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Technology-Enabled Active Learning Practices and Readiness: Basis for Instructional Supervision Plan in Elementary Special Program

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ABSTRACT

This study examined technology-enabled active learning practices and teacher readiness in the Special Program in Science at Minglanilla Central Elementary School, Minglanilla, Cebu, during school year 2025–2026, as the basis for an instructional supervision plan. A descriptive-correlational design was employed, drawing on adapted survey responses from 22 public elementary school teachers. Frequencies, percentages, weighted means, and Pearson product–moment correlation coefficients were used to describe respondents' characteristics, four dimensions of active-learning perceptions, four readiness dimensions, and their relationships with teacher profile variables. Respondents strongly agreed with the potential of technology-enabled active learning for interactive engagement (M = 4.68), problem-solving (M = 4.55), interest (M = 4.52), and feedback (M = 4.52). Readiness was highest in the attitudinal dimension (M = 4.66), followed by instructional (M = 4.22), pedagogical (M = 4.14), and technological readiness (M = 4.00). Training and seminars attended were significantly and positively related to perceptions (r = .47, p = .027) and readiness (r = .51, p = .016). Age, gender, educational attainment, and years of service had no statistically significant associations with either outcome in the reported analysis. These findings informed a proposed instructional supervision plan emphasizing hands-on technology training, peer coaching, classroom-focused feedback, and technical assistance. The findings reflect self-reported perceptions and associations rather than verified effects on student achievement.

Keywords: *technology-enabled active learning; teacher readiness; instructional supervision; educational technology; elementary science education; professional development*

INTRODUCTION

Active learning in elementary education requires students to participate in inquiry, dialogue, investigation, feedback, and collaborative problem-solving rather than rely solely on information delivery. Digital technologies can create additional opportunities for such engagement, but the availability of devices alone does not establish whether instruction becomes more participatory. Teachers must be prepared to select appropriate digital tools, organize inquiry-oriented tasks, assess learning, and maintain meaningful social interaction. The technology-enabled active learning construct therefore places technology within the wider purpose of engaging learners in active and reflective experiences (Shroff et al., 2019; Zhang et al., 2025).

The need for teacher readiness becomes especially pertinent in a science-focused elementary program, where simulations, digital assessment, collaborative exploration, and rapid feedback may support classroom inquiry. Readiness includes technological knowledge and operational capability, but it also extends to pedagogical decision-making, instructional implementation, and attitudes toward adopting new tools. Mishra and Koehler

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(2006) described effective technology-supported teaching as an interaction among content, pedagogy, and technological knowledge. The framework provides a basis for understanding why a teacher who uses technology confidently may still require support in designing developmentally appropriate learning tasks.

Research on educational technology indicates that teachers' intentions and practices are shaped by perceived usefulness, preparedness, and professional conditions (Scherer et al., 2019; Yue et al., 2024). In Philippine contexts, technology integration may also be constrained by uneven infrastructure and opportunities for professional learning, as observed in vocational education settings (Sumaoy et al., 2026). This suggests that school-based improvement efforts should examine both teachers' reported practices and their perceived readiness rather than assume that advanced educational qualifications or years of service necessarily translate into technology-enabled instruction.

The source thesis identified a local knowledge gap concerning the joint examination of active-learning perceptions and multidimensional readiness among teachers in an elementary Special Program in Science. Accordingly, this study assessed the profile of participating teachers, their perceptions of technology-enabled active learning in interactive engagement, problem-solving, interest and feedback, and their readiness across technological, pedagogical, instructional and attitudinal dimensions. It also tested whether the teachers' profiles were associated with perceptions and readiness at the .05 significance level. The practical goal was to design an instructional supervision plan aligned with the observed needs, not to claim that the plan had already improved learning outcomes.

Literature Review

Technology-Enabled Active Learning and Constructivist Instruction

Technology-enabled active learning is an instructional orientation that uses digital environments to facilitate participation, interaction, inquiry, feedback, and reflection. Drawing on constructivist conceptions of learning, Vygotsky (1978) placed social interaction and mediated learning at the center of the development of understanding. Within technology-supported science instruction, these perspectives invite teachers to treat digital tools as resources for scaffolding collaboration and problem-solving, not as substitutes for teachers' pedagogical judgment.

Shroff et al. (2019) developed and validated a framework for students' perceptions of technology-enabled active learning that explicitly comprised interactive engagement, problem-solving skills, interest, and feedback. These four dimensions are directly relevant to the questionnaire structure used in the source thesis. The framework permits a more detailed assessment than a general question about whether teachers like technology, although adapted measures may require separate validation when transferred to new respondent groups and settings.

