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# Digital learning access, parental involvement, teacher support, and learning motivation as predictors of academic achievement among senior high school students in Jakarta, Indonesia

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## ABSTRACT

Improving educational quality in Indonesia requires evidence of how home, school, digital, and motivational factors jointly predict student achievement. This APA-style manuscript presents a quantitative research article focused on senior high school students in Jakarta, Indonesia. The study was framed as a cross-sectional explanatory design and used an illustrative dataset constructed to match a simple random sample of 254 students because no field dataset was supplied. Academic achievement was modeled as a function of digital learning access, parental involvement, teacher support, and learning motivation, with gender, grade level, school type, and household socioeconomic status entered as controls. Descriptive statistics, Pearson correlations, and hierarchical multiple regression analyses were reported in APA format. The illustrative model explained 53.5% of the variance in students' academic achievement. Learning motivation emerged as the strongest positive predictor ($\beta = .42$, $p < .001$), followed by parental involvement ($\beta = .19$, $p < .001$), teacher support ($\beta = .18$, $p < .001$), and digital learning access ($\beta = .17$, $p = .001$). Household socioeconomic status was significant in the control model but became non-significant once proximal learning variables were entered, suggesting that school and family processes may absorb part of the influence of structural inequality. This article argues that, even in a relatively well-connected metropolitan context, academic performance depends less on infrastructure alone than on the combination of access, supportive relationships, and student agency. Implications are drawn for Jakarta schools and broader Indonesian education reform under Kurikulum Merdeka.

**Keywords**: academic achievement; digital learning access; Indonesia; Jakarta; learning motivation; multiple regression; parental involvement; teacher support

## 1. INTRODUCTION

Indonesia has made major gains in educational participation over the past two decades; however, learning quality remains a central challenge. National debates about schooling are no longer focused only on access, enrollment, or school completion; they increasingly ask whether students are acquiring the foundational competencies needed for higher studies, productive work, and citizenship. International and national indicators underscore the urgency of this change. The World Bank (2024) reported that 53 percent of children in Indonesia were not able to read proficiently by the end of primary school and that 49 percent of students did not reach minimum proficiency at the end of primary education. Likewise, the OECD Education GPS profile for Indonesia (OECD, 2024a) shows that average performance in mathematics, reading, and science remains low and that results have declined compared with 2018. These indicators do not reduce the richness of Indonesian education to a single metric, but they do show that improving day-to-day learning processes remains a strategic priority in the education sector.

Indonesia's policy response has been increasingly reform-oriented. Through *Merdeka Belajar* and *Kurikulum Merdeka*, the Ministry of Education, Culture, Research, and Technology has attempted to rebalance the curriculum toward foundational competencies, deeper learning, project-based pedagogy, and greater flexibility for schools and teachers. OECD analyses of reform in Indonesia describe this agenda as emphasizing streamlined content, literacy and numeracy, teacher autonomy, and more formative approaches to assessment (OECD, 2024b). UNESCO's discussion of Indonesia's recent digital transformation similarly highlights how national platforms and teacher-facing digital ecosystems have been mobilized to support reform at scale (UNESCO, 2024). Together, these initiatives suggest that Indonesian education policy has entered a stage in which learning quality depends not only on what is mandated centrally, but also on how students, families, and teachers interact with resources and expectations in everyday school life.

Jakarta is a compelling setting for examining these questions. As the capital region, Jakarta tends to enjoy stronger educational infrastructure, denser school networks, and better digital connectivity than do many other provinces. Simultaneously, metropolitan advantages should not be mistaken for educational uniformity. Public and private schools differ in terms of resources, household backgrounds are heterogeneous, and digital access is multidimensional. Students may own devices but still face unstable connections, crowded homes, or uneven guidance on how to use digital tools for academic purposes. For this reason, Jakarta offers an analytically useful case: if student performance continues to vary substantially within the country's most connected urban environment, then the explanation is likely to lie in the combined influence of household support, teacher practices, motivation, and the effective use of learning technology rather than in hardware alone.

Therefore, this study focuses on four proximal predictors of academic achievement among senior high school students in Jakarta: digital learning access, parental involvement, teacher support, and learning motivation. These factors were selected for both theoretical and practical purposes. Digital learning access captures whether students can reliably reach and use educational content in a system that increasingly depends on platforms, online materials and data-informed teaching. Parental involvement reflects the home environment through which routines, expectations, emotional support and monitoring are communicated. Teacher support represents the relational and instructional quality of the classroom. Learning motivation captures the degree to which students see schooling as meaningful, persist through difficulties, and regulate their own efforts. Each factor has been studied independently in prior research, but schools and policymakers rarely confront them one at a time. In practice, students learn at the intersection of these influences.

This study makes three contributions. First, it provides an integrated student-level model of achievement for the Jakarta senior high school context, using hierarchical multiple regression to estimate the relative contributions of home, school, digital, and motivational factors. Second, it frames the analysis within the current Indonesian reform priorities, linking micro-level educational behavior with macro-level efforts to improve literacy, numeracy, and student agency. Third, it offers a complete APA-style article draft that can serve as a research guide. Because no raw field dataset was supplied, the numerical results

reported here are based on an illustrative dataset constructed to match the requested research design of simple random sampling in Jakarta, with 254 students. The analytical logic, measurement framework, and reporting structure are therefore fully developed, while the numerical outputs should be replaced with the observed field data before formal submission. Within these boundaries, this study addresses the following question: To what extent do digital learning access, parental involvement, teacher support, and learning motivation predict academic achievement among senior high school students in Jakarta after controlling for demographic and school-related factors?

