IMPACT OF OVERCROWDED CLASSROOMS ON MATHEMATICS LEARNING AMONG JUNIOR HIGH SCHOOL STUDENTS AT INDANAN NATIONAL HIGH SCHOOL – TIMBANGAN

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ABSTRACT. Overcrowded classrooms remain a persistent condition in Philippine public secondary schools, yet their direct influence on specific dimensions of mathematics learning in localized settings remains insufficiently articulated. Mathematics learning in such environments was associated with challenges in sustaining attention and achieving consistent performance, particularly in resource-constrained schools. The inquiry determined the level of impact of overcrowded classrooms on concentration and focus during lessons and performance in mathematics assessments, and examined whether differences exist when analyzed across selected demographic characteristics. A descriptive–correlational design was employed involving 100 junior high school students selected through purposive sampling. Data were gathered using a structured questionnaire and analyzed using mean, standard deviation, t-test, and analysis of variance. Results showed that overcrowded classrooms had a noticeable effect on students' concentration (M = 3.68) and were associated with performance in assessments (M = 3.52), indicating that classroom congestion contributes to attentional disruption and limitations in academic outcomes. Differences across demographic characteristics were generally not observed, although variation was identified in conceptual understanding based on gender (p = 0.017) and in concentration based on parental educational attainment (p = 0.033). These findings indicate that overcrowding influences mathematics learning through reduced attention, constrained instructional interaction, and limited feedback opportunities. The findings provide a focused account of how classroom congestion shapes mathematics learning in a rural Philippine school and underscore the need to improve instructional conditions to support sustained attention and academic performance.

Keywords: *Overcrowded Classrooms, Mathematics Learning, Junior High School Students*

ARTICLE DETAILS
JEAS-00101; Received: March 4, 2026; Accepted: March 20, 2026; Published: April 21, 2026
CITATION:
Salamuddin, A. A. & Antao, M. A. (2026). IMPACT OF OVERCROWDED CLASSROOMS ON MATHEMATICS LEARNING AMONG JUNIOR HIGH SCHOOL STUDENTS AT INDANAN NATIONAL HIGH SCHOOL –TIMBANGAN. Journal of Education and Academic Settings, 3(1). DOI: 10.62596/7j5v9h35

1. INTRODUCTION

Overcrowded classrooms in Philippine public secondary schools have been widely examined in relation to general academic outcomes; however, limited accounts have simultaneously

analyzed how mathematics learning is shaped by both classroom congestion and learner characteristics in geographically isolated areas, particularly in Sulu. Existing discussions often describe the constraints of large class sizes or demographic variability independently, leaving a gap in explaining how these conditions interact in a single localized setting. Many rural public schools in Philippines, instructional delivery is constrained by insufficient facilities and limited pedagogical support, conditions that become more pronounced as student numbers increase (Mncube, 2023; Bruce & Samuel, 2025). Heavy instructional demands placed on teachers may further reduce their capacity to provide individualized attention in overcrowded classrooms (Castro et al., 2024). While such constraints have been recognized, they have not been sufficiently articulated in relation to specific domains such as mathematics learning among junior high school students in peripheral Philippine communities.

Large class sizes have been consistently associated with reduced instructional clarity, limited feedback, and constrained student engagement, particularly in subjects requiring sequential reasoning and guided practice. Jolou Vincent and Lyllan (2025) reported that excessive class size weakens learners' participation and comprehension in mathematics, where conceptual development depends on sustained interaction and immediate correction of errors. Similarly, Rey and Darling (2024) and Yoshinori and Hyumin (2205) noted that teachers in congested classrooms encounter difficulty addressing individual misconceptions, resulting in accumulated learning gaps that hinder progression in mathematical understanding. Learning gaps tend to accumulate when students are unable to receive immediate clarification and reinforcement (Batucan et al., 2025). These accounts highlight persistent instructional limitations but remain largely descriptive of general classroom conditions rather than integrated analyses of learning dimensions and learner variability. Students' actual learning experiences in mathematics are shaped by both environmental conditions and classroom interactions (Verdeflor, 2024).

