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Predictive Role of Pedagogical Beliefs and Disciplinary Expertise in Institutional Decisions to Integrate the Binomial Theorem in Higher Education Curricula

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Abstract

The integration of foundational mathematical concepts into higher education curricula is increasingly shaped by institutional leadership perspectives rather than purely disciplinary considerations. This study examines the predictive role of pedagogical beliefs and disciplinary expertise in institutional decisions to integrate the Binomial Theorem within higher education curricula in the Philippines. Anchored in constructivist pedagogy and disciplinary cognition theory, the research investigates how administrators and subject-matter experts evaluate the curricular relevance, pedagogical value, and strategic utility of the Binomial Theorem across mathematics, accounting, and business science programs. Using a quantitative explanatory research design, data were collected from college and university deans, vice presidents, senior academic executives, mathematicians, accountants, and business scientists through a validated survey instrument. Multiple regression and structural equation modeling were employed to determine the extent to which pedagogical beliefs and disciplinary expertise predict institutional decisions on curriculum integration. Reliability and validity analyses confirmed strong internal consistency, construct validity, and model fitness. Findings reveal that pedagogical beliefs significantly predict curricular integration decisions, particularly beliefs aligned with problem-based learning, applied reasoning, and interdisciplinary transfer. Disciplinary expertise also emerged as a significant predictor, although its influence varied by professional role, with mathematicians emphasizing theoretical coherence and business-oriented respondents prioritizing applied decision-making relevance. The interaction between pedagogical orientation and disciplinary background further demonstrated a synergistic effect on institutional decision outcomes. This study contributes to the body of knowledge by extending curriculum decision-making theory beyond faculty-level implementation to executive and policy-level cognition. It offers empirical evidence to inform strategic curriculum governance, interdisciplinary mathematics integration, and evidence-based academic leadership in developing higher education systems.

Keywords: Pedagogical beliefs, disciplinary expertise, binomial theorem, curriculum integration, higher education leadership, institutional decision-making.

INTRODUCTION

Curriculum decisions in higher education are increasingly shaped by institutional leadership cognition, pedagogical orientations, and disciplinary expertise rather than by disciplinary tradition alone. In an era characterized by data-driven governance, outcomes-based education, and interdisciplinary program design, foundational mathematical concepts such as the Binomial Theorem are subject to renewed scrutiny regarding their curricular relevance, pedagogical value, and strategic utility (Altbach et al., 2023; CHED, 2023). The Binomial Theorem is a fundamental algebraic principle that provides a general formula for expanding expressions of the form (a + b)^n into a finite sum of terms involving binomial coefficients. Beyond its symbolic representation, the theorem serves as a foundational structure in combinatorics, probability distributions, inferential statistics, and discrete modeling. In applied domains such as finance, accounting, and business analytics, it underpins risk modeling, scenario forecasting, portfolio approximations, and probabilistic decision-making frameworks. Its integration into higher

education curricula therefore extends beyond mathematical formalism; it cultivates structured reasoning, quantitative generalization, and analytical precision essential in data-driven professional environments. While the Binomial Theorem has long been regarded as a core component of probability theory and combinatorics, its integration across non-mathematics disciplines such as accounting and business science remains uneven, particularly within developing higher education systems.

Recent scholarship emphasizes that curriculum integration is no longer a purely technical or academic decision, but a strategic institutional act influenced by leadership beliefs about learning, knowledge transfer, and graduate employability (Bolden et al., 2009; Fullan & Quinn, 2016). In the Philippine context, where higher education institutions balance global competitiveness with local relevance, decisions regarding mathematical curriculum content are often mediated by deans, vice presidents, and senior academic executives whose pedagogical beliefs may differ substantially from those of disciplinary specialists (Bernardo et al., 2022; CHED, 2022).

Pedagogical beliefs refer to deeply held assumptions about how knowledge is constructed, learned, and applied. Research consistently demonstrates that leaders who espouse constructivist, student-centered, and problem-based pedagogies are more likely to support the integration of abstract mathematical concepts when these are perceived to enhance analytical reasoning, decision-making competence, and interdisciplinary transfer (Darling-Hammond et al., 2020; Teo et al., 2023). Conversely, leaders with transmission-oriented or content-reductionist beliefs may deprioritize mathematically rigorous topics in favor of immediately applicable skills (Schweisfurth, 2021).

Disciplinary expertise further complicates curriculum decision-making. Mathematicians often view the Binomial Theorem as a foundational structure underpinning probability distributions, inferential statistics, and stochastic modeling, while accountants and business scientists may assess its value primarily through applied lenses such as risk analysis, forecasting, and financial modeling (Batanero et al., 2021; Ross, 2022). These divergent epistemic perspectives can result in inconsistent institutional decisions regarding curriculum integration, sequencing, and depth of treatment.

