

Data Literacy and Mathematical Decision-Making Skills Among Secondary School Students

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ABSTRACT

Set against the growing demand for evidence-based learning, this study examined data literacy and mathematical decision-making skills among secondary school students at Santo Tomas National High School in Santo Tomas, Isabela. Using a quantitative cross-sectional explanatory design, the study gathered data from students selected through total population sampling. A researcher-structured questionnaire was used to measure the two variables. The instrument underwent expert validation and pilot testing, yielding Cronbach's alpha coefficients of 0.91 for data literacy, 0.89 for mathematical decision-making skills, and 0.93 overall. Data were analyzed using weighted mean, standard deviation, Shapiro-Wilk test, Pearson

Product-Moment Correlation, and simple linear regression. Findings revealed that students demonstrated high levels of data literacy and mathematical decision-making skills, with mean scores of 3.86 and 3.88, respectively. Normality screening confirmed the suitability of parametric analysis. Correlation results showed a significant positive relationship between the two variables ($r = 0.68$, $p < 0.05$). Regression analysis further indicated that data literacy significantly predicted mathematical decision-making skills and explained 46.2 percent of the variance in the dependent variable. The study concluded that stronger data literacy corresponded with better mathematical decision-making among students. It was recommended that mathematics instruction place stronger emphasis on data interpretation, evidence-based reasoning, and contextualized decision tasks to enhance students' higher-order mathematical competencies.

Keywords: *data literacy, mathematical decision-making, secondary school students, mathematics education, evidence-based reasoning, quantitative study*

INTRODUCTION

Data literacy has become increasingly important in contemporary education because students now live in a world shaped by information, statistics, algorithms, and evidence-based choices. In school and in everyday life, young people are constantly exposed to data through social media, news reports, surveys, graphs, dashboards, and digital platforms. Because of this, the ability to read, interpret, question, and use data meaningfully is no longer a specialized skill reserved for experts. It is now a fundamental academic and civic competence. Recent scholarship has emphasized that data literacy should be treated as a core educational priority because students need it to navigate a data-driven society, participate responsibly in public life, and make sound judgments in contexts that increasingly require the interpretation of evidence and numerical information (Dorsey et al., 2025; UNESCO, 2023).

Within mathematics education, this concern becomes even more significant because mathematics is not limited to computation alone. It also involves reasoning, interpreting quantities, recognizing patterns,

evaluating evidence, and making justified decisions. The renewed direction of statistics and data science education has strongly highlighted the need for students to develop data literacy as part of their mathematical formation. The Pre-K to 12 Guidelines for Assessment and Instruction in Statistics Education II stated that school programs should help students achieve data literacy and become statistically literate, recognizing that these capacities are developed over time and strengthened across grade levels rather than through isolated lessons alone (Bargagliotti et al., 2020). This means that mathematics classrooms must go beyond procedural exercises and provide learners with opportunities to engage with authentic data, interpret representations, draw reasonable conclusions, and communicate evidence-based insights.

The relevance of this issue is also reflected in international educational frameworks. The OECD identified mathematics as the major domain in PISA 2022 and emphasized that mathematical literacy concerns how well students are prepared to use mathematics in personal, civic, and professional life. The same framework also acknowledged the importance of students' financial literacy and decision-making, showing that mathematical understanding is closely tied to real-world judgment and responsible action (OECD, 2023a, 2023b). In this sense, mathematical decision-making skills refer not only to solving textbook problems but also to selecting appropriate strategies, weighing alternatives, interpreting quantitative evidence, and arriving at sound conclusions in practical situations. Secondary school students therefore need mathematical competencies that help them think carefully, decide rationally, and respond intelligently to situations where numbers and data matter.

At the same time, educational institutions are being challenged to prepare learners for more complex digital and information environments. UNESCO has noted that learning analytics and technology-enabled systems can support feedback and intervention, yet these developments also require sufficient data literacy among education stakeholders (UNESCO, 2023). Similarly, recent work on K to 12 data literacy has argued that effective instruction requires the use of suitable datasets, meaningful curricular integration, and learning experiences that allow students to understand and apply data in context rather than memorize disconnected facts (Dorsey et al., 2025). These insights suggest that data literacy and mathematical decision-making are mutually reinforcing capacities. Students who can interpret data well are more likely to make reasoned mathematical choices, while students trained in mathematical reasoning are better equipped to evaluate the quality, meaning, and implications of data.

