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Data-Driven Decision Making (DDDM) and the Optimization of Mathematics Curriculum Planning and Development

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Abstract

This study examined the relationship between data-driven decision making (DDDM) and the optimization of mathematics curriculum planning and development among school leaders and teachers in selected public high schools in the District of Naic, Cavite, Philippines. Using a descriptive correlational research design, the study measured the extent of DDDM through five dimensions – educator data literacy, availability and quality of educational data, decision-making culture, collaborative practices, and alignment with curriculum standards – while assessing curriculum optimization across seven criteria, including curriculum objectives alignment, content coherence, instructional strategies integration, assessment alignment, stakeholder involvement, contextualization, and iterative review. The participants consisted of mathematics teachers and school leaders from five public secondary schools, providing complementary perspectives on administrative and instructional practices. Findings revealed strong integration of data use and collaborative practices in decision making, as well as high levels of curriculum optimization; however, gaps remained in directly linking data analysis to instructional improvement, enhancing data accessibility, engaging stakeholders more meaningfully, and formalizing structured review processes. The study also identified a significant positive relationship between DDDM and mathematics curriculum optimization, suggesting that evidence-based decision making contributes to more effective, responsive, and contextually relevant curriculum practices. Based on these results, professional development initiatives focusing on data literacy were proposed to further enhance the effectiveness of data-informed curriculum planning.

Keywords: data-driven decision making, curriculum optimization, mathematics education, educational leadership, professional development, public high schools, evidence-based practice

INTRODUCTION

The integration of Data-Driven Decision Making (DDDM) into the optimization of mathematics curriculum planning and development represents a transformative approach in contemporary education. It enables educators, administrators, and policymakers to make informed choices grounded in empirical evidence, which is critical for enhancing both student learning outcomes and the overall relevance of curriculum content. In an era where education must respond swiftly to technological advancements and changing workforce demands, the ability to analyze and apply data effectively ensures that mathematics curricula are not only aligned with academic standards but also tailored to meet the diverse needs of learners. Globally, there is a growing recognition that data analytics – ranging from student assessment results, attendance records, behavioral data, to formative evaluations – can provide valuable insights to inform curriculum design, resource allocation, and instructional methodologies (Johnson et al., 2022). For instance, countries with robust data ecosystems leverage predictive analytics to anticipate learning gaps and redesign mathematics content accordingly, thus personalizing learning paths and optimizing educational outcomes. Despite this progress, significant disparities remain, particularly in the effective utilization of real-time student data and advanced analytics to create dynamic, adaptable curricula. Martinez and Smith (2021) highlight that in many educational contexts, especially in low-resource environments, the availability of data does not always translate into its meaningful application, often due to limitations in technological infrastructure, data literacy, and institutional capacity.

In the Philippines, the government has taken significant steps toward modernizing education through reforms such as the K to 12 Basic Education Curriculum, which emphasizes competency-based and learner-centered education. While these policies highlight the importance of data-informed instruction, there is a noticeable gap in the systematic use of DDDM specifically for mathematics curriculum optimization at the school level.

Reyes and Santos (2024) argue that despite policy directives, many schools lack comprehensive frameworks that integrate data analytics into curriculum planning cycles. Filipino teachers often encounter barriers such as limited access to digital data management platforms and insufficient professional development opportunities focused on data analysis skills. Additionally, data collection processes tend to be fragmented and inconsistent, leading to gaps in data quality and timeliness (Delgado et al., 2023). These constraints make it difficult for educators to implement responsive curriculum adjustments that could address students' evolving learning needs in mathematics effectively.

In the District of Naic, Cavite, Philippines – where schools such as Naic Coastal Integrated National High School, Ciudad Nuevo de Naic National High School, Naic Integrated National High School, Centro de Naic National High School, and Pueblo del Mar National High School serve diverse student populations – the challenge of optimizing mathematics curriculum planning through data-driven decision-making (DDDM) is particularly pronounced. These schools operate within a rapidly changing educational landscape shaped by initiatives like the Department of Education's (DepEd) MATATAG Curriculum and the Basic Education Development Plan 2030, both of which advocate for the use of learning data to inform and improve instructional practices. Despite this policy direction, research shows that many schools in the Philippines still face substantial difficulties in integrating data effectively into curriculum design and decision-making processes. According to Pugeda and Arrogante (2022), one of the critical barriers to DDDM in public schools is the limited capacity of educators and school leaders to interpret and apply student performance data for instructional planning. Furthermore, Javier and Tan (2021) highlight that while assessment tools are regularly administered, the results are often underutilized, with data seldom translated into actionable curriculum adjustments or teacher professional development plans.

These observed gaps highlight the critical need for targeted research and development of data-driven models that are sensitive to the specific educational contexts of the Philippines. By fostering stronger data infrastructures, enhancing teacher training in data literacy, and developing clear protocols for data integration into curriculum planning, it is possible to create more responsive and evidence-based mathematics curricula. Such advances would support teaching effectiveness, improve student performance, and align with broader goals of educational equity and quality.

Moreover, addressing these gaps resonates with global education priorities advocating for innovation and data utilization as key drivers of curriculum reform (World Bank, 2021). The Philippine Department of Education's strategic plans also emphasize the importance of evidence-based policymaking and curricular innovation to prepare learners for 21st-century challenges (Department of Education Philippines, 2022). Consequently, this research seeks to contribute to the ongoing discourse by exploring how data-driven decision-making frameworks can be optimized within the Philippine mathematics education context to foster sustainable improvements.

LITERATURE REVIEW

DDDM has emerged globally as a transformative leadership approach, shifting from intuition-based decisions to evidence-informed strategies (Mandinach & Schildkamp, 2021). School leaders in countries like Singapore and the Netherlands use data analytics and collaborative inquiry to guide instructional leadership and school improvement (van Gasse et al., 2021; Schildkamp et al., 2020). Embedding DDDM fosters accountability and targeted interventions (Wayman & Jimerson, 2023). In the Philippines, DDDM is gaining traction through DepEd's Basic Education Development Plan 2030 and the Philippine Professional Standards for School Leaders (Department of Education, 2022). Filipino school leaders use data to craft SIPs and LRCPs (David et al., 2021), though challenges persist in infrastructure, data literacy, and institutional support (Flores & Bustamante, 2020; Bernardo & Garcia, 2023). Institutions like SEAMEO INNOTECH and PNU are bridging these gaps. Post-pandemic, DDDM has been vital in identifying learning losses and guiding equitable resource allocation.

Educator data literacy, the ability to interpret and apply data, is essential for personalized learning and instructional improvement (Mandinach & Gummer, 2021). Globally, countries like the US, Australia, and Singapore integrate data literacy into teacher training and PLCs (Poortman & Schildkamp, 2022; van Gasse et al., 2021). However, many educators still feel overwhelmed by data complexity (Jimerson et al., 2022).

In the Philippines, PPST emphasizes data use in planning and assessment (Department of Education, 2022), but implementation is uneven. Teachers often lack formal training and face digital access barriers (Flores & Bustamante, 2020; Bernardo & Garcia, 2023). Initiatives by PNU and SEAMEO INNOTECH aim to improve capacity. The pandemic underscored the need for real-time data use to monitor learning loss and inform remote interventions (UNESCO, 2022).