## 2. LITERATURE REVIEW AND HYPOTHESES

### 2.1. The Indonesian Education Context and the Value of an Integrated Model

Academic achievement is a multi-determined outcome. In the Indonesian context, this is particularly important because national reform has moved away from narrow exam preparation toward a broader conception of learning. The current policy architecture places greater attention on foundational literacy and numeracy, project-based learning, social-emotional development, and the use of school-level evidence to improve instruction. Such goals imply that achievement should be understood not merely as the result of cognitive ability or curriculum coverage but as the product of interactions among resources, relationships, and student dispositions. Fredricks et al. (2004) argued that school success is closely tied to engagement processes that connect emotional, behavioral, and cognitive participation in school. Therefore, a regression approach is useful because it estimates how several plausible influences operate simultaneously rather than in isolation.

An integrated model is warranted because the boundaries between school, home, and technology have become less distinct. The acceleration of digital learning during and after the pandemic blurred the traditional separation between classroom time and independent studies. Teachers now distribute materials through digital platforms, parents often monitor or facilitate access to online work, and students themselves must decide how to allocate their attention across educational and non-educational media. Indonesia's reform agenda has embraced this reality by promoting digital platforms, educational dashboards, and teacher-facing resources on a large scale. However, policy success ultimately depends on whether students experience these resources as accessible, supported, and motivating. A student with strong internet access but weak teacher guidance may not benefit; similarly, a student with committed teachers may still struggle if their home routines are chaotic or their motivation is low.

This study adopts an ecological view of achievement, in which student performance is shaped by the immediate conditions under which learning takes place. Household socioeconomic status, gender, grade level, and school type were included as background controls because they often structure opportunities. However, the central theoretical expectation is that more proximal processes are especially important. Parental involvement and teacher support are relationship-based mechanisms through which expectations and assistance are conveyed. Digital learning access represents material and technological opportunities. Learning motivation represents a student's internalized willingness to engage. When these variables are examined together, it becomes possible to assess whether background inequalities operate directly or whether part of their influence is absorbed by the quality of support and engagement surrounding the learner's learning experience.

### 2.2. Digital Learning Access and Academic Achievement

Digital access is now part of the ordinary architecture of education, rather than a temporary supplement. In principle, improved access to devices, stable internet, and usable digital resources expand opportunities for information retrieval, practice, communication, feedback, and differentiated learning. However, the empirical literature has long cautioned that technology does not automatically improve outcomes. Bulman and Fairlie (2016) showed that the effects of educational technology depend heavily on how resources are used, with some interventions producing gains and others generating null or even negative effects on learning. This distinction remains relevant in Indonesia, where digital expansion has occurred alongside persistent variations in school readiness, teacher capability, and student self-regulation.

Current Indonesian policy frames digital access as a lever for equity and quality, rather than simply modernization. UNESCO (2024) described how national digital platforms have been used to scale educational support, while the OECD's report on Indonesian reform emphasized the role of digital tools, such as the Education Scorecard, in helping teachers and subnational governments respond to learning needs (OECD, 2024b). However, digital inclusion is not guaranteed by platform availability. Gottschalk and Weise (2023) stress that access must be interpreted broadly to include connectivity, devices, skills, and the capacity to benefit from online learning environments. In urban settings such as Jakarta, the most consequential differences may therefore concern the quality and stability of access, rather than absolute access alone.

At the student level, better digital learning access can support academic achievement in several ways. First, it increases the probability that students can retrieve learning materials on time and review the content outside classroom hours. Second, it facilitates communication between teachers and peers. Third, it may support independent practice and revision, particularly for subjects that require repeated exposure, such as mathematics and language. Finally, it can improve perceived competence when students feel able to meet the digital demands of contemporary schooling. Therefore, this study proposes the following hypothesis:

**H1**: Digital learning access positively predicts academic achievement among senior high school students in Jakarta.

### 2.3. Parental Involvement and Academic Achievement

Parental involvement is one of the most consistently studied predictors of student success. Across diverse settings, the literature shows that students tend to perform better when parents communicate expectations, monitor attendance and homework, provide emotional encouragement, and maintain school-related routines. Meta-analytic evidence strongly supports this relationship. Wilder (2014) concluded that parental involvement is positively associated with academic outcomes, while Castro et al. (2015) similarly found that parental participation and home-based support are linked to higher achievement. The importance of parental involvement should not be reduced to direct help with academic content; for adolescents, the more salient effects often come from structure, expectations, and relationship availability.

In Indonesia, parental involvement is significant because educational inequality is often mediated by differences in household information, study space, and educational aspirations. Even where formal schooling is universal, students experience school through the rhythm of family life. Parents help determine whether time is protected for homework, whether digital devices are used for learning rather than as a distraction, and whether setbacks are framed as temporary challenges or fixed limitations. Zhang et al. (2021) showed that the relationship between family socioeconomic status and achievement is meaningfully linked to parental involvement, underscoring the need to examine home processes alongside structural backgrounds. Indonesian evidence on special education and broader school participation also suggests that parental engagement affects not only academic performance but also persistence and effort. This is especially relevant in the senior high school years, when academic pressure increases and students begin to link their current performance to future study and employment pathways.

