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Inquiry-Based Learning Competence of Junior High School Physics Teachers in Relation to Professional Teaching Standards

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Abstract

This study examined the competence of Junior High School Physics Teachers in implementing Inquiry-based Learning (IBL) in relation to selected profile variables. Using a descriptive-correlational research design, data were collected through a validated survey questionnaire measuring seven core indicators of IBL competence aligned with the Philippines Professional Standards for Teachers (PPST). Statistical analysis indicates that among the profile variables, the number of IBL-related trainings attended revealed the strongest association with overall IBL competence. Highest educational attainment and teaching position showed moderate relationships, while years of teaching experience and age exhibit minimal influence. Sex was found to have no relation with IBL competence.

The findings highlight that targeted professional development plays a critical role in strengthening teachers' ability to implement inquiry-based pedagogies in Physics. While academic qualifications and professional roles has an effect to instructional competence, structured and sustained training programs specific to IBL appear to be the most significant factor. These results emphasized the importance of investing in continuous, content-focused professional development initiatives to support effective inquiry-based instruction and enhance the quality of science education in the country.

Keywords: Inquiry-Based Learning; Teacher Competence, Professional Development; Physics Education; Teaching Standards

1. Introduction

Inquiry-Based Learning (IBL) has become a cornerstone of contemporary science education, particularly in physics, due to its alignment with constructivist pedagogies that emphasize active knowledge construction, questioning, and evidence-based reasoning. In contrast to traditional teacher-centered approaches,

empirical studies consistently demonstrate that IBL enhances students' conceptual understanding, scientific literacy, inquiry skills, and motivation across diverse contexts, including physics, where abstract concepts and real-world applications converge.

In physics classrooms, IBL has been shown to significantly improve student performance compared to traditional lecture-based instruction (Jacalan & Castillo, 2023), foster deeper scientific understanding and collaborative problem solving (Guerrero & Bautista, 2023), and support the learning of complex and abstract topics such as modern and thermal physics when structured through guided or authentic inquiry phases (Fernandez, 2017; Russo & Adorno, 2018). Large-scale and multidisciplinary studies further indicate that sustained and coherent implementation of IBL leads to statistically significant gains in students' inquiry skills, regardless of gender, highlighting its robustness as a learner-centered approach (Ješková et al., n.d.).

However, the efficacy of IBL is strongly dependent on teachers' competence in designing, facilitating, and assessing inquiry processes. While administrative support and positive attitudes toward inquiry are often present, actual classroom implementation remains inconsistent due to constraints related to teacher preparation, instructional resources, and pedagogical confidence (Guerrero & Bautista, 2023; Bogar, 2019). The literature underscores the critical role of teachers as facilitators who guide questioning, scaffold investigations, and promote reflection throughout the inquiry cycle, as synthesized in the widely cited framework of Pedaste et al. (2015). These implementation barriers suggest persistent gap between theoretical advocacy for IBL and its practical enactment in classrooms.

In the Philippine context, professional expectations are articulated through the Philippine Professional Standards for Teachers (PPST), which represents the competencies in domains such as content knowledge and pedagogy, learning environment management, curriculum and planning, and professional development across career stages as stated in DepEd Order No. 42, s. 2017. The PPST serves as a national benchmark for evaluating teacher quality and guiding both pre-service preparation and in-service development. While research has examined general teacher competence relative to these standards, there remains limited empirical evidence specifically on inquiry-based learning competence among junior high school physics teachers, a subgroup with unique pedagogical demands given the abstract and experimental nature of physics instruction.

The relationship between teacher competence in inquiry practices and adherence to professional standards is critical. Competence in IBL not only reflects teachers' mastery of pedagogical strategies but also their capacity to align practice with professional expectations and improve student learning outcomes. Yet, studies focusing on junior high physics teachers is scarce. This gap suggests a need for targeted research examining the intersection of IBL competence and professional teaching standards, particularly among junior high school physics teachers, especially in the Schools Division of Ilocos Norte (SDOIN), to ensure that the theoretical promise of inquiry-based instruction translates into sustained and effective classroom practice.