Effective DDDM depends on timely, accurate, and actionable data (Datnow & Park, 2020). High-performing systems like Finland and Canada curate contextually relevant data (Poortman & Schildkamp, 2022), while developing countries face fragmented systems and technical gaps (UNESCO, 2022).

Locally, DepEd's EBEIS, LIS, and Learning Resource Portal have improved data availability (Department of Education, 2022), but usability issues persist (Castillo & Reyes, 2023). Teachers often lack training to interpret technical datasets (Salvador & Fajardo, 2021), and poor connectivity hampers access. The World Bank (2021) highlights the gap between data collection and utility, recommending capacity-building and database integration. Ensuring equitable access to quality data is essential for inclusive planning and curriculum development (Mandinach et al., 2023).

A decision-making culture promotes shared responsibility, transparency, and continuous learning (Schildkamp & Poortman, 2021). Globally, distributed leadership and PLCs support collaborative data use (van Gasse et al., 2020; Datnow et al., 2022). Policies like SBM and RPMS in the Philippines encourage participatory governance, but top-down traditions limit autonomy (Cruz & Reyes, 2022). Lack of reflective analysis and collaborative interpretation impedes strategic use of data (Santiago & de Vera, 2023). NEAP's transformation initiative aims to strengthen instructional leadership (DepEd, 2023). Cultivating a decision-making culture requires systemic shifts in leadership behavior and organizational norms (Datnow & Park, 2020).

Stakeholder collaboration enhances legitimacy and contextual responsiveness in data use (Mandinach et al., 2023). Systems in Finland and Singapore embed collaboration in governance structures (Schildkamp & Teddlie, 2021). PLCs and data teams foster co-designed interventions (Datnow & Park, 2022). School-Based Management (SBM) in the Philippines mandates stakeholder involvement, but practice often remains superficial (Dizon & dela

Cruz, 2021). Barriers include time constraints, hierarchical culture, and limited data literacy (Reyes et al., 2023; Alcantara & Santos, 2024). Brigada Eskwela and LACs offer platforms for dialogue, though not always data-driven. Effective collaboration requires trust, professional learning, and inclusive leadership (Fullan & Gallagher, 2020).

Curriculum alignment ensures instructional coherence and equity (Mandinach & Schildkamp, 2021; Braun & Gray, 2023). Globally, systems use data to audit curriculum fidelity and inform reforms (OECD, 2022). The K to 12 Curriculum in the Philippines mandates alignment, but gaps in training and planning hinder implementation (Almonte & Dizon, 2021). LMS data and formative assessments offer insights into alignment, contingent on leader capacity (Reyes & Cruz, 2023). MELCs aimed to simplify curriculum during the pandemic, but success depended on instructional guidance (Brillantes & Taguinod, 2021). Strategic alignment supports accountability of global competencies (DepEd, 2022).

Globally, mathematics curriculum optimization emphasizes coherence, relevance, and adaptability (OECD, 2021). Systems like Singapore and Finland integrate conceptual learning and cross-disciplinary strategies (Schleicher, 2022; Tan et al., 2020). Optimization involves aligning objectives, integrating instructional strategies, and using assessment data (Boaler, 2021; Carless & Winstone, 2021). While in the country, the K to 12 curriculum promotes spiral progression and contextualization, but implementation gaps persist (Pascual & Castañeda, 2021; Del Rosario & Cortez, 2023). Localized content integration is uneven (Cruz et al., 2022). Stakeholder collaboration and iterative review are essential (Fullan, 2020; SEAMEO INNOTECH, 2021). LRCP post-COVID-19 supports curriculum decongestion and remediation (DepEd, 2023).

Clear alignment of objectives enhances instructional focus and student achievement (Fullan & Quinn, 2020; Hattie, 2021). In mathematics, alignment supports cumulative learning and conceptual progression (Cobb et al., 2022). Francisco and Corpuz (2021) articulated that curriculum guides in the Philippines exist but are often misinterpreted due to limited training. MELCs highlighted the need for prioritization and clarity (DepEd, 2020). PLCs and data-informed planning help realign instruction (Santos & Fajardo, 2023). Digital tools support efficient mapping (Mandinach & Schildkamp, 2021).

Content coherence ensures logical sequencing and conceptual continuity (Schmidt et al., 2020). Systems like Japan and Singapore exemplify coherent frameworks (OECD, 2021). Incoherence leads to redundancy and learning gaps (Hirsch, 2021). The presence of misalignment between materials and instruction in the Philippines disrupts coherence (Mateo & De Guzman, 2022). MELCs narrowed focus but affected flow (DepEd, 2020). Collaborative planning and curriculum mapping enhance coherence (Cobb et al., 2022; Francisco & Mendoza, 2021).

Effective integration of strategies like inquiry-based learning and digital tools fosters engagement and achievement (Hattie & Yates, 2021; Kim et al., 2022). Systems like Finland support teacher autonomy and innovation (Sahlberg, 2020). In the Philippines, DepEd promotes learner-centered approaches, but disparities in training and resources affect implementation (Santos & Reyes, 2023; Villanueva et al., 2022). The pandemic accelerated blended learning, revealing gaps and opportunities (Garcia & Bautista, 2021). LACs support peer learning and strategy sharing (Torres & Mendoza, 2022).

Aligned assessments validate learning and guide instruction (Black & Wiliam, 2020) while formative feedback supports conceptual growth (Heritage, 2021). Technology enables adaptive feedback (Kulikowski et al., 2023). In the country, reforms promote authentic assessments, but summative reliance persists (Morales & Cruz, 2023; Reyes et al., 2022). Feedback culture is emerging, involving peers and parents (Lacson & dela Cruz, 2024).

Effective feedback fosters motivation and self-regulation (Shute, 2020). Republic Act 10533 mandates curriculum localization and stakeholder engagement, yet implementation varies across regions (Cruz et al., 2022). Community participation often centers on logistical support rather than curricular input (Mateo & De Guzman, 2022). Initiatives like Brigada Eskwela and LAC sessions provide platforms for collaboration, but data-informed dialogue remains limited (Reyes et al., 2023). Strengthening stakeholder roles in curriculum planning requires capacity-building, inclusive leadership, and sustained engagement (Fullan, 2020; UNESCO, 2023).

Curriculum review is essential for responsiveness to societal shifts, technological advancements, and learner needs (OECD, 2021; Braun & Gray, 2023). High-performing systems conduct periodic evaluations using student performance data, teacher feedback, and labor market trends (Schleicher, 2022). In the Philippines, DepEd's Curriculum and Instruction strand leads review cycles, including the recent MELCs revision during the pandemic (DepEd, 2020). However, reviews often lack stakeholder breadth and data triangulation (Santos & Mendoza, 2023). Continuous improvement demands iterative feedback loops, cross-sectoral consultation, and integration of global competencies (UNESCO, 2022; Cruz et al., 2022).

