

Teachers' Competence in Teaching Science: A Cornerstone for Professional Development.

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Abstract

This study assessed the teaching competence of Grade 5 teachers teaching Science in Ambaguio, Nueva Vizcaya, focusing on their knowledge, skills, attitudes, and the factors affecting their competence. Anchored on the Input-Process-Output (IPO) framework, the study employed a descriptive research design using a researcher-made, validated questionnaire administered to purposively selected Science teachers. Data were analyzed using frequency, percentage, and weighted mean to describe the respondents' profile and evaluate their teaching competence. The findings revealed that the respondents were predominantly experienced, middle-aged, married female teachers who actively pursued professional development and demonstrated strong commitment to the teaching profession. The respondents exhibited a very evident level of competence in terms of knowledge (WM = 4.65), skills (WM = 4.64), and attitudes (WM = 4.40), particularly in lesson planning, content development, instructional delivery, communication, learner engagement, collaboration, fairness, and professionalism. However, the factors affecting teaching competence were perceived as moderately serious (WM = 2.70), with administrative workload, limited instructional resources, insufficient training opportunities, unclear operational procedures, and performance appraisal processes identified as the primary concerns. The study concluded that while Science teachers demonstrate a high level of teaching competence, continuous institutional support and professional development remain necessary to sustain and further enhance instructional effectiveness. Accordingly, the study recommends continuous professional development, strengthened collaboration among teachers, improved administrative support, adequate instructional resources, enhanced parent-school communication, mentoring initiatives, and regular feedback mechanisms to further improve teaching competence. This study supports Sustainable Development Goal (SDG) 4: Quality Education by promoting teacher competence as a key component of quality Science instruction. It also contributes to educational and institutional sustainability by providing evidence that can guide teacher development initiatives, strengthen instructional practices, and promote continuous improvement in educational quality.

Keywords: Competence, Knowledge, Science Teachers, Skills, Teaching Competence, Teachers' Attitudes

1. Introduction

Teacher competence is essential to improving the quality of Science education and student learning. Effective Science teaching requires adequate knowledge, instructional skills, and positive professional attitudes that enable teachers to respond to changing educational demands. Recognizing the influence of teacher competence on educational outcomes, this study examines the competence of Grade 5 teachers teaching Science in Ambaguio, Division of Nueva Vizcaya and the factors affecting their competence.

1.1 Background of the Study

Teachers are central to educational success, and their competence significantly influences student achievement (Hanushek, Kain, and Rivkin, 1998). Teacher competence encompasses knowledge, skills, attitudes, professional values, and the ability to apply these effectively in diverse teaching situations (Drucker, 1985; Boyatzis, Stubbs, and Taylor, 2002; Spencer and Spencer, 1993; Zarifian, 1999; McClelland, 1973; Fleury and Fleury, 2000). Despite extensive research, questions remain regarding the competencies required for effective Science teaching, highlighting the need to assess teachers' competence in terms of knowledge, skills, attitudes, and influencing factors (Lanier & Little, 1986; Koster, Brekelmans, Korthagen, & Wubbels, 2005).

1.2 Themes and Insights from Related Literature

The literature identifies teacher competence as a combination of subject mastery, pedagogical knowledge, instructional skills, classroom management, communication, professional commitment, and continuous learning. Effective teachers employ appropriate teaching strategies, motivate learners, assess learning effectively, and collaborate with students, parents, and colleagues (Mann, 1980; Balachandran, 1981; McBer 2000; Jasman 2002; Anderson 2004; Harslett et al.2000;

Everston and Randolph 1999; Wang et al. 1999). Studies also emphasize that professional competence integrates knowledge, skills, beliefs, values, and reflective practice, making continuous professional development essential for teaching effectiveness (Goodman et al., 2008; Oser, Achtenhagen, & Renold, 2006; Turner-Bisset 2001; Shulman 1986; Shulman 1987).

1.3 Local, National, and Global Context

Globally, teacher competence is recognized as a key factor in improving educational quality. Research emphasizes that effective teachers possess strong subject knowledge, pedagogical competence, classroom management skills, and positive professional attributes that enhance student learning (Abulon, 2014; Carey, 2004; Mansour, 2010b). Nationally, the professional development of Science teachers remains a priority, encouraging continuous learning through seminars, trainings, and Learning Action Cell (LAC) sessions to strengthen both content and pedagogical knowledge (Obikan for Research and Development, 2010; Damayon, 2018). Locally, challenges such as weak lesson planning, limited contextualization of instruction, and ineffective assessment practices continue to affect Science teaching, highlighting the need to assess teachers' competence and identify factors that influence instructional effectiveness (Hudson, 2008; Clinchy, 2012; Fullan, 2012).