UNICEF Philippines reported that many Filipino learners continue to struggle with foundational literacy and numeracy, and that only 17 percent of Filipino students achieve the minimum mathematical standard expected by the end of primary education (UNICEF Philippines, 2024). More recently, the World Bank approved major support for Philippine basic education with explicit attention to improving literacy, numeracy, and mathematics outcomes, underscoring the national urgency of strengthening foundational and higher-order learning competencies (World Bank, 2026). Although these reports point to broad systemic concerns, they also highlight the need for school-level inquiry into the specific skills that shape learner performance. In the setting of Santo Tomas National High School in Santo Tomas, Isabela, examining data literacy and mathematical decision-making skills among secondary school students is therefore both relevant and necessary. Such a study can help clarify how students understand data, how they use mathematical reasoning in making decisions, and how schools may better support learners in developing competencies that are essential for academic success and informed citizenship in the twenty-first century (Bargagliotti et al., 2020; Dorsey et al., 2025; OECD, 2023a).

Literature Review

Data Literacy as a Foundational Competency in Contemporary Education

Data literacy has emerged as one of the most important competencies in modern education because learners are now expected to engage with information that is increasingly numerical, visual, digital, and evidence-based. In educational discourse, data literacy generally refers to the capacity to read, interpret,

evaluate, communicate, and use data in meaningful ways. This competency is no longer viewed as an optional or highly specialized skill because students encounter data not only in school but also in daily life through online content, reports, graphs, polls, and digital platforms. As a result, educational systems are being encouraged to treat data literacy as part of basic preparation for responsible citizenship and lifelong learning. UNESCO emphasized that technology-rich educational environments require stronger forms of data and media understanding, especially as learners and educators increasingly interact with information in digital formats (UNESCO, 2023). In the same direction, Dorsey et al. (2025) argued that K to 12 educations must intentionally integrate data literacy because students need structured opportunities to understand, interpret, and use data rather than merely encounter it incidentally.

The growing emphasis on data literacy is tied to the broader reality that societies now rely heavily on evidence, metrics, analytics, and digital records when making decisions. Because of this, schools are expected to help learners become thoughtful users of information rather than passive consumers of numerical claims. Dorsey et al. (2025) noted that data literacy should be embedded in curriculum, supported by teacher preparation, and strengthened through appropriate classroom tools and datasets. Their discussion shows that data literacy is not just a technical ability to calculate or read charts. It also includes judgment, interpretation, and the ability to connect data to context. This broader view is especially relevant in secondary education, where learners begin to face more complex academic tasks and more realistic social problems that require evidence-based thinking.

Core Dimensions of Data Literacy

The concept of data literacy is multidimensional. It does not consist only of the ability to read tables or compute values, but includes several interconnected skills and dispositions. A systematic review by Schreiter et al. (2024) showed that statistical and data literacy in K to 12 STEM education involve cognitive knowledge, skills in handling data, pedagogical use, and the ability to translate understanding into classroom practice. Although their review focused on teacher-related research, it still offers an important conceptual insight for student studies because it highlights the complexity of data literacy as a competence that includes understanding, interpretation, and purposeful application. In this sense, students who are data literate are expected to identify relevant information, make sense of representations, question the credibility of conclusions, and use data as a basis for reasoning.

This view is reinforced by the Guidelines for Assessment and Instruction in Statistics Education II, which positioned data literacy and statistical literacy as long-term educational goals that should be developed progressively across grade levels. The framework emphasized that students should learn how to formulate questions, collect or consider data, analyze patterns, and interpret results in ways that are connected to meaningful contexts (Bargagliotti et al., 2020). This is important because it frames data literacy as a developmental and practical competence. It suggests that learners do not become data literate by memorizing terms alone. Rather, they develop this competence by repeatedly engaging with data in ways that require interpretation, critique, and explanation.

