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Teacher Attributes and Institutional Support as Determinants of Problem-Based Learning in the Junior High Schools of Zambales

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ABSTRACT

This study examined the role of teacher attributes and institutional support in the competence of Junior High School (JHS) mathematics teachers in implementing Problem-Based Learning (PBL) in the Province of Zambales, Philippines. A quantitative descriptive-survey, correlational, and comparative design was used with 102 public secondary mathematics teachers. Teacher attributes were described in terms of length of teaching, grade level handled, highest educational attainment, and number of PBL-related trainings. Institutional support was examined through resources, administrative support, and professional development, while PBL implementation competence was assessed through the five phases of the 5E instructional model: Engagement, Exploration, Explanation, Elaboration, and Evaluation. The researcher-structured questionnaire contained 170 scale-based items; expert validation produced a rating of 4.48, interpreted as very highly valid, while a try-out with 10 teachers from another division yielded Cronbach's alpha of 0.922. Results showed that institutional support was highly implemented overall (M = 3.06), with administrative support receiving the highest rating (M = 3.28), followed by professional development (M = 3.04) and resources (M = 2.85). Teachers rated themselves very highly competent in all five PBL phases, with Engagement highest (M = 3.56) and Elaboration lowest (M = 3.46). Length of teaching was weakly related to institutional support ($r = .287$, $p = .003$), whereas the other teacher attributes were not significantly related to institutional support. None of the teacher attributes was significantly related to overall PBL competence. In contrast, institutional support was significantly and positively related to all five PBL phases: Engagement ($r = .558$), Exploration ($r = .591$), Explanation ($r = .555$), Elaboration ($r = .609$), and Evaluation ($r = .655$), all $p < .001$. Moderation analyses likewise showed significant direct effects of institutional support but no significant interaction with teacher attributes. The findings indicate that strengthening school-level support, particularly specialized resources and professional development for Elaboration and Evaluation, offers a practical pathway for sustaining and improving PBL implementation across school types in Zambales.

Keywords: *Problem-Based Learning, mathematics education, teacher competence, institutional support, 5E instructional model, professional development, Zambales*

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INTRODUCTION

Problem-Based Learning (PBL) has emerged as a learner-centered approach that places students in situations where they investigate meaningful problems, construct knowledge, explain reasoning, and apply ideas to new contexts. In mathematics education, this orientation responds to the need to move beyond procedural fluency toward conceptual understanding, reasoning, problem solving, and mathematical communication. The related literature reviewed in the dissertation describes PBL as an instructional philosophy that positions learners as active and self-directed constructors of knowledge and connects PBL with constructivist perspectives (Piaget, 1970; Hmelo-Silver et al., 2021; Schoenfeld, 2020).

The policy context in the Philippines makes this issue particularly relevant. The dissertation situates the study within the Department of Education's continuing emphasis on inquiry-oriented, learner-centered pedagogies and the Revised K–10 Curriculum. Within this context, mathematics teachers are expected to translate curriculum intentions into classroom practices that develop higher-order thinking and adaptive mathematical reasoning.

Teacher competence, however, cannot be understood solely from individual teacher characteristics. The literature reviewed in the study emphasizes that instructional practices are shaped by the organizational environment, including administrative leadership, instructional resources, technical assistance, professional development, and workload conditions. Research cited in the dissertation likewise points to the importance of school support in enabling teachers to implement complex learner-centered approaches.

At the same time, the relationship between teacher attributes and effective pedagogy is not straightforward. Teaching experience, educational attainment, grade-level assignment, and participation in professional development may contribute to teachers' knowledge and readiness, but prior research has reported mixed relationships between these characteristics and instructional practice. This creates a need to examine whether teacher attributes themselves explain differences in PBL competence or whether institutional conditions provide a more consistent explanation.

The present study addresses this gap by examining public JHS mathematics teachers across Zambales. The province-wide scope was selected to capture variation in school conditions and to determine whether the relationships among teacher attributes, institutional support, and PBL competence remain consistent across school classifications. The study specifically asks: (1) What are the professional attributes of the teachers? (2) What is the extent of institutional support in resources, administrative support, and professional development? (3) What is the level of PBL competence across the five 5E phases? (4) What relationships exist among teacher attributes, institutional support, and PBL competence? (5) Do these relationships differ across school types? and (6) What professional development plan can be proposed from the findings?

The study is significant because it shifts attention from teacher characteristics alone toward the institutional conditions that may enable teachers to enact PBL consistently. Its practical output is an integrated development plan intended to strengthen institutional support and teacher competence in the Division of Zambales.

METHODS

Research Design and Locale

The study employed a quantitative descriptive-survey, correlational, and comparative research design. The descriptive component established a profile of the participants and summarized perceived institutional support and PBL competence. The correlational component examined the strength and significance of relationships among teacher attributes, institutional support, and PBL competence without manipulating variables. The comparative component examined whether institutional support and PBL competence differed according to school classification. The study was conducted in public secondary schools in the Province of Zambales, Philippines.