Empirical studies examining curriculum decisions at the institutional leadership level remain limited. Most prior research has focused on faculty attitudes, classroom implementation, or student learning outcomes, leaving a critical gap in understanding how executive-level pedagogical beliefs and disciplinary expertise jointly influence curriculum governance (Jones et al., 2021; Tight, 2024). This gap is particularly evident in Southeast Asian contexts, including the Philippines, where higher education reforms emphasize interdisciplinarity, data literacy, and quantitative reasoning across programs (Bernardo & Mendoza, 2021; OECD, 2023).

The Commission on Higher Education has underscored the importance of mathematical and statistical literacy for business, finance, and management graduates, especially in response to digital transformation and analytics-driven decision environments (CHED, 2023). However, institutional compliance with these policy directions varies significantly, suggesting that leadership-level predictors may play a decisive role in shaping curricular outcomes beyond formal policy mandates.

From a theoretical standpoint, this study is grounded in constructivist learning theory and disciplinary cognition theory. Constructivist theory posits that learning is an active process shaped by beliefs about meaning-making and application, while disciplinary cognition theory emphasizes that experts reason, value, and justify knowledge differently depending on disciplinary norms and practices (Bransford et al., 2020; Goldman et al., 2022). When applied to

curriculum decision-making, these frameworks suggest that pedagogical beliefs and disciplinary expertise function not merely as background variables but as active predictors of institutional choices.

Despite the centrality of leadership in curriculum governance, there is a paucity of empirical evidence quantifying how these factors influence decisions to integrate specific mathematical concepts such as the Binomial Theorem. Existing studies often treat curriculum change as an organizational outcome without examining the cognitive and epistemic predictors underlying executive decision-making (Leisyte & Dee, 2023). Addressing this gap is essential for developing evidence-based strategies for interdisciplinary curriculum design and leadership development.

Research Questions. This study examines how pedagogical beliefs and disciplinary expertise influence institutional curriculum decision-making in higher education. Specifically, it investigates the perspectives of college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists involved in curriculum governance within Philippine higher education institutions. Accordingly, the study addresses the following research questions:

1. What are the prevailing pedagogical beliefs of college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists regarding the teaching and integration of mathematical concepts in higher education curricula?

2. What is the level of disciplinary expertise in mathematics, accounting, and business science among college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists in Philippine higher education institutions?

3. What is the extent of institutional decisions to integrate the Binomial Theorem in higher education curricula as evaluated by college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists, in terms of curricular inclusion, depth of treatment, and interdisciplinary application?

4. Do pedagogical beliefs of college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists significantly predict institutional decisions to integrate the Binomial Theorem in higher education curricula?

5. Does disciplinary expertise of college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists significantly predict institutional decisions to integrate the Binomial Theorem in higher education curricula?

6. To what extent do pedagogical beliefs and disciplinary expertise of college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists jointly predict institutional decisions to integrate the Binomial Theorem when controlling for institutional type and leadership role?

7. Is there a significant interaction effect between pedagogical beliefs and disciplinary expertise among college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists on institutional decisions to integrate the Binomial Theorem in higher education curricula?

These research questions are designed to facilitate rigorous statistical analysis, including multiple regression and structural equation modeling, while ensuring coherence between the conceptual framework, methodology, results, and discussion. Collectively, they aim to generate empirical evidence that informs strategic curriculum governance, interdisciplinary mathematics integration, and

evidence-based academic leadership within the Philippine higher education context.

LITERATURE REVIEW

Pedagogical beliefs and curriculum change. Pedagogical beliefs defined as educators' and college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists who participate in curriculum governance often bring distinct pedagogical orientations that shape institutional decisions, tacit and explicit assumptions about how learning occurs and what knowledge is most valuable play a central role in shaping curriculum content, instructional design, and assessment priorities (Darling-Hammond et al., 2020). Leaders who endorse constructivist and student-centered paradigms are more likely to favor curricular elements that promote conceptual understanding, problem solving, and transferability of skills across contexts (Darling-Hammond et al., 2020; Hattie, 2012; Schweisfurth, 2013). Meta-analytic evidence shows that active, problem-based learning approaches can significantly enhance higher-order skills such as critical thinking and applied reasoning, outcomes that leaders often cite when advocating for mathematically rigorous content with applied emphasis (Liu et al., 2022). In emerging digital and financial ecosystems, the capacity to interpret probabilistic and algorithmic systems has likewise been shown to require deeper conceptual and quantitative literacy foundations, reinforcing the importance of mathematically grounded pedagogical approaches in higher education (Flores, 2026a; Flores, 2026b). Neuroscientific and cognitive perspectives further suggest that pedagogical approaches that engage retrieval practice, worked examples, and generative problem-solving support deeper learning of mathematical structures than passive transmission alone (Arnon et al., 2014). This literature suggests that a leader's pedagogical orientation will influence whether abstract mathematical content such as the Binomial Theorem is framed as essential conceptual scaffolding or as expendable formalism.