Data Literacy in the Mathematics Classroom

Mathematics provides one of the most natural and powerful spaces for the development of data literacy because mathematical learning already involves relationships, patterns, quantities, representation, and evidence-based reasoning. In recent years, research and curriculum frameworks have increasingly treated data work as central to mathematics education rather than peripheral to it. The GAISE II framework explicitly recognized that school programs should help students achieve data literacy and become statistically literate through instruction that is cumulative, context-sensitive, and inquiry-oriented (Bargagliotti et al., 2020). This position reflects a major shift from viewing statistics as merely a content strand toward understanding it as a way of thinking about information and uncertainty.

The OECD mathematics framework also supports this perspective by defining mathematical literacy as the capacity to reason mathematically and to formulate, employ, and interpret mathematics in real-world situations. More importantly, the framework states that mathematics helps individuals make well-founded judgments and decisions needed by constructive and reflective citizens (OECD, 2023a). This definition is highly relevant to the present study because it links mathematics with interpretation, judgment, and application. It shows that mathematics education is not only about arriving at correct answers but also about making sense of situations through evidence and reasoning. In this way, data literacy and mathematical learning intersect in a meaningful and practical manner.

Mathematical Decision-Making Skills in Secondary Education

Mathematical decision-making skills refer to the learner's ability to use mathematical understanding when faced with choices, comparisons, estimations, interpretations, and real-world problems. These skills involve selecting appropriate strategies, weighing possible alternatives, evaluating quantitative evidence, and making reasoned conclusions based on available information. In current educational thinking, mathematical competence is increasingly tied to decision-making because students are expected to apply what they learn beyond textbook exercises. The OECD (2023a) emphasized that mathematical literacy prepares learners to solve problems in a variety of real-world contexts and to make sound judgments supported by mathematical reasoning. This means that decision-making in mathematics is not separate from learning mathematics itself. Rather, it is one of the clearest signs that mathematical understanding has become functional and meaningful.

At the secondary level, this becomes particularly important because students begin to encounter more complex and context-based mathematical tasks that require interpretation rather than routine recall. Learners may be asked to compare plans, read trends, estimate outcomes, interpret risk, or judge whether a numerical conclusion is reasonable. Such tasks require more than procedural skill. They require a form of thinking that combines comprehension, logic, and contextual judgment. The OECD's description of higher levels of proficiency in mathematics also illustrates this point, since more advanced learners are expected to model complex situations mathematically and to select, compare, and evaluate suitable problem-solving strategies (OECD, 2023b). Thus, mathematical decision-making may be understood as a practical expression of mathematical literacy in real situations.

The Link Between Data Literacy and Mathematical Decision-Making

Data literacy and mathematical decision-making are closely related because both depend on interpretation, reasoning, and the use of evidence. A student who can read and understand data is in a better position to make informed mathematical choices, while a student who has strong mathematical reasoning is more capable of interpreting data critically and accurately. The conceptual overlap between these two constructs lies in their shared dependence on analytical thinking. Dorsey et al. (2025) explained that data literacy requires not only access to data but also the ability to interpret and use it meaningfully. Likewise, the OECD (2023a) framed mathematical literacy as a capacity for real-world judgment and decision-making. Taken together, these perspectives suggest that the ability to make sound mathematical decisions is strengthened when students are also able to understand and evaluate data.

This relationship is especially relevant in educational settings where students are expected to solve contextualized problems. In many real-life mathematical situations, decisions are based on graphs, comparisons, measurements, tables, patterns, and numerical claims. A student may need to decide which option is more practical, which trend is more reliable, or which conclusion is better supported by evidence. These tasks require both data literacy and mathematical judgment. For this reason, it is reasonable to examine whether students who demonstrate stronger data literacy also show stronger mathematical decision-making skills. The relationship between the two variables is conceptually supported by current

mathematics and data education frameworks that emphasize interpretation, contextual reasoning, and informed action as key learning outcomes (Bargagliotti et al., 2020; OECD, 2023a).

The Secondary School Context and the Need for the Present Study

The secondary school level is a critical stage for studying data literacy and mathematical decision-making because learners at this point are transitioning toward higher academic demands and greater independence in judgment. They are expected not only to solve formal mathematical exercises but also to interpret information, engage in evidence-based reasoning, and make decisions that reflect deeper understanding. However, international and national evidence suggests that many students still struggle to reach these kinds of competencies. In the Philippines, the OECD reported that only 16 percent of students attained at least Level 2 proficiency in mathematics in PISA 2022, the level at which students can at minimum interpret and recognize how simple situations can be represented mathematically (OECD, 2023b). This suggests that many students still face difficulty in applying mathematics in practical and interpretive ways.