Zhang et al. (2025) found that a structured technology-enhanced active learning environment could support preservice teachers' TPACK and technology beliefs. Meanwhile, Bond et al. (2020) mapped studies connecting educational technology and student engagement in higher education. Taken together, this literature supports the educational promise of purposeful technology-supported activity while indicating that evidence from other levels and populations should not be treated as direct proof of effects in the present elementary program.

Technological, Pedagogical, and Instructional Readiness

The Technological Pedagogical Content Knowledge framework conceptualizes meaningful technology integration as the coordination of knowledge of subject matter, teaching methods, and technological tools (Mishra & Koehler, 2006). Koehler et al. (2013) emphasized that these elements interact in situated and often complex classroom settings. In elementary science teaching, technological competence might enable teachers to operate a platform, whereas pedagogical and instructional readiness guide their decisions about when, why, and how the tool should support a learning objective.

Digital competence frameworks also identify professional engagement, educational resources, teaching and learning, assessment, and learner empowerment as areas for teacher development (Redecker, 2017).

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UNESCO's ICT Competency Framework for Teachers similarly offers a scaffold for strengthening classroom use of technology and institutional capacity (UNESCO, 2018). Such frameworks underscore that readiness is not a single fixed characteristic; it represents multiple areas that may require differentiated professional support.

Basilotta-Gómez-Pablos et al. (2022) synthesized research on educators' digital competencies, including the role of knowledge, skills, and attitudes. Yue et al. (2024) examined teachers' TPACK readiness and attitudes toward artificial intelligence education, demonstrating the value of examining both technical preparedness and disposition. This supports the source study's decision to consider attitudinal readiness separately from technological, pedagogical, and instructional dimensions.

Teacher Characteristics and Professional Learning

Professional background may shape opportunities for technology use, although age, years of service, and educational attainment do not necessarily determine teachers' willingness to adopt or integrate educational technology. In meta-analytic work, Scherer et al. (2019) connected teachers' educational technology adoption with perceived usefulness, attitudes, and related acceptance mechanisms. Scherer and Teo (2019) likewise highlighted that relationships between technology acceptance indicators vary across studies and settings. These patterns justify empirical examination rather than presuming uniform demographic effects.

Evidence from technology-integration research also suggests that institutional circumstances and access to meaningful professional support matter. UNESCO (2023) emphasized that educational technology should be selected with attention to relevance, equity, quality, and learners' actual needs. Sumaoy et al. (2026), in a Philippine TVE context, reported favorable pedagogical perceptions alongside differences in infrastructure-related conditions. Such findings provide relevant context for assessing how teachers can be supported within one school, although the contexts are not identical.

Effective professional development requires more than isolated workshops. Desimone (2009) called for a coherent account of professional development content, active learning, collaboration, duration, and links to instructional practice. For an elementary science program, training can therefore be paired with demonstration lessons, peer mentoring, observation feedback, and opportunities to rehearse digital assessment and classroom troubleshooting. This approach complements the present study's intent to translate questionnaire results into a practical instructional supervision plan.

Instructional Supervision and Study Framework

Instructional supervision may serve a developmental role by identifying instructional needs, providing actionable feedback, and creating opportunities for supported classroom improvement. Wiyono et al. (2021) examined ICT use in instructional supervision and its association with instructional process quality, illustrating how technology can form part of supervision itself. The emphasis is especially pertinent where teachers report stronger willingness to adopt technology than confidence in troubleshooting and implementation.

The adopted instruments also merit attention. Woldemariam et al. (2025) developed and validated an educational technology integration instrument for teacher educators, while Shroff et al. (2019) validated a separate technology-enabled active learning perception instrument. Both publications support instrument development in their original contexts; neither automatically establishes psychometric validity for the adapted teacher questionnaire in Minglanilla. The resulting findings should consequently be interpreted as descriptive evidence from the participating teachers.

In the source thesis, the conceptual framework links constructivist learning theory, TPACK, the SAMR model, and cited Philippine legal bases with perceptions and readiness in technology-enabled active learning, culminating in an instructional supervision plan. The original framework is reproduced in Figure 1, retaining its labels and relationships. These relationships are conceptual rather than demonstrations of causation, and the proposed supervisory output had not yet undergone an outcome evaluation.