Curriculum planning faces challenges such as resource constraints, misalignment with assessment, and limited teacher autonomy (Datnow & Park, 2020; Mandinach & Schildkamp, 2021). In developing contexts, these are compounded by infrastructure gaps and policy fragmentation (UNESCO, 2022). The Philippines has its own share of challenges. Issues include inconsistent training, digital divide, and centralized decision-making (Flores & Bustamante, 2020; Bernardo & Garcia, 2023). Teachers often struggle to contextualize content due to rigid pacing guides and lack of localized materials (Mateo & De Guzman, 2022). Addressing these challenges requires systemic reforms, professional development, and participatory governance (Fullan & Quinn, 2020).

Technology enhances curriculum planning through data visualization, adaptive learning platforms, and collaborative tools (Kulikowski et al., 2023; Boaler, 2021). Systems like Singapore and Estonia leverage AI and analytics for personalized instruction and curriculum mapping (Tan et al., 2020; OECD, 2021). EdTech adoption in the Philippines accelerated during the pandemic, with platforms like DepEd Commons and LMS supporting remote learning (Garcia & Bautista, 2021). However, digital inequity and limited training hinder optimization (Villanueva et al., 2022). Integrating technology into curriculum development requires infrastructure investment, capacity-building, and inclusive design (SEAMEO INNOTECH, 2021; UNESCO, 2023).

Robust policy frameworks guide curriculum coherence, equity, and innovation (OECD, 2021; Mandinach et al., 2023). International models emphasize stakeholder consultation, evidence-based design, and alignment with national goals (Schleicher, 2022). In the Philippines, RA 10533, PPST, and BEDP 2030 provide strategic direction (Department of Education, 2022). However, policy-practice gaps persist due to limited dissemination, monitoring, and feedback mechanisms (Cruz & Reyes, 2022). Strengthening policy implementation involves capacity-building, inter-agency coordination, and data-informed evaluation (David et al., 2021; UNESCO, 2022).

Optimizing mathematics curriculum requires coherence, contextual relevance, and data-informed strategies (Boaler, 2021; Cobb et al., 2022). Internationally, systems integrate conceptual progression, real-world applications, and formative assessment (Hattie, 2021; Carless & Winstone, 2021). The spiral progression model aims to scaffold learning, but gaps in instructional design and resource alignment remain in the Philippines (Pascual & Castañeda, 2021). MELCs provided temporary relief during the pandemic, yet long-term optimization demands curriculum mapping, stakeholder input, and continuous review (Del Rosario & Cortez, 2023; Cruz et al., 2022). Data-driven planning supports targeted interventions and equitable learning outcomes (Mandinach & Schildkamp, 2021).

Theoretical Framework. This study is anchored on Data-Driven Decision-Making (DDDM) Theory by Datnow and Park (2020), which underscores the strategic use of educational data to enhance instructional quality and student achievement. In mathematics curriculum planning, DDDM provides a lens for evaluating how empirical data – such as assessment results, learner profiles, and classroom observations – can optimize curricular relevance and coherence. Key sub-variables include educators' data literacy (Mandinach & Gummer, 2021), the availability and quality of data (Schildkamp et al., 2020), and the institutional culture of decision-making (Datnow et al., 2021). Collaborative practices, such as Professional Learning Communities (Farley-Ripple & Buttram, 2020), and alignment with curriculum standards (Means et al., 2022) further reinforce the theory's applicability. These elements collectively support a dynamic, evidence-informed approach to mathematics curriculum development, ensuring responsiveness to student needs and contextual realities.

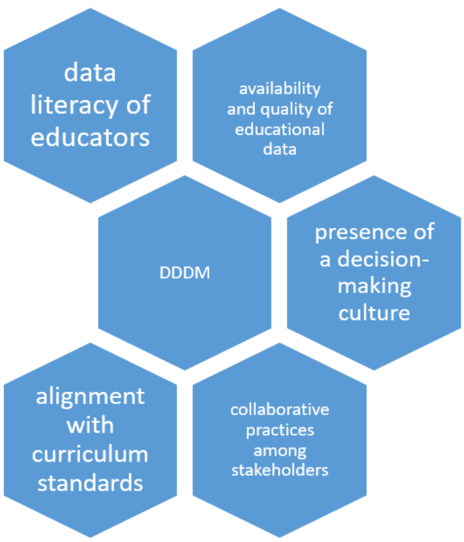

Figure 1
Theory of Data-Driven Decision Making (DDDM), (Datnow & Park, 2020)

Complementing this is the Curriculum Design and Development Theory, particularly Taba's Curriculum Planning Model (1962). The model offers a robust framework for optimizing mathematics curriculum development through a teacher-led, diagnostic, and iterative approach. Central to the model is the belief that curriculum should emerge from classroom realities, not top-down mandates – making it highly relevant for mathematics education, where scaffolding and contextualization are essential. The study applies Taba's principles by examining sub-variables such as curriculum objectives alignment (Wang, 2023), content coherence (Li & Li, 2022), and instructional strategy integration (Drechsler et al., 2024), ensuring that mathematical concepts are sequenced logically and taught using evidence-based methods. It also incorporates assessment alignment (Tang et al., 2022), stakeholder collaboration (Kim & Reeves, 2021), and localization (Zhao, 2023), which collectively enhance relevance and responsiveness. Finally, curriculum review mechanisms (Bautista et al., 2020) ensure continuous improvement. This comprehensive application positions Taba's model as a dynamic tool for achieving curricular rigor, adaptability, and learner-centeredness in mathematics.

Conceptual Framework. This study employs the Input-Process-Output (IPO) model to examine how data-driven decision making (DDDM) influences the optimization of mathematics curriculum planning and development. The Input phase identifies key dimensions of DDDM among school leaders, including educators' data literacy, the availability and quality of educational data, the presence of a decision-making culture, collaborative practices, and alignment with curriculum standards. These inputs are paralleled by curriculum optimization indicators such as alignment of objectives, content coherence, instructional strategy integration, assessment feedback mechanisms, stakeholder involvement, contextualization, and iterative review.

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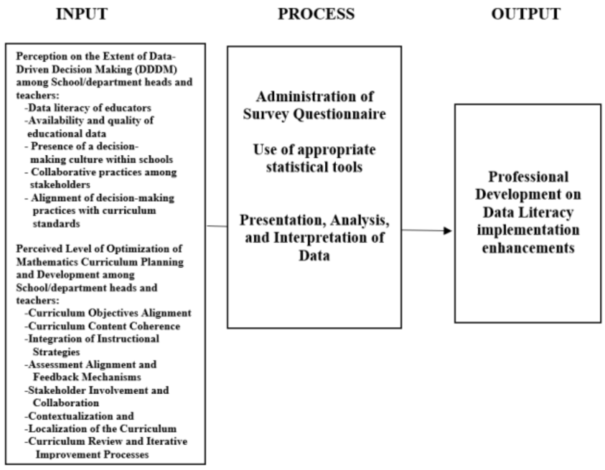

Figure 2
Research Paradigm

Together, these variables form a comprehensive foundation for assessing how institutional data capacity and collaborative engagement shape curriculum decisions in mathematics education.

