

RESEARCH ARTICLE

Stress levels of science teachers when delivering distance education instruction in a state college during the COVID-19 pandemic

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ABSTRACT

The COVID-19 pandemic has dramatically reshaped education worldwide, compelling institutions to rapidly adopt distance education models. Among those most affected are science educators, who face unique challenges in transitioning traditional classroom instruction to virtual platforms. Understanding the stressors experienced by science teachers during this shift is crucial not only for their well-being but also for the effectiveness of educational delivery. This study aims to investigate the stress levels and sources of stress experienced by science teachers at Zamboanga State College of Marine Sciences and Technology (ZSCMST) during the shift to distance education. The specific objectives were to determine the overall stress levels, identify the least stressful pre-identified causes of stress, compare the significance of different categories of stressors, and develop an intervention program based on the findings. A descriptive comparative research design with a quantitative approach was used, involving a purposive sample of 45 science teachers. Data were collected through a structured questionnaire, which included sections on demographic information, perceived stress levels, and specific stressors related to professional skills, technical skills, work-home conflict, and support systems. The data were analyzed using descriptive statistics and one-way ANOVA. The results indicated that science teachers experienced moderate to high levels of stress, with professional and technical skills being the most prominent stressors. Support systems, although somewhat helpful, still contributed to the overall stress levels. The findings highlight the need for targeted interventions to alleviate these stressors, such as professional development programs, enhanced support systems, and policies addressing work-home conflict. In conclusion, this study underscores the importance of addressing the specific stressors identified to improve the well-being of science teachers and the effectiveness of distance education. Further research is recommended to develop and evaluate interventions aimed at reducing teacher stress, enhancing teaching effectiveness, and understanding the long-term impact of these interventions in digital environments.

Keywords: COVID-19 pandemic; distance education; stress level

1. Introduction

The COVID-19 pandemic, identified by the United Nations Development Program as the greatest challenge since its emergence in Asia in 2019, is more than just a health crisis; it has also caused an

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unprecedented socioeconomic upheaval globally, including in the Philippines. The pandemic has disrupted social, economic, and political activities, leading to widespread stress due to uncertainty and the lack of routine and social support from lockdowns and social distancing measures. This stress can cause physical, psychological, and emotional issues, including anxiety and depression, which, in turn, reduce productivity.

The pandemic triggered transformative events worldwide, impacting economies, healthcare, and education across all nations and demographics^[1]. In the Philippines, educators, students, and school administrators have had to adapt to these challenges. The shift to distance learning emerged as the most viable option to ensure continuous education. However, this transition has introduced significant uncertainties for both students and teachers in delivering effective educational methods.

The shift towards distance education, remote teaching, and online instruction has been complex and challenging. Teachers faced significant stressors as they supported students while dealing with their own adversities^[2]. The blurred boundaries between work and home life added to the stress. Teachers had to quickly adapt to utilizing information and communication technology (ICT) to offer educational support, influencing their confidence and perspectives on remote education. Adapting to these challenges is a crucial initial step in the learning process, particularly with the rise of distance learning^[3].

This disruption in traditional educational frameworks and practices, relied upon for many years, goes beyond simply shifting from face-to-face to online instruction. The true challenge lies in cultivating a culture that embraces innovative practices, demanding new skills and competencies from teachers, students, mentors, and administrators, while maintaining educational quality. Essentially, it involves rapidly turning what was once exceptional into the new standard.

Depending on their skills, some teachers may have perceived the situation positively, while others found it irrelevant and stressful. The increased dependence on digital tools for teaching and communication posed no real problem for skilled teachers. However, those with less-acquired skills found it challenging, potentially resulting in lower teaching performance^[4]. Additionally, the stressors extended beyond the technical aspects of delivering distance education to include the teachers' ability to create learning materials using ICT, with minimal support from family and peers also emerging as a significant stressor.

In the Philippines, educators, students, and schools are still adjusting to distance learning. A study by Alea et al.^[5] showed that teachers were highly aware of the COVID-19 pandemic and its consequences but focused only on the readiness of secondary school teachers for distance learning. No studies have been conducted on the stress levels and causes among science teachers in higher education institutions. This study aims to determine the stress levels of science teachers in higher education institutions during the pandemic and identify the most and least stressful causes. The findings will provide insights into the current educational challenges and highlight the need for stress-intervention programs that offer both instrumental and emotional support, particularly for those struggling with professional and work-home technology-based distance teaching.