The mechanism connecting parental involvement to achievement is likely to be both direct and indirect. Parents can directly provide reminders, resources, and accountability. Indirectly, parental attention may strengthen motivation, help students interpret school demands as legitimate, and reduce stress by creating a predictable, supportive home environment. For students in Jakarta, where opportunities and distractions coexist in dense urban settings, parental involvement may be especially important as a regulatory influence. Accordingly, the second hypothesis is as follows:

**H2**: Parental involvement positively predicts academic achievement among senior high school students in Jakarta.

### 2.4. Teacher Support and Academic Achievement

Teacher support is central to contemporary theories of school engagement and achievement because it links instructional quality to relational trust. Students are more likely to invest effort when teachers explain the material clearly, provide timely feedback, communicate respect, and signal that improvement is possible. Roorda et al. (2011), in a meta-analysis of affective teacher-student relationships, demonstrated that positive relationships are associated with engagement and achievement. Wang and Holcombe (2010) similarly found that adolescents' perceptions of the school environment and support are closely connected to engagement and performance. Tao et al. (2022) likewise showed that perceived teacher support is positively connected with student engagement and academic outcomes. These results are especially important in educational systems that seek to move from rote instruction to deeper learning because supportive teaching becomes the medium through which new pedagogies are translated into student experiences.

The Indonesian reform context makes teacher support analytically essential. Kurikulum Merdeka gives teachers greater autonomy to focus on foundational competencies and project-based learning, but autonomy only matters if students experience it as coherent support rather than inconsistency. The OECD's analysis of reform in Indonesia notes both the promise and challenge of placing teachers at the center of curriculum implementation (OECD, 2024b). In schools serving diverse learners, supportive teaching is also part of educational equity: students who receive constructive feedback and respectful guidance are better positioned to benefit from the curriculum regardless of their starting point.

Teacher support may predict academic achievement through various pathways. It can increase comprehension by improving the clarity of instruction. It can support persistence by normalizing difficulties and offering feedback. It can also increase psychological safety, allowing students to ask questions and participate more fully in the learning process. In secondary school, where subject matter becomes more specialized and evaluative pressure intensifies, these relational and instructional functions are substantial. Therefore, this study advances the following hypothesis:

**H3**: Teacher support positively predicts academic achievement among senior high school students in Jakarta.

### 2.5. Learning Motivation and Academic Achievement

Among the variables considered in this study, learning motivation is expected to be the most proximal to achievement because it directly shapes attention, persistence, and self-regulation. From a self-determination perspective, students are more likely to engage deeply when they experience learning as meaningful, feel capable, and supportive environments encourage autonomy rather than passive compliance. Ryan and Deci (2020) emphasized that the quality of motivation matters as much as its quantity because autonomous regulation is associated with deeper learning and more durable persistence. Guay (2022) similarly argued that educational motivation should be understood through the quality of regulation and satisfaction of psychological needs, not simply through the presence or absence of effort. Howard et al. (2021) showed in a meta-analysis that more self-determined forms of motivation are associated with adaptive academic outcomes across educational settings.

The relevance of motivation in Indonesia is heightened by national efforts to move beyond memorization and toward deeper understanding. A curriculum that emphasizes projects, inquiry, and competency requires students to take greater responsibility for their learning. This responsibility is difficult to enact when students perceive schooling as externally imposed or disconnected from their goals. Therefore, motivation is not only a personal attribute but also a bridge between policy ambition and classroom reality. It converts opportunities into actions. A student with access to resources and supportive adults may still underperform if their will to persist is weak; conversely, motivated students often use limited resources more effectively than expected.

Empirically, motivated students are more likely to complete tasks, manage distractions, use feedback constructively, and remain engaged in difficult situations. These behaviors are strongly aligned with the routines required in senior high school, particularly in subjects that require cumulative practice. For these

reasons, this study expects a positive achievement advantage for students with higher learning motivation. Therefore, the fourth hypothesis is proposed as follows:
**H4**: Learning motivation positively predicts academic achievement among senior high school students in Jakarta.

### 2.6. Combined Prediction and Conceptual Expectation

Although each predictor is expected to show a positive bivariate relationship with achievement, their simultaneous inclusion in one regression model is analytically more informative than separate tests of each predictor. Digital access, parental involvement, teacher support, and motivation are conceptually related and may reinforce each other. Parents can shape digital routines, teachers can strengthen motivation, and motivated students may capitalize on access. Therefore, a combined model allows researchers to distinguish shared variance from unique explanatory power. It also clarifies whether socioeconomic status remains a strong direct predictor after student-level learning processes have been considered.

Based on the literature, the strongest standardized effect is expected for learning motivation because it is closest to academic behavior. Teacher support and parental involvement are expected to follow because they structure the environments in which motivation is formed and sustained. Digital access is expected to remain significant, but its effect may be smaller once motivational and relational variables are included, since access only becomes educationally meaningful when students and adults use it productively. This leads to the following overarching expectation:
**H5**: After controlling for gender, grade level, school type, and household socioeconomic status, digital learning access, parental involvement, teacher support, and learning motivation jointly explain a significant additional variance in academic achievement.

## 3. METHODOLOGY

### 3.1. Research Design and Transparency Note

This study is presented as a quantitative, cross-sectional, explanatory research article that examines academic achievement among senior high school students in Jakarta, Indonesia. The design uses survey-based predictors and a continuous outcome variable, making hierarchical multiple regression the primary inferential technique used. The article has been written as a complete manuscript rather than a short proposal so that it can function as a ready-to-edit model for a thesis, coursework, or journal preparation.

A transparency note is required. No field or institutional datasets were supplied with the request for this article. Consequently, the numerical analyses reported in the Results section are based on a structured illustrative dataset generated to align with the requested specifications: Jakarta as the research location, simple random sampling, and a final sample size of 254. The purpose of the illustrative dataset is not to misrepresent empirical fieldwork; rather, it enables a full demonstration of APA-style reporting, table construction, interpretation, and discussion. All procedures described below reflect how the study should be conducted in practice, and the reported values should be replaced with the observed data before academic examination, conference presentation, or journal submission.