The Process phase involves administering a researcher-modified survey to gather quantitative and qualitative data on these variables, followed by statistical analysis using descriptive and inferential tools. Techniques such as correlation and regression are applied to uncover relationships between DDDM practices and curriculum optimization outcomes. The Output centers on actionable enhancements, particularly in professional development for data literacy, improved data systems, and strengthened collaborative decision-making cultures. These outputs aim to empower educators and school leaders to translate empirical insights into strategic curriculum reforms. By bridging data capacity with systematic inquiry, the IPO framework provides a structured pathway for sustainable improvements in mathematics education, ensuring that curriculum planning is both evidence-informed and contextually responsive.

Statement of the Problem. This study sought to determine the relationship between data-driven decision making and the optimization of mathematics curriculum planning and development among school leaders according to the teachers and the school leaders themselves in selected public high schools in the Schools Division Office of Cavite City. The results of this study were used to provide implementation enhancements. Specifically, it aimed to answer the following questions:

1. What is the extent of data-driven decision making among school/department heads and teachers classified as to:
   1.1 data literacy of educators;
   1.2 availability and quality of educational data;
   1.3 presence of a decision-making culture;
   1.4 collaborative practices among stakeholders; and,
   1.5 alignment with curriculum standards?

2. What is the level of optimization of mathematics curriculum planning and development as assessed by the two groups of respondents in terms of:
   2.1 Curriculum Objectives Alignment;
   2.2 Curriculum Content Coherence;
   2.3 Instructional Strategies Integration;
   2.4 Assessment Alignment and Feedback Mechanisms;
   2.5 Stakeholder Involvement and Collaboration;
   2.6 Contextualization and Localization; and
   2.7 Curriculum Review and Iterative Improvement?

3. Is there a significant difference between school/department heads and teachers in their perceptions of the extent of data-driven decision-making and the level of optimization of mathematics curriculum planning and development?

4. Is there a significant relationship between the extent of data-driven decision making among school/department heads and teachers and the level of optimization in mathematics curriculum planning and development?

5. What Professional Development on Data Literacy implementation enhancements can be proposed to contribute to the

effectiveness of data-informed curriculum optimization efforts in mathematics education based on the results of the study?

Hypotheses. At 0.05 level of significance, the following null hypotheses were posited:

Ho₁: There is no significant difference exists between school/department heads and teachers in their perceptions of data-driven decision-making and mathematics curriculum optimization; and,

Ho₂: There is no significant relationship exists between the extent of data-driven decision-making and the level of curriculum optimization across these groups.

Significance of the Study. This study offers substantial value to a wide range of stakeholders in the educational ecosystem, particularly within the District of Naic, Cavite, Philippines. For the Department of Education (DepEd), the findings provide empirical support for policy refinement and the advancement of evidence-based practices in mathematics education. These insights contribute to the effective implementation of the K-to-12 curriculum by promoting data-informed instructional improvements. Schools Division Offices and district-level planners gain a clearer understanding of existing strengths and gaps in data literacy and curriculum optimization, enabling targeted capacity-building and inter-school collaboration. Mathematics curriculum planners benefit from actionable strategies for aligning objectives, content, and assessments with real-time student performance data, ensuring that curriculum revisions are both systematic and responsive to learner diversity.

School and department heads are empowered to cultivate a culture of data-informed leadership by investing in professional development, data systems, and collaborative structures. Mathematics teachers, in turn, enhance their instructional decisions through improved data interpretation skills, allowing for more tailored lesson planning and assessment design. Parents are indirectly supported through improved transparency and relevance in curriculum delivery, enabling them to better engage with their children's learning journey. Most importantly, learners stand to gain from a mathematics curriculum that is continually refined to reflect their abilities, contexts, and learning needs – boosting motivation, comprehension, and achievement. Finally, future researchers are provided with a foundational framework for exploring the intersections of data analytics, curriculum development, and educational leadership, paving the way for innovative models and expanded inquiry in education science.

Scope and Delimitations. This study investigates the relationship between data-driven decision making (DDDM) and the optimization of mathematics curriculum planning and development in five public secondary schools within the District of Naic, Cavite, Philippines. Using a descriptive correlational design, it explores how school leaders' practices – such as data literacy, data availability and quality, decision-making culture, stakeholder collaboration, and alignment with curriculum standards – affect curriculum outcomes. The study also evaluates curriculum optimization through seven indicators: alignment of objectives, content coherence, instructional strategy integration, assessment and feedback mechanisms, stakeholder involvement, contextualization, and iterative review. These parameters are assessed through a researcher-modified survey grounded in validated theoretical models.

The respondents include school leaders and teachers, selected to provide complementary insights into both administrative and instructional dimensions of curriculum planning. The study is limited to public high schools in Naic and focuses solely on mathematics, excluding other subject areas and private institutions. While the survey instrument ensures contextual relevance and theoretical grounding, the study's quantitative nature does not capture deeper qualitative nuances such as leadership styles or school culture.

Nonetheless, the findings offer valuable statistical insights into how DDDM influences curriculum development, contributing to policy formulation and instructional improvement in mathematics education.

METHODOLOGY

Research Design. This study employed a descriptive-correlational research design to explore the relationship between data-driven decision making (DDDM) and the optimization of mathematics curriculum planning in selected public high schools within the District of Naic, Cavite, Philippines. The descriptive component assessed the extent of DDDM practices among school leaders, focusing on dimensions such as data literacy, data availability and quality, decision-making culture, stakeholder collaboration, and alignment with curriculum standards.

Simultaneously, the study evaluated curriculum optimization through indicators like objectives alignment, content coherence, instructional strategy integration, assessment feedback systems, contextualization, and iterative review. The correlational aspect determined whether higher levels of DDDM were statistically associated with more effective and responsive curriculum planning. This design proved appropriate for capturing real-world educational practices without manipulating variables, thereby preserving ecological validity. Through survey data and statistical analysis, the study generated empirical insights that informed strategic improvements in mathematics education, supporting evidence-based leadership and curriculum development across the district.

Respondents of the Study. The study involved two key respondent groups from five public secondary schools in the District of Naic, Cavite: 38 mathematics teachers handling Grades 7 to 10 and 10 school leaders, including principals, assistant principals, department heads, and mathematics coordinators. These participants were selected through total enumeration to ensure comprehensive representation of those directly engaged in curriculum planning, implementation, and instructional leadership. Mathematics teachers provided critical insights into classroom-level practices, including lesson planning, instructional strategy selection, assessment administration, and data interpretation for student learning. Meanwhile, school leaders contributed perspectives on institutional policies, resource allocation, professional development, and collaborative structures that influenced curriculum development.

Table 1
Population of mathematics teachers and school leaders/department heads.

Population Group	No. of Respondents	Percentage
Teachers	38	100.0
School Leaders/ Department Heads	10	100.0
Total	**48**	**100.0**

Their combined roles were essential in assessing both the extent of data-driven decision making (DDDM) and the level of curriculum optimization. The inclusion of these groups allowed the study to capture a holistic view of how DDDM was practiced and how it impacted mathematics curriculum planning. This sampling strategy ensured robust data collection and contextual relevance, aligning with the study's goal of evaluating real-world educational practices within the public school system of Naic, Cavite.