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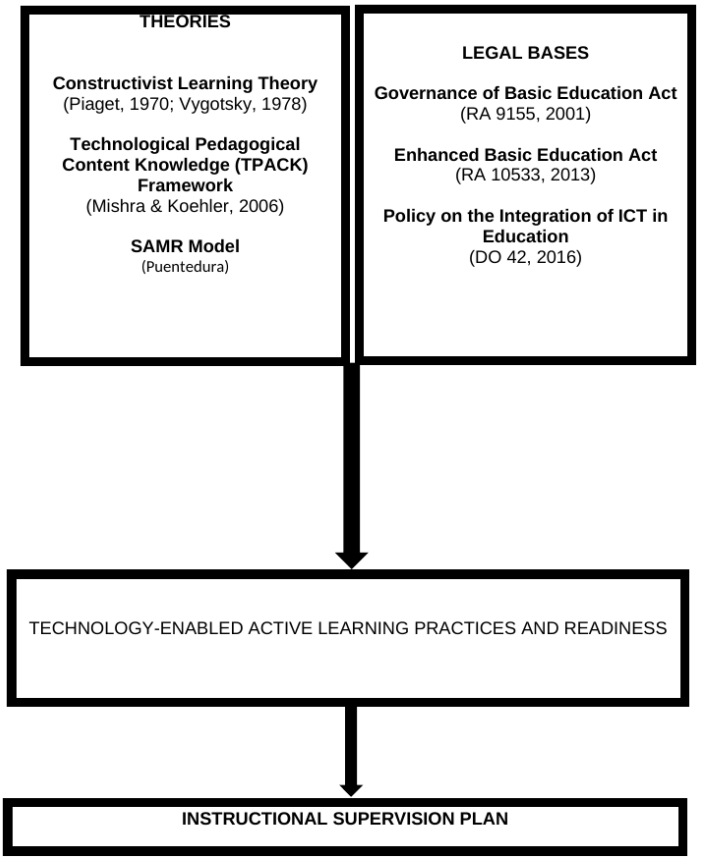


Figure 1. *Conceptual framework of the study*

METHODS

Research Design

The study employed a quantitative descriptive-correlational research design. It described the respondents' profiles, perceptions of technology-enabled active learning, and readiness to integrate technology, then examined associations between selected profile variables and both outcome measures. As the study used a cross-sectional survey, the resulting correlations were not interpreted as evidence that one variable caused another.

Research Locale

The study was conducted during school year 2025–2026 at Minglanilla Central Elementary School, Special Program in Science, in Minglanilla, Cebu, Philippines. This site provides a school-level context in which technology-enabled learning may be aligned with inquiry-based science activities. Conclusions are therefore situated in the participating school rather than generalized across elementary programs.

Participants and Sampling Technique

The participants comprised 22 teachers assigned to the Special Program in Science, representing 100% of the 22 respondents reported in the thesis. The abstract characterizes recruitment as total enumeration, whereas the methodology chapter also refers to purposive and convenience sampling. The journal article reports the achieved sample and study setting without claiming a random selection procedure; the precise recruitment description should be confirmed by the author before submission.

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Research Instrument

A structured, adapted three-part questionnaire was administered. The first part recorded age, gender, highest educational attainment, years in service, and relevant training or seminars. The second part measured four perceptions of technology-enabled active learning—interactive engagement, problem-solving skills, interest, and feedback—using five-point agreement responses. The third part assessed technological, pedagogical, instructional, and attitudinal readiness on the same five-point scale. The thesis identified works by Shroff et al. (2019) and Woldemariam et al. (2025) as instrument sources. It did not provide a new scale-validation analysis for the adapted forms.

Data Gathering Procedure

A transmittal letter was sent to the school principal to secure permission. After approval, the researcher coordinated with the school and oriented participants on the purpose, procedures, and confidentiality safeguards. The questionnaire was administered with instructions and assistance available when required. Completed responses were collected, tallied, organized, and tabulated for statistical interpretation.

Data Analysis

Frequencies and percentages described the participants' profiles. Weighted means summarized five-point Likert responses, following the original categories: 4.20–5.00, strongly agree; 3.40–4.19, agree; 2.60–3.39, neutral; 1.80–2.59, disagree; and 1.00–1.79, strongly disagree. Pearson product–moment correlation coefficients and reported p values tested relationships between profile variables and teachers' perceptions or readiness at $\alpha = .05$. Correlations involving categorically coded characteristics should be interpreted cautiously, particularly given the small sample and the source's lack of details on variable coding.