### 3.2. Research Setting and Population

The study was conducted in DKI Jakarta, the capital region of Indonesia, which includes the municipalities of Central, North, West, South, and East Jakarta. Jakarta was selected because it represents a high-priority educational setting in which policy reform, digital infrastructure, and school diversity converge. The region contains a large mix of public and private senior high schools, substantial socioeconomic heterogeneity, and relatively strong exposure to digital learning platforms compared with other provinces. These characteristics make Jakarta suitable for examining how material access and relational support combine to shape academic results.

The target population consisted of students enrolled in grades 10, 11, and 12 at general senior high schools in Jakarta. Students in this age group are appropriate for the present study because they are expected to manage more complex academic workloads, use digital tools more independently, and make

decisions related to examinations and post-school transitions. Focusing on senior high school students also aligns with the policy relevance of strengthening their readiness for higher education and employment.

### 3.3. Sample Size and Simple Random Sampling

The final sample size was set at 254 students, following the specifications in the assignment and reflecting a practical size for regression analysis with multiple predictors. This sample is adequate for estimating a model with demographic controls and four focal predictors while preserving stable degrees of freedom and a reasonable statistical power. In practical field implementation, the accessible population would first be defined through participating senior high schools willing to provide anonymized student rosters for research.

Simple random sampling will be performed using a computer-generated randomization procedure. Each eligible student in the sampling frame was assigned an identification code, and 254 codes were selected without replacement. If a selected student declined to participate or was unavailable after follow-up, the next code on the randomized reserve list was approached. This procedure preserves the logic of simple random sampling within the accessible population because every listed student has an equal probability of selection at the time of the draw. In the illustrative dataset used for this study, the final 254 students were distributed across the five Jakarta municipalities and included both public and private school enrollees.

Although many educational studies rely on convenience samples, the use of random selection is methodologically valuable because it reduces selection bias and strengthens the interpretability of regression coefficients. This also fits the article's aim of modeling student achievement at the level of the learner rather than drawing conclusions from a highly self-selected subgroup. The demographic composition of the sample is presented in Table 1.

### 3.4. Measures

Academic achievement was the dependent variable in this study. In field implementation, this construct would be operationalized as a composite of students' most recent semester grades in four core subjects: Indonesian language, mathematics, English, and science. Using a four-subject composite reduces dependence on any single teacher's grading style and better reflects broad academic performance. Scores were standardized where necessary and then averaged to form an achievement index scaled from 0 to 100. In the illustrative dataset, academic achievement had a mean of 81.12 and a standard deviation of 6.89, suggesting a moderate variation across the sample.

Digital learning access was measured using a multi-item scale capturing regular access to an Internet-connected device, connection stability, ease of accessing learning platforms, availability of digital materials, confidence in using learning applications, and the presence of a workable study environment for digital tasks. Responses were structured on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The construct was designed to capture educational access rather than general screen time use. In the illustrative results, the scale showed acceptable internal consistency (alpha = .81).

Parental involvement was measured using items that reflected home-based educational support. The indicators included parental monitoring of homework, discussion of school progress, encouragement to study, establishment of study routines, attention to attendance, and willingness to communicate with the school when needed. Consistent with the prior literature, the emphasis was on involvement that communicates expectations and emotional support rather than direct tutoring alone. Responses were recorded on the same 5-point Likert scale, and the illustrative reliability estimate was alpha = .81.

Teacher support was measured through students' perceptions of instructional clarity and relational support. The items covered clarity of explanation, fairness, feedback quality, accessibility when students needed help, respect for student ideas, and encouragement during academic difficulty. This operationalization reflects the view that teacher support includes both pedagogical and socioemotional dimensions. The scale also used a 5-point Likert scale. In the illustrative dataset, the reliability coefficient was alpha = .86, indicating a strong internal consistency.

Learning motivation was measured as students' willingness to engage in schoolwork, persist on challenging tasks, study without constant external pressure, value academic learning, and pursue long-term educational goals. The measure was informed by self-determination theory and broader work on school engagement, but was tailored to senior high school routines in Jakarta. The items were scored on a 5-point Likert scale, with higher scores indicating stronger motivation. The illustrative reliability estimate for the scale was alpha = .87, the highest of the focal predictors.

Household socioeconomic status was included as a control variable because family resources often shape the educational opportunities. Rather than relying solely on parental income, which students may not know accurately, a brief index can be constructed from items such as educational resources at home, adequacy of study space, access to learning devices, and perceived financial sufficiency for schooling needs. This strategy improves the feasibility of school-based surveys. The illustrative internal consistency estimate for the socioeconomic status index was alpha = .82.

Additional control variables included gender, grade, and school type. Gender was coded as male or female, following school records in the illustrative dataset. Grade level was represented by dummy variables for Grades 11 and 12, using Grade 10 as the reference category. School type distinguished public from private senior high schools (SHS). These variables were included because prior studies have often found them to be associated with exposure to educational opportunities, student routines, or achievement.

### 3.5. Instrument Development, Validity, and Pilot Review

As the constructs in this study were perceptual and multidimensional, careful instrument development was important. In practical implementation, questionnaire items should be adapted from the established literature on digital access, parental involvement, teacher support, and academic motivation, and then reviewed by at least two experts in educational research and one practicing school counselor or senior teacher. Expert reviews evaluated item clarity, cultural appropriateness, and construct relevance for Indonesian senior high school students.

A small pilot test with students outside the main sample is advisable before full administration. Pilot feedback can identify ambiguous wording, excessive survey length, and items that do not fit the local school context. Exploratory checks of reliability and corrected item-total correlations can be used to refine the instrument. Because the present study uses an illustrative dataset, such pretesting is described as a methodological recommendation rather than reported as completed fieldwork. Nonetheless, the scale structure and reliability coefficients reported in Table 2 are consistent with those expected from a well-designed instrument.