Research Instruments. Researchers evaluated DDDM and mathematics curriculum design and development optimization using a researcher-modified questionnaire. The survey items and respondent profile followed Datnow and Park's (2020) data-driven leadership approach. Leadership and data use were evaluated by age, sex, education, and position. The first survey segment evaluated DDDM in educator data literacy, educational data availability and quality, decision-making culture, stakeholder involvement, and curricular demands. For each issue, a four-point Likert scale from "Not Utilized" to "Highly Utilized" assessed actions.

Phase two evaluated mathematics curriculum planning and optimization. Topic coherence, curriculum congruence, and teaching methods were its focus. These were assessed on a four-point Likert scale from "Not Optimized" to "Highly Optimized." Content coherence rated grade-level topic sequencing and integration, whereas curriculum objectives alignment assessed goal clarity, relevance, and frequent review. Assessments included differentiated instruction and curricular technologies. Math education curriculum design and leadership are complicated; therefore, the metric represents structural and cultural school operations.

Math teachers, curriculum creators, and educational leaders verified the measure's reliability. Feedback altered clarity, relevance, and context. Pilots checked the instrument's internals before deployment. Construct dependability was shown by Cronbach's alpha scores of 0.839 to 0.969 for each domain. The exam was proven to accurately assess certain aspects and provide policy, instructional, and professional development insights. A comprehensive and evidence-based diagnostic and reflective tool helped educators and administrators assess their data-driven practices and curriculum optimization.

Data Gathering Procedure. The study collected data with methodological rigor to assure validity and reliability. The researcher-modified instrument was content reviewed by educational leadership and curriculum development experts before validation. Their suggestions helped clarify and align the study's goals. A comparable set of respondents took a pilot test, and Cronbach's alpha was used in SPSS to measure internal consistency. High reliability results support the instrument's usefulness for data-driven decision-making and curriculum modification. The researcher's mentor approved the instrument after validation and reliability testing, and the Schools Division Office (SDO) of Cavite granted official clearance.

The survey was done via Google Forms to mathematics instructors and school authorities at five Naic, Cavite public secondary schools after clearance. Formal invitations explained the study's goal, assured anonymity, and stressed voluntary participation. Reminders were issued to boost response rates. After data collection, Excel was used to count, code, and clean missing information before importing into SPSS for statistical analysis. The entire process assured ethical compliance, data integrity, and study goals relative context.

Statistical Treatment. The study employed three statistical tools to analyze the data. Weighted Mean was used to determine the extent of data-driven decision making and the level of mathematics curriculum optimization, as rated by school leaders and teachers across various indicators. The Independent Samples T-Test assessed whether significant differences existed between the perceptions of the two respondent groups. Lastly, Pearson r was applied to examine the relationship between data-driven decision making and curriculum optimization. These tools provided a comprehensive statistical basis for interpreting the study's findings and addressing its core research questions.

Ethical Considerations. The study followed strong ethical guidelines for participant safety, dignity, and autonomy. Before data collection, participants were informed of the study's aims, procedures, length, and data use. Volunteers might leave at any moment without consequence. Anonymous study was conducted without gathering personal data. Responses were encoded to avoid tracking. All digital and physical data was protected for the primary researcher and authorized workers. The survey was carefully developed to minimize psychological distress and properly vetted to eliminate bias and cultural insensitivity.

IRB permission and national and institutional research standards were further ethical criteria. No harm or coercion were caused by the research. Data was analyzed objectively and reported honestly. Academic integrity and IP rights were protected by properly citing all sources. The ethical principles safeguarded participants' rights and legitimized the research, guaranteeing that its findings might affect educational policy and practice.

RESULTS

Extent of data-driven decision making among school leaders classified as to: data literacy of educators; availability and quality of educational data; presence of a decision-making culture; collaborative practices among stakeholders; and alignment with curriculum standards. The results in Table 2 revealed that the highest-rated dimension of data-driven decision making (DDDM) was the "Promotion of Data Literacy among Educators," with an overall mean of 3.55 and a standard deviation of 0.43, interpreted as "Strongly Agree/Highly Utilized." This indicates that school leaders and teachers both recognized the consistent integration of data literacy practices in instructional leadership.

Table 2
Summary table of the mean and standard deviation distribution of data-driven decision making among school heads/department heads.

Variables	School leaders/ Department heads			Teachers			Overall		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
School leaders' promotion of data literacy among educators.	3.58	0.4419	SA/HU	3.52	0.4168	SA/HU	3.55	0.43	SA/HU
School leaders' provision of educational data.	3.44	0.4113	A/U	3.51	0.4599	SA/HU	3.48	0.44	A/U
School leaders' promotion of a data-driven decision-making culture by the school leader.	3.42	0.5356	A/U	3.38	0.4430	A/U	3.40	0.49	A/U
School leaders' support for collaborative practices among stakeholders.	3.49	0.4592	A/U	3.41	0.4617	A/U	3.45	0.46	A/U
School leaders' alignment of curriculum with standards.	3.60	0.4489	SA/HU	3.47	0.4286	A/U	3.54	0.44	SA/HU
Composite Mean:	**3.51**	**0.4594**	**SA/HU**	**3.46**	**0.4420**	**A/U**	**3.48**	**0.45**	**A/U**

Legend: 3.51 to 4.00 = Strongly Agree/Highly Utilized (Data-driven decision-making is highly integrated into practice.); 2.51 to 3.50 = Agree/Utilized (Data is used to some degree but may not be fully consistent.); 1.51 to 2.50 = Disagree/Less Utilized (Data-driven decision-making is used infrequently or inconsistently.); 1.00 to 1.50 = Strongly Disagree/Not Utilized (Data is rarely or never used for decision-making.).

Teachers rated this dimension at 3.52, while school leaders rated it slightly higher at 3.58, suggesting a shared perception of its importance in curriculum planning. The parameter statements, such as guiding curriculum decisions based on data interpretation, supporting professional development, and fostering collaborative data analysis, were evidently well-practiced. This finding aligns with Mandinach and Gummer (2020), who emphasized that data literacy is foundational to effective teaching and should be embedded in professional development programs.

Closely following was the "Alignment of Curriculum with Standards," with an overall mean of 3.54 (SD = 0.44). School leaders rated this highest among all indicators (M = 3.60), reflecting their strategic role in ensuring that curriculum revisions and instructional planning were guided by national benchmarks and student performance data. Teachers rated this slightly lower (M = 3.47), which may suggest a gap in how curriculum alignment is communicated or implemented at the classroom level.

The parameter questions under this domain, such as using data to identify gaps in instruction and leading curriculum revisions based on student needs, highlight the importance of aligning instructional content with mandated competencies. This supports the findings of Schildkamp and Poortman (2020), who noted that leadership perceptions of curriculum alignment often exceed those of teachers due to differences in access to strategic planning processes. The proximity of these two indicators in terms of mean scores underscores their centrality in effective curriculum development.

