

**A DATA DRIVEN NUMERICAL MODELING APPROACH TO PREDICTING
TEACHERS' EFFECTIVENESS AND LEARNERS' NUMERACY PERFORMANCE
FROM SCHOOL HEADS' MANAGEMENT COMPETENCIES USING
EDUCATIONAL INFORMATION SYSTEM**

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Abstract

This study investigated the influence of school heads' operational and resource management literacy on teacher effectiveness and learners' academic and numeracy performance in public elementary schools within the Division of Zamboanga City during the School Year 2022–2023. Using a quantitative-descriptive and qualitative mixed-methods research design, the study gathered data from 12 school heads and 121 Grade 6 teachers. The results revealed that school heads' management literacy in terms of records, financial, facilities and equipment, staff, disaster safety, and emerging opportunities was rated exceptionally high ('Strongly Agree'). Teachers' performance, measured via the Individual Performance Commitment and Review Form (IPCRF), was predominantly 'Very Satisfactory' (61.2%) or 'Outstanding' (31.4%), demonstrating high levels of professional dedication. Conversely, learners' performance on the Division Achievement Test (DAT) fell below the national passing standard of 75%, with school mean percentage scores ranging from 39.9% to 76.8%. Pearson correlation analysis showed a significant positive influence of school heads' management literacy on teacher performance, but no significant direct influence on learners' achievement, highlighting the mediated nature of school leadership. No significant difference was found in management practices when schools were grouped by urban-rural location. Qualitatively, school heads confronted serious challenges, including administrative task overload, severe infrastructure deficits (e.g., lack of ICT laboratories and water/electricity funding), and rigid financial procurement constraints. The study recommends comprehensive policy-level structural support, targeted professional training in digital and financial literacy, and the optimization of administrative support personnel to allow school heads to shift from administrative caretakers to instruction-focused leaders who can directly scaffold learner numeracy development.

Keywords: Management Literacy, Operational Supervision, Instructional Leadership, Teacher Effectiveness, Learner Performance, Numeracy Development, Educational Administration, Zamboanga City

Introduction

In the contemporary global education landscape, the role of the school principal has transitioned from a traditional bureaucratic administrator to a dynamic instructional leader and resourceful manager. To ensure that basic education remains resilient and effective,

school leaders must possess advanced 'management literacy'—the capability to systemically organize, analyze, deploy, and safeguard school resources and operations. However, the rapidly changing educational climate, characterized by frequent curricular reforms, technological integrations, and systemic performance accountability, places unprecedented demands on school heads. As emphasized by Cruz (2016) and Gamala & Marpa (2022), effective administrative and resource management serves as the bedrock for establishing high-performing educational organizations.

In the Philippines, the Department of Education (DepEd) has prioritized educational quality under various policy reforms, including the Philippine Professional Standards for School Heads (PPSSH) institutionalized via DepEd Order No. 24, s. 2020. The PPSSH outlines professional accountability for school heads, underscoring their critical role in managing school operations, human resources, financial assets, and physical facilities. Under Republic Act (RA) 9155, otherwise known as the Governance of Basic Education Act of 2001, school heads are vested with the authority, responsibility, and local accountability for achieving improved learning outcomes. Yet, despite these structural framework implementations, significant gaps remain. The World Bank (2023) and the Program for International Student Assessment (PISA, 2022) results paint a worrying picture: Filipino learners are five to six years behind in reading, mathematics, and scientific numeracy competencies compared to international peers. These results highlight a critical mismatch between high government appropriations and the actual administrative efficiency and instructional quality on the ground. In the study of Casimiro, Atrido & Calahat (2021), they emphasized that teachers' ability to deliver quality instruction is significantly influenced by the support and leadership provided by school administrators. Drawing from this premise, the present study, investigates how the administrative literacy and management competencies of school heads contribute to teacher effectiveness and improved learner numeracy outcomes, thereby extending the discourse from addressing teachers' challenges to examining leadership as a determinant of instructional and student success.

This mismatch highlights the critical concept of 'management literacy.' Operational and financial management must not be seen as disconnected from the classroom. Rather, when a school head demonstrates high management literacy in record-keeping, financial allocation, and facility upkeep, teachers are provided with the physical tools, digital infrastructure, and instructional resources required to deliver quality lessons. Consequently, this study was designed to evaluate the extent of school heads' operational and resource management literacy across six core dimensions—records, financial, facilities and equipment, staff, safety and disaster preparedness, and emerging opportunities—and empirically assess its downstream influence on teacher performance (IPCRF) and learner numeracy and achievement outcomes in selected public elementary schools in the Division of Zamboanga City.