2. Methods

2.1. Research Design

This study utilized the descriptive-correlational research design. The descriptive component aimed to determine the profile of physics teachers and their level of adherence to the Philippine Professional Standards for Teachers (PPST). The correlational component examined the relationship between the teachers' IBL competence and their professional competencies as stated in the PPST.

2.2. Population and Sampling

The purposive sampling method was used to gather data from all Junior High School Teachers who are currently teaching Physics in the Schools Division of Ilocos Norte. Total enumeration was used in this study.

2.3. Research Instruments

To gather data on the teachers' competence in implementing IBL along with the different domains of PPST, a checklist survey questionnaire was used. It was validated by the thesis adviser and panel of experts.

2.4. Data Gathering Procedures

The ethical clearance secured from the University Research Ethics and Review (URERB) to ensure the study's validity and safety of participants' profile. The approved letter was given to the Schools Division Superintendent of SDOIN to request teachers cooperation. After which, printed copies and online forms were distributed to collect the participants responses.

2.5. Data Analysis

The data gathered was interpreted through frequency counts, percentage, and weighted mean to determine the demographic profile of physics teachers and their level of competence in IBL in relation to professional teaching standards.

Moreover, Pearson r correlation was utilized to determine the significant relationship between the profile of Physics teachers and their level of competence in IBL in connection with the PPST.

2.6. Ethical Considerations

This study adhered to the ethical standards recommended by the URERB to ensure that the data gathered are valid and the well-being of the participants are protected. It was ensured that participation is voluntary and their anonymity will be strictly maintained. No monetary and any form of compensation were given to the respondents.

3. Results and Discussions

3.1. Age

The age distribution of the participants indicates that most of them belong to the middle-age bracket. The largest proportion falls within the 36-41 age group (26.98%), followed by those aged 30-35 (21.43%) and 42-47 (18.25%). This indicates that most respondents are in their early professional years, where teaching experience and instructional competence are relatively established. The older age brackets, 54-90 and 60-65, have fewer respondents. This implies that the teaching workforce in the study is largely composed of actively practicing, mid-career educators rather than nearing retirement.

3.2. Sex

The data shows a significant dominance of female physics teachers (85.71%), compared to male physics teachers (14.29%) in the SDOIN. This reflects the common trend in the Philippines basic education sector where teaching, particularly at the junior high school level, is a female-dominated profession.

3.3. Highest Educational Attainment

The data reveals that a significant number of respondents hold Master's Degrees (38.10%) and Bachelor's Degrees with MA/MS units (38.10%), while 23.80% possess only Bachelor's Degree. Notably, none of the respondents holds a Master's or Doctoral Degree with completed Ph.D./Ed.D. units. This suggests that while many teachers are pursuing or have completed graduate studies, advanced doctoral-level qualifications remain limited, highlighting a potential area for further professional growth.

3.4. Teaching Position

Most respondents are positioned as Teacher III (71.43%), followed by Teacher I (14.29%), and Teacher II (9.52%). Very few have higher positions such as Teacher VI (4.76%), and none are classified as Teacher IV and V. This distribution suggests that the sample is largely composed of teaching staff and a little representation of senior teachers, making their perspective relevant to classroom-based learning.

3.5. Number of Years of Teaching Experience

The data reveals that the teaching experience of the teachers is concentrated within the 5-9 years (35.71%) and 10-14 years (27.78%) ranges. This suggests that most of the teachers have enough teaching experience to become competent educators who are open to teaching innovations. Fewer respondents fall under 0-4 years and 20 years above categories, indicating a balanced representation that leans towards teachers with moderate experience.

3.6. Number of IBL Related Trainings

Regarding professional training, 38.10% of the respondents attended just one training, 7.1% attended two, and 54.76% have no training at all relating to inquiry-based learning. This shows limited exposure to formal inquiry-based learning professional development, which may affect teachers' competence and confidence in implementing inquiry-based strategies in physics classes.

Table 1. Distribution of teachers according to personal and professional characteristics (n=126).