Conversely, the lowest-rated dimension was the "Promotion of a Data-Driven Decision-Making Culture," with an overall mean of 3.40 (SD = 0.49). Both school leaders (M = 3.42) and teachers (M = 3.38) agreed that while data use was evident, its institutionalization as a cultural norm remained underdeveloped. This suggests that although data-informed decisions were being made, they were not yet embedded into the school's daily operations or collective mindset. Datnow and Park (2021) emphasized that cultivating a data-driven culture requires structured collaboration, leadership modeling, and accountability systems – elements that may still be evolving in the surveyed schools. The comparative analysis across indicators highlights that while data literacy and curriculum alignment are strengths, fostering a pervasive culture of data use and enhancing stakeholder collaboration are areas for strategic improvement. These findings underscore the need for sustained leadership efforts to bridge perception gaps and institutionalize data practices across all levels of curriculum planning.

Level of optimization of mathematics curriculum planning and development in terms of: Curriculum Objectives Alignment; Curriculum Content Coherence; Instructional Strategies Integration; Assessment Alignment and Feedback Mechanisms; Stakeholder Involvement and Collaboration; Contextualization and Localization; and Curriculum Review and Iterative Improvement. The results in Table 3 revealed that the overall level of optimization in mathematics curriculum planning and development was rated as "Strongly Agree/Highly Optimized" (M = 3.52, SD = 0.4303), indicating that both school leaders and teachers perceived the curriculum to be effectively structured and responsive.

Table 3
Summary table of the mean and standard deviation distribution of optimization of mathematics curriculum planning and development.

Optimization of mathematics curriculum planning and development	School/ department heads			Teachers			Overall		
	Mean	SD	VI	Mean	SD	VI	Mean	SD	VI
2.1. Curriculum Objectives Alignment	3.58	0.37	SA/HO	3.51	0.45	SA/HO	3.55	0.4118	SA/HO
2.2. Curriculum Content Coherence	3.58	0.45	SA/HO	3.56	0.43	SA/HO	3.57	0.4391	SA/HO
2.3. Instructional Strategies Integration	3.53	0.44	SA/HO	3.59	0.42	SA/HO	3.56	0.4296	SA/HO
2.4. Assessment Alignment and Feedback Mechanisms	3.53	0.43	SA/HO	3.54	0.38	SA/HO	3.54	0.4040	SA/HO
2.5. Stakeholder Involvement and Collaboration	3.36	0.42	A/O	3.52	0.42	SA/HO	3.44	0.4201	A/O
2.6. Contextualization and Localization	3.41	0.40	A/O	3.54	0.50	SA/HO	3.48	0.4457	A/O
2.7. Curriculum Review and Iterative Improvement	3.45	0.47	A/O	3.54	0.46	SA/HO	3.50	0.4623	A/O
Overall	**3.49**	**0.43**	**A/O**	**3.54**	**0.43**	**SA/HO**	**3.52**	**0.4303**	**SA/HO**

Legend: 3.51 to 4.00= Strongly Agree (Highly Optimized): The area is fully and effectively optimized; 2.51 to 3.50= Agree (Optimized): The area is generally optimized with minor areas for improvement; 1.51 to 2.50= Disagree (Less Optimized): The area shows limited optimization and requires significant improvement; 1.00 to 1.50= Strongly Disagree (Not Optimized): The area is not optimized and needs major development.

Among the seven indicators, the highest composite mean was recorded under "Curriculum Content Coherence" (M = 3.57, SD = 0.4391), reflecting strong agreement that mathematics content was logically sequenced and progressively organized across grade levels. School leaders and teachers rated this indicator closely (M = 3.58 and M = 3.56, respectively), suggesting a shared recognition of its importance in ensuring conceptual continuity and instructional clarity. This finding aligns with Cruz and Antonio (2023), who emphasized that coherent content flow is essential for sustaining student engagement and mastery in mathematics.

Instructional Strategies Integration also received high ratings (M = 3.56, SD = 0.4296), with teachers assigning it the highest score among all indicators (M = 3.59), slightly above school leaders (M = 3.53). This suggests that teachers felt well-supported in applying diverse pedagogical approaches such as differentiated instruction, technology-enhanced learning, and collaborative methods. Li and Chen (2024) noted that teacher autonomy and access to instructional resources significantly enhance curriculum delivery, particularly in STEM subjects. In contrast, "Stakeholder Involvement and Collaboration" emerged as the lowest-rated indicator (M = 3.44, SD = 0.4201), with school leaders rating it at 3.36 and teachers at 3.52. While still within the "Optimized" range, this disparity highlights a gap in inclusive curriculum development practices. Martinez and Bautista (2022) similarly observed that stakeholder engagement in public school curriculum planning often remains limited to consultative roles, lacking deeper participatory mechanisms.

Another area with mixed perceptions was "Contextualization and Localization," which received an overall mean of 3.48 (SD = 0.4457). Teachers rated this higher (M = 3.54) than school leaders (M = 3.41), suggesting that classroom-level adaptations to local contexts were more visible to teachers than to administrators. This supports Sison and Reyes (2023), who argued that contextual relevance in curriculum design is often driven by teacher initiative rather than institutional policy. Meanwhile, "Curriculum Objectives Alignment"

(M = 3.55) and "Assessment Alignment and Feedback Mechanisms" (M = 3.54) were both rated as highly optimized, indicating that curriculum goals and assessment practices were generally well-integrated. However, the slightly lower teacher rating for objectives alignment (M = 3.51) compared to school leaders (M = 3.58) may reflect gaps in communication or clarity of instructional targets. Overall, the data suggest that while the mathematics curriculum is broadly optimized, greater emphasis on stakeholder collaboration and contextual responsiveness could further enhance its relevance and inclusivity.

Difference between school/department heads and teachers in their perceptions on the extent of data-driven decision-making and the level of optimization of mathematics curriculum planning and development. Table 4 presents the results of a statistical analysis comparing the assessments of school/department heads and teachers regarding the extent of data-driven decision-making (DDDM) among school leaders.

Table 4
T-test results between the assessments of the two groups of respondents on the extent of data-driven decision making.

Sources of Variation	t Value	*p*-Value	Decision	Remarks
1.1 School Leader's Promotion of Data Literacy among Educators	0.61	0.541	Fail to Reject H_0	No significant difference: both groups highly utilize data literacy promotion (SA/HU).
1.2 School Leader's Provision of Educational Data	-0.74	0.460	Fail to Reject H_0	No significant difference: heads slightly lower than teachers but both agree it is utilized (A/U–SA/HU).
1.3 Promotion of a Data-Driven Decision-Making Culture by the School Leader	0.31	0.757	Fail to Reject H_0	No significant difference: both groups agree that DDDM culture is utilized (A/U).
1.4 School Leader's Support for Collaborative Practices Among Stakeholders	0.81	0.420	Fail to Reject H_0	No significant difference: both groups agree collaboration support is utilized (A/U).
1.5 School Leader's Alignment of Curriculum with Standards	1.41	0.162	Fail to Reject H_0	No significant difference: heads slightly higher than teachers, but overall alignment is utilized/highly utilized (A/U–SA/HU).
Overall Extent of Data-Driven Decision-Making	**0.59**	**0.556**	**Fail to Reject H_0**	**No significant difference: overall, both groups agree DDDM is utilized (A/U).**

The analysis examined five key areas: promotion of data literacy, provision of educational data, fostering a data-driven culture, support for collaborative practices, and alignment of curriculum with standards, and included t-values, p-values, decisions on hypotheses, and corresponding remarks. The results indicate no significant differences between the two groups in any of these areas. Specifically, the promotion of data literacy among educators had a t-value of 0.61 and a p-value of 0.541, showing that both groups rated this aspect within the "Strongly Agree/Highly Utilized" range, reflecting a shared commitment to enhancing educators' data literacy. Regarding the provision of educational data, the t-value of -0.74 and p-value of 0.460 revealed no significant difference, with both groups rating this between "Agree/Utilized" and "Strongly Agree/Highly Utilized," suggesting a consensus on its importance for decision-making.