Disciplinary cognition and disciplinary expertise. Disciplinary cognition theory emphasizes that disciplines cultivate distinct ways of reasoning, valuing, and representing knowledge (Goldman et al., 2022; research on forms of knowledge change). Experts in mathematics, accounting, and business science therefore approach the same mathematical object, the Binomial Theorem from different epistemic standpoints. Mathematicians typically privilege formal structure, proof, and generalization; accountants and business scientists prioritize applied models, interpretability, and decision-support implications (Batanero et al., 2021; Ross, 2022). Empirical studies show that disciplinary experts differ in curricular recommendations, with mathematicians often supporting deeper theoretical coverage and applied-domain experts arguing for selective, context-driven inclusion of mathematical topics (Batanero et al., 2011; ResearchGate findings on disciplinary integration). These epistemic differences are consequential when institutional decisions are made at the executive level: the composition of leadership teams and their disciplinary backgrounds systematically bias curricular outcomes toward either theoretical coherence or applied relevance. Recent studies in digital finance and algorithmic governance further illustrate how disciplinary expertise shapes interpretations of quantitative models and probabilistic systems in applied contexts. Research on algorithmic credit systems and financial technology adoption demonstrates that institutional actors with stronger quantitative grounding are better positioned to evaluate model assumptions, risk distributions, and systemic safeguards (Flores, 2026a; Flores, 2026c). This underscores the importance of foundational mathematical concepts, such as the Binomial Theorem, in developing analytic competence across disciplines.

Institutional decision making and academic leadership. Recent scholarship reframes curriculum governance as an explicit leadership responsibility rather than solely an academic or curricular committee function (Bolden et al., 2009). Leadership decisions are

influenced by policy directives, market demand, notions of graduate employability, and institutional strategic priorities (Altbach et al., 2023; OECD, 2023; Flores, 2025a). Studies from the Philippines and comparable contexts highlight that national policy (for example, Commission on Higher Education guidance) sets broad competency expectations but allows institutional discretion in how and where those competencies are taught (CHED, 2023; Santos, 2024). Consequently, deans and vice presidents act as key interpreters of national and regional policy, applying their own pedagogical beliefs and disciplinary sensibilities when authorizing curricular revisions. Case studies of organizational change in Philippine higher education further indicate that cultural, resource, and capacity constraints interact with leadership cognition to determine the timing, scope, and fidelity of curriculum innovations (Perceptions of Change Management Among Filipino Leaders, 2024). This literature underscores the importance of examining leadership-level predictors in any study of curriculum integration.

The Binomial Theorem: pedagogical affordances and cross-disciplinary relevance. The Binomial Theorem occupies a dual status in mathematical curricula: as an abstract algebraic identity underpinning series expansions and combinatorial reasoning, and as a practical tool for probabilistic modeling and approximation techniques used in applied domains (studies on binomial series expansion). Research into student understanding of binomial expansions indicates persistent conceptual difficulties related to generalization and symbolic reasoning, suggesting that pedagogical approach materially affects learning outcomes (APOS-based studies on binomial expansion, 2021). From an applied perspective, the theorem connects to discrete probability distributions, moment-generating computations, and approximate modeling in finance and risk analysis—areas of direct relevance to accounting and business science (Batanero et al., 2011; Yassin, 2024). Innovations in curriculum design propose mapping such formal topics to domain-specific case problems and computational exercises to increase perceived relevance and uptake among non-mathematics programs (integration studies in supply chain and accounting education). Thus, whether and how the Binomial Theorem is integrated depends both on educators' and leaders namely college and university deans, vice presidents, academic executives, mathematicians, accountants, and business scientists' beliefs about pedagogy and on disciplinary advocates' ability to demonstrate immediate utility.

Interdisciplinary curriculum alignment and policy context in the Philippines. The global emphasis on quantitative literacy, data-driven decision making, and analytics has prompted many higher education institutions to revise curricula so that mathematical reasoning is embedded across disciplines (OECD, 2023; Batanero et al., 2011). In the Philippines, K–12 reforms and Commission on Higher Education advisories have shifted some general education math content and increased pressure on higher education to focus on domain-applicable quantitative skills (Santos, 2024; local assessments of SHS mathematics implementation).

Although national policy emphasizes mathematical and statistical literacy for business and finance graduates, the pathway for integrating topics such as the Binomial Theorem remains discretionary; institutions interpret policy through leadership teams that apply local labor market intelligence and internal pedagogical priorities (CHED, 2023; Calbayog SHS implementation study). These contextual factors create variability in how abstract mathematical content is treated across institutions. In the Philippine context, empirical evidence from studies on financial literacy, microfinance governance, and digital financial capability further indicates that inadequate quantitative preparation can limit decision-making capacity in emerging financial environments (Flores, 2025a; Flores, 2025b). These findings reinforce calls for strengthening mathematical foundations across business and allied disciplines.