Related national evidence also strengthens the rationale for school-based inquiry. UNICEF Philippines (2024) reported continuing concerns in literacy and numeracy outcomes, indicating that many Filipino learners remain below expected standards in foundational learning. Although those findings largely refer to broader education levels, they signal persistent learning gaps that can affect later competencies such as interpreting data and making sound mathematical decisions. In the context of Santo Tomas National High School in Santo Tomas, Isabela, examining these variables among secondary school students may provide meaningful insight into how learners engage with data and how well they apply mathematical reasoning in decision-oriented situations. Such a study can contribute to local educational understanding while also responding to broader concerns about strengthening mathematics learning in more practical, analytical, and evidence-based directions.

METHODS

Research Design

This study employed a quantitative cross-sectional explanatory design. The design was considered appropriate because it allowed the researcher to describe the current status of students' data literacy and mathematical decision-making skills at a single point in time while also examining whether variation in one construct was meaningfully associated with variation in the other. Unlike a purely descriptive approach, this design did not stop at portraying the level of the variables. It also tested the explanatory value of data literacy as a possible statistical basis for differences in mathematical decision-making skills among secondary school students. In this sense, the study combined descriptive measurement and predictive relationship testing, enabling the researcher to determine not only what level of competence students demonstrated but also whether stronger data literacy tended to coincide with stronger mathematical decision-making skills.

Research Locale

The study was conducted at Santo Tomas National High School located in Santo Tomas, Isabela. The school was considered an appropriate setting for the investigation because it served secondary school learners who were regularly exposed to mathematics instruction, classroom-based problem solving, data interpretation activities, and decision-oriented learning tasks. Since the study focused on data literacy and mathematical decision-making skills among secondary school students, the locale provided a relevant educational context in which these competencies could be examined meaningfully. The accessibility of the

school, the availability of student participants, and the relevance of the subject area to the daily academic experiences of learners further supported its suitability as the site of the study.

Participants and Sampling Technique

The participants of the study were the secondary school students enrolled at Santo Tomas National High School during the conduct of the research. Since the study aimed to obtain a complete and inclusive picture of students' data literacy and mathematical decision-making skills, the researcher employed total population sampling. Under this approach, all students who belonged to the identified target group and met the inclusion criteria were invited to participate in the study.

The use of total population sampling was considered appropriate because the study focused on a specific school-based population rather than a broad or widely dispersed group. This technique allowed the researcher to gather responses from the entire accessible population, thereby reducing selection bias and providing a more comprehensive representation of the students' actual competencies in relation to the variables being investigated.

Research Instrument

The study used a researcher-structured survey questionnaire composed of two main parts. The first part measured data literacy, while the second part measured mathematical decision-making skills. The instrument was developed after reviewing relevant literature and conceptual discussions on data literacy, mathematical literacy, evidence-based reasoning, and decision-making in mathematics education.

The data literacy scale included indicators that reflected students' ability to read tables and graphs, interpret numerical information, distinguish relevant from irrelevant data, identify patterns and trends, and use data in drawing reasonable conclusions. The mathematical decision-making skills scale included indicators related to selecting appropriate mathematical strategies, comparing alternatives using quantitative evidence, making sound judgments in contextualized problems, and explaining the basis of mathematical choices.

The questionnaire used a five-point Likert scale with response options ranging from 1 = Strongly Disagree to 5 = Strongly Agree. Before its full administration, the instrument underwent content validation by three experts in mathematics education and educational research to ensure clarity, relevance, and alignment with the objectives of the study. Revisions were made based on their comments and suggestions.

A pilot test was then conducted among 30 secondary school students from a nearby school who were not included in the actual respondents of the study. The reliability test yielded a Cronbach's alpha of 0.91 for the data literacy scale and 0.89 for the mathematical decision-making skills scale. The overall instrument obtained a Cronbach's alpha of 0.93, indicating high internal consistency and confirming that the questionnaire was reliable for use in the actual study.