### 3.6. Data Collection Procedure and Ethics

In field implementation, data collection began after approval from the relevant school authorities and, where required, an institutional ethics committee. Because the participants are minors, parental consent and student assent should be secured before the questionnaire is administered. Participation was voluntary, and students were informed that their responses were confidential, would not affect their grades, and could be withdrawn at any time without penalty.

Surveys were administered either in paper form during school hours or through a secure digital platform supervised by the research team. To limit common method bias, students completed the questionnaire individually without the presence of a teacher during item responses, except for logistical supervision. Academic achievement data may be drawn from school records with permission or self-reported and cross-checked, where feasible. All identifiers will be removed before analysis, and the dataset will be stored in password-protected files accessible only to the research team.

### 3.7. Data Analysis Strategy

The analysis was conducted in four stages. First, descriptive statistics were examined to summarize the participants' characteristics and the central tendency of each construct. Second, the internal consistency reliability was assessed for the multi-item scales using Cronbach's alpha. Third, Pearson's correlation coefficients were calculated to examine the bivariate relationships among the main study variables. Fourth,

hierarchical multiple regression was used to test the hypotheses and estimate the incremental explanatory power of the focal predictors.

The regression analysis was specified in two blocks. Model 1 includes the control variables gender, grade level, school type, and household socioeconomic status. Model 2 adds digital learning access, parental involvement, teacher support and learning motivation. This sequencing allows for the assessment of whether the focal predictors explain additional variance in achievement beyond background characteristics. The general regression equation can be represented as follows:

$$\text{Academic Achievement}_i = \beta_0 + \beta_1(\text{Gender})_i + \beta_2(\text{Grade 11})_i + \beta_3(\text{Grade 12})_i + \beta_4(\text{Private School})_i + \beta_5(\text{SES})_i + \beta_6(\text{Digital Access})_i + \beta_7(\text{Parental Involvement})_i + \beta_8(\text{Teacher Support})_i + \beta_9(\text{Learning Motivation})_i + \varepsilon_i.$$

Assumption checks are essential in regression analyses. In practical implementation, the researcher should examine the linearity, normality of residuals, homoscedasticity, multicollinearity, and influential observations. In the illustrative analysis, the variance inflation factors ranged from 1.03 to 1.38, suggesting no multicollinearity concerns. The Durbin-Watson statistic was 2.05, studentized residuals remained within acceptable bounds, and the Breusch-Pagan test was non-significant, indicating no evident heteroscedasticity problem. These diagnostics support the interpretability of the regression coefficients.

## 4. RESULTS AND DISCUSSION

### 4.1. Results

Table 1 summarizes the characteristics of the 254 students in this sample. The gender distribution was relatively balanced, with 138 female (54.3 percent) and 116 male (45.7 percent) students. Grade-level representation was also balanced across the senior high school years: 88 students were in Grade 10, 78 in Grade 11, and 88 in Grade 12. The sample included 168 public school students (66.1 percent) and 86 private school students (33.9 percent), which reflects the mixed institutional landscape of Jakarta schooling. Students were drawn from all five municipalities, with the largest shares coming from South and West Jakarta. The average age of the participants was 16.61 years (SD = 0.98).

This profile suggests that the sample was sufficiently heterogeneous for the regression analysis. It includes variations in school stage, school sector, and municipality, which is important because educational experiences in Jakarta are shaped by both geographic and institutional diversity. Simultaneously, the relatively even distribution of students across key categories reduces the risk that the results are driven by one highly dominant subgroup.

**Table 1. Participant Characteristics (N = 254)**

| Variable | Category | n | % |
|---|---|---|---|
| Gender | Male | 116 | 45.7 |
| | Female | 138 | 54.3 |
| Grade level | Grade 10 | 88 | 34.6 |
| | Grade 11 | 78 | 30.7 |
| | Grade 12 | 88 | 34.6 |
| School type | Public | 168 | 66.1 |
| | Private | 86 | 33.9 |
| Municipality | Central Jakarta | 45 | 17.7 |
| | North Jakarta | 47 | 18.5 |
| | West Jakarta | 56 | 22.0 |
| | South Jakarta | 58 | 22.8 |
| | East Jakarta | 48 | 18.9 |
| Age | Mean (SD) | 16.61 (0.98) | |

**Note**: Percentages may not total 100.0 exactly because of rounding errors.

Table 2 reports the descriptive statistics and reliability estimates of the study variables. Among the focal predictors, learning motivation recorded the highest mean (M = 3.86, SD = 0.60), followed by digital learning access (M = 3.80, SD = 0.61), teacher support (M = 3.71, SD = 0.63), and parental involvement (M = 3.63, SD = 0.59). Household socioeconomic status had a mean of 3.53 (SD = 0.62). These values suggest that students tended to evaluate their learning conditions moderately positively, though not at the ceiling levels. The room for variation is analytically useful because regression requires a meaningful spread in the predictor values.

All multi-item scales demonstrated acceptable to strong internal consistency. Cronbach's alpha coefficients ranged from .81 to .87, indicating that the items within each construct were sufficiently coherent for use in the regression analysis. Teacher support and learning motivation showed the strongest reliability, which is consistent with the conceptual clarity of these constructs and prior educational survey research. The achievement variable, constructed as a core-subject composite, showed an average score of 81.12 (SD = 6.89), indicating that the sample performed in the upper-middle range of the grading distribution while exhibiting substantial variance.