Across the Philippine education system, disparities in mathematics achievement have been linked to structural constraints such as overcrowding and limited instructional resources. Bernardo et al. (2022); and Maricris and January (2025) observed that students in public schools, where congestion is prevalent, are more likely to fall below expected proficiency levels in mathematics compared to their counterparts in less crowded environments. Complementing this, Susanne and Flora (2023) explained that infrastructure shortages restrict the capacity of teachers to deliver differentiated instruction, leading to reliance on generalized teaching approaches that do not adequately address diverse learner needs. These patterns indicate systemic concerns, yet they do not fully explain how such constraints manifest in specific school environments with unique demographic compositions.

Evidence from international settings further supports the negative implications of overcrowded classrooms on mathematics learning while also emphasizing the importance of instructional attention. Allensworth et al. (2021) demonstrated that smaller classes enable closer monitoring and more targeted instruction, leading to improved mathematics achievement, particularly among lower-performing students. In a related account, Antoniou et al. (2024) and Solomon (2025) found that reduced class size enhances student engagement and academic performance, suggesting that teacher attention is a determining factor in learning progression. Although these findings provide strong support for class size reduction, they are largely derived from structured interventions, which differ from naturally occurring overcrowded conditions in under-resourced Philippine schools.

In the Philippines, overcrowding is not an isolated factor but is intertwined with broader educational constraints. Mzimela et al. (2025) and Kholisa et al. (2024) reported that persistent

classroom shortages continue to drive high student–teacher ratios nationwide, resulting in learning environments that limit instructional effectiveness. Motivation—both from teachers and students serves a key role in sustaining learning quality under constrained educational conditions (Nazareth et al., 2026).This condition is further intensified in areas such as Sulu, where socio-economic challenges intersect with educational limitations, shaping the learning experience in ways that are not fully captured in national-level analyses. In such environments, the effects of overcrowding extend beyond physical space, influencing how students engage with mathematical concepts and classroom activities.

Despite established accounts on overcrowded classrooms, limited attention has been given to how classroom congestion specifically affects concentration during lessons and performance in mathematics assessments within localized Philippine public school conditions. Prior discussions often emphasize general academic outcomes or broad learning dimensions, yet do not sufficiently explain how attentional disruption and assessment-related difficulties emerge as direct outcomes of overcrowding in naturally occurring classroom environments. In addition, variations across learner characteristics such as gender and parental educational attainment have not been consistently examined in relation to these specific dimensions, resulting in an incomplete understanding of how students experience and respond to overcrowded conditions in mathematics learning.

Addressing this gap, this inquiry determines the level of impact of overcrowded classrooms on mathematics learning among junior high school students at Indanan National High School – Timbangan, particularly in terms of concentration and focus during lessons and performance in assessments. It further examines whether significant differences and relationships exist in these effects when analyzed across selected demographic characteristics. Through this focused approach, the inquiry provides a more grounded explanation of how classroom congestion influences both the learning process and academic outcomes, ensuring alignment between identified gaps and the observed findings.

2. METHODS

2.1 Research Design

This inquiry utilized a descriptive–correlational design to examine the existing conditions of overcrowded classrooms and their association with mathematics learning among junior high school students. The descriptive component enabled a systematic presentation of students' experiences and perceptions regarding classroom congestion, while the correlational component determined the relationships among identified variables without manipulating any conditions. This design is appropriate for examining naturally occurring educational phenomena and identifying patterns of association among variables in school environments, particularly when the aim is to understand relationships rather than establish causation (Loyong et al., 2026). Through this approach, the study was able to capture both the extent of overcrowding and its connection to multiple dimensions of mathematics learning.

2.2 Research Locale

The study was conducted at Indanan National High School – Timbangan, a public secondary school located in Barangay Timbangan, Indanan, Sulu. This campus is recognized for having a high student population compared to other campuses under the same school system, resulting in consistently congested classrooms. The condition of having a large number of learners within limited instructional space provided a relevant setting for examining how overcrowding influences students' learning experiences in mathematics. The school environment reflects common challenges faced by public secondary schools in the Philippines, particularly in areas where educational resources and infrastructure remain limited.

2.3 Participants of the Study

The participants consisted of junior high school students enrolled during the Academic Year 2025–2026 at Indanan National High School – Timbangan. A total of 100 students were selected, with equal representation from Grade 7 to Grade 10 to ensure balanced participation across grade levels. Including students from different year levels allowed the study to capture variations in learning experiences and perceptions related to overcrowded classrooms across developmental stages in junior high school. The participants were considered appropriate for this investigation as they were directly exposed to the classroom conditions being examined.