2. Research questions

This study aims to investigate the levels and sources of stress experienced by science teachers at ZSCMST while delivering distance education. The specific research questions are:

1. What are the stress levels experienced by science teachers at ZSCMST during distance education?
2. Which of the pre-identified causes of stress in delivering distance education is the least stressful?

3. Do the pre-identified categories of stressors in delivering distance education instruction significantly differ from each other?
4. Based on the findings, what intervention program can be developed to address the stressors?

3. Literature review

3.1. Teachers' stress in distance education

The transition to distance education during the COVID-19 pandemic has posed significant challenges for higher education institutions. A study at a California liberal arts college highlighted the resilience of faculty in adapting to remote teaching, emphasizing the importance of instructional plans and technology support for effective distance education^[4]. This underscores the need for targeted support to address technical and professional skill gaps among science teachers.

Stress is an adverse reaction to excessive pressure or demands. For teachers, stress arises from internal factors within educational institutions (e.g., work overload, poor relationships) and external factors (e.g., demanding parents, changing educational policies). These stressors negatively affect teachers' performance, satisfaction, and overall productivity^[6,7].

Internally, factors such as fewer rewards, heavy workloads, and poor institutional policies contribute to stress^[8]. Externally, factors include demanding parents and stringent governmental rules^[9]. Addressing these factors is crucial for institutions to create strategies that uphold academic integrity in digital learning environments, thereby reducing stress among educators and students^[10] and improving their working conditions.

Researchers have noted negative faculty perceptions of online learning due to barriers such as lack of training and support, which contribute to occupational stress^[11]. The pandemic intensified these issues, increasing workload and stress levels among teachers, who had to balance professional responsibilities with personal challenges^[12,13].

A study in Germany found that teachers experienced medium to high stress levels during the lockdown, primarily due to technical barriers and increased workload. Similarly, a study in Russia highlighted the lack of administrative support and the increased demands of remote teaching as major stressors^[13]. These studies suggest that improving teachers' digital skills and providing better resources can alleviate some of the stress they experience. Globally, teachers have reported higher workloads and stress during the pandemic. Effective online teaching requires adaptability and good planning, with long-term professional development focused on online distance learning^[14].

Thus far, the studies discussed have been conducted abroad; however, their findings are applicable universally to all teachers. Nevertheless, there is a lack of research specifically addressing the stress levels of science teachers in higher education institutions who are engaged in distance education during a pandemic in the Philippines.

3.2. Stress intervention among the teachers

Effective stress management programs for teachers include components such as mindfulness, relaxation response activation, cognitive restructuring, and collegial support. Mindfulness involves directing attention to the present moment without judgment, and it has been shown to reduce occupational stress and improve job satisfaction and performance. Relaxation response activation, through techniques like breathing exercises and guided meditation, helps restore balance after stress. Cognitive restructuring assists teachers in reshaping negative cognitions into neutral or positive ones, thereby reducing stress levels. Collegial collaboration,

which includes training in communication skills, improves collegial relationships, leading to decreased emotional exhaustion and increased job satisfaction.

4. Methods

The primary objective of this research was to investigate the levels and sources of stress experienced by science teachers at ZSCMST during the shift to distance education. This study employed a descriptive, comparative research design, which is a quantitative research method. This approach systematically obtained information to answer the research questions, specifically to describe the phenomenon of stress levels among science teachers.

4.1. Research design

The study employed a descriptive comparative research design using a quantitative research method. This design was chosen to explore the relationship between pre-identified causes of stress and their levels without manipulating variables. The aim was to describe the phenomenon of stress levels among science teachers delivering distance education. A descriptive comparative research design, also known as causal-comparative or pre-experimental research, is characterized by 1) no manipulation of an independent variable, 2) no random assignment to groups, and 3) often including a control or comparison group^[15].

4.2. Sampling and participants

The participants of this study were 45 science teachers at ZSCMST who were engaged in delivering distance education during the second semester of the 2019–2020 school year and the first semester of the 2020–2021 school year. A purposive sampling method was employed to select participants for this study. This non-probability sampling technique was chosen because it allows for the selection of individuals who meet specific criteria and possess particular characteristics relevant to the research objectives. Unlike random sampling, which seeks to represent the entire population, purposive sampling gathers a sample that can offer detailed, pertinent, and illuminating insights into the study topic^[16].