Statement Of The Problem

The main objective of this study was to determine the extent of school heads' management of resources and operations and its influence on teachers' and learners' performance in selected public elementary schools in the Division of Zamboanga City during the School Year 2022–2023. Specifically, it sought to answer the following questions:

1. What is the extent of school heads' management of resources and operations in terms of: (1.1) records, (1.2) financial, (1.3) facilities and equipment, (1.4) staff, (1.5) safety for disaster preparedness, and (1.6) emerging opportunities and challenges?
2. What is the teachers' performance in terms of the Individual Performance Commitment and Review Form (IPCRF) for the School Year 2022–2023?
3. What is the learners' performance in terms of the Division Achievement Test (DAT) mean percentage score for the School Year 2022–2023?
4. Does the extent of school heads' management of resources and operations significantly influence teachers' performance?
5. Does the extent of school heads' management of resources and operations significantly influence learners' numeracy performance?
6. Is there a significant difference in the extent of school heads' management of resources and operations when data are grouped according to the geographical location of the school (urban vs. rural)?
7. What are the specific qualitative challenges met by the school heads in the management of resources and operations of their respective schools?

Theoretical And Conceptual Framework

This study is theoretically anchored on the Philippine Professional Standards for School Heads (PPSSH) mandated by DepEd Order No. 24, s. 2020. The PPSSH outlines five primary domains of practice: (1) Leading Strategically, (2) Managing School Operations and Resources, (3) Focusing on Teaching and Learning, (4) Developing Self and Others, and (5) Building Connections. This study specifically zooms in on Domain 2 (Managing School Operations and Resources) to examine how administrative competency directly translates to improved classroom environments and pedagogical success. Additionally, the study relies on the National Competency-Based Standards for School Heads (NCBSSH) established via DepEd Order No. 32, s. 2010, which provides that school leaders must act as primary change agents who coordinate human, material, and financial assets to maximize student learning. Conceptually, the school heads' management of operations and resources is treated as the independent variable, while the performance ratings of teachers (IPCRF) and academic outcomes of students (DAT scores) are treated as the dependent variables, with school geographical location acting as a moderating variable. In Casimiro's (2021) study, he emphasized that teachers' curricular and pedagogical readiness is indispensable for delivering quality instruction, implementing effective teaching strategies, and fostering holistic child development. It further highlighted that teachers' competence is strengthened through continuous instructional support, professional development, and a conducive learning

environment. Building on these findings, the present study, investigates how the administrative literacy and management competencies of school heads serve as critical enablers of teacher effectiveness by providing instructional leadership, curriculum support, capacity-building opportunities, and sound school management practices. These leadership competencies empower teachers to effectively implement the curriculum and evidence-based pedagogical approaches, thereby creating classroom environments that enhance learner engagement and improve numeracy performance.

Methods

To achieve a robust understanding of both administrative performance and systemic challenges, this study utilized a convergent parallel mixed-methods research design. The quantitative component employed a descriptive-correlational design to measure the extent of school heads' operational and resource management literacy, alongside the performance levels of teachers and learners, analyzing their statistical relationships. The qualitative component utilized descriptive thematic analysis to uncover the specific, lived institutional challenges encountered by school heads. This mixed design allows the qualitative insights to explain and contextualize the quantitative statistical trends, providing a comprehensive assessment.

The target population comprised elementary school heads ($N = 12$) and Grade 6 teachers ($N = 121$) across twelve selected public elementary schools within the Division of Zamboanga City during the School Year 2022–2023. These schools were selected using simple random sampling. To ensure exhaustive representation and statistical validity given the small administrative population, total enumeration (census sampling) was applied to the school heads and Grade 6 teachers within the selected schools. The participating schools were officially coded as School A through School L, protecting institutional privacy. Chronologically, these schools are Sta. Maria CS, Salom ES, Canelar IS, Baliwasan CS, Mampang ES, Putik CS, Mercedes CS, Pasobolong ES, Sangali ES, Labuan CS, Bunguiao ES, and Recodo ES.

The primary research instrument was a multi-part structured survey questionnaire adapted from the NCBSSH and PPSSH frameworks, comprising sixty (60) items split evenly across the six dimensions of operational management (10 items per dimension). Responses were recorded on a 4-point Likert scale (4: Strongly Agree; 3: Agree; 2: Disagree; 1: Strongly Disagree). Teacher performance was evaluated using their official IPCRF rating scale, while learner performance was collected from school-level DAT mean percentage scores (MPS). The instrument's content validity was certified by a panel of educational administration experts. A pilot test conducted on thirty non-respondent teachers yielded a Cronbach's alpha coefficient of 0.931, indicating highly acceptable internal reliability. Qualitative data were collected through structured interviews with the school heads. Quantitative analysis was performed using SPSS, employing frequencies, percentages, weighted means, Pearson product-moment correlation (r), and independent samples t-tests to evaluate differences across geographical locations.