Table 1. Distribution of the sample among students in junior high school according to grade level and sections

Grade and Sections	Students
Grade 7	25
Grade 8	25
Grade 9	25
Grade 10	25
Total	**100**

2.4 Sampling Technique

A purposive sampling technique was employed in selecting the participants of the study. This method allowed the researcher to intentionally select respondents who possess characteristics relevant to the objectives of the investigation. Students were chosen based on their availability and their exposure to overcrowded classroom conditions. This approach ensured that essential variables such as age, gender, grade level, and parental educational attainment were adequately represented in the sample. Purposive sampling is appropriate in studies that require participants with specific experiences or characteristics that align with the focus of the inquiry (Tajik et al., 2024).

2.5 Data Gathering Procedure

The data collection process followed a structured and formal procedure. Permission to conduct the study was first secured from the Office of the Graduate Studies Dean of Sulu State College, followed by approval from the Schools Division Superintendent and the school principal of

Indanan National High School – Timbangan. After obtaining the necessary authorizations, the researcher personally administered the survey questionnaire to the selected participants during scheduled class periods. Clear and standardized instructions were provided to ensure that respondents understood how to answer the instrument. The completed questionnaires were collected immediately after administration, organized systematically, and prepared for data encoding and analysis. The researcher directly supervised the entire process to maintain accuracy, consistency, and completeness of the collected data.

2.6 Research Instrument

The study utilized a structured survey questionnaire adapted from established instruments related to class size and student academic performance. The instrument consisted of two main sections: the first section gathered demographic information, including age, gender, grade level, and parental educational attainment, while the second section measured the perceived impact of overcrowded classrooms on mathematics learning. The second section was divided into four dimensions, namely understanding of mathematical concepts, concentration and focus during lessons, participation in class activities, and performance in assessments, with each dimension consisting of ten items. The instrument employed a Likert-scale format to quantify students' responses, allowing for systematic analysis of their perceptions regarding the effects of classroom congestion on learning.

2.7 Validity and Reliability of the Instrument

To ensure the appropriateness of the instrument for the present investigation, the questionnaire underwent expert evaluation. Faculty members from the Graduate Studies of Sulu State College reviewed the instrument to assess its clarity, relevance, and alignment with the objectives of the study. Necessary revisions were made based on their recommendations to improve the overall quality of the instrument. The adaptation of previously validated tools, combined with expert validation, contributed to the reliability and consistency of the data gathered.

2.8 Statistical Treatment of Data

The data collected were analyzed using appropriate statistical techniques. Frequency and percentage were used to describe the demographic profile of the participants. Mean and standard deviation were employed to determine the level of impact of overcrowded classrooms on mathematics learning across the identified dimensions. To examine differences in responses based on demographic variables, an independent samples t-test was used for gender, while analysis of variance (ANOVA) was applied for age, grade level, and parental educational attainment. Additionally, the Pearson Product–Moment Correlation Coefficient was utilized to determine the relationships among the dimensions of mathematics learning affected by overcrowded classrooms. These statistical tools allowed for a comprehensive analysis of both descriptive and inferential aspects of the data.

2.9 Ethical Considerations

Ethical standards were strictly observed throughout the conduct of the study. Participants were fully informed about the purpose, procedures, and scope of the investigation, and their voluntary participation was secured through informed consent. Confidentiality and anonymity were maintained by ensuring that no identifying information was disclosed in any report or publication.

Participants were given the freedom to withdraw at any point without any consequences. The researcher ensured that all data were collected, recorded, and reported accurately, avoiding any form of fabrication or misrepresentation. Respect for participants' rights, dignity, and well-being was upheld at all times, and the study complied with institutional ethical guidelines, including the acquisition of ethical clearance prior to data collection.

3. RESULTS

Objective 1. To determine the level of impact of overcrowded classrooms on mathematics learning among junior high school students at Indanan National High School – Timbangan in terms of understanding of mathematical concepts, concentration and focus during lessons, participation in class activities, and performance in assessments.

Table 2. Level of impact of overcrowded classrooms on mathematics learning among junior high school students at Indanan National High School - Timbangan in the context of Concentration and Focus during Lessons.

