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Synergizing Science Preservice Teachers' Competence and Deployment Preparedness: Catalyst to Success

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Abstract

Readiness to teach is a major outcome of teacher preparation, especially in the area of science education where the combination of content knowledge, pedagogy and technology is critical to effective teaching . However, there is a lack of empirical evidence on the manifestation of levels of these competences among the preservice teachers in developing environments. The study aimed to examine the pre-deployment preparedness, technical competence, implementation of the science curriculum and readiness to teach of preservice science teachers in the Philippine teacher education framework. The study employed a quantitative descriptive study technique. Using a validated questionnaire, data were obtained from 206 preservice science teachers and 206 cooperating teachers coming from selected teacher education institutes in Davao City. The analyses were performed via descriptive statistics. Findings showed very high levels of pre-deployment preparedness.

Keywords: teaching readiness, pre-deployment preparedness, technological competence, curriculum implementation, preservice teachers

Introduction

Teaching science requires teachers' expertise of subject matter, pedagogy, and technology integration. Pre-service teachers need content knowledge and the ability to implement instructional strategies in diverse, active learning situations. The literature so far highlights the importance of pre-deployment training for teacher competence and confidence (Darling-Hammond et al., 2020) [3]. Teachers' knowledge of the curriculum also allows them to translate content into relevant learning experiences (Deng, 2021) [5]. Technology competency is a factor that leads to the development of education delivery and student engagement (Backfisch et al., 2024; Vilarinho-Pereira et al., 2024) [3, 14].

Nevertheless, there is still a gap in knowledge on how these competencies are manifested in terms of levels among preservice science teachers, especially in the Philippine setting. This study addresses this gap by examining pre-deployment preparedness, technological competence, curriculum implementation and teaching readiness.

Methodology

The study used a quantitative descriptive research method for the determination of the levels of pre-deployment preparedness, curriculum implementation, technical competence and teaching readiness of preservice science teachers. The respondents of the study were 206 preservice science teachers who have

undergone teaching internship and 206 cooperating teachers from selected teacher education institutes in Davao City. Purposive sampling was utilized to include only those participants with relevant internship experience. The data were collected using a researcher-developed questionnaire, which was validated by experts and piloted. The instrument was found to be internally consistent as evidenced by the Cronbach's alpha coefficients for all constructs which ranged from 0.962 to 0.991 indicating excellent reliability. Institutional clearances and informed consent of all subjects were taken as ethical procedures for data collection. The data collected was analyzed using descriptive statistics of mean and standard deviation for the values of the variables.

Results

Table 1: Level of Pre-deployment Preparedness of Science Pre-service Teachers

Indicators	Mean	SD	Interpretation
Alignment of Pre-Service Standards	4.38	0.65	Very High
Engagement in Reflective Practice	4.35	0.73	Very High
Development of Critical Thinking and Problem-Solving Skills	4.30	0.66	Very High
Exposure in Teaching Methodology	4.28	0.73	Very High
Participation in Training and Seminar	4.22	0.81	Very High
Overall Mean	**4.30**	**0.64**	**Very High**

Table 1 presents the pre-deployment level of preparedness of science pre-service teachers in five crucial areas. Generally, science pre-service teachers felt very well prepared (M = 4.30, SD = 0.64) indicating a good foundation of readiness prior to classroom deployment. The highest rated features were alignment with pre-service standards (M = 4.38) and engagement in reflective practice (M = 4.35). This indicates that teacher education programs are successful in developing professional alignment and reflective abilities. The least scoring item was participation in training and seminars (M = 4.22). This was again in an extremely high range, which indicates a continual and intensive preparation of the science pre-service teachers.

Table 2: Level of Implementation of Science Curriculum of Science Pre-service Teachers

Indicators	Mean	SD	Interpretation
Engagement and Practical Experience	4.47	0.76	Very High
Integration of Cross-Disciplinary Concepts	4.46	0.70	Very High
Integration of Scientific Skills	4.39	0.74	Very High
Alignment with National Standards	4.38	0.70	Very High
Content Knowledge	4.31	0.74	Very High
Overall Mean	**4.40**	**0.67**	**Very High**

Table 2 illustrates the level of implementation of science curriculum by pre-service teachers. The total mean (M = 4.40, SD = 0.67) showed a high level of implementation, as respondents could appropriately incorporate curriculum standards in their classroom practice. The most powerful dimensions were engagement and practical experience (M = 4.47) and integration of cross-disciplinary concepts (M = 4.46), indicating a focus on experiential and interdisciplinary learning. Content knowledge (M = 4.31) is on the

other hand the lowest of the three, but still has a very high rating, which indicates that the subject matter required for effective teaching is known.

Table 3: Level of Technological Competence of Science Pre-service Teacher

Indicators	Mean	SD	Interpretation
Multimedia Resources for Science Instruction	4.39	0.74	Very High
Problem-Solving Skills	4.37	0.73	Very High
Continuous Learning and Adaptability	4.34	0.73	Very High
Educational Technology	4.29	0.77	Very High
Laboratory Equipment	4.27	0.71	Very High
Overall Mean	**4.33**	**0.67**	**Very High**

Table 3 shows the level of technological skill of science pre-service teachers by five parameters. The overall average score (M = 4.33, SD = 0.67) shows that the participants are proficient in the use of technology for education. The highest rated multimedia resources were those related to science instruction (M = 4.39) and problem-solving skills (M = 4.37), suggesting a strong ability to integrate digital resources and to solve instructional problems. Laboratory equipment (M = 4.27) is relatively low but also demonstrates very high level of competency. This shows that pre-service teachers have enough skills to deal with the digital as well as hands-on technology applications.

