more comprehensive understanding of the dynamics at play. Future research could explore additional variables that may contribute to the unexplained variance in academic achievement posed by the statistical models in this study.

CONCLUSION

This study aimed to assess the level of support in the learning environments of Generation Z learners and examine their relationship with academic achievement in science. Results indicate that students perceive their school, home, and community environments as generally supportive which highlights a positive perception of supportiveness across these settings. The factorial analysis of variance (factorial ANOVA) emphasizes the critical roles of school and home learning environments in shaping academic outcomes, with significant main effects observed for both factors. While the community learning environment may not independently influence academic achievement, its interaction with other environments suggests potential synergies. Familial factors, particularly positive family relations, emerge as significant predictors of academic achievement which underscores the importance of family dynamics in shaping learners' educational outcomes. Contrary to conventional assumptions, economic and social status alone do not exhibit a significant main effect on academic achievement, but their interaction with family relations demonstrates a more substantial influence. Simultaneous multiple linear regression analysis identifies positive family relations, higher family social status, and strong support from home and community environments as significant predictors of academic achievement in science. These findings put stress on the need for collaborative efforts among schools, families, and communities to create a supportive ecosystem for Gen Z learners. While this study provides valuable insights, further research is warranted to explore additional variables and contextual factors contributing to academic achievement among Gen Z students.

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