	Statements	Mean	S.D	Rating
1	I find it harder to concentrate on mathematics lessons when there are many students in the classroom	3.53	1.010	Agree
2	Overcrowded classrooms produce more noise and distractions, which lowers my attention during math lessons	3.91	1.147	Agree
3	Off-task behavior by some students reduces my ability to stay focused on math task	3.74	1.268	Agree
4	I often cannot see the board or teacher clearly, which reduces my concentration	3.36	1.049	Neutral
5	Because teachers cannot move around to monitor everyone in big classes, I get interrupted more and lose focus	3.49	1.030	Neutral
6	The physical discomfort (crowded seating) in an overcrowded class reduced my ability to concentrate on mathematics	3.86	1.005	Agree
7	In overcrowded lessons my attention span for sustained math problem-solving is shorter than in smaller class	3.77	.920	Agree
8	Frequent interruptions (moving students, seating changes) in large classes break my focus during mathematics instruction	3.71	1.122	Agree
9	When class is too big the classroom layout becomes cramped and this environmental factor distracts me from learning math	3.78	.894	Agree

10	I am more likely to daydream or lose interest in long math explanations when class is overcrowded	3.66	1.066	Agree
	Total Weighted Mean	**3.68**	**.62405**	**Agree**

Legend: (5) 4.50-5.00=Strongly Agree; (4) 3.50-4.49= Agree; (3) 2.50- 3.49= Neutral; (2) 1.50- 2.49=Disagree; (1) 1.00- 1.49= Strongly Disagree

Table 2. shows that the overall weighted mean of 3.68 is interpreted as agree, indicating that students generally perceive overcrowded classrooms as having a noticeable effect on their concentration and focus during mathematics lessons. This suggests that increased classroom density contributes to environmental distractions such as noise, movement, and limited physical space, which may disrupt students' attention during instruction. Since mathematics requires sustained mental engagement to follow procedures, analyze problems, and process sequential steps, even minor interruptions can affect comprehension. The result implies that overcrowding may reduce students' ability to remain attentive throughout the lesson, potentially leading to incomplete understanding of concepts. Finding highlights that concentration is one of the most affected aspects of learning in crowded classrooms, emphasizing the importance of maintaining a learning environment that supports continuous focus.

Table 3. Level of impact of overcrowded classrooms on mathematics learning among Junior High School students at Indanan National High School - Timbangan in the context of Performance in Assessments.

	Statements	Mean	S.D	Rating
1	Overcrowded classrooms make it harder for me to do well on math tests because I receive less individualized instruction	3.34	1.007	Neutral
2	I receive less detailed feedback on homework, which negatively affects my test scores	3.32	.973	Neutral
3	Because teachers have less time to mark individual work, I get fewer corrective comments to improve before exams	3.56	1.018	Agree
4	Overcrowded classrooms limit remedial or extra help opportunities, which lowers my performance in mathematics assessments	3.59	.986	Agree
5	I believe my math grades would improve if class were smaller because teachers could give more one-to-one support	3.76	1.182	Agree
6	Teacher uses more standardized assessments and fewer diagnostic assessments, reducing the match between instruction and assessment	3.44	.957	Neutral

7	Overcrowding reduces opportunities for formative assessment during lessons, so I enter tests less prepared	3.65	1.104	Agree
8	When the classroom is overcrowded, I receive less targeted preparation for high-stakes math exams	3.44	.967	Neutral
9	The extra workload on teachers in large classes reduces the time available for designing varied assessments that better reflect my learning	3.54	.892	Agree
10	My overall math performance suffers in crowded classrooms compared with when I study in smaller classes	3.58	1.046	Agree
	Total Weighted Mean	**3.52**	**.63079**	**Agree**

Legend: (5) 4.50-5.00=Strongly Agree; (4) 3.50-4.49= Agree; (3) 2.50- 3.49= Neutral; (2) 1.50- 2.49=Disagree; (1) 1.00- 1.49= Strongly Disagree

Table 3 presents an overall weighted mean of 3.52, interpreted as agree, indicating that students perceive overcrowded classrooms as having an effect on their performance in mathematics assessments. This suggests that the limitations brought about by classroom congestion—such as reduced teacher attention, limited feedback, and fewer opportunities for remediation—may influence students' academic outcomes. When students are not able to fully clarify misconceptions or receive timely guidance, gaps in understanding may persist and eventually affect their performance during quizzes and examinations. The result implies that overcrowding does not only impact the learning process during instruction but also extends to measurable academic achievement. Overall, the finding underscores that classroom conditions are directly associated with how well students perform in mathematics assessments.

Objective 2. To examine whether significant differences and relationships exist in the impact of overcrowded classrooms on mathematics learning when analyzed across selected demographic characteristics.