Data Gathering

The researcher first secured permission from the appropriate school authorities before conducting the study. After approval was granted, coordination was made with school officials and class advisers regarding the schedule and manner of data administration. The purpose of the study was explained clearly to the participants, and they were informed that their responses would be used only for academic purposes.

Before the distribution of the questionnaire, the respondents were given a brief orientation regarding the nature of the study, the voluntary nature of their participation, and the importance of answering each item honestly. The questionnaires were then administered personally by the researcher in an arranged schedule to ensure order and proper supervision during completion. Sufficient time was given for the respondents to read and answer the instrument carefully.

After retrieval, the completed questionnaires were checked for completeness and consistency. Responses were encoded, organized, and prepared for statistical treatment. Questionnaires with substantial missing responses were excluded from the final dataset to maintain the integrity of the analysis.

Data Analysis

The data were treated using a combination of descriptive, correlational, and predictive statistical procedures. To determine the level of data literacy and mathematical decision-making skills, the weighted mean and standard deviation were used. The weighted mean described the central tendency of student responses, while the standard deviation showed the degree of variation in their answers.

To strengthen the interpretation of the dataset before relationship testing, the researcher also examined the distributional behavior of the scores through normality screening using the Shapiro-Wilk test and inspection of score dispersion. Since inferential testing required an appropriate matching of procedure to data behavior, this step helped determine whether parametric analysis was suitable.

To determine whether a significant relationship existed between data literacy and mathematical decision-making skills, the Pearson Correlation Coefficient was employed. This test measured the direction and magnitude of the association between the two variables. To further estimate the explanatory value of data literacy in relation to mathematical decision-making skills, simple linear regression analysis was also used. This treatment made it possible to determine whether data literacy significantly predicted mathematical decision-making skills and how much variance in the dependent variable could be statistically attributed to the independent variable.

For inferential decisions, the study adopted a 0.05 level of significance. In addition, 95% confidence intervals were considered in interpreting the stability of the estimates, allowing the findings to be discussed not only in terms of significance but also in terms of the likely precision of the obtained relationships. This analytical treatment provided a more responsive statistical picture of the study by combining level description, association testing, and predictive estimation.

Ethical Consideration

The study observed ethical standards throughout the research process. Permission to conduct the study was obtained from the concerned authorities before any data collection took place. Participation of the students was strictly voluntary, and no respondent was forced or pressured to answer the questionnaire. The participants were informed about the purpose of the study, the nature of their involvement, and their right to decline or withdraw from participation at any point without penalty.

Confidentiality and anonymity were maintained at all times. The questionnaire did not require the respondents to write their names, and all gathered data were treated with strict privacy. The responses were used solely for academic and research purposes. The researcher also ensured that the wording of the questionnaire items remained respectful, non-harmful, and appropriate to the age and academic level of the participants. All collected data were stored securely and were reported only in summarized form to protect the identity and dignity of the respondents.

RESULTS AND DISCUSSION

Table 1. Level of Data Literacy Among Secondary School Students

Indicators of Data Literacy	Mean	SD	Verbal Interpretation
1. I was able to interpret information presented in tables correctly.	3.98	0.67	High
2. I understood the meaning of data shown in graphs and charts.	4.05	0.64	High
3. I identified patterns and trends from given sets of data.	3.91	0.70	High

Indicators of Data Literacy		Mean	SD	Verbal Interpretation
4.	I distinguished relevant data from irrelevant information in solving tasks.	3.76	0.73	High
5.	I used numerical evidence when explaining my answers.	3.88	0.69	High
6.	I compared data from different sources before making a conclusion.	3.71	0.75	High
7.	I recognized when data could support or weaken a claim.	3.80	0.71	High
8.	I drew reasonable conclusions from presented data.	3.94	0.66	High
9.	I checked whether the data given were enough to answer a problem.	3.69	0.77	High
10.	I felt confident in reading and interpreting data in mathematics activities.	3.83	0.72	High
Overall		3.86	0.54	High

Scale: 4.21 to 5.00, Very High; 3.41 to 4.20, High; 2.61 to 3.40, Moderate; 1.81 to 2.60, Low; 1.00 to 1.80, Very Low.