1.4 Theoretical or Conceptual Basis

This study is anchored on the Input-Process-Output (IPO) framework. The input consists of teachers' demographic profile, competence in terms of knowledge, skills, and attitudes, and the factors affecting their competence. The process involves the continuous monitoring and evaluation of Science teachers' competence, while the output focuses on strengthening teacher competence to improve Science instruction in Ambaguio District, Division of Nueva Vizcaya. The framework provides a systematic basis for examining teacher competence and identifying areas for professional improvement.

1.5 Research Gaps and Rationale

Although numerous studies have examined teacher competence and effective teaching, limited attention has been given to evaluating the specific competencies of secondary Science teachers and the factors influencing their competence in local school settings. This study addresses this gap by assessing teachers' knowledge, skills, attitudes, and the factors affecting their competence in teaching Science in Elementary schools in Ambaguio District, providing evidence that may guide teacher development initiatives.

1.6 Alignment with Relevant Sustainable Development Goals (SDGs)

This study supports SDG 4 – Quality Education by promoting teacher competence as a foundation for improving Science instruction and student learning. Strengthening teachers' knowledge, skills, and attitudes contributes to quality, equitable, and effective education.

1.7 Importance of the Study to Multidisciplinary Sustainability

The study contributes to educational and institutional sustainability by providing evidence that can support teacher professional development, improve instructional practices, and strengthen Science education. Enhanced teacher competence benefits schools, teachers, students, and educational stakeholders by promoting continuous improvement and long-term educational quality.

2. Material and methods

2.1 Research Design

This study utilized a descriptive research design to determine the teaching competence of Grade 5 teachers teaching Science. The descriptive survey method was appropriate because it described the teachers' current level of competence in terms of knowledge, skills, attitudes, and the factors affecting their competence without establishing causal relationships. This design provided a comprehensive description of the existing conditions related to Science teaching.

2.2 Locale of the Study

The study was conducted in Elementary schools in Ambaguio, Nueva Vizcaya. The locale was selected because of its accessibility and proximity to the researcher's workplace, facilitating efficient data collection and coordination with the respondents. Nueva Vizcaya consists of fifteen municipalities with numerous Elementary schools serving different districts. Ambaguio is recognized for its agricultural resources, cultural heritage, and peaceful community, providing an appropriate setting for examining the competence of Science teachers within the local educational context.

2.3 Respondents of the Study

The respondents were Grade 5 teachers teaching Science from Elementary schools in Ambaguio, Nueva Vizcaya. They were chosen because of their direct involvement in teaching Science and their ability to provide relevant information regarding teaching competence.

2.4 Sample and Sampling Procedure

The study employed purposive sampling, a non-probability sampling technique in which respondents were intentionally selected based on their relevance to the objectives of the study. This approach ensured that only Science teachers with appropriate teaching experience participated, allowing the researcher to obtain focused and meaningful data regarding their competence.

2.5 Research Instrument

Data were collected using a researcher-made survey questionnaire developed with the guidance of the research adviser and validated by experienced teachers from other Elementary schools who were not included in the study. The instrument consisted of two parts: the first gathered the respondents' demographic profile, while the second assessed teachers' competence in terms of knowledge, skills, attitudes, and the factors influencing their teaching competence. Responses were measured using a five-point Likert scale. Teaching competence was interpreted using qualitative descriptions ranging from Least Evident to Very Evident, while the factors affecting teaching competence were interpreted using qualitative descriptions ranging from Least Serious to Very Serious. These rating scales provided a standardized basis for evaluating teachers' competence and the extent of factors influencing their effectiveness in teaching Science.

2.6 Data Gathering Procedure

After obtaining approval from the Schools Division Superintendent through the respective school principals, the researcher personally administered the questionnaires to the selected Science teachers. Respondents were informed that all information gathered would remain confidential in accordance with the Data Privacy Act, encouraging honest and voluntary participation. The completed questionnaires were personally retrieved by the researcher to ensure complete data collection.

2.7 Data Analysis Techniques

The collected data were classified, organized, and analyzed according to the objectives of the study. Frequency counts and percentage distributions were used to describe the respondents' demographic profile, while the weighted mean was utilized to determine the overall level of teaching competence and the extent of factors affecting teachers' competence in teaching Science. These statistical techniques facilitated the objective interpretation of the survey responses.