**Table 2. Descriptive Statistics and Reliability of the Study Variables**

| Variable | Items | alpha | M | SD |
|---|---|---|---|---|
| Digital learning access | 6 | .81 | 3.80 | 0.61 |
| Parental involvement | 6 | .81 | 3.63 | 0.59 |
| Teacher support | 6 | .86 | 3.71 | 0.63 |
| Learning motivation | 7 | .87 | 3.86 | 0.60 |
| Household SES | 4 | .82 | 3.53 | 0.62 |
| Academic achievement | 4 subjects | - | 81.12 | 6.89 |

**Note**: All multi-item predictors were measured using a 5-point Likert scale. Academic achievement is a composite of semester scores in the Indonesian language, mathematics, English, and science.

Table 3 presents Pearson's correlations among the main study variables. All focal predictors were positively and significantly associated with the academic achievement. Learning motivation displayed the strongest bivariate relationship with achievement ($r = .64$, $p < .01$), followed by teacher support ($r = .46$, $p < .01$), digital learning access ($r = .45$, $p < .01$), and parental participation ($r = .45$, $p < .01$). Household socioeconomic status was also positively correlated with achievement ($r = .38$, $p < .01$).

The pattern of intercorrelations among the predictors was theoretically coherent and methodologically reassuring. Digital learning access correlated moderately with motivation ($r = .42$) and parental involvement ($r = .30$), suggesting that students with stronger access also tended to report more supportive learning environments. Teacher support was correlated with motivation ($r = .38$), which is consistent with the argument that supportive teachers help sustain student engagement. Household socioeconomic status was positively related to both parental involvement ($r = .37$) and motivation ($r = .43$) in this study. Importantly, none of the predictor intercorrelations were high enough to indicate problematic overlap, a conclusion confirmed by the low variance inflation factors in the regression diagnostics.

**Table 3. Pearson Correlations Among the Main Study Variables**

| Variable | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Digital learning access | - | .30** | .27** | .42** | .28** | .45** |
| 2. Parental involvement | | - | .32** | .33** | .37** | .45** |
| 3. Teacher support | | | - | .38** | .22** | .46** |
| 4. Learning motivation | | | | - | .43** | .64** |
| 5. Household SES | | | | | - | .38** |
| 6. Academic achievement | | | | | | - |

**Note**: N = 254. SES = socioeconomic status. ** $p < .01$ (two-tailed).

The main hypothesis tests were conducted using a hierarchical multiple regression analysis. Table 4 presents the model summary, and Table 5 reports the coefficients of the final model. In Model 1, which included only the control variables, the regression equation was statistically significant, F(5, 248) = 9.43, p < .001, and explained 16.0 percent of the variance in academic achievement (R^2 = .160, adjusted R^2 = .143). Within this control model, household socioeconomic status was a significant positive predictor (B = 4.32, p < .001), whereas gender, grade, and school type were not statistically significant.

When digital learning access, parental involvement, teacher support, and learning motivation were entered in Model 2, the explanatory power increased substantially. The full model was statistically significant, F(9, 244) = 31.16, p < .001, and accounted for 53.5 percent of the variance in academic achievement (R^2 = .535, adjusted R^2 = .518). The change in explained variance from Model 1 to Model 2 was .375, and this increase was statistically significant (Delta F (4, 244) = 49.19, p <.001). This result supports H5 and indicates that the four focal predictors jointly provide substantial explanatory value beyond background characteristics.

**Table 4. Hierarchical Regression Model Summary for Academic Achievement**

| Model | Predictor block | R^2 | Adjusted R^2 | F | Delta R^2 |
|---|---|---|---|---|---|
| 1 | Gender, grade, school type, SES | .160 | .143 | 9.43*** | .160 |
| 2 | Model 1 + digital access, parental involvement, teacher support, motivation | .535 | .518 | 31.16*** | .375 |

**Note**: SES = socioeconomic status. Model 1: F(5, 248) = 9.43, p < .001. Model 2: F(9, 244) = 31.16, p < .001. Delta F(4, 244) = 49.19, p < .001. *** p < .001.

Consistent with expectations, learning motivation was the strongest unique predictor in the final model (B = 4.78, beta = .42, p < .001). This means that, holding other variables constant, students with higher motivation tended to earn substantially higher academic scores. Parental involvement was also a significant positive predictor (B = 2.16, beta = .19, p < .001), as was teacher support (B = 1.95, beta = .18, p < .001). Digital learning access remained significant (B = 1.88, beta = .17, p = .001). These findings support H1, H2, H3, and H4, respectively.

**Table 5. Final Regression Coefficients Predicting Academic Achievement**

| Predictor | B | SE B | beta | t | p |
|---|---|---|---|---|---|
| Intercept | 38.48 | 2.77 | - | 13.90 | < .001 |
| Grade 11 | -0.17 | 0.76 | -.02 | -0.22 | .826 |
| Grade 12 | -0.63 | 0.73 | -.09 | -0.86 | .389 |
| Female | 0.12 | 0.62 | .01 | 0.20 | .843 |
| Private school | 0.89 | 0.65 | .06 | 1.37 | .171 |
| Household SES | 0.53 | 0.56 | .05 | 0.95 | .345 |
| Digital learning access | 1.88 | 0.57 | .17 | 3.32 | .001 |
| Parental involvement | 2.16 | 0.58 | .19 | 3.72 | < .001 |
| Teacher support | 1.95 | 0.54 | .18 | 3.63 | < .001 |
| Learning motivation | 4.78 | 0.62 | .42 | 7.75 | < .001 |

**Note**: SES = socioeconomic status. Standardized coefficients (beta) are not reported for intercepts. Reference categories were Grade 10, male, and public school.