Ethical Considerations

The source study described voluntary participation, informed consent, anonymity, and confidentiality. Participants were informed of the research purpose and their rights before responding. Data were used for the study's academic purposes. Identifying respondent-level information was not included in the journal article.

RESULTS AND DISCUSSION

Teacher Profile and Professional Development Exposure

The survey represented 22 teachers. The largest age group was 31–40 years (12, 54.54%); 21 participants (95.45%) were women; and 15 (68.18%) had units in a doctoral program. Seven teachers (31.81%) reported 1–5 years of service. The most common training level was division-level participation (11, 50%). These results indicate a group with substantial formal educational exposure but diverse service histories. They do not, by themselves, establish digital proficiency or causal effects on instruction.

Table 1. *Selected profile characteristics of respondents (n = 22)*

Profile dimension	Leading category	Frequency	Percentage
Age	31–40 years	12	54.54%
Gender	Female	21	95.45%
Educational attainment	With units in doctoral program	15	68.18%
Years in service	1–5 years	7	31.81%
Relevant training attended	Division level	11	50.00%

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Because teachers varied in years of service and prior training opportunities, supervision is best organized around assessed needs rather than assumptions about age or formal credentials. The high number with graduate-level study also offers potential for peer-led demonstration, reflective planning, and collegial coaching. Such activities align with a sustained professional learning model (Desimone, 2009).

Perceptions of Technology-Enabled Active Learning

Participants strongly agreed with statements across the four perceptions measured. Interactive engagement recorded the highest overall mean (4.68), followed by problem-solving skills (4.55), interest (4.52), and feedback (4.52). These values reflect teachers' own judgments about opportunities offered by technology; the study did not directly observe the frequency or quality of classroom active-learning episodes.

Table 2. *Respondents' perceptions of technology-enabled active learning*

Dimension	Overall mean	Interpretation
Interactive engagement	4.68	Strongly agree
Problem-solving skills	4.55	Strongly agree
Interest	4.52	Strongly agree
Feedback	4.52	Strongly agree

Within interactive engagement, teachers rated their ability to respond quickly and engage during technology-enabled interaction at 4.86, while an item about navigating digital features received 4.45. The problem-solving dimension included a high rating for using technology to evaluate ideas in context (4.68). In the feedback domain, the timeliness of feedback for improving performance received 4.31, a lower score than other feedback statements. This pattern supports the study's emphasis on strengthening practical, classroom-facing assessment and feedback strategies.

The use of four perception dimensions follows the organizing framework of Shroff et al. (2019). Nevertheless, consistently favorable ratings should not be treated as demonstrated gains in pupils' problem-solving or academic achievement. Evidence on digital learning suggests that instructional design and context influence engagement, so the perception results serve primarily as a needs assessment for supervision (Bond et al., 2020; Zhang et al., 2025).

Technological, Pedagogical, Instructional, and Attitudinal Readiness

The highest readiness score was attitudinal (M = 4.66, strongly agree). Instructional readiness also reached the strongly agree category (M = 4.22), whereas pedagogical (M = 4.14) and technological readiness (M = 4.00) were interpreted as agree. These differences suggest that willingness to adopt technology was stronger than respondents reported operational skills. They also indicate a practical starting point: sustained interest in innovation can be leveraged through applied training in technological and pedagogical tasks.

Table 3. *Teachers' reported readiness dimensions*

Readiness dimension	Overall mean	Interpretation
Technological	4.00	Agree
Pedagogical	4.14	Agree
Instructional	4.22	Strongly agree
Attitudinal	4.66	Strongly agree

The technological readiness item on troubleshooting basic problems during instruction was rated 3.63, one of the lowest item-level results. By contrast, confidence in incorporating technology into everyday practice was rated 4.22. In pedagogical readiness, teachers rated technology-supported critical thinking and problem-solving at 4.31, while designing activities for active participation was rated 3.90. Such differences make targeted

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hands-on demonstrations and guided lesson design preferable to training that assumes teachers only need encouragement.

Within instructional readiness, developing technology-supported materials received 4.27 and digital assessment of learning outcomes 4.31, while managing technology-enabled learning activities received 4.13. Attitudinal readiness was consistently high, including openness to professional development at 4.68 and confidence in the benefits of technology-enabled active learning at 4.77. The contrast between positive attitudes and comparatively lower technical readiness accords with digital competence frameworks that distinguish disposition from applied capabilities (Redecker, 2017; UNESCO, 2018).