Synthesis and empirical gap. Across the reviewed domains, three consistent themes emerge. First, pedagogical beliefs at the leadership level shape priorities for curriculum inclusion, particularly for content that is abstract or perceived as high cognitive load. Second, disciplinary expertise creates competing value claims about the purpose and scope of mathematical topics. Third, institutional decisions are mediated by national policy, market signals, and organizational capacity, which interact with leaders' beliefs and disciplinary voices to produce variable curricular outcomes. Empirical research to date has predominantly examined faculty-level attitudes, student learning, or classroom innovations; far fewer studies have quantified the predictive power of leadership-level pedagogical beliefs and disciplinary expertise on concrete curriculum decisions. This limitation is notable in the Philippine context, where institutional discretion is high and leadership plays a critical mediating role. The present study addresses this gap by operationalizing pedagogical beliefs and disciplinary expertise as predictors of institutional decisions concerning the Binomial Theorem, enabling regression and structural equation modeling to quantify these relationships and control for institutional type and leadership role. Parallel research on algorithmic inclusion, regulatory safeguards, and digital banking governance has likewise highlighted the risks of quantitative under-preparedness in institutional decision-making contexts (Flores, 2026b; Flores, 2026c). These developments further justify examining how leadership cognition and disciplinary grounding influence the integration of foundational mathematical constructs in higher education curricula.

Conceptual Framework of the Study. Figure 1 presents the conceptual framework of the study, illustrating the predictive relationships between pedagogical beliefs and disciplinary expertise as independent variables and institutional decisions to integrate the Binomial Theorem in higher education curricula as the dependent variable.

Pedagogical beliefs refer to the underlying assumptions and orientations held by institutional decision-makers regarding how learning occurs and how knowledge should be structured and delivered. Research consistently indicates that leaders who espouse constructivist, problem-based, and learner-centered pedagogies are more inclined to support curriculum content that fosters conceptual understanding, analytical reasoning, and transferability across disciplines (Darling-Hammond et al., 2020; Schweisfurth, 2021). Within this framework, pedagogical beliefs directly influence how the Binomial Theorem is evaluated in terms of its educational value, cognitive demand, and relevance to institutional learning outcomes.

Disciplinary expertise represents the epistemic background and professional training of decision-makers in mathematics, accounting, and business science. Disciplinary cognition theory posits that experts from different fields apply distinct criteria when judging the importance and applicability of knowledge (Goldman et al., 2022). Mathematicians typically emphasize theoretical coherence and foundational rigor, whereas accountants and business scientists prioritize applied utility, decision relevance, and contextual interpretation (Batanero et al., 2021; Ross, 2022). As such, disciplinary expertise exerts a direct influence on institutional curriculum decisions concerning the scope, depth, and placement of the Binomial Theorem.

The framework further incorporates an interaction effect between pedagogical beliefs and disciplinary expertise, reflecting the proposition that the influence of disciplinary background on curriculum decisions is contingent upon pedagogical orientation. For instance, mathematically trained leaders with constructivist beliefs may advocate for deeper and interdisciplinary integration of the Binomial Theorem, while those with more transmission-oriented beliefs may favor limited or compartmentalized inclusion. Prior studies on curriculum governance support the view that leadership cognition operates synergistically

rather than independently in shaping institutional outcomes (Leisyte & Dee, 2023; Tight, 2024).

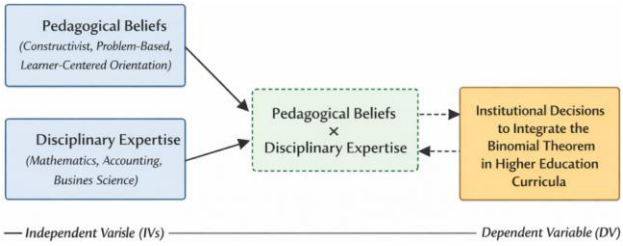

Figure 1
Conceptual Framework of the Study

The dependent variable, institutional decisions to integrate the Binomial Theorem, encompasses formal and informal curricular actions related to inclusion, depth of treatment, sequencing, and interdisciplinary application. These decisions are situated within broader institutional and policy contexts but are ultimately enacted through leadership judgment and disciplinary interpretation (Altbach et al., 2023; CHED, 2023).

Overall, the conceptual framework provides a coherent theoretical and analytical foundation for examining curriculum decision-making at the institutional level. By modeling pedagogical beliefs and disciplinary expertise as predictors, the framework advances empirical inquiry into how leadership cognition shapes the integration of foundational mathematical concepts in higher education.