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Characteristics		Frequency, f	Percentage
Age	60-65	3	2.38%
	54-59	7	5.56%
	48-53	12	9.52%
	42-47	23	18.25%
	36-41	34	26.98%
	30-35	27	21.43%
	24-29	20	15.87%
Sex	Male	18	14.29%
	Female	108	85.71%
Highest Educational Attainment	Ed.D./Ph.D.	0	0.00%
	Master's degree with Ed.D./Ph.D.	0	0.00%

Teaching Position	Master's degree	48	38.10%
	Bachelor's degree with MA/MS units	48	38.10%
	Bachelor's degree	30	23.80%
	Teacher VI	6	4.76%
	Teacher V	0	0.00%
	Teacher IV	0	0.00%
	Teacher III	90	71.43%
Number of Years of Teaching Experience	Teacher II	12	9.52%
	Teacher I	18	14.29%
	35-39	1	0.79%
	30-34	1	0.79%
	25-29	5	3.97%
	20-24	8	6.35%
	15-19	19	15.08%
Number of Trainings related to Inquiry-based Learning	10-14	35	27.78%
	5-9	45	35.71%
	0-4	12	9.52%
	2	9	7.14%
	1	48	38.10%
	0	66	54.76%

In PPST Domain 7 (Personal Growth and Development), teachers are expected to actively pursue ongoing learning opportunities to meet the evolving educational demands and improve student outcomes. Yet, the lack of experience and training in IBL (Roslan et al., 2023) is confirmed from this study despite the a majority of teachers are mid-career professionals with moderate experience and graduate education or graduate units.

In addition, Muamaroh and Thoyibi (2025) stated that the teaching position of teachers have no significant difference related to student engagement. Additionally, the longevity in teaching does not have any variation in relation to work engagement or digital competence among teachers (Ogegbo, 2023).

Professional competence involves the ability to function successfully within the given profession. As stated by Widia et al. (2025), teachers who attends various training sessions are more likely to create and modify teaching materials for their students. Additionally, it was further proved by Shakoor et al. (2013) that in-service trainings not only improves teachers competence. It also made them implement the science curricula to students more effectively as well as their attitude towards science teaching.

3.7. Content Knowledge and Pedagogy

Teachers rated themselves highly in content knowledge (4.21), research-based teaching principles (4.07), ICT integration (4.14), and higher-order thinking strategies (4.14). This result suggest strong pedagogical content knowledge, which is central to successful inquiry-based science instruction. Gess-Newsome et al., 2019 indicates that teachers with strong pedagogical content knowledge are better able to scaffold inquiry processes and promote conceptual understanding. Moreover, the high rating in promoting critical and creative thinking is consistent with findings that IBL fosters higher-order thinking when teachers are competent in questioning and facilitation strategies (Villanea, 2023).

3.8. Learning Environment

This domain obtained the highest composite mean, particularly in management of classroom (4.29) and learner safety (4.21). A well-managed and psychologically safe classroom is essential for inquiry, where students are encourage to experiment, hypothesize, and express ideas without the fear of being criticized. Additionally, effective classroom communication (4.10) and support for participation (4.21) further indicate that teachers create logical spaces conducive to scientific discourse. Studies show that positive classroom environment significantly predicts students' engagement in inquiry and collaborative problem solving (Kiemer et al., 2015).

3.9. Diversity of Learners

Although still rated Very Satisfactory, this domain obtained the lowest composite mean. Indicators related to differentiated instruction for learners with special needs (3.90) and those in difficult circumstances (3.86) were comparatively lower. This suggests that teachers may need further professional development in inclusive practices, particularly in responding to socio-economic and contextual diversity common in Philippine classrooms. Especially, Florian and Beaton (2018) underscores that inclusive inquiry requires adaptive scaffolding and differentiated strategies to accommodate diverse learners.

3.10. Curriculum and Planning

Based on the data, there is high ratings in aligning learning outcomes with competencies (4.12) and planning teaching-learning processes (4.12) indicate that teachers are able to operationalize inquiry within curriculum standards. Professional collaboration (4.10) further supports sustained inquiry implementation, as collaborative planning enhances instructional coherence and innovation (Draper, 2015).

3.11. Assessment and Reporting

Teacher demonstrated competence in using assessment data (4.14) and designing strategies (4.10). Inquiry-based assessment emphasizes formative feedback and authentic performance tasks, which align with the high evaluation in feedback provision (4.05). Meñendez et al (2019) and Morris et al. (2021) confirms that formative assessment significantly improves learning outcomes in inquiry settings. Slightly lower ratings in stakeholder communication (3.95) suggest a need to strengthen reporting mechanisms that clearly articulates inquiry-based progress.

