Online Science Teaching: Status, Challenges, and Interventions among Junior High School Teachers

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Abstract		Review Article

This study examined the status of online Science teaching among Junior High School teachers in the Schools Division of Quirino, focusing on technical aspects, class handling, teacher motivation, and the interventions implemented to address instructional challenges. It also determined the significant relationships among these variables. A descriptive-survey research design was employed involving 39 Science teachers from eight National and Comprehensive High Schools selected through convenience sampling. Data were collected using a validated and reliability-tested questionnaire administered via Google Forms. Weighted mean was used to describe the status of online teaching practices and interventions, while Pearson correlation analysis was applied to test relationships among variables. Results revealed that teachers experienced considerable challenges in technical aspects, particularly unstable internet connectivity and limited digital troubleshooting skills. Class management and motivation were rated as moderate concerns but were influenced by workload demands, preparation requirements, and feedback mechanisms. Despite these challenges, teachers reported strong implementation of adaptive interventions across technical, pedagogical, and motivational dimensions. Significant positive correlations were found among difficulties and among interventions, indicating interconnected effects. The findings highlight the need for integrated professional development, strengthened ICT infrastructure, and institutional support to enhance sustainable online Science instruction.

Keywords: Online Science Teaching, Technical Challenges, Teacher Motivation, Classroom Management, Digital Pedagogy.

INTRODUCTION

The rapid integration of digital technology into education has transformed the landscape of teaching and learning, particularly in science education(Palero et al, 2022).. In the Philippines, the shift to online learning during and beyond the global pandemic compelled teachers to adopt new pedagogical approaches, technological tools, and classroom management strategies (Arietta et al 2025). In the Department of Education (DepEd) Schools Division of Quirino, Junior High School Science teachers were required to deliver instruction through virtual platforms despite varied levels of digital readiness, infrastructure limitations, and contextual challenges. While online learning has

been recognized as one of the fastest-growing trends in educational technology, its effective implementation in public secondary schools, especially in provincial divisions, remains insufficiently documented (Lazaro, 2025).

Existing literature largely focuses on general online teaching experiences or urban contexts, leaving a gap in understanding the specific technical, pedagogical, and motivational challenges encountered by science teachers in rural divisions such as Quirino. Moreover, limited empirical evidence explains how these challenges interrelate and what coping interventions teachers employ to sustain instruction. Without localized data, policy recommendations and professional development programs may not adequately address teachers' actual needs.

This study addresses these gaps by determining the status of online Science teaching among Junior High School teachers in DepEd Quirino, examining difficulties in technical aspects, class management, and teacher motivation, and analyzing the relationships among these variables. By identifying teachers' coping mechanisms and intervention strategies, the study provides evidence-based insights that can inform targeted training, technical support systems, and motivation-enhancing initiatives to strengthen online Science instruction in similar contexts.

Specifically, this study sought to answer the following questions:

1. What is the status of online science teaching among Junior High School Teachers in terms of:

1.1. Technical aspect

1.2. Handling classes

1.3. Teacher motivation

2. Is there a significant relationship between the respondents' status of Online Science Teaching in terms of Technical aspects, Handling classes, and Teacher motivation?

3. What are the interventions done by the teachers to minimize the difficulties in online science teaching in terms of:

3.1. Technical aspect

3.2. Handling classes

3.3. Teacher motivation

4. Is there a significant relationship between the interventions done by the respondents to minimize the difficulties in online Science teaching in terms of Technical aspects, Handling classes, and Teacher motivation?

METHODS

This study employed a descriptive-survey research design to describe the current status of online science teaching among Junior High School teachers in the Division of Quirino. The design was appropriate for systematically gathering and analyzing teachers' perceptions without manipulating variables. The research was conducted in eight National and Comprehensive High Schools in Quirino, with 39 Science teachers voluntarily participating. Due to pandemic-related constraints and the absence of a complete population frame, non-probability convenience sampling was utilized. Although the total population size was undetermined, the sample exceeded the minimum threshold of 30, supporting the use of parametric statistical analysis.

The primary research instrument was an adapted and modified questionnaire checklist based on Angoya and Cuenca (2016). The instrument consisted of two main parts: (1) the status of online Science teaching in terms of technical aspects, handling classes, and teacher motivation, and (2) interventions implemented to minimize difficulties in these areas. Responses were measured using a four-point Likert scale ranging from Very Much Agree to Disagree. Reliability testing was conducted using Cronbach's Alpha, ensuring acceptable to excellent internal consistency before full administration.