Table 4: Level of Teaching Readiness of Science Pre-service Teacher as Perceived by the Science Pre-Service Teachers

Indicators	Mean	SD	Interpretation
Communication Skills	4.46	0.71	Very High
Assessment and Evaluation	4.42	0.71	Very High
Classroom Management	4.37	0.73	Very High
Content Knowledge	4.33	0.69	Very High
Pedagogical Knowledge	4.33	0.71	Very High
Overall Mean	**4.38**	**0.67**	**Very High**

Table 4 presents the self-assessment of the level of teaching readiness of science pre-service teachers. The mean (M = 4.38, SD = 0.67) is a very high level of preparedness. This implies that science pre-service teachers feel prepared to perform teaching duties. The highest rated categories were communication skills (M = 4.46) and assessment and evaluation (M = 4.42) which indicate good instructional and evaluative competencies. Pedagogical knowledge and content knowledge (both M = 4.33) were scored much lower but still in the very high range, indicating continuous preparation in all areas.

Table 5: Level of Teaching Readiness of Science Preservice Teacher as Perceived by the Cooperating Teachers

Indicators	Mean	SD	Interpretation
Assessment and Evaluation	4.43	0.78	Very High
Communication Skills	4.43	0.80	Very High

Content Knowledge	4.41	0.78	Very High
Pedagogical Knowledge	4.39	0.78	Very High
Classroom Management	4.37	0.80	Very High
Overall Mean	**4.41**	**0.76**	**Very High**

Table 5 shows the level of teaching readiness of science pre-service teachers as perceived by cooperating teachers. The overall mean (M = 4.41, SD = 0.76) indicates a very high level of preparation, thereby corroborating good external assessments of the science pre-service teachers' teaching competencies. The assessment and evaluation and the communication skills (both M = 4.43) were ranked best, indicating good competence in instructional delivery and contact with students. Classroom management (M = 4.37) is the lowest but still in the very high range, showing that the pre-service teachers are well-prepared in all aspects of the teaching practice.

Discussion

The results show that pre-service science teachers have a very high level of proficiency in all areas, and this means that the current teacher education programs are effective. The very high level of pre-deployment preparedness is indicative that the teacher preparation programs have been successful in integrating organized training, reflective practice and alignment with professional norms. This lends support to the statement that good professional development programs are crucial in improving teachers' efficacy, confidence, and readiness to implement classroom instruction (Darling-Hammond et al., 2020; Shulman & Shulman, 2021) [3, 13]. Furthermore, reflective engagement and alignment with standards are essential components of good teaching practice, contributing to preservice teachers' professional identity construction and lifelong learning (Shulman & Shulman, 2021; Marangio et al., 2024) [13, 10].

The high level of the curriculum implementation also fulfills the preservice teacher competency to implement the theoretical knowledge into meaningful classroom practices. The results suggest that the learning experience and the training through practicum are necessary to close the gap between theory and practice. Preservice teachers' field experiences involve teaching demonstrations, classroom observations, and supervised practice teaching which help them to internalize instructional ideas and implement them into practice in real classroom environments (Fitzsimons et al., 2025; Ibrahim et al., 2025) [6, 8]. Furthermore, the introduction of interdisciplinary concepts and scientific abilities shows a greater emphasis on inquiry-based and interdisciplinary science education approaches, which are essential for developing higher-order thinking skills in students (Marangio et al., 2024; Ajani, 2024) [10, 1].

Likewise, the rising level of technological literacy reflects the increasing demand for digital literacy and technology inclusion in school. The preservice teachers' use of multimedia resources, instructional technologies and problem-solving skills demonstrates their preparedness to perform well in technology-enhanced learning contexts. This is in line with recent research that have suggested a beneficial effect of technological fluency on instructional delivery, student engagement and learning outcomes (Backfisch et al., 2024; Redecker & Punie, 2024) [2, 12]. In addition, the need of developing flexible and lifelong learning skills among educators highlights the need for educators to be adaptable to respond to rapid changes in technology and evolving educational needs (Redecker & Punie, 2024; Momdjian et al., 2025) [12, 11].

Both the self-assessment of science pre-service teachers and the evaluations provided by cooperating teachers consistently indicate a very high level of teaching readiness, hence indicating the success of

teacher education programs in preparing future teachers for their teaching profession. Assessment of both types of participants is valid since the preservice teachers feel confident of their abilities and are effective in practicing their teaching in the classroom setting. Teaching practice under supervision and mentorship in the classroom are very instrumental in improving preparedness and professionalism (Fitzsimons et al., 2025; Ibrahim et al., 2025) [6, 8]. Skills in communicating, evaluating, and classroom management form the building blocks of teaching skills (Funa et al., 2023; Shulman & Shulman, 2021) [7, 13].

The result suggest that in order to take science teachers as competent and practice-ready, there is a need of well-defined teacher education programs which incorporate structured training within using technology along with the implementation of curriculum. These findings reinforce the need to continue investing in experiential learning, curriculum alignment and technology integration so that preservice teachers are fully prepared for 21st-century classrooms.

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