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Participants and Sampling

The participants were 102 Junior High School mathematics teachers from public secondary schools in Zambales. The dissertation reports purposive selection of teachers across the province. The participants represented Grades 7–10 and schools classified as Mega, Large, Medium, and Small, allowing the analysis to consider the diversity of school settings.

Table 1. *Participants and Sampling*

Teacher attribute	Category	n	%
Length of teaching	1–5 years	20	19.6
	6–10 years	29	28.4
	11–15 years	26	25.5
	16 years and above	27	26.5
Grade level handled	Grade 7	15	14.7
	Grade 8	38	37.3
	Grade 9	29	28.4
	Grade 10	20	19.6
Highest educational attainment	Bachelor's degree	18	17.6
	With master's units	64	62.7
	Master's degree	14	13.7
	Doctorate degree	6	5.9
PBL-related trainings	Less than 10	74	72.5
	11–15	15	14.7
	16 and above	13	12.7

Research Instrument

Data were collected using a researcher-structured questionnaire containing 170 scale-based items in addition to demographic and institutional profile matrices. The instrument assessed institutional support in three dimensions—Resources, Administrative Support, and Professional Development—and PBL competence in the five 5E phases. The questionnaire was validated by three mathematics Head Teachers who had served as resource speakers for Schools Division Office training. The reported expert validity rating was 4.48, interpreted as very highly valid. Reliability was established through a try-out with 10 teachers from another division, yielding Cronbach's alpha of 0.922.

Data Collection and Analysis

Participation was voluntary and informed consent was obtained. Frequency and percentage distributions were used for categorical teacher attributes. Weighted means were used to summarize institutional support and PBL competence using the four-point interpretation scale: 3.26–4.00 = Very Highly Implemented/Competent; 2.51–3.25 = Highly Implemented/Competent; 1.76–2.50 = Moderately Implemented/Competent; and 1.00–1.75 = Least Implemented/Competent. Pearson correlation was used to examine relationships. Moderation analyses examined whether institutional support changed the relationship between each teacher attribute and PBL competence. One-way ANOVA was used to test differences by school classification.

RESULTS

Teacher Profile

The 102 respondents were distributed relatively evenly across the four teaching-experience categories, although the largest group had 6–10 years of experience (28.4%). Grade 8 teachers constituted the largest grade-level group (37.3%). Most respondents (62.7%) had master's units, while 13.7% had

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completed a master's degree and 5.9% held doctorates. Specialized PBL exposure was comparatively limited: 72.5% reported fewer than 10 PBL-related trainings.

Institutional Support

Table 2. *Institutional Support*

Dimension	Mean	Interpretation
Resources	2.85	Highly Implemented
Administrative Support	3.28	Very Highly Implemented
Professional Development	3.04	Highly Implemented
Overall	**3.06**	**Highly Implemented**

Administrative support was the strongest institutional dimension (M = 3.28). Resource support was comparatively lower (M = 2.85), with multimedia equipment and collaborative learning spaces among the stronger indicators, while dynamic mathematics software such as GeoGebra/Desmos and stable internet connectivity were among the weakest resource indicators. Professional development was rated highly (M = 3.04), but the findings indicate continuing room for more specialized PBL-focused opportunities.

PBL Implementation Competence

Table 3. *PBL Implementation Competence*

5E phase	Mean	Interpretation	Rank
Engagement	3.56	Very Highly Competent	1
Exploration	3.52	Very Highly Competent	3
Explanation	3.53	Very Highly Competent	2
Elaboration	3.46	Very Highly Competent	5
Evaluation	3.47	Very Highly Competent	4

All five phases were rated Very Highly Competent. Engagement received the highest mean (M = 3.56), particularly reflecting activation of prior knowledge and connection of lessons to learners' experiences. Elaboration had the lowest overall mean (M = 3.46), while Evaluation was also comparatively lower (M = 3.47). Within Evaluation, assessment through problem-solving activities was the lowest-rated indicator (M = 3.38), pointing to a possible need for stronger authentic, problem-centered assessment practices.

Relationships Among the Variables

Table 4. *Relationships Among the Variables*

Relationship	r	p	Interpretation
Length of teaching ↔ Institutional support	.287	.003	Significant, weak positive
Grade level ↔ Institutional support	.057	.568	Not significant
Educational attainment ↔ Institutional support	.145	.146	Not significant
PBL training frequency ↔ Institutional support	.094	.350	Not significant
Length of teaching ↔ PBL competence	.173	.082	Not significant
Grade level ↔ PBL competence	.009	.929	Not significant

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Educational attainment ↔ PBL competence	.009	.925	Not significant
PBL training frequency ↔ PBL competence	.082	.410	Not significant

Institutional support showed strong positive and statistically significant relationships with every 5E phase of PBL competence:

Table 5. *PBL competence*

PBL phase	r	p
Engagement	.558	< .001
Exploration	.591	< .001
Explanation	.555	< .001
Elaboration	.609	< .001
Evaluation	.655	< .001

The strongest relationship was observed for Evaluation (r = .655), followed by Elaboration (r = .609). Explanation showed the smallest coefficient (r = .555), although it remained statistically significant.