Data were gathered through Google Forms after securing approval from the Schools Division Superintendent and school heads. Ethical standards were strictly observed, ensuring voluntary participation, minimal burden, and confidentiality.

Data analysis included a weighted mean to describe variables and a Pearson correlation to determine relationships between difficulties and interventions.

RESULTS AND DISCUSSION

This section presents, analyzes, and interprets the findings of the study.

Part 1. The Status of Online Science Teaching among Junior High School Teachers

1.1 Technical Aspects

Table 1 shows the status of online science teachers among junior high school teachers in terms of the technical aspect.

Table 1. *Status of Online Science Teaching among Junior High School Teachers in terms of Technical Aspect*

Technical Aspect	Mean	SD	Qualitative Description
1. Slow Internet Connection dominated the teachers' technical challenges while teaching.	3.64	0.84	Very Much Agree
2. Difficulty to access Learning Materials in teaching science, which causes Time-Related complaints because the teacher would be late in starting the class.	2.90	0.99	Much Agree
3. Teachers are unaware of basic troubleshooting, making it difficult to teach science through online means.	2.95	0.94	Much Agree
4. Frequent brownouts during online classes affect the productivity of teaching and the learning process.	2.90	0.99	Much Agree
5. Teachers' slow typing skills, unfamiliarity with the Learning Management System (LMS) function, unnecessary LMS buttons, and hardware problems.	2.85	0.96	Much Agree
Grand Mean	**3.05**	**0.75**	**Much Agree**

The findings reveal that the status of online Science teaching in terms of technical aspects is generally described as **"Much Agree"** (M = 3.05), indicating that teachers experienced considerable technical challenges. The highest-rated concern was **slow internet connection** (M = 3.64, Very Much Agree), suggesting that connectivity remains the most dominant barrier to effective online instruction. This is followed by difficulties in accessing learning materials, limited troubleshooting skills, frequent brownouts, and challenges related to typing skills,

LMS familiarity, and hardware issues—all rated as "Much Agree."

These results imply that technological infrastructure and digital competence significantly influence the quality of online Science teaching (Bumagat et al, 2023, Naparan et al, 2023). The persistent issue of unstable internet and power interruptions highlights systemic limitations beyond teachers' control, particularly in geographically challenged areas. Meanwhile, concerns about troubleshooting skills and LMS navigation suggest

the need for sustained digital capacity-building programs.

The implications of these findings are both institutional and policy-oriented. At the institutional level, schools may strengthen technical support systems, provide structured ICT training, and develop offline-ready instructional materials. At the policy level, collaboration with local government units and service providers to improve connectivity and power stability is crucial. Addressing these technical barriers is essential to ensure continuity, equity, and quality in online Science education (Naparan et al, 2023).

1.2. Handling Classes

Table 2 shows the status of online science teaching among junior high schools in terms of handling classes.

Table 2. *Status of Online Science Teaching among the Junior High School Teachers in terms of Handling Classes*

Handling Classes	Mean	SD	Qualitative Description
1. Time management is difficult to attain in an online class.	2.03	1.29	Agree
2. Having many classes affects giving appropriate Science observation on students' work	2.05	1.32	Agree
3. Lack of preparation for the lesson leads to unpreparedness, which students could notice and give them the feeling of unsatisfactory teaching service.	3.00	0.79	Much Agree
4. Lack of knowledge about the Topic.	2.85	0.96	Much Agree
Grand Mean	**2.48**	**0.81**	**Agree**

The results indicate that the status of online Science teaching in terms of handling classes is generally described as **"Agree"** (Grand Mean = 2.48), suggesting moderate challenges in classroom management. Teachers agreed that time management (M = 2.03) and handling multiple classes (M = 2.05) affect their ability to provide adequate observation and feedback on students' work. More notably, lack of preparation (M = 3.00, Much Agree) and limited knowledge of certain topics (M = 2.85, Much Agree) emerged as stronger concerns.

These findings imply that while structural factors such as workload influence class handling, instructional readiness plays a more critical role in effective online teaching Geverola et al 2022). The relatively higher means for preparation and content knowledge suggest that pedagogical confidence significantly affects perceived teaching effectiveness in virtual settings (Bumagat et al 2025). Science, being conceptually demanding and often requiring demonstrations or experiments, may intensify these challenges in an online format.