3. Results and Discussion

3.1 Profile of the Respondents

3.1.1 Gender Distribution

The respondents were predominantly female, comprising 75% of the participants, while males accounted for 25%. This indicates that female teachers constitute the majority of Science teachers in the selected public secondary schools. The predominance of female teachers reflects the continuing trend of female representation in the teaching profession. This demographic profile highlights the importance of providing equal professional development opportunities for all teachers to continuously strengthen their competence in Science instruction.

3.1.2 Age Distribution

Most respondents (50%) were between 36 and 40 years old, followed by 31–35 years old (25%). Teachers aged 26–30 years and 41 years and above each represented 10%, while only 5% belonged to the 20–25 age group. The findings indicate that most respondents are experienced, mid-career educators. The age profile suggests that respondents possess sufficient teaching experience that may contribute to stronger pedagogical competence. It also indicates the need for continuous professional development programs that address the varying needs of teachers across different career stages.

3.1.3 Civil Status

The majority of respondents (90%) were married, while only 10% were single. This indicates that most teachers have established family responsibilities alongside their professional roles. Being predominantly married may contribute to greater maturity, responsibility, and commitment in the teaching profession. These personal characteristics can positively influence classroom management, professional behavior, and participation in continuous professional development.

3.1.4 Highest Educational Attainment

Most respondents (60%) had earned units toward a master's degree, while 25% had completed a master's degree. Only 10% held a bachelor's degree, and 5% had doctoral units. These findings demonstrate that the majority of teachers are pursuing

advanced studies. The respondents' educational attainment reflects their commitment to lifelong learning and professional growth. Pursuing graduate education strengthens teachers' content knowledge and instructional competence, supporting improved teaching effectiveness, consistent with the findings of Zhang (2008).

3.1.5 Length of Teaching Experience

Half of the respondents had more than eleven years of teaching experience, while the remaining teachers were distributed across lower experience categories. This indicates that the majority are experienced educators. Extensive teaching experience enables educators to refine instructional strategies, classroom management, and learner engagement. As emphasized by Bancual (2019), experience complements academic preparation by strengthening teachers' professional knowledge and instructional competence.

3.1.6 Latest Performance Rating

Most respondents (90%) received an Outstanding performance rating, while 10% were rated Very Satisfactory. None received lower ratings. These results indicate consistently high professional performance among the respondents. The high performance ratings demonstrate teachers' commitment to quality instruction and professional excellence. Performance evaluation provides valuable feedback that supports continuous improvement and motivates teachers to sustain high standards in teaching.

3.1.7 Seminars and Trainings Attended

Most respondents attended seminars and trainings at the division level (50%), followed by the national (25%), regional (15%), and school levels (10%). None had attended international training programs. The findings indicate active participation in professional development activities, primarily within local and national contexts. Participation in seminars and trainings demonstrates teachers' commitment to continuous professional development. Such learning opportunities enhance pedagogical competence and support the implementation of current educational practices, consistent with the Department of Education's emphasis on continuing professional development through Department Order No. 50, s. 2016.

3.2 Teaching Competence of Secondary Science Teachers

3.2.1 Knowledge-Based Teaching Competence

The respondents demonstrated a very evident level of knowledge-based teaching competence, with an overall weighted mean of 4.65. The highest-rated competencies were preparing and executing teaching plans, developing subject content, and designing appropriate evaluation procedures. Teachers also reported high competence in constructing higher-order questions, utilizing various teaching methodologies, seeking feedback, organizing classes effectively, assigning responsibilities to learners, and understanding cultural diversity. The findings indicate that the respondents possess strong pedagogical knowledge necessary for effective Science instruction. Their ability to integrate lesson planning, content development, assessment, and instructional strategies reflects sound professional preparation. This supports the view of Kennedy (1990) and Turner-Bisset (2001) that effective teaching depends not only on content knowledge but also on the integration of pedagogical and contextual knowledge. Continuous professional development and reflective practice remain essential in sustaining and enhancing these competencies.