4.3. Instrument

The researcher adapted and customized standardized questionnaires from reputable sources such as Shahid, Wilkinson, Marcu, and Shapiro^[17] and Çoklar, Efilti, and Sahin^[18]. The questionnaire included a single question about the participants' perceived stress levels and four categories, each with 10 pre-identified stressors related to delivering distance education. Stress levels were rated on a Likert scale ranging from "not stressful at all" to "very stressful."

Additionally, the instrument featured demographic questions to analyze differences among variables such as age, faculty rank, discipline, teaching experience, and highest educational attainment. The survey was administered using Google Forms, an online platform that automatically compiles survey responses, providing essential data for this study. This structured approach ensured comprehensive data collection, facilitating an in-depth analysis of stress factors affecting science teachers in distance education.

4.4. Data gathering procedure

Informed consent was obtained from all participants before they completed the survey questionnaire. The consent letter and questionnaire were administered via Google Forms, an online platform chosen due to restrictions on face-to-face interactions and gatherings during the study period. The Google Form automatically collected the respondents' data. Once the survey was completed, the results were downloaded

from the platform for further analysis using SPSS and descriptive statistics. This study strictly adhered to the institution's safety protocols and COVID-19 IATF guidelines.

4.5. Data analysis

The results from the Google Forms questionnaire were compiled using Microsoft Excel to summarize responses to demographic items and levels of stress. Descriptive statistics, such as mean, standard deviation, and frequency, were computed using SPSS to provide fundamental information about variables and identify potential relationships among them. To assess significant differences among the means of the four pre-identified categories of stressors, the researcher conducted an analysis of variance (ANOVA).

ANOVA tests the relationship between a categorical variable and a numeric variable by evaluating differences among means and produces a p-value to determine the significance of the relationship. Subsequently, if significant results were found by one-way ANOVA, Tukey's Honestly Significant Difference (HSD) test was conducted to determine which specific pairs of stressor categories differed significantly in terms of their means.

5. Results

Question 1. What are the stress levels experienced by science teachers at ZSCMST during distance education?

5.1. Teachers' perceived stress levels

The survey revealed that science teachers at ZSCMST experienced varying levels of stress while delivering distance education. A majority of teachers reported being "quite stressed" (20 teachers) or "somewhat stressed" (17 teachers), with only a small minority indicating lower stress levels. The weighted mean of 3.24 suggests an overall perception of being "somewhat stressed" on average, highlighting a moderate level of stress among the respondents.

The descriptive statistics for the perceived stress levels in delivering distance education instruction are summarized in **Table 1**, showing a weighted mean of 3.24. This indicates that, on average, science teachers are "somewhat stressed" in delivering distance education instruction.

Table 1. Stress level of the science teachers when delivering distance education instruction.

ITEMS	F	X	WP	Interpretation
Not stressed at all	1	1	1	
A little stressed	7	2	14	
Somewhat stressed	17	3	51	
Quite stressed	20	4	80	
Very stressed	0	5	0	
	45		146	
Weighted Mean			3.24	Somewhat Stressed

Question 2. Which of the pre-identified causes of stress in delivering distance education is the least stressful?

5.2. Teachers' stress level on pre-identified ctressors

The second part of the survey focused on four categories, each containing ten pre-identified causes of stress related to delivering distance education instruction: Technical Skills, Professional Skills, Support, and

work-personal interface. Respondents were asked to assess their level of stress for each cause using a scale where 1 indicates "not stressful at all" and 5 indicates "very stressful".

Table 2 presents the causes of stress specifically related to Technical Skills among science teachers when delivering distance education. The weighted mean of each cause indicates its level of stress. Cause number 10 in Table 2, “unable to resolve connectivity problems on my own resulting in poor delivery of distance teaching”, had the highest weighted mean of 3.44 (SD = 1.10), indicating that it was “quite stressful”. All other causes of stress in delivering distance education were considered “somewhat stressful”. However, cause 1, “finding myself inadequately trained to use new technologies for distance teaching”, had the lowest weighted mean of 2.84 (SD = 1.03), indicating it was the least stressful in this category.

Table 2. Level of stress in delivering distance education instruction in terms of Technical Skills.