Table 4. Difference in the level of impact of overcrowded classrooms on mathematics learning among Junior High School students at Indanan National High School - Timbangan when data are grouped according to their demographic profile in terms of gender.

Variables	Grouping	Mean	S.D	Mean Difference	t	Sig.	Description
Understanding of Mathematical Concepts	Male	3.5400	.66055	.28200	2.419*	.017	Significant
	Female	3.2580	.49326				
Concentration and Focus during Lessons	Male	3.7580	.48533	.15400	1.237	.219	Not Significant
	Female	3.6040	.73428				

Participation in Class Activities	Male	3.4640	.70182	.00600	.049	.961	Not Significant
	Female	3.4580	.49367				
Performance in Assessments	Male	3.5360	.65458	.02800	.221	.826	Not Significant
	Female	3.5080	.61240				

* Significant at alpha 0.05

Table 4. indicates that most dimensions do not show statistically significant differences when grouped according to gender, except for understanding of mathematical concepts. This suggests that male and female students generally experience the effects of overcrowded classrooms in a similar manner, particularly in terms of concentration, participation, and performance. The presence of a significant difference in conceptual understanding implies that there may be slight variations in how learners process mathematical ideas under crowded conditions. However, the overall pattern reflects that gender is not a strong determining factor in shaping students' experiences of overcrowding in mathematics learning.

Table 5. Difference in the level of impact of overcrowded classrooms on mathematics learning among Junior High School students at Indanan National High School - Timbangan when data are grouped according to their demographic profile in terms of Parent's educational attainment.

Sources of Variation		**Sum of squares**	**df**	**Mean Square**	**F**	**Sig.**	**Description**
Understanding of Mathematical Concepts	Between Groups	1.914	6	.319	.889	.506	Not Significant
	Within Groups	33.375	93	.359			
	Total	35.290	99				
Concentration and Focus during Lessons	Between Groups	5.180	6	.863	2.406*	.033	Significant
	Within Groups	33.374	93	.359			
	Total	38.554	99				
Participation in Class Activities	Between Groups	1.067	6	.178	.472	.827	Not Significant
	Within Groups	35.011	93	.376			
	Total	36.078	99				
Performance in Assessments	Between Groups	.973	6	.162	.393	.882	Not Significant
	Within Groups	38.418	93	.413			
	Total	39.392	99				

* Significant at alpha 0.05

Table 5 shows that most dimensions do not exhibit statistically significant differences when grouped according to parental educational attainment, except for concentration and focus during lessons. This indicates that students' family educational background may influence their ability to maintain attention in overcrowded classrooms. Learners from different parental education levels may differ in how they cope with distractions and classroom conditions. Despite this, the absence of significant differences in other areas suggests that overcrowding produces relatively similar effects on understanding, participation, and performance across different family backgrounds.

4. DISCUSSION

The findings of this study provide a direct response to the stated objectives by clarifying how overcrowded classrooms influence mathematics learning and whether such effects vary across selected demographic characteristics. Results indicate that classroom congestion exerts a noticeable influence on learners' concentration during lessons and performance in assessments, while differences across demographic variables remain limited and selective.

With respect to the level of impact, the findings reveal that concentration and focus during lessons are notably affected under overcrowded conditions. This outcome suggests that increased classroom density introduces environmental disruptions that interfere with sustained attention, thereby limiting students' ability to process mathematical procedures effectively. Mathematics requires sequential reasoning and continuous mental engagement; thus, interruptions in attention may lead to fragmented understanding. This finding aligns with the argument of He et al. (2025), who noted that excessive class size weakens learner engagement and reduces comprehension in mathematics. In a similar manner, Nasir et al., (2023) emphasized that constrained instructional conditions restrict opportunities for clarification, which may result in incomplete understanding of mathematical concepts. The present findings extend these observations by showing that attentional disruption is a central mechanism through which overcrowding affects learning.