A notable feature of the model is the change in socioeconomic status coefficient. While socioeconomic status was significant in Model 1, it became non-significant in Model 2 (B = 0.53, p = .345). This pattern suggests that part of the achievement advantage associated with higher household resources may operate through more immediate factors, such as digital access, supportive parental practices, and stronger student motivation. The result should not be interpreted as evidence that structural

inequality no longer matters; rather, it indicates that the pathway from background advantage to achievement may be channeled through daily learning conditions.

Diagnostic checks indicated that the final model met the common regression assumptions. The Durbin-Watson statistic was 2.05, suggesting no concern with residual autocorrelation. The studentized residuals ranged from approximately -2.82 to 2.56, with no cases exceeding the conventional absolute threshold of 3.00. The Breusch-Pagan test was non-significant ($p = .51$), indicating no clear heteroscedasticity problem. Finally, all variance inflation factors were well below the commonly used cutoffs, ranging from 1.03 to 1.38. Taken together, these indicators suggest that the regression estimates are stable and suitable for interpretation of the results.

## 4.2. Discussion

### 4.2.1. Interpretation of the Main Findings

The findings of this study reinforce the view that academic achievement is best understood as the outcome of layered support systems rather than as a simple consequence of student ability or school type. Taken together, digital learning access, parental involvement, teacher support, and learning motivation explained a substantial share of the variation in achievement among Jakarta senior high school students. The size of the full-model R^2 is notable in educational research, where achievement is rarely determined by a single factor. This pattern supports the conceptual argument advanced in the literature review: students learn at the intersection of material access, relational support, and personal engagement.

Among the predictors, learning motivation was the strongest unique contributor. This result is consistent with self-determination theory and meta-analytic evidence showing that more self-directed forms of motivation are associated with more adaptive academic outcomes. This finding is also highly plausible in the Indonesian reform context. Kurikulum Merdeka expects students to participate more actively, respond to inquiry-oriented learning, and take greater responsibility for progress. Such expectations are difficult to satisfy without motivation, which is at least partly internalized. In practical terms, motivated students are more likely to study consistently, persist through difficult material, use digital resources purposefully, and constructively respond to teacher feedback. The current results suggest that motivation may be the mechanism through which educational inputs are converted into actual performance.

Parental involvement and teacher support also retained significant independent effects in the full model, even after controlling for background factors and other focal predictors. This result is important because it rejects the idea that adolescents succeed only through self-reliance once they reach high school. However, the findings indicate that supportive adults remain central. At home, parental involvement likely sustains routines, communicates expectations, and provides emotional regulation during academically demanding periods. At school, teacher support appears to shape both comprehension and confidence by making learning feel accessible and improvement-oriented. These results align with prior meta-analyses and suggest that home-school partnerships remain relevant well beyond primary education.

### 4.2.2. Digital Access as an Enabler Rather Than a Stand-Alone Solution

Digital learning access was significant in both bivariate and multivariate analyses, but its standardized coefficient was smaller than that of motivation, parental involvement, and teacher support. This pattern is theoretically significant. In policy debates, digitalization is sometimes treated as if infrastructure alone will solve learning deficits. The present findings suggest a more nuanced interpretation of these results. Access matters, but its educational value depends on whether students can translate access into disciplined study, whether parents reinforce productive technology use, and whether teachers provide coherent, digitally mediated instruction.

This conclusion is particularly relevant for Jakarta. Because the city generally enjoys stronger connectivity than many other regions, the educational question is not only whether students are online, but also how effectively they use that access for learning. Students with a device but no quiet study space, parental boundaries, or weak motivation may not realize the potential benefits of digital resources.

Conversely, students with strong motivational and relational support may extract substantial value from modest digital opportunities. In this sense, digital access should be understood as an enabling condition that increases the opportunity to learn, not as a stand-alone driver of achievement.

The policy implication is that digital investment should be paired with pedagogical and family facing strategies. School leaders must ensure that digital tools are integrated into meaningful learning routines rather than layered onto already overloaded schedules. Teachers need support in designing activities that go beyond content delivery and focus on feedback, practice, and student agency. Parents need simple guidance on structuring home technology use for schooling. Without these accompanying conditions, improvements in access may have weaker effects than expected.

**4.2.3. Socioeconomic Status and Proximal Educational Processes**

One of the most instructive findings of the regression analysis is the changing role of household socioeconomic status. In the control model, socioeconomic status significantly predicted achievement, which is consistent with extensive educational research showing that family resources shape opportunities. However, the coefficient lost its significance after the focal predictors were entered. This does not imply that social inequality is not relevant. Rather, it suggests that in this Jakarta sample, part of the influence of socioeconomic background may be expressed through more immediate learning conditions: access to technology, quality of parental engagement, and level of motivation that students are able to sustain.

This interpretation has both theoretical and practical implications. Theoretically, this supports an ecological account in which structural advantages influence achievement through the environments and relationships that surround the learner. This suggests that schools and local authorities are not powerless in the face of socioeconomic inequality. They may not be able to eliminate income differences directly, but they can invest in teacher support systems, student motivation strategies, and targeted access interventions that buffer some of the disadvantages. Therefore, this finding offers a cautiously optimistic message: while inequality matters, some of its educational consequences may be modifiable through policy and school practice.

**4.2.4. Implications for Indonesian Education Reform**

The study's findings resonate with Indonesia's current reform trajectory in two ways. Merdeka Belajar and Kurikulum Merdeka emphasize foundational competencies, greater pedagogical flexibility, and formative assessment. The results reported here complement that agenda by showing that student achievement in Jakarta is associated not only with structural background factors but also with the quality of the learning ecology around the student. If motivation is central, then reform must include classroom practices that support autonomy, relevance and competence. If parental involvement matters, communication between schools and families should be treated as a core component of improvement rather than an optional extra. If teacher support matters, then teacher development must focus not only on curriculum documents but also on feedback practices, relational pedagogy, and responsiveness to students' needs.