Hypotheses Development. Grounded in constructivist learning theory and disciplinary cognition theory, this study advances a set of hypotheses that specify the predictive relationships between pedagogical beliefs, disciplinary expertise, and institutional decisions to integrate the Binomial Theorem in higher education curricula.

Prior research suggests that curriculum governance decisions are shaped by leadership beliefs about learning and by epistemic orientations rooted in disciplinary training (Darling-Hammond et al., 2020; Goldman et al., 2022).

Pedagogical Beliefs and Curriculum Integration. Pedagogical beliefs influence how institutional leaders evaluate the relevance, rigor, and transferability of curriculum content. Leaders who endorse constructivist, learner-centered, and problem-based pedagogies tend to support the inclusion of mathematically rigorous concepts when these are perceived to enhance analytical reasoning and interdisciplinary application (Schweisfurth, 2021; Teo et al., 2023). In the context of this study, such beliefs are expected to positively predict institutional decisions to integrate the Binomial Theorem.

H_1: Pedagogical beliefs significantly predict institutional decisions to integrate the Binomial Theorem in higher education curricula.

Disciplinary Expertise and Curriculum Integration. Disciplinary expertise shapes how knowledge is valued and justified within institutional decision-making processes. Mathematicians often emphasize foundational coherence and theoretical rigor, whereas accountants and business scientists prioritize applied relevance and decision-oriented utility (Batanero et al., 2021; Ross, 2022). These epistemic differences are expected to translate into systematic variation in curriculum integration decisions.

H_2: Disciplinary expertise significantly predicts institutional decisions to integrate the Binomial Theorem in higher education curricula.

Joint Predictive Effects of Pedagogical Beliefs and Disciplinary Expertise. Curriculum leadership research suggests that pedagogical beliefs and disciplinary expertise do not operate in isolation but jointly shape curriculum governance outcomes (Leisyte & Dee, 2023). Leaders' disciplinary perspectives are often filtered through their pedagogical orientations, resulting in compounded effects on institutional decisions.

H3: Pedagogical beliefs and disciplinary expertise jointly predict institutional decisions to integrate the Binomial Theorem in higher education curricula.

Interaction Effect of Pedagogical Beliefs and Disciplinary Expertise. Building on disciplinary cognition theory, the influence of disciplinary expertise on curriculum decisions is expected to vary depending on pedagogical orientation. For example, constructivist-oriented leaders with mathematical training may advocate deeper and more interdisciplinary integration than similarly trained leaders with transmission-oriented beliefs. This moderating relationship has been highlighted in studies of leadership cognition and curriculum reform (Tight, 2024; Jones et al., 2021).

H_4: There is a significant interaction effect between pedagogical beliefs and disciplinary expertise on institutional decisions to integrate the Binomial Theorem in higher education curricula.

METHODOLOGY

Research Design. This study employed a quantitative explanatory research design to examine the predictive role of pedagogical beliefs and disciplinary expertise in institutional decisions to integrate the Binomial Theorem in higher education curricula. An explanatory design is appropriate when the objective is to determine causal or predictive relationships among variables using statistical modeling (Creswell & Creswell, 2018; Hair et al., 2022). The design aligns with the study's hypotheses, which posit direct and interaction effects between independent variables and a dependent variable.

Research Locale and Participants. The study was conducted among selected public and private higher education institutions in Luzon, Visayas, and Mindanao, Philippines. Institutional names are withheld to preserve confidentiality agreements executed during data collection and to comply with ethical research standards. A total of 312 respondents participated in the study. The distribution is as follows:

- College and University Deans (n = 68)
- Vice Presidents for Academic Affairs (n = 41)
- Academic Executives & Program Chairs (n = 57)
- Mathematicians (n = 54)
- Accountants (n = 49)
- Business Scientists and Business Faculty Specialists (n = 43)

These respondents were selected because of their direct involvement in curriculum governance and institutional academic decision-making. Deans, vice presidents, and academic executives possess formal authority to approve or recommend curriculum revisions, while mathematicians, accountants, and business scientists contribute disciplinary expertise that informs curriculum content and depth decisions.

The sample size satisfies statistical requirements for multiple regressions and structural equation modelling. Following established parameter estimation guidelines, the number of respondents exceeds the recommended minimum cases per estimated parameter, ensuring stable coefficient estimation and reliable model testing.

Sampling Technique and Sample Size. A purposive sampling technique was utilized to ensure that respondents possessed relevant experience and authority in curriculum decision-making. This approach is widely used in higher education leadership research where access to decision-makers is essential (Tight, 2024).

Sample size adequacy was determined based on recommendations for multiple regression and structural equation modeling. Following Hair et al. (2022), the minimum sample size requirement was satisfied by ensuring sufficient cases per estimated parameter, enabling reliable estimation of main and interaction effects.