Results

This section presents the statistical and qualitative findings of the study, structured to systematically address the seven research questions. APA formatting style is utilized for all tables to ensure academic clarity and standard research presentation.

Table 1. Summary of School Heads' Extent of Operations and Resource Management Literacy

Management Dimension	Mean Score	Adjectival Rating
1. Records Management	3.56	Strongly Agree
2. Financial Management	3.49	Strongly Agree
3. Facilities & Equipment	3.50	Strongly Agree
4. Staff Management	3.57	Strongly Agree
5. Safety & Disaster Preparedness	3.55	Strongly Agree
6. Emerging Opportunities & Challenges	3.52	Strongly Agree
Composite Average Mean	3.53	Strongly Agree

Note. Scale: 3.25–4.00 (Strongly Agree); 2.50–3.24 (Agree); 1.75–2.49 (Disagree); 1.00–1.74 (Strongly Disagree).

Table 2. Grade 6 Teachers' Performance Based on IPCRF (S.Y. 2022–2023)

IPCRF Scale	Adjectival Rating	Frequency (f)	Percentage (%)
4.500 – 5.000	Outstanding	38	31.4%
3.500 – 4.499	Very Satisfactory	74	61.2%
2.500 – 3.499	Satisfactory	9	7.4%
1.500 – 2.499	Unsatisfactory	0	0.0%
Below 1.500	Poor	0	0.0%

Total	—	121	100.0%
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Note. N = 121 teachers.

Table 3. Learners' Division Achievement Test (DAT) Mean Percentage Scores (MPS)

School Identifier	Location	DAT MPS (%)	Adjectival Status (Ref. 75% Passing)
School A	Urban	53.4%	Below Standard
School B	Urban	51.2%	Below Standard
School C	Rural	64.5%	Below Standard
School D	Urban	59.2%	Below Standard
School E	Rural	54.8%	Below Standard
School F	Urban	58.9%	Below Standard
School G	Rural	55.6%	Below Standard
School H	Rural	76.8%	Met Standard
School I	Rural	39.9%	Below Standard
School J	Urban	68.8%	Below Standard
School K	Rural	64.8%	Below Standard
School L	Rural	63.4%	Below Standard

Note. National standard level of acceptable Mean Percentage Score is 75%.

Table 4. Correlation Analysis: School Heads' Management Literacy and Teacher Performance (IPCRF)

Management Dimension (X)	r-value	p-value	Statistical Decision	Interpretation
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1. Records Management	.304	.001	Reject Hypothesis	Null	Significant (Low Positive)
2. Financial Management	.248	.006	Reject Hypothesis	Null	Significant (Very Low Positive)
3. Facilities & Equipment	.256	.005	Reject Hypothesis	Null	Significant (Very Low Positive)
4. Staff Management	.243	.007	Reject Hypothesis	Null	Significant (Very Low Positive)
5. Safety & Disaster Prep.	.270	.003	Reject Hypothesis	Null	Significant (Very Low Positive)
6. Emerging Opp. & Challenges	.295	.001	Reject Hypothesis	Null	Significant (Very Low Positive)

Note. Significance is evaluated at the .05 alpha level (N = 121).

Table 5. Correlation Analysis: School Heads' Management Literacy and Learners' DAT Scores

Management Dimension (X)	r-value	p-value	Statistical Decision		Interpretation
1. Records Management	-.281	.377	Accept Hypothesis	Null	Not Significant
2. Financial Management	-.501	.097	Accept Hypothesis	Null	Not Significant
3. Facilities & Equipment	-.305	.336	Accept Hypothesis	Null	Not Significant

4.	Staff Management	-.544	.068	Accept Hypothesis	Null	Not Significant
5.	Safety & Disaster Prep.	-.484	.111	Accept Hypothesis	Null	Not Significant
6.	Emerging Opp. & Challenges	-.337	.283	Accept Hypothesis	Null	Not Significant

Note. Significance is evaluated at the .05 alpha level (N = 12).

Table 6. Independent Samples t-Test of Management Literacy by School Geographical Location

Location	N	Mean	Std. Dev.	t-value	df	p-value	Interpretation
Urban	51	3.63	0.45	1.869	119	.064	Not Significant
Rural	70	3.47	0.51				

Note. Significance is evaluated at the .05 alpha level.