In terms of performance in assessments, the results indicate that overcrowded classrooms are associated with observable limitations in students' academic outcomes. This suggests that restricted access to feedback, limited teacher attention, and fewer opportunities for remediation may contribute to gaps in learning that become evident during evaluations. Difficult learning environments may also heighten students' anxiety and reduce confidence in mathematics performance (Inoferio et al., 2024). Mathematics assessment relies heavily on prior understanding and continuous feedback; when these are constrained, performance may decline. This interpretation is consistent with Bernardo et al. (2022), who reported that students in congested public schools tend to demonstrate lower levels of proficiency in mathematics. Infrastructure limitations reduce the capacity for differentiated instruction, which may hinder students' preparedness for assessments (Aguhayon et al., 2023). The current findings reinforce these accounts by demonstrating that classroom congestion is associated not only with learning processes but also with measurable academic outcomes. Motivation in mathematics learning is

often influenced by the quality of classroom experiences and instructional support (Gumallaoi et al., 2026). However, when teacher overload may reduce the effectiveness of classroom management and instructional delivery (Alcasoda et al., 2025).

The analysis of differences across demographic characteristics provides further insight into how overcrowding is experienced among learners. The absence of significant variation across most variables suggests that the effects of overcrowded classrooms are generally uniform among students, regardless of age or grade level. This indicates that classroom congestion functions as a shared constraint that shapes learning experiences in a similar manner across groups. However, the presence of a significant difference in conceptual understanding based on gender suggests that learners may differ in how they process mathematical content under constrained instructional conditions. This variation may be linked to differences in learning strategies or cognitive engagement, although the effect appears limited to specific dimensions rather than the overall learning experience.

In addition, parental educational attainment shows a significant difference in relation to concentration and focus, indicating that learners' home background may influence how they manage attention in crowded classrooms. Students with varying levels of parental educational support may differ in their ability to sustain focus despite environmental distractions. Student interest in mathematics is closely linked to the quality of instructional conditions and learning environment (Espartero et al., 2024). Learners in constrained educational environments often require adaptive teaching strategies to sustain meaningful engagement (Barrientos, 2025). This finding resonates with the assertion of Wang and Jacquet (2025) and Franieza et al. (2024) who emphasized that learning conditions in Philippine public schools are shaped not only by institutional constraints but also by external factors that affect student engagement. The present results suggest that while overcrowding imposes a common constraint, individual differences related to family background may influence how students cope with its effects.

When linked to established theoretical explanations, the findings support the propositions of Carroll's Model of School Learning, which posits that learning is dependent on the amount of time and attention allocated to instructional activities (Kraft et al., 2024). In overcrowded classrooms, limited teacher attention reduces opportunities for individualized support, thereby affecting both concentration and performance. Similarly, Vygotsky's Sociocultural Theory underscores the importance of guided interaction in cognitive development; overcrowding restricts such interaction, leading to uneven learning progression (Gragenda et al., 2024). The findings also align with behaviorist principles, where consistent feedback is necessary for reinforcement. In crowded classrooms, delayed or limited feedback may weaken learning outcomes, particularly in mathematics where practice and correction are essential. Sustained engagement is critical in mathematics learning, yet it becomes difficult to maintain in environments where interaction is constrained (Legarde et al., 2025).

Findings suggest that overcrowded classrooms influence mathematics learning through interconnected mechanisms involving attention, instructional support, and feedback. While the effects are broadly consistent across learners, selected differences indicate that individual and family-related factors may shape how students respond to these conditions (Laurian and Prospery, 2025). The results contribute to existing knowledge by providing a localized account of how classroom congestion operates in a rural Philippine setting, highlighting that its impact

extends beyond physical space and is closely associated with cognitive engagement and academic performance.

5. CONCLUSION

Classroom congestion is associated with difficulties in maintaining concentration during lessons and is linked to variations in performance in mathematics assessments. These outcomes suggest that when instructional environments become densely populated, students experience challenges in sustaining attention and fully engaging with mathematical tasks, which may lead to gaps in understanding that eventually affect academic performance. Thus, overcrowding is not limited to physical space constraints but is directly associated with how effectively students process and demonstrate mathematical learning.

Further analysis reveals that differences in the perceived impact of overcrowded classrooms across demographic characteristics are generally limited. The absence of variation across most variables suggests that the effects of overcrowding are experienced in a relatively consistent manner among learners. However, selected differences indicate that certain aspects of learning may vary depending on individual characteristics. In particular, conceptual understanding differs across gender, while concentration is influenced by parental educational attainment, indicating that individual and family-related factors may shape how students respond to congested classroom conditions. Despite these variations, the overall pattern confirms that overcrowding remains a common constraint that affects learners regardless of demographic grouping.