3.2.2 Skill-Based Teaching Competence

The respondents likewise exhibited a very evident level of skill-based teaching competence, obtaining an overall weighted mean of 4.64. Communication skills received the highest rating, followed by the ability to gain learners' attention, provide timely feedback, encourage learners to monitor their progress, and utilize diverse teaching methods, including technology. Teachers also demonstrated competence in inspiring learners, fostering creativity and analytical thinking, managing time effectively, and maintaining enthusiasm in teaching. These findings suggest that the respondents possess the instructional skills needed to facilitate meaningful learning experiences. Effective communication, learner engagement, feedback, and instructional flexibility are essential competencies that support quality Science instruction. Consistent with Parry (1996), competence extends beyond knowledge to include the application of skills and attitudes that can be strengthened through continuous training and professional development.

3.2.3 Attitudinal-Based Teaching Competence

The respondents demonstrated a very evident level of attitudinal competence, with an overall weighted mean of 4.40. They rated highest in avoiding discrimination, cooperating with school personnel, parents, and students, and treating learners with respect. They also showed willingness to pursue professional growth, collaborate with colleagues, demonstrate responsibility, and work toward common institutional goals. Lower ratings were observed in punctuality and being friendly and understanding, although these remained within acceptable levels. The results indicate that positive professional attitudes significantly contribute to effective teaching. Respect, fairness, collaboration, and commitment strengthen teachers' relationships with learners and stakeholders while promoting a supportive learning environment. These findings support Nadine J. Kaslow et al. (2012), who emphasized that teaching competence includes transformational leadership qualities rooted in positive attitudes and values. Likewise, Mann (1980), Coladarsi (2002), Harslett et al. (2000), Drucker

(1985), Chen and Rovegno (2000), Darling-Hammond (2000), and Tobias Ley and Albert D. (2003) highlighted that teachers' attitudes influence professional commitment, instructional effectiveness, and continuous professional growth.

3.3 Factors Affecting Teaching Competence

3.3.1 Factors Influencing the Teaching Competence of Science Teachers

The respondents perceived the factors affecting their teaching competence as moderately serious, with an overall weighted mean of 2.70. The most influential factors were the interference of ancillary services with teaching responsibilities, insufficient infrastructure and instructional resources, limited training and development opportunities, unclear operating procedures, personal demands in meeting organizational needs, and performance appraisal processes. Less serious concerns included inappropriate subject loads, organizational issues, acceptance of responsibilities, and unwillingness to adopt new teaching methodologies. The findings indicate that teachers' competence is influenced not only by individual capability but also by organizational and institutional conditions. Administrative workload, inadequate resources, limited professional development opportunities, and unclear policies may reduce teachers' effectiveness in delivering quality Science instruction. Addressing these concerns through adequate institutional support, relevant training programs, sufficient instructional resources, and fair performance evaluation can strengthen teachers' professional competence. Continuous organizational commitment to teacher development is therefore essential in fostering quality instruction and improving student learning outcomes.

4. Conclusion & Recommendations

The study found that the respondents were predominantly experienced, middle-aged, married female teachers who actively pursued professional development and demonstrated strong commitment to their profession. They exhibited a very evident level of teaching competence in terms of knowledge, skills, and attitudes, particularly in lesson planning, content development, instructional delivery, communication, learner engagement, collaboration, fairness, and professionalism. Although organizational concerns, limited resources, and professional development opportunities moderately affected their teaching competence, the respondents remained committed to continuous improvement, indicating that strengthening institutional support and professional development can further enhance the quality of Science instruction.

The study recommends sustaining continuous professional development through relevant trainings on innovative teaching strategies, technology integration, assessment practices, and classroom management. Schools should strengthen collaboration among teachers through professional learning communities and mentoring programs, improve communication with parents, recognize teachers' professional contributions, provide adequate instructional resources and administrative support, and implement regular feedback and evaluation mechanisms to further enhance teachers' competence and instructional effectiveness.

The study was limited to Grade 5 teachers teaching Science in Ambaguio, Nueva Vizcaya, and focused only on their demographic profile, teaching competence in terms of knowledge, skills, and attitudes, and the factors affecting their competence using a descriptive survey and self-reported questionnaire. Consequently, the findings are specific to the respondents and study setting and may not be generalized beyond the population covered by the research.

Compliance with ethical standards

The author declares no conflict of interest. This study received no external funding. The author acknowledges the cooperation of the participating Science teachers, school principals, and the Schools Division Office of Nueva Vizcaya for their support in the conduct of the study. Participation in this study was voluntary, and informed consent was obtained from all respondents prior to data collection. Data were collected through non-invasive survey questionnaires, and all information was treated with strict confidentiality in accordance with the Data Privacy Act, with no identifying information disclosed. The authors declare no conflict of interest.

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