Moderation and School-Type Comparisons

Moderation analyses consistently showed a significant direct effect of institutional support on PBL competence but no significant interaction with the teacher attributes examined. For example, institutional support had a direct effect of b = 0.5432 (p < .001), while the interaction between length of teaching and institutional support was not significant (b = 0.0216, p = .722). Similar non-significant interactions were found for grade level (b = −0.0348, p = .655), educational attainment (b = 0.0116, p = .852), and number of PBL-related trainings (b = −0.1188, p = .232).

The dissertation also reports no statistically significant differences in institutional support or PBL competence across Mega, Large, Medium, and Small school classifications. For example, Evaluation competence did not differ significantly by school type (F = 1.508, p = .217). These results support the interpretation that the institutional-support pathway operates broadly across the province rather than being confined to a particular school classification.

DISCUSSION

The findings point to an important distinction between individual teacher characteristics and the organizational conditions in which teaching occurs. Although the respondents were largely experienced and many had pursued graduate coursework, these attributes did not significantly predict overall PBL competence. This is consistent with the mixed evidence in the literature regarding the direct contribution of years of experience and formal educational attainment to complex learner-centered practices. Experience may provide pedagogical knowledge and classroom familiarity, but it does not automatically result in greater use of PBL.

The strongest empirical pattern in the study is the relationship between institutional support and PBL competence. All five 5E phases were significantly and positively associated with institutional support. This finding suggests that teachers' ability to sustain inquiry, facilitate exploration, support mathematical explanation, extend learning through elaboration, and conduct meaningful evaluation is closely connected to the resources and professional environment provided by schools.

The relatively high rating for administrative support is particularly important. Teachers perceived school leaders as supportive of learner-centered approaches and innovative teaching. Such leadership may create the organizational climate needed for teachers to take on the demanding facilitative role required by

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PBL. In contrast, the lower rating for resources—especially specialized mathematics software and reliable connectivity—shows that general classroom resources do not necessarily guarantee full technological readiness for inquiry-based mathematics instruction.

The results for Elaboration and Evaluation deserve particular attention. These phases had the two lowest overall means, although both remained in the Very Highly Competent range. Elaboration requires teachers to extend students' initial solutions into new, non-routine or interdisciplinary contexts, while Evaluation requires assessment practices that capture reasoning, application, and authentic problem solving. The findings therefore suggest that future professional learning should move beyond introductory PBL awareness toward task design, mathematical modeling, scaffolding for transfer, authentic assessment, and rubric development.

The absence of significant moderation effects is also consequential. Institutional support did not operate differently according to teaching experience, grade-level assignment, educational attainment, or PBL training frequency. In practical terms, the results favor a broad institutional strategy rather than a program designed only for novice teachers, teachers with particular degrees, or teachers with limited training. The school environment appears to be a common lever that can benefit teachers across career stages and school classifications.

The school-type findings reinforce this interpretation. Because institutional support and PBL competence did not differ significantly across Mega, Large, Medium, and Small schools, the study supports a division-level approach that establishes minimum support standards for all schools while allowing local adaptation. This is consistent with the dissertation's proposed integrated development plan, which emphasizes resource auditing, administrative alignment, intensive capacity building, school-based coaching, peer observation, and division-wide sharing of effective PBL practices.

CONCLUSION

The study concludes that institutional support is a more consistent correlate of PBL implementation competence than the individual teacher attributes examined. JHS mathematics teachers in Zambales reported very high competence across all five 5E phases, yet the strength of the relationships shows that competence is closely connected to the support teachers receive from their schools. The strongest association was between institutional support and Evaluation competence.

The findings imply that improving PBL implementation should not depend primarily on teachers' tenure, academic credentials, grade-level assignments, or the number of trainings previously attended. Instead, schools and the Division of Zambales should ensure sustained access to appropriate resources, supportive leadership, specialized professional development, mentoring, and opportunities for collaborative practice.

The proposed development priorities are: (1) strengthen specialized digital and mathematics resources, including reliable connectivity and dynamic mathematics software; (2) provide intensive professional learning focused on Elaboration and Evaluation; (3) strengthen authentic and rubric-based assessment literacy; (4) institutionalize school-based Learning Action Cell coaching and peer observation; and (5) maintain division-level monitoring and sharing of contextualized PBL practices. The dissertation's integrated development plan specifically proposes a sequence of administrative alignment and resource audit, intensive capacity building, school-based coaching and peer observation, and a division mathematics PBL summit with impact evaluation.

Limitations

The study used self-reported survey measures and a purposively selected sample of 102 public JHS mathematics teachers in Zambales. Consequently, the results describe perceived institutional support and self-reported competence rather than directly observed classroom implementation or student achievement. The correlational design also does not establish causal relationships. Future studies may combine classroom

observations, teacher interviews, student performance measures, and longitudinal designs to examine whether improvements in institutional support produce measurable changes in PBL implementation and mathematics learning outcomes.

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