Technical Skills	WM	SD	Interpretation
1. finding myself inadequately trained to use new distance teaching technologies	2.84	1.03	Somewhat Stressful
2. managing insufficient resources for distance teaching (physical resources: internet connection, laptop/computers, smartphones, etc.)	3.24	0.85	Somewhat Stressful
3. finding the remote teaching tools too complex for me to understand and use effectively	2.89	0.96	Somewhat Stressful
4. Familiarizing students with the tools needed for efficient distance teaching	3.04	0.98	Somewhat Stressful
5. upgrading my technological skills to meet the needs of distance teaching (training, self-teaching, etc.)	3.02	0.91	Somewhat Stressful
6. change my teaching strategies to conform to new technology for distance teaching	3.24	1.03	Somewhat Stressful
7. finding that students know more about technology used in remote education than I do	2.96	1.19	Somewhat Stressful
8. encountering constant changes/updates in distance teaching platforms	3.24	0.97	Somewhat Stressful
9. correcting/fixing errors made in delivering instruction using technologies for distance teaching	3.13	1.10	Somewhat Stressful
10. unable to resolve connectivity problem on my own resulting to poor delivery of distance teaching	3.44	1.10	Quite Stressful
Overall Weighted Mean	3.11		Somewhat Stressful

Table 2. (Continued)

Range: *Very Stressful* - (4.21 - 5.00)

Quite Stressful - (3.41 - 4.20)

Somewhat Stressful - (2.61 - 3.40)

A little Stressful - (1.81 - 2.60)

Not Stressful at all - (1.00 - 1.80)

Table 3. Level of stress in delivering distance education instruction in terms of professional skills.

Professional Skills	WM	SD	Interpretation
1. preparing/creating learning material for distance teaching (e.g.: modules, assessments)	3.40	1.03	Somewhat Stressful
2. finding limited teaching strategies can be employed in delivering distance education	3.60	1.03	Quite Stressful

3. motivating the students to always participate actively in online asynchronous and synchronous classes	3.87	1.01	Quite Stressful
4. evaluating/ assessing students' learning remotely (e.g. checking outputs, tasks, laboratory)	3.96	0.95	Quite Stressful
5. dealing with students' discipline problem to create positive atmosphere in distance learning (e.g. attitude and behavior in online class)	3.49	1.12	Quite Stressful
6. unable to carry out distance teaching to my satisfaction due to the non-teaching workload	3.07	1.37	Somewhat Stressful
7. controlling cheating/plagiarizing of students' outputs in distance teaching	4.27	1.01	Very Stressful
8. identifying and understanding students' needs to improve class participation and performance. (e.g. working students, connectivity)	3.82	1.01	Quite Stressful
9. soliciting responses from students to assure understanding of the lessons/ instruction given in remote teaching	3.53	0.92	Quite Stressful
10. accepting and considering overdue submission of students' outputs	4.02	0.89	Quite Stressful
Overall Weighted Mean	3.70		Quite Stressful

Table 3. (Continued)

Range: Very Stressful - (4.21 - 5.00)

Quite Stressful - (3.41 - 4.20)

Somewhat Stressful - (2.61 - 3.40)

A little Stressful - (1.81 - 2.60)

Not Stressful at all - (1.00 - 1.80)

Table 3 displays the pre-identified causes of stress related to Professional Skills among science teachers when delivering distance education instruction. The stress level for each cause was determined by its weighted mean.

Cause number 7 in Table 3, “controlling cheating/plagiarizing of students’ outputs in distance teaching”, had the highest weighted mean of 4.27 (SD = 1.01), indicating that it was “very stressful”. All other causes except for causes 6 and 1 were rated “quite stressful”. Causes 6 and 1 are considered “somewhat stressful”, with cause 6, “unable to carry out distance teaching to my satisfaction due to the non-teaching workload”, having the lowest weighted mean of 3.07 (SD = 1.37), and is regarded as the least stressful cause in delivering distance education instruction.

Table 4. Level of stress in delivering distance education instruction in terms of support.