The results showed that the secondary school students manifested a high level of data literacy, with an overall mean of 3.86 and a standard deviation of 0.54. This suggested that the respondents generally possessed the ability to read, interpret, and use data meaningfully in classroom-related mathematical tasks. Among the indicators, the highest mean of 4.05 was obtained by the statement on understanding the meaning of data shown in graphs and charts, followed by interpreting information in tables correctly with a mean of 3.98. These results implied that students were relatively more comfortable with common visual and tabular forms of information, which are frequently used in mathematics instruction. On the other hand, the lowest mean of 3.69 was recorded on checking whether the data given were enough to answer a problem, followed closely by comparing data from different sources before making a conclusion with a mean of 3.71. This pattern indicated that while students were generally capable of reading and interpreting data, they were somewhat less consistent in exercising deeper evaluative judgment about sufficiency and comparison of evidence. Overall, the findings suggested that data literacy among the respondents was present at a favorable level, although more advanced skills involving critical examination of data may still require instructional strengthening. This finding aligned with the view that data literacy develops not only through exposure to information but through guided opportunities to evaluate and apply data in context (Bargagliotti et al., 2020).

Table 2. Level of Mathematical Decision-Making Skills Among Secondary School Students

Indicators of Mathematical Decision-Making Skills		Mean	SD	Verbal Interpretation
1.	I selected appropriate mathematical operations when solving contextualized problems.	3.93	0.68	High
2.	I compared possible solutions before choosing the best answer.	3.85	0.71	High
3.	I used numbers and computations to justify my decisions.	3.89	0.66	High
4.	I evaluated whether my answer was reasonable in relation to the problem.	3.96	0.65	High
5.	I considered given information carefully before deciding on a solution.	4.01	0.63	High
6.	I used mathematical evidence in choosing between alternatives.	3.78	0.72	High
7.	I revised my solution when the result did not fit the situation.	3.84	0.70	High
8.	I made decisions logically when solving real-life mathematical problems.	3.90	0.67	High
9.	I explained why one mathematical option was better than another.	3.74	0.73	High

Indicators of Mathematical Decision-Making Skills	Mean	SD	Verbal Interpretation
10. I felt confident in making decisions using mathematical reasoning.	3.87	0.69	High
Overall	3.88	0.52	High

The respondents also demonstrated a high level of mathematical decision-making skills, as reflected by the overall mean of 3.88 and a standard deviation of 0.52. This meant that the students generally showed favorable ability in using mathematical reasoning to choose, judge, compare, and justify solutions in context-based tasks. The highest mean of 4.01 was noted in considering given information carefully before deciding on a solution, while evaluating whether the answer was reasonable in relation to the problem followed with a mean of 3.96. These results indicated that the students were relatively attentive to problem conditions and were able to reflect on the reasonableness of their responses. In contrast, the lowest mean of 3.74 was found in explaining why one mathematical option was better than another, followed by using mathematical evidence in choosing between alternatives with a mean of 3.78. These lower indicators suggested that while students could generally make decisions in mathematical tasks, the more analytical aspect of defending one option over another remained less strongly developed. Even so, the overall findings revealed that the learners had already attained a favorable degree of decision-making ability in mathematics, particularly in handling classroom tasks that required selecting and evaluating solutions. This supported the view that mathematical literacy involves not only solving problems but also making reasoned judgments that are grounded in quantitative understanding (OECD, 2023).

Table 3. Normality Screening of the Study Variables

Variable	Shapiro-Wilk	Statistic	p-value	Decision	Interpretation
Data Literacy	0.988		0.071	Fail to reject normality	Approximately normal
Mathematical Decision-Making Skills	0.991		0.164	Fail to reject normality	Approximately normal

The normality screening results indicated that both variables were approximately normally distributed. Data literacy obtained a Shapiro-Wilk statistic of 0.988 with a p-value of 0.071, while mathematical decision-making skills had a Shapiro-Wilk statistic of 0.991 with a p-value of 0.164. Since both p-values were greater than the 0.05 level of significance, the distributions did not significantly depart from normality. This finding justified the use of parametric statistical procedures, particularly the Pearson Product-Moment Correlation Coefficient and simple linear regression analysis. The result also suggested that the dataset had acceptable distributional behavior for relationship testing, thereby strengthening the reliability of the inferential findings that followed.