The findings also suggest a practical way to interpret national digital reforms. Indonesia has invested in platforms and data systems to scale support across a large and diverse country. Such systems are valuable, but their impact will likely vary depending on the degree to which teachers and students can use them. In Jakarta, where digital infrastructure is comparatively strong, policy should move beyond the simple metric of access and ask whether students experience digital learning as organized, manageable, and academically useful. This is where school leadership becomes crucial. Principals and teachers can convert digital infrastructure into improved achievement only when routines, feedback and expectations are aligned.

Several actionable priorities have emerged for local education offices in Jakarta. First, schools should identify students whose digital access is unstable, not only because of device ownership but also because of connectivity quality and study-space limitations. Second, family outreach should focus on feasible forms of parental involvement, such as routine monitoring, encouragement, and communication, rather than demanding unrealistic levels of content tutoring. Third, teacher professional development should explicitly

address supportive feedback, academic scaffolding and motivational climate. Fourth, schools should integrate motivation-building practices into regular instruction, including goal-setting, student reflection, and authentic tasks that demonstrate the usefulness of what is being learned. These measures are modest compared with large-scale structural reforms, but the regression results indicate that they are likely to be significant.

#### 4.2.5. Theoretical Contribution

This study contributes theoretically by demonstrating the value of combining relational, technological, and motivational predictors into one explanatory model. Many prior studies have examined these variables separately, which can obscure the fact that they operate within a shared educational system. The present model shows that when examined simultaneously, each of the four focal factors retains unique explanatory power, but motivation has the strongest coefficient. This pattern supports the argument that educational inputs have the most direct effect on achievement when they shape how students engage with learning tasks.

The findings also illuminate the distinction between distal and proximal predictors. Socioeconomic status is a distal background factor, and digital access, parental involvement, teacher support, and motivation are proximal learning conditions. Therefore, the attenuation of the socioeconomic coefficient in the full model is conceptually significant, even in an illustrative dataset. This suggests that researchers studying education in Indonesia may benefit from analyzing not only who students are or where they come from but also what their immediate learning environments enable them to do. Future research can extend this insight by testing mediation and moderation models, including whether teacher support strengthens the benefits of digital access or whether parental involvement has stronger effects on students with lower baseline motivation.

#### 4.2.6. Limitations and Directions for Future Research

This study has several limitations. First, the numerical results are illustrative because no original field dataset was provided for analysis. Although the dataset was structured to match the requested design and produce plausible regression outputs, the coefficients should not be cited as real empirical evidence from Jakarta schools. This article is best understood as a full research manuscript draft with a worked analytical example. Any formal academic use requires the replacement of illustrative results with observed data.

Second, this study used a cross-sectional design. Even with real field data, such a design would support association rather than causal inferences. For example, higher-achieving students may perceive more teacher support or report stronger motivation because they are already successful, not only the reverse. Longitudinal designs are better suited for tracing directionality over time. Third, several constructs relied on student self-reports. Self-reporting is often necessary in educational surveys, but it can introduce social desirability bias and shared method variance. Future research could combine student responses with parent surveys, teacher ratings, platform usage logs, or administrative grade records.

Fourth, the study is geographically focused on Jakarta, Indonesia. This is a strength for contextual relevance but a limitation for generalization purposes. Provinces with weaker digital infrastructure, different school densities, or different family labor patterns may produce different relationships among the same variables. Therefore, comparative studies across Indonesian provinces would be valuable. Fifth, the model does not include all possible influences on the achievement. Peer effects, school leadership, mental health, attendance, and prior achievement may all contribute to additional explanatory power. Future studies should explore broader models and test whether the predictors operate differently by school type or socioeconomic subgroup.

## 5. CONCLUSION

This study aimed to examine whether digital learning access, parental involvement, teacher support, and learning motivation predict academic achievement among senior high school students in Jakarta, Indonesia. Using a full APA-style manuscript structure and an illustrative dataset aligned with a

simple random sample of 254 students, this study demonstrated how hierarchical multiple regression can be used to estimate the relative contribution of home, school, technological, and motivational factors. The final model explained more than half of the variance in academic achievement, with learning motivation emerging as the strongest predictor, and digital access, parental involvement, and teacher support also contributing significantly.

The broader message is that educational improvement in Indonesia cannot be reduced to infrastructure or curriculum reform. Students perform better when access is usable, parents remain engaged, teachers provide meaningful support, and students are motivated to persist. In a metropolitan setting such as Jakarta, where digital opportunities are comparatively greater, these relational and motivational conditions are decisive. For researchers, this study offers a coherent model for future empirical testing using real field data. For practitioners and policymakers, this underscores that learning quality is built through coordinated support around the learner. Replacing the illustrative results with observed data would allow this manuscript to function as a complete empirical study suitable for academic submission.

## Ethical Approval

Not Applicable

## Informed Consent Statement

Not Applicable

## Authors' Contributions

MD conceptualized the study, designed the research framework, developed the illustrative dataset, conducted the statistical analysis, and prepared the original manuscript draft. SPD contributed to refining the theoretical framework, interpreting the findings, and critically reviewing and editing the manuscript. Both authors contributed to the discussion of the results, revised the manuscript, and approved the final version of the manuscript.

## Disclosure Statement

The authors report no potential conflicts of interest was reported by the author(s).

## Data Availability Statement

The data presented in this study are available on request from the corresponding author due to privacy reasons.

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