Support	WM	SD	Interpretation
1. asking assistance from technical experts in using online teaching technologies	2.80	1.01	Somewhat Stressful
2. collaborating with co teachers in delivering distance education instruction	2.71	1.06	Somewhat Stressful
3. asking school administrators for supplemental resources for the delivery of distance education (devices, internet connection, etc.)	3.40	0.96	Somewhat Stressful
4. school officials disallowing my academic decision and autonomy in distance teaching	2.69	1.00	Somewhat Stressful
5. inciting job insecurity and conflict between coworkers/school heads because of personal biases in delivering distance teaching	2.58	1.06	Somewhat Stressful
6. sharing of learning materials from other teachers are unavailable (e.g. lectures, activities)	2.62	1.10	Somewhat Stressful

7. conflicting policies on delivering distance education disregards teachers and students welfare (e.g. learning modality, students' evaluation)	3.27	1.03	Somewhat Stressful
8. unrecognized hard work and efficient performance in delivering distance education instruction (e.g. what did you do as a teacher)	3.09	1.04	Somewhat Stressful
9. school officials take no part in the educational process of student in distance education (e.g. unaware of the difficulty of distance education, dropping of students)	3.16	1.07	Somewhat Stressful
10. parents take no part in the educational process of their children in distance education (e.g. unreachable when contacted)	3.33	1.02	Somewhat Stressful
Overall Weighted Mean	2.96		Somewhat Stressful

Table 4. (Continued)

Range: *Very Stressful* - (4.21 - 5.00) *Quite Stressful* - (3.41 - 4.20)
Somewhat Stressful - (2.61 - 3.40) *A little Stressful* - (1.81 - 2.60)
Not Stressful at all - (1.00 - 1.80)

Table 4 presents the pre-identified causes of stress related to Support for science teachers' delivery of distance education instruction. The stress level for each cause is determined by its weighted mean.

All causes in Table 4 were rated "Somewhat stressful" based on their weighted means. However, cause number 3, "asking school administrators for supplemental resources for the delivery of distance education (devices, internet connection, etc.)", has the highest weighted mean of 3.40 (SD = 0.96), making it the most stressful cause in terms of providing support for distance education. Cause number 5, "inciting job insecurity and conflict between coworkers/school heads because of personal biases in delivering distance teaching", has the lowest weighted mean at 2.58 (SD = 1.06), indicating it is the least stressful cause.

Table 5. Level of stress in delivering distance education instruction in terms of work personal interface.

Work-Personal Interface	WM	SD	Interpretation
1. prevents me to do the day-to-day household chores due to the remote teaching	2.78	1.15	Somewhat Stressful
2. spending less to no quality time with my family during this distance teaching	2.89	1.05	Somewhat Stressful
3. managing my time for work and for personal life	3.04	1.17	Somewhat Stressful
4. deciding out between work and my personal priorities	3.00	1.24	Somewhat Stressful
5. attending students' problems and needs while dealing with personal necessities	3.27	1.10	Somewhat Stressful
6. attending to school officials demands even beyond my specified working hour	3.13	1.27	Somewhat Stressful
7. conforming to the set boundaries between work and personal life	3.11	1.23	Somewhat Stressful
8. disrupting my everyday teaching plan due to family emergencies	2.96	1.29	Somewhat Stressful
9. compromising my health just to deliver teaching and non-teaching work that is expected from me	3.18	1.27	Somewhat Stressful
10. disrupting my everyday teaching plan due to on-call school responsibilities	3.20	1.15	Somewhat Stressful

Overall Weighted Mean 3.06 Somewhat Stressful

Table 5. (Continued)

Range: *Very Stressful* - (4.21 - 5.00) *Quite Stressful* - (3.41 - 4.20)
Somewhat Stressful - (2.61 - 3.40) *A little Stressful* - (1.81 - 2.60)
Not Stressful at all - (1.00 - 1.80)

Table 5 displays the pre-identified causes of stress related to Work-Personal Interface among science teachers in delivering distance education instruction. The level of stress for each cause is determined by its weighted mean.

All causes in Table 5 are categorized as “Somewhat stressful” based on their weighted means. However, cause number 5, “attending students’ problems and needs while dealing with personal necessities”, has the highest weighted mean of 3.27 (SD = 1.10), indicating it is the most stressful cause in terms of the work-personal interface. Cause number 1, “prevents me from doing day-to-day household chores due to remote teaching”, has the lowest weighted mean at 2.78 (SD = 1.15), indicating it is the least stressful cause in this category.