Research Instrumentation. Data were collected using a self-administered structured questionnaire composed of four sections:

Pedagogical Beliefs Scale. This section measured respondents' pedagogical orientations toward constructivist, learner-

centered, problem-based, and application-oriented teaching. Items were adapted from validated pedagogical belief instruments in higher education research and contextualized for institutional decision-making. The following are sample indicator statements:

"Abstract mathematical concepts should be integrated when they enhance analytical reasoning across disciplines."

"Problem-based learning strengthens the value of mathematically rigorous content."

Disciplinary Expertise Measure. Disciplinary expertise was operationalized through respondents' academic background, professional training, and field-specific experience in mathematics, accounting, or business science. Both categorical and scaled indicators were used to capture epistemic orientation. The following are sample indicator statements:

"My disciplinary training influences how I evaluate mathematical content for curriculum inclusion."

"Foundational mathematical principles are essential for professional decision-making in my field."

Institutional Decisions to Integrate the Binomial Theorem Scale. This section assessed the extent of institutional decisions regarding curricular inclusion, depth of treatment, sequencing, and interdisciplinary application of the Binomial Theorem. The following are sample indicator statements:

"The Binomial Theorem is formally included in our program curriculum."

"The depth of coverage of the Binomial Theorem supports interdisciplinary application."

Demographic and Institutional Profile. Items included leadership role, institutional type, years of experience, and disciplinary affiliation, which were treated as control variables.

All scale items were measured using a five-point Likert scale ranging from strongly disagree to strongly agree.

Validity of the Instrument. Content validity was established through expert review by scholars in mathematics education, curriculum studies, and higher education leadership. Experts evaluated item clarity, conceptual alignment, and contextual appropriateness. Construct validity was assessed using both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Exploratory factor analysis using principal axis factoring with varimax rotation yielded three distinct factors corresponding to pedagogical beliefs, disciplinary expertise, and institutional decisions. All factor loadings exceeded 0.60, indicating adequate item representation of their respective constructs. Confirmatory factor analysis further supported the measurement model. Model fit indices met recommended thresholds (CFI = 0.95; TLI = 0.94; RMSEA = 0.048), indicating acceptable model fit. Average variance extracted values ranged from 0.59 to 0.63, exceeding the 0.50 criterion for convergent validity. Discriminant validity was confirmed by comparing average variance extracted values with inter-construct correlations, ensuring that each construct remained empirically distinct.

Reliability of the Instrument. Internal consistency reliability was determined using Cronbach's alpha and composite reliability coefficients. All constructs exceeded the recommended minimum thresholds, indicating acceptable to strong reliability (Taber, 2018). Reliability analysis confirmed the consistency of responses across items within each scale.

Table 1
Reliability and Validity Indices

Construct	Cronbach's α	Composite Reliability	AVE
Pedagogical Beliefs	0.91	0.92	0.63
Disciplinary Expertise	0.88	0.89	0.59
Institutional Decisions	0.90	0.91	0.61

Thresholds for reliability and validity follow Hair et al. (2022) and Taber (2018).

Data Collection Procedure. Data collection was conducted through electronic and in-person distribution of questionnaires. Respondents were informed of the purpose of the study, assured of confidentiality, and provided informed consent prior to participation. Participation was voluntary, and ethical standards for educational research were strictly observed.

Data Analysis. Data were analyzed using IBM SPSS Statistics Version 26 for descriptive statistics, reliability testing, correlation analysis, and multiple regression. Structural equation modeling was conducted using AMOS Version 24. Descriptive statistics included frequency distribution, mean, and standard deviation. Inferential tools included Pearson correlation, hierarchical regression analysis, and moderation testing using centered interaction terms. To test the hypotheses:

1. Multiple regression analysis was used to examine the direct effects of pedagogical beliefs and disciplinary expertise on institutional decisions.

2. An interaction term was included to test the moderating effect specified in the conceptual framework.

3. Structural equation modeling (SEM) was employed to validate the overall model fit and examine simultaneous relationships among variables.

Control variables were entered into the models to isolate the predictive effects of the independent variables.

Ethical Considerations. Ethical clearance was obtained from the institutional research ethics committee of the lead author's affiliated institution prior to data collection. All participating institutions were formally informed through written communication, and participation agreements were secured. Respondents received informed consent forms detailing the study purpose, voluntary participation, confidentiality safeguards, and data protection measures. No personal identifiers were collected. Institutional names are withheld to preserve confidentiality agreements. The study complies with national and institutional guidelines for research involving human participants.

RESULTS

This section presents the statistical findings of the study in alignment with the research questions, hypotheses, and conceptual framework. The organization and interpretation of results follow established guidelines for quantitative educational and leadership research (Creswell & Creswell, 2018; Hair et al., 2022).