Qualitative Descriptive Analysis: Core Management Challenges

While the quantitative metrics revealed high overall self-and-teacher-assessed competencies, structured qualitative interviews with the school heads unveiled six core structural and administrative challenges that compromise educational management. These challenges are thematic representations of the raw realities faced by leaders on the ground:

- **Task Allocation and Management (Administrative Overload):** School heads reported a severe deficiency of dedicated administrative or non-teaching personnel. This forced teachers to take on heavy clerical roles, managing physical and electronic student files (LIS/EBEIS), which led to role conflict and reduced instructional focus.
- **Financial Management and Rigid Procurement Rules:** Unforeseen administrative requirements and instructional needs (e.g., student sports registrations, emergency travel for teacher training) are frequently omitted from the annual school improvement plans (SIP/AIP). Because accounting policies forbid the disbursement of school maintenance and other operating expenses (MOOE) for unlisted items, school heads faced severe cash-flow standstills and procedural bottlenecks.
- **Resource Scarcity and Spatial Inequality:** Rural schools faced severe digital literacy and resources deficits compared to urban ones. For instance, Participant 1 noted receiving only

two computers from DepEd for the entire school, forcing teachers to use their personal funds to purchase critical ICT equipment. Additionally, lack of classrooms forced double-shift classroom rotations, reducing learner-teacher contact hours.

- **Educational Personnel Management and Behavior:** School heads noted significant resistance to organizational change, variable professional attitudes, and uneven willingness to adopt modern digital technologies or participate in intensive pedagogical professional development (CPD).
- **Deficits in Disaster Preparedness Infrastructure:** While school heads actively conducted evacuation drills, they lacked the financial capacity to procure actual survival equipment, establish emergency first-aid clinics, or complete school fencing, rendering campuses highly vulnerable to natural disasters and localized security breaches (e.g., theft).
- **Absence of Operational Preparedness and Contingency Planning:** School heads expressed anxiety regarding 'unplanned and top-down' directives from division levels that disrupt local lesson calendars. The absence of adaptive local backup plans often caused institutional confusion during sudden external disruptions.

Discussion

The primary focus of this study was to link school heads' operational management literacy with professional and student achievement outcomes, specifically bridging administrative competency with learner numeracy development. The quantitative finding that school heads' management literacy is rated as 'Strongly Agree' (composite mean = 3.53) indicates that basic administrative systems, compliance reports, and policy adherence are firmly established. However, the deep qualitative bottlenecks revealed that this compliance is achieved at a high cost—namely, severe role overload for teachers and a major diversion of school heads' time toward bureaucratic maintenance rather than active, instruction-focused leadership.

This tension is clearly reflected in the correlation results. The study discovered a statistically significant positive relationship between school heads' management literacy across all six dimensions and teacher performance ($p < .05$). When school heads implement stable online record back-ups (e.g., Google Drive), manage personnel tasks with clear delegation, and ensure the prompt procurement of physical supplies (such as calculators, printers, and lesson sheets), teachers' stress levels decrease and they are motivated to perform. This is consistent with the findings of Borgonos (2022) and Espinosa (2018), who noted that administrative and financial support from school heads is a critical driver of teacher morale and classroom readiness.

In sharp contrast, the correlation between school heads' management literacy and student academic outcomes was found to be statistically insignificant ($p > .05$) across all dimensions. This statistical divergence is a critical theoretical finding. It supports the leadership mediation model proposed by Sun and Leithwood (2015), which posits that school administrators do not directly influence student learning. Instead, their influence is completely mediated by teacher performance, instructional design, and classroom-level pedagogical dynamics. Because the school head does not have direct, daily contact with students in a teaching role, any positive

management practice must be filtered through the teacher. If the teacher is bogged down with fifty-plus administrative and ancillary tasks (e.g., serving as canteen managers, feeding coordinators, and file processors), the positive benefits of leadership management are lost, and classroom instruction and student numeracy suffer.

This mediation bottleneck is highly evident in the student numeracy data. With the exception of School H (76.8% MPS), which possessed advanced ICT laboratories and dedicated classrooms, eleven out of the twelve schools failed to meet the national standard passing score of 75% on the Division Achievement Test (DAT). The lowest-performing, School I (39.9% MPS), suffered from severe infrastructure deficits, lacking any computer facilities and forcing students into double-shift rotations due to classroom shortages. As a result, valuable contact hours were lost, directly hurting mathematical problem solving, data interpretation, and core numeracy performance. This stark spatial inequality shows that high administrative compliance on paper does not translate into academic progress if physical, technical, and spatial deficits remain unresolved.

Pedagogical Implications And Strategic Recommendations

The pedagogical implication of these findings is that basic numeracy development among elementary learners requires school heads to actively transition from administrative caretakers to instructional leaders. In line with this, the study recommends that the DepEd central policy-making body strengthen its commitment to student performance by providing direct, structured support. This includes fully implementing policies that remove administrative tasks from teachers (e.g., DepEd Order No. 2, s. 2024) and deploying dedicated non-teaching Administrative Officers to handle clerical work. Furthermore, school heads must be provided with specialized professional training in digital data literacy and financial asset management, allowing them to optimize MOOE funds and leverage external community partnerships (SEF, PTAs) to address critical spatial and technological deficits.

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