Question 3. Do the pre-identified categories of stressors in delivering distance education instruction significantly differ from each other?

5.3. Stress level of science teachers in different categories of stressors

The average weighted mean for each category of stressor was calculated to identify the most and least stressful factors. **Figure 1** illustrates that Professional Skills had the highest average weighted mean of 3.70, indicating it is “Quite Stressful”. This is followed by Technical Skills with an average weighted mean of 3.11, then Work-Personal Interface with an average weighted mean of 3.06. Support had the lowest average weighted mean of 2.29, although all three categories are considered “Somewhat Stressful”.

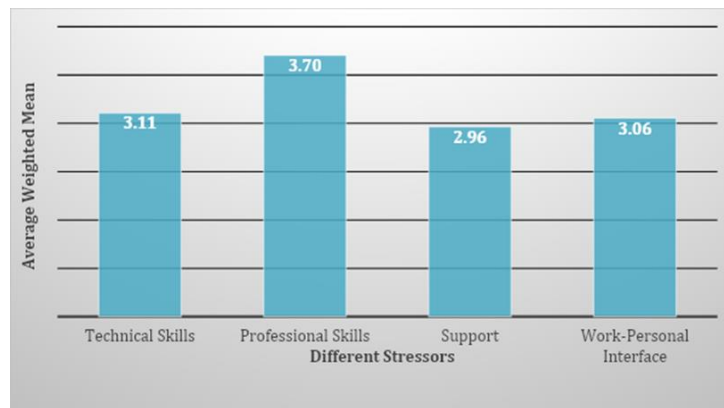


Figure 1. Average weighted mean of the different causes of stress in delivering distance education instruction.

Table 6. Testing for significant difference on the level of stress among different stressors.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	3.370802	3	1.123601	15.93311	9.34E-07	2.866266
Within Groups	2.538716	36	0.07052			

Total 5.909519 39

Table 6. (Continued)

Statistical analysis indicated significant variation in the levels of stress across different categories of stressors, with a significance level of $P < 0.05$ (see **Table 6**). Specifically, the results highlighted that professional skills were significantly higher compared to other stressors. This suggests that during the COVID-19 pandemic, science teachers at ZSCMST experienced higher stress levels in delivering distance education instruction, particularly related to professional skills.

Table 7. Post Hoc using Tukey test.

Multiple Comparisons

Dependent Variable: WM

Tukey HSD

(I) Categories	(J) Categories	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Technical Skills	Professional Skill	-.59900*	.11868	.000	-.9186	-.2794
	Support	.13900	.11868	.649	-.1806	.4586
	Work-Personal Interface	.04800	.11868	.977	-.2716	.3676
Professional Skills	Technical Skill	.59900*	.11868	.000	.2794	.9186
	Support	.73800*	.11868	.000	.4184	1.0576
	Work-Personal Interface	.64700*	.11868	.000	.3274	.9666
Support	Technical Skill	-.13900	.11868	.649	-.4586	.1806
	Professional Skill	-.73800*	.11868	.000	-1.0576	-.4184
	Work-Personal Interface	-.09100	.11868	.869	-.4106	.2286
Work-Personal Interface	Technical Skill	-.04800	.11868	.977	-.3676	.2716
	Professional Skill	-.64700*	.11868	.000	-.9666	-.3274
	Support	.09100	.11868	.869	-.2286	.4106

*. The mean difference is significant at the 0.05 level.

The table above presented the results of multiple comparisons to identify which categories influenced significant differences. According to the statistical analysis, professional skills showed significantly higher levels compared to other categories, with a significance level of $P < 0.05$ (see **Table 7**). Conversely, the other categories did not show significant differences when compared with each other, with a significance level of $P > 0.05$.

The collected data aligns with various studies on the stress levels of teachers in delivering distance education, indicating moderate to high perceived stress levels. Specifically, the results indicate that professional skills are the most stressful category, followed by technical skills, which contribute to higher stress levels in delivering distance education. Marek et al.^[21] emphasizes the importance of adaptability and effective planning for teachers, beyond just ICT readiness, to effectively deliver instruction in distance learning settings. The need to revisit and redesign teaching strategies relevant to distance teaching adds to the stress experienced by science teachers, requiring them to invest more time and effort in learning new methods.