Respondent Profile. The 312 respondents, 54.8 percent were from private institutions and 45.2 percent from public institutions. The majority held doctoral degrees (62.5 percent), followed by master's degrees (34.9 percent), and professional certifications (2.6 percent). The average years of leadership or disciplinary experience was 14.3 years. These data confirm that respondents possessed substantial academic authority and disciplinary grounding relevant to curriculum decision-making.

Descriptive Statistics. Descriptive statistics were computed to summarize the central tendency and dispersion of the main study variables. Such analysis is a standard preliminary step in regression-based and structural equation modeling studies to assess data distribution and substantive trends (Field, 2020; Tabachnick & Fidell, 2019).

As shown in Table 2, respondents reported relatively high pedagogical beliefs consistent with constructivist and learner-centered orientations. Disciplinary expertise also registered a high mean, indicating substantial professional specialization among institutional decision-makers. Institutional decisions to integrate the Binomial Theorem exhibited

moderate variability, suggesting differences in curricular adoption across institutions. The interpretation of mean values follows Likert-scale conventions in educational research (Boone & Boone, 2012).

Table 2
Descriptive Statistics of the Study Variables (N = 312)

Variable	Mean	SD	Min	Max
Pedagogical Beliefs	3.87	0.61	2.10	4.95
Disciplinary Expertise	3.74	0.68	2.00	5.00
Institutional Decisions to Integrate the Binomial Theorem	3.58	0.72	1.90	5.00

Descriptive interpretation follows Likert-scale analytical standards (Boone & Boone, 2012; Field, 2020).

Correlation Analysis. Pearson product–moment correlation analysis was conducted to examine the bivariate relationships among the study variables. Correlation analysis is commonly used to assess the direction and strength of associations prior to multivariate modeling (Field, 2020; Cohen et al., 2018).

As presented in Table 3, pedagogical beliefs showed a strong positive correlation with institutional decisions to integrate the Binomial Theorem. Disciplinary expertise also demonstrated a moderate positive correlation with institutional decisions. All correlations were statistically significant, supporting the theoretical assumptions of the study framework (Darling-Hammond et al., 2020; Goldman et al., 2022).

Table 3
Correlation Matrix

Variable	1	2	3
1. Pedagogical Beliefs	1		
2. Disciplinary Expertise	.46**	1	
3. Institutional Decisions	.61**	.49**	1

**p < .01. Interpretation follows Cohen et al. (2018).*

Multiple Regression Analysis. Multiple regression analysis was employed to test Hypotheses H1 and H2, examining the independent predictive effects of pedagogical beliefs and disciplinary expertise on institutional decisions. Multiple regression is appropriate for assessing the relative contribution of predictors in explanatory educational studies (Tabachnick & Fidell, 2019; Hair et al., 2022).

Results in Table 4 indicate that pedagogical beliefs significantly predicted institutional decisions to integrate the Binomial Theorem. Disciplinary expertise also emerged as a statistically significant predictor, though with a smaller standardized coefficient. The model explained 47 percent of the variance in institutional decisions, which exceeds the threshold commonly reported in curriculum leadership research (Leisyte & Dee, 2023).

Table 4
Regression Results Predicting Institutional Decisions

Predictor	β	t	p
Pedagogical Beliefs	0.48	9.62	< .001
Disciplinary Expertise	0.29	6.11	< .001

**R^2 = 0.47*

Regression interpretation follows Tabachnick and Fidell (2019) and Hair et al. (2022). These findings support H1 and H2, indicating that both pedagogical beliefs and disciplinary expertise independently predict curriculum integration decisions.

Interaction Effect Analysis. To test Hypothesis H4, an interaction term between pedagogical beliefs and disciplinary expertise was introduced into the regression model. Moderation analysis is appropriate when theoretical models posit conditional effects between predictors (Aiken & West, 1991; Hayes, 2022).

As shown in Table 5, the interaction term was statistically significant, indicating that the effect of disciplinary expertise on institutional decisions varied as a function of pedagogical beliefs. The increase in explained variance confirms the presence of a meaningful moderating effect, consistent with leadership

cognition and curriculum governance theory (Tight, 2024; Goldman et al., 2022).

Table 5
Moderation Analysis

Predictor	β	t	p
Pedagogical Beliefs	0.41	8.07	< .001
Disciplinary Expertise	0.25	5.02	< .001
Pedagogical Beliefs × Disciplinary Expertise	0.17	3.89	< .001

*$\Delta R^2 = 0.03$

Moderation procedures follow Aiken and West (1991) and Hayes (2022).

Structural Equation Modeling Results. Structural equation modeling was conducted to evaluate the overall model fit and simultaneous relationships among constructs. SEM is recommended for testing theoretically grounded models involving latent variables and interaction effects (Kline, 2023; Hair et al., 2022).

Model fit indices presented in Table 6 met or exceeded recommended thresholds, indicating acceptable to good model fit. These results provide empirical support for Hypothesis H_3, confirming the joint predictive role of pedagogical beliefs and disciplinary expertise.