3.12. Community Linkages and Professional Engagement

Teachers reported strong adherence to school practice (4.10) and community responsiveness (4.02). Engaging families and communities enhances contextualized inquiry learning, especially in science education where real-world applications are emphasized (Epstein, 2018). However, slightly lower ratings in parental engagement (3.95) indicate opportunities for strengthening collaborative partnerships to support inquiry beyond the classroom.

3.13. Personal Growth and Professional Development

High ratings in philosophy of teaching (4.17) and professional reflection (4.12) suggest that teachers possess reflective position aligned with inquiry pedagogy. Reflective practice is strongly associated with sustained instructional improvement and innovation (Darling-Hammond et al, 2019). Boice et al (2021) confirmed that programs for teacher development, like STEAM, enhances teachers' capacity to refine inquiry strategies and adapt to evolving science education demands.

Table 2: Physics teachers' competence in implementing inquiry-based learning.

Statements	Mean	Descriptive Interpretation
Content Knowledge and Pedagogy		
1. Content knowledge and its application within and across curriculum areas	4.21	Very Satisfactory
2. Research-based knowledge and principles of teaching and learning	4.07	Very Satisfactory
3. Positive use of ICT	4.14	Very Satisfactory
4. Strategies for promoting literacy and numeracy	4.17	Very Satisfactory
5. Strategies for developing critical and creative thinking, as well as other higher-order thinking skills	4.14	Very Satisfactory
6. Mother Tongue, Filipino and English in teaching and learning	4.12	Very Satisfactory
Composite Mean	4.14	Very Satisfactory
Learning Environment		
7. Classroom communication strategies	4.10	Very Satisfactory
8. Learner safety and security	4.21	Very Satisfactory
9. Fair learning environment	4.17	Very Satisfactory
10. Management of classroom structure and activities	4.29	Very Satisfactory
11. Support for learner participation	4.21	Very Satisfactory
12. Promotion of purposive learning	4.17	Very Satisfactory
Composite Mean	4.19	Very Satisfactory
Diversity of Learners		
13. Management of learner behavior	4.12	Very Satisfactory
14. Differentiated teaching to suit learner's gender, needs, strengths, interests, and experiences	3.98	Very Satisfactory
15. Differentiated teaching strategies that are responsive to the learners' linguistic, cultural, socio-economic and religious backgrounds.	3.95	Very Satisfactory
16. Use strategies responsive to learners with disabilities, giftedness and talents.	3.90	Very Satisfactory
17. Demonstrate understanding of the special educational needs of learners in difficult circumstances, including: geographic isolation; chronic illness; displacement due to armed conflict, urban resettlement or disasters; child abuse and child labor practices.	3.86	Very Satisfactory
Composite Mean	3.96	Very Satisfactory
Curriculum and Planning		
18. Planning and management of teaching and learning process	4.12	Very Satisfactory
19. Learning outcomes aligned with learning competencies	4.12	Very Satisfactory
20. Relevance and responsiveness of learning programs	4.10	Very Satisfactory
21. Professional collaboration to enrich teaching practice	4.10	Very Satisfactory
22. Teaching and learning resources including ICT	4.10	Very Satisfactory
Composite Mean	4.11	Very Satisfactory
Assessment and Reporting		
23. Design, selection, organization and utilization of assessment strategies	4.10	Very Satisfactory

24. Monitoring and evaluation of learner progress and achievement	4.05	Very Satisfactory
25. Feedback to improve learning	4.05	Very Satisfactory
26. Communication of learners needs, progress and achievement to key stakeholders	3.95	Very Satisfactory
27. Use of assessment data to enhance teaching and learning practices and programs	4.14	Very Satisfactory
Composite Mean	4.06	Very Satisfactory
Community Linkages and Professional Engagement		
28. Establishment of learning environments that are responsive to community contexts	4.02	Very Satisfactory
29. Engagement of parents and the wider school community in the educative process	3.95	Very Satisfactory
30. Professional ethics	3.92	Very Satisfactory
31. School policies and procedures	4.10	Very Satisfactory
Composite Mean	4.00	Very Satisfactory
Personal Growth and Professional Development		
32. Philosophy of teaching	4.17	Very Satisfactory
33. Dignity of teaching as a profession	4.12	Very Satisfactory
34. Professional links with colleagues	4.10	Very Satisfactory
35. Professional reflection and learning to improve practice	4.12	Very Satisfactory
36. Professional development goals	4.12	Very Satisfactory
Composite Mean	4.13	Very Satisfactory
Overall Mean	4.08	Very Satisfactory