Relationships Between Teacher Profiles, Perceptions, and Readiness

The reported correlations indicate that participation in related training and seminars was the only profile variable significantly associated with perceptions of active learning ($r = .47$, $p = .027$) and readiness ($r = .51$, $p = .016$). In contrast, age, gender, educational attainment, and years in service had p values greater than .05 in the two sets of reported analyses. The results should be described as positive associations with training exposure, not proof that training caused higher scores.

Table 4. *Reported profile correlations with active-learning perceptions and readiness (n = 22)*

Profile variable	Perception r	Perception p	Readiness r	Readiness p
Age	.32	.148	.29	.191
Gender	−.08	.718	−.06	.790
Educational attainment	.28	.205	.31	.161
Years in service	.35	.108	.34	.121
Training/seminars attended	.47	.027*	.51	.016*

The finding on training is consistent with the broader expectation that relevant, ongoing professional learning supports educators' capacity to implement technology deliberately (Desimone, 2009; Wiyono et al., 2021). It should not, however, be overgeneralized: the sample was confined to one school program, the measures were self-reported, and neither experimental assignment nor pretest–posttest evaluation was undertaken. A school-level supervision response is justified as a practical proposal, while its eventual effectiveness remains to be assessed.

Proposed Instructional Supervision Plan

The findings used to formulate an Instructional Supervision Plan with two linked priorities: strengthening teachers' readiness through training and development, and improving classroom application through regular instructional support. The source implementation matrix allocates ₱5,000 to each area from Maintenance and Other Operating Expenses (MOOE) and describes an August–March 2026 time frame. No actual accomplishment data were supplied; the plan is therefore presented as a proposed output.

Table 5. *Condensed proposed instructional supervision plan from the thesis*

Priority	Core activities	Responsible groups	Proposed budget
Technology-enabled active learning	Technology integration training; hands-on workshops; peer coaching and mentoring	Teachers; school administrator; other professionals	₱5,000
Readiness for technology-enabled learning	LAC sessions; post-observation feedback; demonstration teaching; technical assistance	Teachers; school administrator; other professionals	₱5,000

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Implementation may begin with an assessment of teachers' specific support requirements, particularly troubleshooting and instructional design, followed by collaborative lesson planning, supervised classroom trials, and reflective feedback conferences. Peer observation could document whether teachers use technology to support interactive tasks and formative assessment rather than merely reproduce conventional presentation methods. Wiyono et al. (2021) provide a relevant precedent for ICT-assisted supervision, while the frameworks outlined by UNESCO (2023) and Redecker (2017) encourage attention to suitability, learner needs, and teachers' continuing development.

The supervisory matrix should be treated as a planning document until activities are implemented and independently evaluated. Subsequent evaluation could examine participation, lesson plans, observed instruction, teacher reflection, student work samples, and feedback quality. Such evidence would be necessary to establish any claims about improvements in teaching or learning following the proposed program.

CONCLUSION

Among the 22 teachers of Minglanilla Central Elementary School's Special Program in Science, technology-enabled active learning received strongly positive perception ratings for interactive engagement, problem-solving, interest, and feedback. Participants also reported favorable readiness, led by attitudinal and instructional dimensions, although their technical readiness scores were comparatively lower. The difference suggests an opportunity to translate positive disposition into stronger operational and pedagogical practice through hands-on, context-specific support.

Training and seminars attended were significantly and positively related to both the perceptions and readiness measures. Age, gender, educational attainment, and years of service were not significantly associated with either measure in the reported results. These are associations from a small, single-site, self-report study and do not establish causal effects, observable teaching quality, or improvements in student performance. The contribution of the study is an evidence-informed proposal for an instructional supervision plan oriented toward ongoing training, coaching, mentoring, and classroom technical assistance.

Recommendation

School administrators and instructional supervisors may use the proposed plan to organize differentiated training, practical sessions on basic troubleshooting and digital assessment, supervised lesson demonstration, collaborative planning, peer mentoring, and post-observation coaching. Activities should be linked to specific classroom tasks and supported by realistic access to tools and connectivity. Monitoring should include evidence of lesson implementation, the quality of feedback, and teachers' reflective improvements rather than attendance in workshops alone.

DepEd program managers and teacher education partners may support sustained, accessible professional development tailored to the actual context of elementary science instruction. Teachers may participate in professional learning communities and exchange instructional resources developed through these activities. Future research should confirm the sampling procedure and instrument properties, include larger and more varied groups, examine how categorical profile variables were coded, and evaluate the supervision plan using direct observations and outcome measures before drawing conclusions about effects on teaching or learning.

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