In promoting a data-driven decision-making culture, the t-value of 0.31 and p-value of 0.757 indicated that both groups agreed this culture is utilized, emphasizing its integral role in effective school leadership. Support for collaborative practices among stakeholders, with a t-value of 0.81 and p-value of 0.420, also showed no significant difference, highlighting the shared recognition of collaboration in implementing DDDM. The alignment of curriculum with standards, with a t-value of 1.41 and p-value of 0.162, demonstrated slightly higher ratings from school leaders than teachers, but both groups still fell within the "Agree/Utilized" to "Strongly Agree/Highly Utilized" range, underscoring mutual recognition of curriculum alignment in data-driven practices. Overall, the total extent of data-driven decision-making yielded a t-value of 0.59 and a p-value of 0.556, reflecting agreement between the groups that DDDM is utilized effectively. In conclusion, the analysis confirms that school/department heads and teachers share similar perceptions regarding data-driven decision-making, indicating a collaborative and consistent approach to integrating data into educational leadership. These results are supported by recent research highlighting the role of data literacy training in enabling educators to make informed decisions that positively impact student outcomes (Frontiers in Education, 2025).

Table 5 presents the results of a statistical analysis comparing the assessments of school/department heads and teachers on the level of optimization of mathematics curriculum planning and development. The analysis included seven key areas: curriculum objectives alignment, content coherence, instructional strategies integration, assessment alignment and feedback mechanisms, stakeholder involvement and collaboration, contextualization and localization, and curriculum review and iterative improvement. The table reports t-values, p-values, decisions on hypotheses, and corresponding remarks for each area.

Table 5
T-test results between the assessments of the two groups of respondents on the level of optimization of mathematics curriculum planning and development.

Sources of Variation	t Value	P-Value	Decision	Remarks
2.1 Curriculum Objectives Alignment	0.52	0.605	Fail to Reject H_0	No significant difference: both groups perceive objectives alignment as highly optimized (SA/HO).
2.2 Curriculum Content Coherence	0.23	0.817	Fail to Reject H_0	No significant difference: content coherence perceived as highly optimized by both groups (SA/HO).
2.3 Instructional Strategies Integration	-0.63	0.530	Fail to Reject H_0	No significant difference: both groups perceive strategies integration as highly optimized (SA/HO).
2.4 Assessment Alignment and Feedback Mechanisms	-0.11	0.912	Fail to Reject H_0	No significant difference: both groups perceive assessment alignment as highly optimized (SA/HO).
2.5 Stakeholder Involvement and Collaboration	-1.50	0.136	Fail to Reject H_0	No significant difference: heads perceive slightly lower optimization, teachers higher, but overall optimized (A/O–SA/HO).
2.6 Contextualization and Localization	-1.39	0.167	Fail to Reject H_0	No significant difference: teachers perceive slightly higher optimization, but both groups agree overall (A/O–SA/HO).
2.7 Curriculum Review and Iterative Improvement	-1.13	0.261	Fail to Reject H_0	No significant difference: both groups agree iterative improvement is optimized (A/O–SA/HO).
Overall Level of Curriculum Optimization	**-1.03**	**0.306**	Fail to Reject H_0	**No significant difference: overall, both groups perceive the curriculum as optimized/highly optimized (SA/HO).**

The results indicate no significant differences between the two groups across all dimensions. Specifically, curriculum objectives alignment had a t-value of 0.52 and a p-value of 0.605, showing that both groups perceive objectives alignment as highly optimized (SA/HO). Curriculum content coherence, with a t-value of 0.23 and a p-value of 0.817, also showed no significant difference, indicating agreement on high optimization in content coherence. Instructional strategies integration (t = -0.63, p = 0.530) and assessment alignment and feedback mechanisms (t = -0.11, p = 0.912) similarly demonstrated no significant differences, with both groups rating these aspects as highly optimized. Stakeholder involvement and collaboration, while slightly higher among teachers than heads (t = -1.50, p = 0.136), remained overall optimized, reflecting shared recognition of collaborative practices. Contextualization and localization (t = -1.39, p = 0.167) and curriculum review and iterative improvement (t = -1.13, p = 0.261) also showed no significant differences, with both groups agreeing that these areas are optimized or highly optimized. Overall, the total level of curriculum optimization yielded a t-value of -1.03 and a p-value of 0.306, confirming that both groups perceive the mathematics curriculum as optimized/highly optimized (SA/HO).

In conclusion, the statistical analysis demonstrates that school/department heads and teachers share similar perceptions regarding the optimization of mathematics curriculum planning and development. The absence of significant differences across all areas suggests a consistent and collaborative approach to curriculum design and implementation, aligning with recent studies that emphasize the importance of evidence-based curriculum planning to improve educational quality and student outcomes (OECD, 2025; Center for Curriculum Redesign, 2020).

Relationship between the extent of data-driven decision making among school/department heads and teachers and the level of optimization in mathematics curriculum planning and development. The results presented in Table 6 clearly indicate a significant positive relationship between data-driven decision making (DDDM) and the optimization of mathematics curriculum planning and development. For school/ department heads, the computed correlation coefficient (r = 0.721, p = 0.0001) reflects a strong and statistically significant positive relationship. This suggests that administrators who extensively utilize data in their decision-making processes are more likely to achieve effective and optimized mathematics curriculum planning. Similarly, among teachers, the relationship also proves statistically significant (r = 0.683, p = 0.0003), indicating that educators who employ data to guide instructional strategies and curricular adjustments contribute substantially to the enhancement of mathematics curriculum implementation. The overall correlation (r = 0.702, p = 0.0002) reinforces this finding, supporting the assertion that a data-informed culture within educational institutions fosters curriculum development that is evidence-based, responsive and aligned with both learner needs and educational standards.

Table 6
Pearson r test between data-driven decision making and the optimization of mathematics curriculum planning and development

Sources of Variation	r-value	Sig. Value (p)	Decision	Remarks
School leaders/ department heads	0.721	0.0001	Reject the null	Significant positive relationship
Teachers	0.683	0.0003	Reject the null	Significant positive relationship
Overall	0.702	0.0002	Reject the null	Significant positive relationship

Recent 2020–2025 study supports this. Alonzo et al. (2024) found that ICT-based data systems supporting teacher DDDM improved mathematics curriculum coherence, instructional alignment, and student assessment. Timely student performance data enables teachers to make pedagogically sound and contextually relevant curriculum modifications, researchers found. In 2021, Lui and Bonner optimized math instruction with data analytics and decision-making algorithms. The study found that DDDM teachers had greater curricular alignment and efficiency.