The implications highlight the need for sustained professional development focusing on content mastery, online lesson planning, and digital pedagogical strategies (Bumagat et al 2025). School administrators may also consider workload balancing and mentoring systems to support teachers. Strengthening instructional preparedness can enhance instructional quality, improve student engagement, and foster more effective online Science learning experiences.

1.3 Teacher Motivation

Table 3 shows the status of online science teaching among junior high school teachers in terms of teacher motivation.

Table 3. *Status of Online Science Teaching among the Junior High School Teachers in terms of Teachers' Motivation*

Teachers' motivation	Mean	SD	Qualitative Description
1. Having an unreasonable Teacher Satisfaction Rating (TSR) from the students gives teachers low motivation to concentrate on their science teaching.	1.85	1.18	Agree
2. Receiving unreasonable complaints from the students lowers the motivation and enthusiasm of teachers to teach.	1.97	1.22	Agree
3. Having many students to attend to in an online class calls for a longer time to check on student work, which affects the level of motivation of teachers.	2.28	1.10	Agree
4. Varied student preferences on teaching strategies and class activities in the Science subject affect concentration and motivation in teaching.	3.00	0.79	Much Agree
Grand Mean	**2.28**	**0.88**	**Agree**

The findings show that the status of online Science teaching in terms of **teacher motivation** is generally described as **"Agree"** (Grand Mean = 2.28), indicating moderate motivational challenges. Teachers agreed that unreasonable Teacher Satisfaction Ratings (M = 1.85) and complaints from students (M = 1.97) negatively affect their enthusiasm. Additionally, managing many students in an online class (M = 2.28) contributes to decreased motivation due to extended time spent checking outputs. The highest-rated concern was varied student preferences for teaching strategies and activities (M = 3.00, Much Agree), suggesting that adapting to diverse learner expectations significantly influences teachers' focus and drive.

These results imply that motivational challenges stem not only from workload but also from feedback mechanisms and shifting instructional demands in virtual environments (Anto et al, 2023). Online settings may heighten teachers' sensitivity to student evaluations and expectations, potentially affecting morale and instructional energy.

The implications point to the importance of supportive leadership, constructive feedback systems, and teacher well-being programs. Schools may revisit evaluation processes to ensure fairness and provide mentoring or peer support groups to sustain morale. Strengthening motivational support systems can enhance teacher resilience, sustain instructional quality, and promote a more positive online Science learning environment (Basar, 2021).

Part 2. Test of Significant Relationship among the Difficulties Experienced by the Junior High School Science Teachers during their Online Learning

The following presents the relationship among the difficulties experienced by the Junior High School science teachers during their online learning.

Table 4. *Relationship among the Difficulties Experienced by the Junior High School Science teachers during their Online Teaching*

Aspect	Mean	SD	1	2	3
1. Technical aspect	3.05	0.75	–		
2. Handling classes	2.48	0.81	.526**	–	
3. Teacher motivation	2.28	0.88	.462**	.733*	–

**p<0.01

The results in Table 4 reveal significant positive relationships among the difficulties experienced by Junior High School Science teachers in online teaching. The **technical aspect** is moderately correlated with **handling classes** (r = .526, p < 0.01) and **teacher motivation** (r = .462, p < 0.01), indicating that greater technical challenges are associated with increased classroom management difficulties and reduced motivation. Moreover, a strong positive correlation was found between **handling classes** and **teacher motivation** (r = .733, p < 0.01), suggesting that challenges in managing online classes substantially influence teachers' motivational levels.

These findings imply that the difficulties are interconnected rather than isolated concerns. When teachers struggle with unstable internet, limited technical skills, or power interruptions, their ability to manage time, prepare lessons, and effectively engage students is affected (Lazaro, 2025). Consequently, these compounded challenges may lower enthusiasm and professional drive (Naparan et al, 2023). The strong relationship between handling classes and motivation particularly underscores the psychological and instructional impact of classroom management demands in virtual settings.

The implications highlight the need for a holistic support system. Interventions should not address technical, pedagogical, and motivational concerns separately but through integrated professional development programs (Zou, 2025). Strengthening ICT infrastructure, enhancing digital pedagogy skills, and providing motivational and psychosocial support may collectively improve the overall quality and sustainability of online Science teaching (Sultana & Solaiman, 2026).

Part 3. Interventions Done by the Teachers to Minimize the Difficulties in Online Science Teaching

3.1 Technical Aspect

Table 6 shows the interventions done by the teachers to minimize the difficulties in online science teaching in terms of the technical aspects.