3.14. Relationship between the Physics Teachers' Profile and Level of Competence in Implementing Inquiry-based Learning

Based on the data presented, the findings show different degrees of influence of teacher's profile variables on their competence in implementing Inquiry-Based Learning (IBL) in Physics. The values under the competence indicators and the overall competence score indicate the strength of association between each profile variable and IBL teaching competence.

Among the profile variables, number of IBL-related trainings emerged with highest competence (0.485). This suggests that increased exposure to professional development in IBL correlates with stronger competence in implementing IBL strategies. This finding is consistent with research indicating that effective professional development enhances teachers' pedagogical competence and instructional quality. To further support this claim, Emden et al (2025) found that inquiry-based science teaching framework focusing on experimentation benefits teachers regarding content knowledge and improved classroom practice. Similarly, Garcia-Ruiz et al (2020) conclude that a one month inquiry-based science education (IBSE) training program is effective in designing activities in IBSE. The consistency of positive claims across columns implies that training has a strong and stable contribution to effective IBL implementation.

The highest educational attainment (0.269) and teaching position (0.269) also showed relatively high overall competence values, indicating that advanced academic qualifications and higher professional roles are associates with better IBL competence. This aligns with studies from Atud et al (2025) that higher degrees positively contribute to knowledge and skill competency, providing a direct empirical basis for a positive

correlation between highest attainment and IBL competence. Mansour et al (2024) also identify that formal teacher education as pivotal for competencies in integrated, inquiry-like pedagogies, complements the interpretation that higher qualifications relate to stronger IBL competence. These findings imply that deeper theoretical grounding and greater instructional responsibilities may enhance teachers' capacity to implement inquiry-oriented strategies effectively.

Meanwhile, years of teaching experience (0.180) and age (1.165) exhibit moderate influence, suggesting that experience and maturity contribute to IBL competence, but not strongly as targeted professional training. Though experience can increase confidence and classroom management, research finds that experience alone does not guarantee improved pedagogical competence unless it is coupled with reflective practice and on going development (Mansour et al, 2024 and Atud et al, 2025).

Notably, sex registered the lowest overall competence value (0.046), indicating that competence in implementing IBL is largely independent of gender. This shows that sex is negligible association with competence, suggesting that male and female teachers are equally capable of implementing IBL when other factors, such as training, education, and experience, are accounted for. This support research from Atud et al (2025) and Aksoy (2020), indicating that gender is not a strong predictor of teaching competency and understanding of inquiry in science education.

Table 3. Correlation coefficients of Physics teachers' profile and their competence in implementing IBL.

Profile Variable	Competence of Physics Teachers in Implementing IBL							Overall Competence
	1	2	3	4	5	6	7	
Sex	0.045	0.048	0.040	0.042	0.043	0.050	0.047	0.046
Age	0.178	0.162	0.150	0.155	0.168	0.170	0.175	0.165
Years of Teaching Experience	0.190	0.182	0.170	0.175	0.180	0.185	0.188	0.180
Highest Educational Attainment	0.310	0.300	0.275	0.290	0.285	0.280	0.305	0.295
Teaching Position	0.265	0.270	0.260	0.275	0.268	0.263	0.270	0.269
Number of IBL-related Trainings	0.480	0.500	0.460	0.470	0.490	0.470	0.495	0.485

The data strongly indicate that professional development, particularly IBL-focused training, is the most influential factor in enhancing Physics teachers' competence in implementing inquiry-based instruction. Additionally, academic qualifications and instructional roles contribute positively, while demographic variables such as age and gender have minimal impact on competence. This aligns with broader research showing that quality training and continuous professional learning are critical scaffolds for improving teacher practice, especially for student-centered pedagogies like IBL.

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