Findings affirm that overcrowded classrooms influence both the learning process and academic outcomes in mathematics, primarily through reduced attention, limited instructional support, and constrained feedback. These results contribute to a more grounded understanding of how classroom congestion operates in a localized Philippine setting, particularly in areas where educational resources are limited. The findings further suggest that improving classroom conditions may enhance students' ability to engage with mathematical content and perform more effectively in assessments.

The outcomes of this inquiry also open directions for further work that may extend the present findings. Future efforts may consider examining additional variables such as instructional strategies, teacher workload, or classroom management practices to deepen understanding of how overcrowding interacts with teaching processes. Expanding the scope to include other subject areas or different school contexts may also provide a broader view of how classroom density influences learning. Such directions may contribute to the development of more targeted interventions aimed at improving learning conditions and strengthening mathematics achievement among students in similar educational environments.

References

Aguhayon, H., Tingson, R., & Pentang, J. (2023). Addressing students learning gaps in mathematics through differentiated instruction. International Journal of Educational Management and Development Studies, 4, 69–87. https://doi.org/10.53378/352967

Alcasoda, J. J., Cutillas, A. L., Sabella, R. O., et al. (2025). Supervision strategies in managing stress of instructors due to inevitable academic overloads and pressures. Environment and Social Psychology, 10(6), 3824. https://doi.org/10.59429/esp.v10i6.3824

Allensworth, E., Cashdollar, S., & Gwynne, J. (2021). Improvements in math instruction and student achievement through professional learning around the Common Core State Standards in Chicago. AERA Open, 7.

Antoniou, F., Alghamdi, M. H., & Kawai, K. (2024). The effect of school size and class size on school preparedness. Frontiers in Psychology, 15, 1354072. https://doi.org/10.3389/fpsyg.2024.1354072

Barrientos, A. A. (2025). Harnessing science teaching strategies for the least-exposed learners in science real-life settings. Environment and Social Psychology, 10(12), 3232. https://doi.org/10.59429/esp.v10i12.3232

Batucan, N. A., Inoferio, H. V., Quisay, A. R. C., et al. (2025). Busting fear and enhancing comprehension of learners in mathematics and science-oriented courses. Environment and Social Psychology, 10(10), 3364. https://doi.org/10.59429/esp.v10i10.3364

Bernardo, A. B. I., Cordel, M. O., II, Lapinid, M. R. C., Teves, J. M. M., Yap, S. A., & Chua, U. C. (2022). Contrasting profiles of low-performing mathematics students in public and private schools in the Philippines: Insights from machine learning. Journal of Intelligence, 10(3), 61. https://doi.org/10.3390/jintelligence1003006

Castro, F. L. T., Ventura, B. L. O., Estajal, R. S., et al. (2024). Teachers handling multiple subject areas: Difficulties and adaptive attributes in the delivery of instructions. Environment and Social Psychology, 9(9), 2520. https://doi.org/10.59429/esp.v9i9.2520

Dictado, M., & Dagdag, J. (2025). Barriers to achieving mathematics proficiency: Synthesis of research. Journal of Interdisciplinary Perspectives, 3, 242–250. https://doi.org/10.69569/jip.2025.254

Espartero, M. M., Caldaza, K. P. D., & Prado, R. T. D. (2024). Analyzing the level of interest of high school students in solving mathematical problems in modular and face-to-face learning. Environment and Social Psychology, 9(4), 2167. https://doi.org/10.54517/esp.v9i4.2167

Frianeza, E., Maravilla, H., Relox, R., Dagaraga, S., Cruz, C., Solomon, E., & Mohammad, N. (2024). Challenges in the Philippine educational system and its impact towards teachers' instructional strategies and professional growth. Journal of Pedagogy and Education Science, 3, 63–71. https://doi.org/10.56741/jpes.v3i01.414

Grageda, C., Tinapay, A., Tirol, S., & Abadiano, M. (2022). Socio-cultural theory in the cognitive development perspective. NeuroQuantology, 20, 1482–1493. https://doi.org/10.14704/NQ.2022.20.16.NQ880145

Gumallaoi, J. G., Carbonel, P. A., Gabriel, E. D., et al. (2026). Experiential learning anxiety and inducing motivation of learners in mathematics and science-oriented courses. Environment and Social Psychology, 11(1), 4238. https://doi.org/10.59429/esp.v11i1.4238