In their updated research of educational data mining, Romero and Ventura (2024) observed that predictive analytics and student performance tracking systems can help curriculum planners identify topic areas that require reinforcement or revision. They stated data utilization enhances curriculum responsiveness to student needs and learning performance. Calegari and Delgado (2024) used process mining to optimize curriculum and discovered that DDDM schools had more streamlined mathematics programs, especially when data were used to monitor curricular flow and learning milestones.

These studies collectively affirm the quantitative findings of the present research. The significant r-values ranging from 0.683 to 0.721 across all respondent groups indicate that the integration of data into decision-making processes is a critical driver for optimizing mathematics curriculum planning. This alignment with empirical evidence underscores the value of institutionalizing DDDM frameworks in basic education settings to improve curriculum implementation, enhance learner achievement, and support continuous instructional improvement.

Proposed professional data literacy enhancements. Presented below is the proposed professional development on data literacy enhancements aiming to contribute in the effectiveness of data-informed curriculum optimization efforts in mathematics education.

Title. "Enhancing Data-Informed Curriculum Optimization in Mathematics Education: Strategic Implementation Plan"

Rationale. Today's fast-changing educational landscape requires data-driven curriculum building for responsive, equitable, and national standard-aligned instruction. Many schools fail to use student performance data to plan and teach math, when learning inequities persist. The study identified low educational data literacy, low data analytic collaboration, and inconsistent local context and stakeholder input integration. These findings indicate strategic implementation improvements for data usage and curriculum development. Filling these gaps will enhance mathematics instruction and evidence-based decision-making.

General Objective. To propose implementation enhancements that will strengthen the effectiveness of data-informed curriculum optimization efforts in mathematics education based on the findings of the study.

The research of data-driven decision-making in education found gaps in curricular implementation and instruction. First, educators encourage data literacy slightly, but hands-on assessment data and instructional design training might enhance this.

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Second, somewhat lower mean ratings on data accessibility and utilization highlight the need for centralized digital dashboards with real-time, accurate, and user-friendly student performance data. Third, Professional Learning Communities (PLCs) where instructors evaluate data and create teaching techniques encourage collaborative data utilization.

Table 7
Matrix of proposed enhancements according to thematic areas

Thematic Area	Findings-Based Gaps	Proposed Enhancements
1. **Promotion of Data Literacy**	Moderate agreement on effective promotion of data literacy among teachers	Conduct regular, hands-on training workshops on interpreting assessment data and using data for instructional design
2. **Accessibility and Quality of Educational Data**	Slightly lower mean on data accessibility and utilization	Establish centralized digital dashboards for real-time access to updated, reliable student performance data
3. **Collaborative Data Culture**	Need for stronger teacher collaboration on data use	Institutionalize **Professional Learning Communities (PLCs)** focused on collaborative data analysis and planning
4. **Curriculum Alignment with Standards**	Inconsistencies in aligning teaching to standards using data	Integrate standard alignment checklists and performance mapping in curriculum review sessions
5. **Contextualization and Localization**	Lower scores from administrators on local context integration	Develop localized modules and real-life contextual math problems based on regional cultures and daily experiences
6. **Stakeholder Involvement**	Weak feedback loop involving parents, students, and community experts	Include structured stakeholder consultation mechanisms in curriculum planning and review (e.g., quarterly town halls)
7. **Instructional Strategies and Innovation**	Need for more integrated strategies aligned with data insights	Encourage experimentation with adaptive learning technologies and differentiated instruction techniques
8. **Assessment-Driven Instruction**	Gap in timely feedback and formative use of assessments	Deploy tools for formative assessment tracking and ensure feedback cycles within 48 hours after assessments
9. **Curriculum Review and Improvement Cycle**	Inconsistent periodic review and teacher involvement	Institutionalize annual curriculum audit cycles with teacher-driven data insights for updates and improvements

Inconsistent instruction-standard alignment necessitates curriculum assessment standard alignment checks and performance mapping. Fifth, school/department heads' lower evaluations on local context integration emphasize the need for personalized educational modules and genuine local experiences. Poor feedback methods limit stakeholder engagement. This curriculum design and revision gap is addressed via quarterly town halls with parents, students, and community specialists.

Seventh, data-driven education requires adaptive and individualized learning systems. Digital formative tracking and 48-hour feedback loops may help narrow the assessment gap. Last, curriculum review and enhancement lack teacher involvement and consistency. Using yearly teacher-generated curriculum audits can stimulate responsive and iterative educational transformation.

DISCUSSION

The findings of this study affirm the pivotal role of Data-Driven Decision Making (DDDM) in enhancing mathematics curriculum planning and development in public high schools within Naic, Cavite, Philippines. Both school leaders and teachers reported high levels of data literacy and curriculum alignment, indicating a shared commitment to evidence-informed practices. However, gaps in stakeholder engagement, contextualization, and iterative review suggest that while data is available and partially utilized, its full integration into curriculum cycles remains inconsistent. The significant positive correlation between DDDM and curriculum optimization underscores the need to institutionalize data use not merely as a technical tool but as a cultural norm embedded in instructional leadership and collaborative planning. These results align with global literature advocating for data-informed curriculum reforms and reinforce the relevance of localized strategies in the Philippine context.

Despite strong ratings in instructional strategies and content coherence, the study revealed areas requiring strategic enhancement. Teachers perceived greater optimization in contextualization and stakeholder collaboration than administrators, suggesting that classroom-level adaptations are more visible than system-level planning. To address this, the study recommends structured mechanisms such as quarterly "Curriculum Data Review Days" and "Math Curriculum Forums" to bridge perception gaps and foster inclusive planning. Moreover, the underutilization of assessment data for instructional improvement calls for the deployment of formative tracking tools and feedback cycles within 48 hours, ensuring that data translates into timely pedagogical adjustments. The proposed professional development plan emphasizes hands-on training in data interpretation, centralized dashboards for real-time access, and PLCs focused on collaborative analysis – each designed to strengthen the feedback loop between data insights and curriculum decisions.

Finally, the absence of significant differences between school leaders and teachers in their perceptions of DDDM and curriculum optimization reflects a promising foundation for unified reform. However, sustaining this alignment requires formal policy integration, capacity-building in data analytics, and leadership modeling of data-informed instructional plans. The study recommends annual curriculum audits driven by teacher-generated insights and the use of predictive analytics to anticipate learning gaps. By embedding these enhancements into institutional routines, schools can ensure that mathematics curricula remain responsive, coherent, and equitable. Ultimately, the study contributes to the broader discourse on educational leadership by demonstrating that when data is systematically harnessed, curriculum planning evolves from static compliance to dynamic responsiveness – empowering educators to meet the diverse and evolving needs of Filipino learners.

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Data availability statement. All data supporting the findings of this study are included within the manuscript and its supplementary materials.

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