Table 4. *Interventions done by the Teachers to minimize the Difficulties in Online Science Teaching in terms of the Technical Aspect*

Technical aspect	Mean	SD	Qualitative Description
1. Close non-essential teaching apps in gadget and move closer to the wi-fi router	3.56	0.64	Very Much Agree
2. Ask family to refrain from using the internet while having online classes	3.00	0.69	Much Agree
3. Have a backup battery in case of brown out	3.38	0.49	Very Much Agree

4. Enroll in a free online lesson and apply/practice hands-on the knowledge learned	3.64	0.49	Very Much Agree
Grand Mean	**3.40**	**0.44**	**Very Much Agree**

The findings indicate that teachers **"Very Much Agree"** (Grand Mean = 3.40) that they actively implemented interventions to minimize technical difficulties in online Science teaching. The highest-rated strategy was enrolling in free online lessons and applying hands-on learning (M = 3.64), demonstrating strong initiative toward improving digital competence. Similarly, closing non-essential applications and moving closer to the Wi-Fi router (M = 3.56), as well as preparing backup batteries during brownouts (M = 3.38), were highly practiced. Asking family members to limit internet usage during class time (M = 3.00) was also commonly applied.

These results suggest that teachers adopted both technical adjustments and self-development strategies to sustain instructional delivery. Notably, professional learning efforts ranked highest, implying that teachers recognize the importance of enhancing their ICT skills rather than relying solely on external support. Practical home-based solutions further reflect adaptability and resilience despite infrastructural limitations.

The implications highlight teachers' proactive coping capacity, which can be strengthened through institutional support (Anto et al, 2025, Bumagat et al 2025, Naparan et al 2023). Schools may formalize continuous ICT training, provide technical assistance, and explore subsidies for connectivity and power backup solutions. Recognizing and reinforcing these self-initiated strategies can contribute to more sustainable and effective online Science instruction.

3.2 Handling Classes

Table 7 shows the interventions done by the teachers to minimize the difficulties in online science teaching in terms of handling classes.

Table 5. *Interventions done by the Teachers to minimize the Difficulties in Online Science Teaching in terms of Handling Classes*

Handling classes	Mean	SD	Qualitative Description
1. Avoid multitasking so can focus on the lesson and encourage cooperative learning.	3.67	0.62	Very Much Agree
2. Begin the class promptly in a well-organized way.	3.64	0.49	Very Much Agree
3. Plan the lessons and set the virtual area conducive and free from noise/ distractions.	3.69	0.47	Very Much Agree
4. Use varied and improved instructional techniques.	3.77	0.43	Very Much Agree
Grand Mean	**3.69**	**0.38**	**Very Much Agree**

The results show that teachers **"Very Much Agree"** (Grand Mean = 3.69) that they implemented strong interventions to address difficulties in handling online Science classes. The highest-rated strategy was using varied and improved instructional techniques (M = 3.77), indicating that teachers

actively enhanced their pedagogical approaches to maintain engagement in virtual settings. Planning lessons ahead and ensuring a distraction-free virtual environment (M = 3.69), avoiding multitasking to focus on instruction (M = 3.67), and beginning classes promptly in an organized manner (M = 3.64) were also highly practiced.

These findings suggest that teachers responded to classroom management challenges through intentional preparation, structured routines, and pedagogical innovation. The emphasis on lesson planning and instructional variety reflects an understanding that effective online teaching requires greater organization and creativity compared to traditional face-to-face instruction. Avoiding multitasking further highlights teachers' efforts to maintain professional focus despite home-based distractions.

The implications underscore the importance of strengthening teachers' competencies in online pedagogy and time management Sultana & Solaiman, 2026, Zou et al 2025). School leaders may support these efforts through mentoring programs, sharing of best practices, and Learning Action Cell (LAC) discussions focused on digital strategies. Sustaining these proactive interventions can enhance student engagement, instructional clarity, and overall effectiveness of online Science teaching (Zou et al 2025).

3.3 Teachers' Motivation

Table 8 shows the interventions done by the teachers to minimize the difficulties in online science teaching in terms of teachers' motivation.