He, Y., Zhang, S., Fan, L., Yu, B., & Wang, L. (2025). The relationship between class size and secondary students' mathematics achievement: Longitudinal evidence from a large-sized class in China. Cambridge Journal of Education, 55(4), 587–603. https://doi.org/10.1080/0305764X.2025.2521514

Hu, H., Wang, Y., & Jacquet, W. (2025). Cross-regional students' engagement and teacher relationships across online and in-school learning. Education Sciences, 15(8), 993. https://doi.org/10.3390/educsci15080993

Inoferio, H. V., Espartero, M. M., Asiri, M. S., et al. (2024). Coping with math anxiety and lack of confidence through AI-assisted learning. Environment and Social Psychology, 9(5), 2228. https://doi.org/10.54517/esp.v9i5.2228

Jala, J. V., & Magdale, L. (2025). The effect of large class size on academic performance and student satisfaction in City College of El Salvador. DIT ADS International Multidisciplinary Research Journal. https://doi.org/10.63941/DIT.ADSimrj.2025.1.4.93

Kholisah, N., Saskia, B., Dinarti, N., Rohmatilahi, L., & Rostika, D. (2024). Analysis of the impact of lack of classrooms on students' conductivity while learning. Progres Pendidikan, 5, 134–138. https://doi.org/10.29303/prospek.v5i2.408

Kraft, M. A., & Novicoff, S. (2024). Time in school: A conceptual framework, synthesis of the causal research, and empirical exploration. American Educational Research Journal, 61(4), 724–766. https://doi.org/10.3102/00028312241251857

Legarde, M. A. A., Del Mundo, M., Chavez, J. V., et al. (2025). Empowering learning engagement in higher education with active learning experiences in STEM classrooms. Environment and Social Psychology, 10(9), 3878. https://doi.org/10.59429/esp.v10i9.3878

Likuru, L., & Mwila, P. (2022). Overcrowded classrooms: Effect on teaching and learning process in public secondary schools in Ilemela Municipality, Tanzania. Asian Journal of Education and Social Studies, 75–87. https://doi.org/10.9734/ajess/2022/v30i230744

Loyong, D., Lapeña, M. A., Hesera, H., & Bacatan, J. (2026). Students' perception on classroom design, student engagement, and academic performance among Grade 3 learners. International Journal of Social Sciences and English Literature, 10, 6–17. https://doi.org/10.55220/2576-683x.v10i1.861

Mangarin, R., & Caballes, D. (2024). Difficulties in learning mathematics: A systematic review. International Journal of Research and Scientific Innovation, 11, 401–405. https://doi.org/10.51244/IJRSI.2024.1109037

Mncube, D., Ajani, O., Ngema, T., & Mkhasibe, G. (2023). Exploring the problems of limited school resources in rural schools and curriculum management. UMT Education Review, 6, 1–31. https://doi.org/10.32350/UER.62.01

Mzimela, V. H., Mngomezulu, T. P., Makhonza, L. O., Buthelezi, N., & Ajani, O. (2025). Unearthing the effects of classroom overcrowding on the quality of education in public schools. International Journal of Innovative Technologies in Economy. https://doi.org/10.31435/ijite.3(51).2025.3083

Nasir, R., Siahaan, U., & Prafianti, R. (2023). Analysis of mathematical instruction barriers in terms of developing students' mathematical reasoning. Vygotsky, 5, 65. https://doi.org/10.30736/voj.v5i1.723

Nazareth, I. M., Chavez, J. V., Dusaban, A. C. M., et al. (2026). Intrinsic motivation of teacher education instructors in contributing to the sustainable development goal on quality education. Environment and Social Psychology, 11(1), 3863. https://doi.org/10.59429/esp.v11i1.3863

Schwab, S., & Woltran, F. (2023). Obstacles to differentiated instruction (DI): Reviewing factors outside the classroom that contribute to successful DI implementation.

Shimizu, Y., & Kang, H. (2025). Research on classroom practice and students' errors in mathematics education: A scoping review of recent developments (2018–2023). ZDM Mathematics Education. https://doi.org/10.1007/s11858-025-01704-0

Solomon, K. (2025). Assessing the influence of class size on learners' academic performance at Jolo District, Division of Sulu. Journal of Education and Academic Settings, 2, 1–15. https://doi.org/10.62596/k8h89h36

Tajik, O., Golzar, J., & Noor, S. (2024). Purposive sampling. International Journal of Educational and Life Sciences, 2, 1–9. https://doi.org/10.22034/ijels.2025.490681.1029