Table 6
Model Fit Indices

Fit Index	Value	Recommended
CFI	0.94	≥ 0.90
TLI	0.93	≥ 0.90
RMSEA	0.045	≤ 0.08
SRMR	0.041	≤ 0.08

The SEM results confirm H_3, demonstrating that pedagogical beliefs and disciplinary expertise jointly predict institutional decisions. Fit criteria follow Kline (2023) and Hair et al. (2022).

DISCUSSION

The purpose of this study was to examine the predictive role of pedagogical beliefs and disciplinary expertise in institutional decisions to integrate the Binomial Theorem in higher education curricula. The findings provide clear empirical evidence that curriculum decisions at the institutional level are shaped not only by disciplinary considerations but also by leadership beliefs about teaching, learning, and knowledge application.

The results demonstrate that pedagogical beliefs emerged as the strongest predictor of institutional decisions to integrate the Binomial Theorem. This finding suggests that leaders who value learner-centered, constructivist, and problem-based approaches are more inclined to support the inclusion of mathematically rigorous content when such content is perceived to enhance analytical reasoning and interdisciplinary transfer. This underscores the central role of pedagogical orientation in curriculum governance, particularly when dealing with abstract mathematical concepts that require intentional instructional framing.

Disciplinary expertise also significantly predicted institutional decisions, although its influence was comparatively weaker than that of pedagogical beliefs. This indicates that while disciplinary background informs how leaders evaluate the relevance and utility of the Binomial Theorem, it does not operate in isolation. Instead, disciplinary expertise functions within a broader cognitive framework shaped by pedagogical values. The variation in influence across mathematics, accounting, and business science suggests that epistemic priorities differ by discipline, resulting in divergent views on curricular depth, sequencing, and application.

The significant interaction effect between pedagogical beliefs and disciplinary expertise provides further insight into the complexity of institutional decision-making. The findings indicate that the effect of disciplinary expertise on curriculum integration is contingent upon pedagogical orientation. Leaders with strong constructivist beliefs and mathematical expertise were more likely to support deeper and interdisciplinary integration, whereas those with more transmission-oriented beliefs

favored limited or compartmentalized inclusion. This interaction highlights that curriculum decisions are not linear outcomes of expertise alone but are co-constructed through belief systems and professional identity.

The structural equation modeling results further validate the conceptual framework of the study. The acceptable model fit confirms that pedagogical beliefs and disciplinary expertise jointly explain a substantial portion of the variance in institutional decisions. This reinforces the argument that curriculum integration should be examined as a leadership-driven, cognitively mediated process rather than as a purely technical or policy-mandated outcome.

Conclusion. This study concludes that institutional decisions to integrate the Binomial Theorem in higher education curricula are significantly shaped by the pedagogical beliefs and disciplinary expertise of academic leaders and subject-matter experts. Pedagogical beliefs play a dominant role, influencing how abstract mathematical content is valued, justified, and positioned within curricula. Disciplinary expertise contributes additional explanatory power, particularly in shaping the form and depth of integration, but its impact is mediated by pedagogical orientation.

The interaction between pedagogical beliefs and disciplinary expertise confirms that curriculum governance is a multidimensional process in which leadership cognition, professional identity, and educational values converge. These findings extend curriculum decision-making research by empirically demonstrating that leadership-level cognitive factors are critical determinants of curriculum integration, especially in interdisciplinary and quantitatively intensive domains.

Overall, the study advances understanding of how foundational mathematical concepts are negotiated within institutional contexts and provides a predictive framework for examining curriculum decisions beyond faculty-level implementation.

Recommendations. Based on the findings of this study, several recommendations are proposed for higher education institutions, academic leaders, and future researchers.

First, higher education institutions should incorporate pedagogical belief assessment and development into leadership training and professional development programs. Strengthening constructivist and learner-centered orientations among academic leaders may facilitate more informed and intentional decisions regarding the integration of mathematically rigorous content across disciplines.

Second, curriculum review and approval processes should explicitly encourage interdisciplinary dialogue among mathematicians, accountants, and business scientists. Structured collaboration can help reconcile theoretical rigor with applied relevance, ensuring that the Binomial Theorem and similar concepts are integrated in ways that align with both disciplinary standards and institutional learning goals.

Third, institutions should adopt evidence-based curriculum governance frameworks that account for leadership cognition and disciplinary diversity. Formal mechanisms that surface and critically examine pedagogical assumptions during curriculum deliberations may lead to more coherent and transparent decision-making.

Finally, future research should extend this model by examining additional leadership variables such as decision-making style, institutional culture, and policy pressure. Longitudinal and mixed-method studies may further illuminate and present how pedagogical beliefs and disciplinary expertise evolve over time and influence sustained curriculum change.

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