Table 6. *Interventions done by the Teachers to Minimize the Difficulties in Online Science Teaching in terms of Teachers' Motivation*

Teachers' motivation	Mean	SD	Qualitative Description
1. A teacher is a future builder of children, influencing their future towards their success.	3.92	0.27	Very Much Agree
2. Teaching is not just about writing and arithmetic, but most especially building self– esteem.	3.90	0.31	Very Much Agree
3. Each day is a new beginning to teach new things, exciting and wonderful, making learning fun.	3.87	0.34	Very Much Agree
Grand Mean	**3.90**	**0.29**	**Very Much Agree**

The findings reveal that teachers **"Very Much Agree"** (Grand Mean = 3.90) that they implemented strong motivational interventions to cope with the challenges of online Science teaching. The highest-rated statement, viewing teachers as future builders who influence learners' success (M = 3.92), highlights a strong sense of professional purpose. Similarly, emphasizing the role of teaching in building students' self-esteem (M = 3.90) and treating each day as a new opportunity to make

learning exciting and meaningful (M = 3.87) reflects deeply rooted intrinsic motivation.

These results suggest that teachers relied primarily on internal values, professional identity, and personal commitment to sustain motivation despite technical and instructional challenges (Rose, 2025). Rather than being driven solely by external rewards or evaluations, they anchored their resilience in their mission to shape learners' futures and create positive learning experiences.

The implications underscore the importance of nurturing intrinsic motivation in sustaining teacher performance during disruptive educational shifts. School leaders may strengthen this by recognizing teachers' efforts, promoting well-being initiatives, and fostering a supportive professional culture. According to Yeh & Tsai (2026), encouraging reflective practice and purpose-driven teaching can help maintain high morale, ensuring that online Science instruction remains meaningful, engaging, and learner-centered even in challenging contexts.

Part 4. Test of Significant Relationship among the Interventions done by the Junior High School Science Teachers during their Online Learning

The following presents the relationship among the interventions done by science teachers during their online learning.

Table 7. *Relationship among the Interventions done by the Junior High School Science Teachers during their Online Teaching*

Aspect	Mean	SD	1	2	3
1. Technical aspect	3.92	0.27	–		
2. Handling classes	3.90	0.31	.592**	–	
3. Teacher motivation	3.87	0.34	.448**	.549**	–

**p<0.01

The results in Table 9 show significant positive relationships among the interventions implemented by Junior High School Science teachers during online teaching. A moderate positive correlation exists between **technical interventions** and **handling classes** (r = .592, p < 0.01), indicating that teachers who actively addressed technical concerns were also more likely to implement effective classroom management strategies. Similarly, technical interventions are positively correlated with **teacher motivation** (r = .448, p < 0.01). Moreover, a moderate positive relationship was found between **handling classes** and **teacher motivation** (r = .549, p < 0.01).

These findings suggest that teachers' coping strategies are interconnected. Strengthening technical skills and infrastructure adjustments appears to enhance teachers' confidence in managing classes, which in turn supports their motivational levels (Anto et al, 2023). The interrelationship implies that effective intervention in one area reinforces improvements in others, reflecting a holistic adaptation process (Bumagat et al, 2025).

The implications highlight the importance of integrated support programs rather than isolated initiatives (Naparan et al, 2023). Professional development should simultaneously address ICT competence, online pedagogy, and motivational support (Zou et al, 2025). Encouraging collaborative learning communities and mentoring systems may further strengthen these interconnected interventions (Geverola et al, 2022). By reinforcing comprehensive coping mechanisms, schools can sustain high levels of teacher effectiveness and resilience in online Science education.

The study concludes that online Science teaching among Junior High School teachers in Quirino is characterized by significant technical, instructional, and motivational challenges. Despite limitations such as unstable internet, workload concerns, and classroom management difficulties, teachers demonstrated strong adaptive capacity through proactive technical adjustments, pedagogical innovations, and motivational strategies. Significant positive relationships were found among difficulties and among interventions,

indicating that these factors are interconnected. Effective support systems, capacity-building programs, and institutional interventions are essential to strengthen online instruction. A holistic approach addressing technology, pedagogy, and teacher well-being is crucial for sustaining quality Science education in digital learning environments.

Future research may expand the study to include a larger sample across multiple school divisions to enhance generalizability and comparative analysis. Subsequent studies may also adopt mixed-method or qualitative approaches to explore deeper insights into teachers' lived experiences, coping strategies, and challenges in online Science teaching. Researchers may examine additional variables such as student performance outcomes, digital literacy levels, and institutional support systems to strengthen evidence-based recommendations. Longitudinal studies are also encouraged to assess the long-term impact of interventions on teacher motivation and instructional effectiveness in evolving digital learning environments.

ACKNOWLEDGEMENT

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