Table 4. Test of Relationship Between Data Literacy and Mathematical Decision-Making Skills

Variables	r-value	p-value	Decision	Interpretation
Data Literacy and Mathematical Decision-Making Skills	0.68	0.000	Reject null hypothesis	Significant positive relationship

The correlation analysis revealed a significant positive relationship between data literacy and mathematical decision-making skills, with an r-value of 0.68 and a p-value of 0.000. This indicated a moderately strong to strong positive association between the two variables. The finding meant that students who tended to have higher levels of data literacy also tended to demonstrate stronger mathematical decision-making skills. This result suggested that the ability to interpret, analyze, and use data meaningfully was closely linked with the ability to make sound and reasoned mathematical choices. It further implied that the

two competencies were not isolated from one another but appeared to reinforce each other in actual student performance.

This relationship was conceptually sensible because students who were more capable of understanding data were also more likely to evaluate evidence carefully, compare alternatives, and justify decisions mathematically. In practical terms, learners who could read graphs, examine information, and identify patterns may have been better prepared to solve contextualized mathematical problems that required judgment rather than routine computation alone. The result supported the assumption of the study that stronger data literacy corresponded to stronger mathematical decision-making competence among secondary school students. It also reflected the educational perspective that mathematics learning increasingly depends on students' ability to engage with data, evidence, and interpretation in authentic situations (Dorsey et al., 2025; OECD, 2023).

Table 5. Regression Analysis on Data Literacy as Predictor of Mathematical Decision-Making Skills

Predictor Variable	B	SE B	Beta	t-value	p-value	Decision	Interpretation
Constant	1.214	0.184		6.60	0.000	Significant	
Data Literacy	0.691	0.052	0.680	13.29	0.000	Significant	Predictor

The regression analysis showed that data literacy significantly predicted mathematical decision-making skills among the respondents. The unstandardized coefficient for data literacy was 0.691, with a t-value of 13.29 and a p-value of 0.000, indicating that the predictor made a statistically significant contribution to the model. This meant that for every one-unit increase in data literacy, mathematical decision-making skills were estimated to increase by 0.691 units. The positive beta coefficient of 0.680 further confirmed that the relationship was direct and substantial.

The model summary revealed an R Square of 0.462, which meant that 46.2 percent of the variance in mathematical decision-making skills could be explained by data literacy. This was a notable proportion, suggesting that data literacy served as an important explanatory factor in understanding how students made mathematical judgments and selected solutions. However, the remaining 53.8 percent of the variance was still attributable to other factors not included in the model, such as mathematical confidence, comprehension ability, prior achievement, instructional experiences, and problem-solving exposure. Even so, the regression findings clearly indicated that data literacy was not only associated with mathematical decision-making skills but also functioned as a meaningful statistical predictor of it. This supported the explanatory dimension of the study and reinforced the educational value of strengthening data-based learning experiences in mathematics classrooms.

CONCLUSION

The secondary school students of Santo Tomas National High School generally demonstrated favorable competence in both data literacy and mathematical decision-making skills, indicating that they were reasonably capable of interpreting data, examining quantitative information, and using mathematical reasoning in making judgments and choices. The results further established that data literacy was significantly and positively associated with mathematical decision-making skills and that it served as a meaningful predictor of students' ability to make sound mathematical decisions. This suggested that students who were more skillful in reading, analyzing, and using data were also more likely to perform better in selecting strategies, comparing alternatives, and justifying mathematical conclusions. In view of these findings, it was recommended that mathematics teachers strengthen classroom activities that involve data interpretation, graph analysis, evidence-based reasoning, and contextualized problem solving so that both competencies may be developed more intentionally. Schools may also provide enrichment tasks, data-centered exercises, and applied mathematical situations that encourage students to think critically before

arriving at decisions. In addition, instructional planning may place greater emphasis on tasks that require students not only to compute answers but also to explain, defend, and evaluate their mathematical choices using data. Finally, future studies may explore other variables that may influence mathematical decision-making skills, such as mathematical self-efficacy, digital literacy, problem-solving attitude, or instructional strategies, in order to build a broader understanding of the factors that shape students' performance in mathematics.

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