Furthermore, the challenges of executing laboratory classes in distance learning settings also contribute to the stress of science teachers, although technological solutions can help mitigate these challenges. Singh

and Hurley^[19] note that teachers in higher education have access to more advanced facilities and equipment for teaching and learning.

In contrast, support from family, colleagues, and school officials emerged as the least stressful aspect. According to Petrakova^[13], common strategies for coping with stress among teachers include seeking social and emotional support, engaging in physical exercise, and pursuing hobbies. Greenglass and colleagues (1996, 1997) found that support from colleagues is particularly effective in buffering the impact of stress on burnout among teachers, more so than support from family and friends. This could explain why support emerged as the least stressful factor in this study, potentially mitigating the effects of stress from technical skills, professional skills, and work-personal interface.

Question 4. Based on the findings, what intervention program can be made to address the stressors?

5.4. Recommendation for coping with stress

Teaching is widely acknowledged as a profession associated with high levels of stress. However, coping strategies are rarely integrated into teachers' preparation programs. Teachers can effectively manage stress through (a) adopting healthy coping strategies and (b) developing social-emotional competencies that contribute to positive learning environments and help mitigate high-stress conditions. In response to current challenges, teachers are compelled to reconsider their instructional methods beyond traditional face-to-face encounters^[5].

Various methods have been proposed to enhance teachers' ability to cope with stress. These methods include direct approaches aimed at addressing the root causes of stress, such as managing technical challenges, improving relationships between teachers and administrators, participating in professional development, and balancing work-home expectations. Indirect methods involve helping individuals change their interpretation, behavior, or response to stressors, which might include exercise, dietary changes, relaxation techniques, or adjusting expectations.

The developed intervention program targets the three most stressful causes within each category of potential stressors related to delivering distance education. The program utilizes both indirect and direct interventions tailored to the identified stressors. Indirect interventions include activities such as mindfulness, relaxation response activation, cognitive restructuring, and collegial collaboration^[20]. Direct interventions involve immediate responses to address the source of stress, such as acquiring and improving specific skills.

6. Discussion

This study identified three key findings. First, it revealed that science teachers experienced moderate to high levels of stress when delivering distance education instruction, with a majority reporting varying degrees of stress. Notably, the study refrained from making direct comparisons to pre-lockdown stress levels due to the absence of baseline data.

Second, contrary to expectations, professional skills emerged as the most significant stressor category for science teachers, surpassing technical skills, which ranked second. This finding aligns with Yang and Cornelius^[21], who similarly identified technical issues as impactful on satisfaction with online classes. Specifically, within the professional skills category, controlling student cheating and plagiarism during distance teaching emerged as the most stressful issue. This concern has grown alongside increased internet usage for academic purposes^[22].

Third, delivering distance education with adequate support was perceived as the least stressful category among all identified stressors. Issues such as job insecurity and interpersonal conflicts due to personal biases

in distance teaching were identified as the least stressful causes. However, it's worth noting that all aspects within the support category were still considered somewhat stressful. Research has consistently shown that social support can mitigate the impact of stressors on psychological well-being, job satisfaction, and overall health^[23]. Furthermore, significant variations were observed in stress levels across different stressor categories, with professional skills standing out as notably more stressful compared to others.

7. Conclusion

This study reveals significant insights into the stress experienced by science teachers during distance education. The findings indicate that professional skills, particularly issues related to academic integrity such as controlling student plagiarism, emerged as the most stressful aspect of online teaching. This highlights the critical need for targeted training and support mechanisms to equip teachers with the necessary skills and strategies. Contrary to initial expectations, technical challenges ranked lower in stress compared to professional skills, suggesting that while technological proficiency is vital, it is overshadowed by the complexities of maintaining academic standards in digital classrooms.

The study underscores the importance of institutional support and resource allocation in alleviating teacher stress. Adequate provision of technology, coupled with ongoing professional development, is essential for enhancing teacher preparedness and confidence in delivering effective distance education. Practically, educational institutions should prioritize initiatives that foster a supportive environment and address the specific needs identified by this study. Strategies to enhance academic integrity and provide robust support networks can significantly mitigate stress levels among educators.

In future research, employing rigorous research designs and methodologies, such as experimental studies or case studies focusing on specific interventions, will contribute to a deeper understanding of effective strategies to support educators in distance education settings.

Conflict of interest

The authors declare no conflict of interest.

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