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Empirical research on the impact of job demands and stress in distance education on Chinese college teachers' job burnout in the post-epidemic era of COVID-19

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Abstract

COVID-19 has had serious effects on people worldwide in all aspects, including life, education and work, which had irreversible impacts on people's physical and mental health. In order to explore the impact of the job demands and stress of distance education on teachers' job burnout during the Covid-19 epidemic period, 234 college teachers from China were investigated by using quantitative analysis, while correlations between job demands, stress, and teachers' burnout in distance education were analyzed by constructing a structural equation model (SEM). The results show that teachers from Chinese university had generally experienced high-intensity work demands and pressure during the Covid-19 epidemic period when online teaching was required to carry out. Empirical research through SEM indicated that job demands had a significant positive impact on stress, while stress had a significant positive impact on job burnout. The results reveal that job demands and stress of distance education during the Covid-19 epidemic period confused teachers' professional identity and caused their fatigue. Despite the negative impacts, teachers should find ways to overcome it through self-inspiration or finding new balances and superior department should make effort to provide necessary support and resources to alleviate their burdens.

Keywords: Post epidemic era, job demands, stress, job burnout, SEM

Introduction

The global outbreak of the COVID-19 has had adverse effects on the physical and mental health of people worldwide, as well as causing significant damages to the social and economic development. In order to respond to and prevent the spread of the epidemic, governments have implemented various prevention and control measures, such as regional lockdowns, advocating for social distancing, wearing masks, establishing nucleic acid testing sites, and urging comprehensive testing (Ma *et al.*, 2020) ^[19]. However, these control measures targeting the COVID-19 pandemic have disrupted the normal functioning of society, leading to unprecedented challenges in the field of education. The planned start dates for education at all levels in various regions have been postponed, and remote education has been put on the agenda. Initially, remote teaching was considered a temporary form of instruction during the extraordinary time of COVID-19 pandemic, serving as a substitute for attending school and classes. However, as the pandemic continued to spread, governments began to implement various specific and stricter control measures, resulting in the prolonged implementation of remote education (Sun *et al.*, 2021) ^[23]. Over time, online-based teaching and other aspects of student work exposed problems and limitations. Teachers have had to increase their workload to overcome these issues, while the new job demands had added to the pressure and burden on teachers. College teachers often bear the responsibilities of teaching, research, and administration, and the complexity of their work combined with frequent role transitions has increased their work-related stress, leading to mental exhaustion and occupational burnout (Li & Yang, 2004) ^[14].

Previous research has primarily focused on the current state and effects of online education during the COVID-19 pandemic from the perspective of students (Huang & Wang, 2022; Sun *et al.*, 2021) ^[9, 23], while less attention has been given to the physical and mental health

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of teachers. In order to protect the physical and mental well-being of college teachers, improve the quality of education, and create a win-win situation for both teachers and students, it is necessary to pay attention to teacher burnout and explore ways to overcome it. In this study, we reviewed the job demands, stress, and burnout experienced by college teachers during the adaptation to remote education during the COVID-19 pandemic. We explored the influence of job demands and stress on burnout, as well as the efforts made by teachers to overcome stress and burnout, aiming to elucidate the difficulties and needs faced by college teachers in remote education during the pandemic. Discussions and suggestions for preventing teacher burnout and providing insights for future policy-making in the context of ongoing remote education and unforeseen public crises are also presented.

Literature Review

Remote education

Remote education is a form of teaching that takes place at different times or locations (Ding, 2000) [5]. It primarily consists of three forms: remote interactive teaching, where teachers and students utilize remote learning platforms such as China's Rain Classroom and Tencent Meeting for video lectures; content-oriented teaching, where teachers pre-record lectures or learning materials for students to access, such as Massive Open Online Courses (MOOCs); and task-oriented teaching, where teachers provide online assignments based on specific course requirements. To ensure the orderly implementation of remote education, education departments and relevant authorities in various provinces of China have successively opened up online resource platforms for teaching, learning, and communication (Wang *et al.*, 2020) [24]. Schools at all levels have also formulated detailed guidelines for remote education based on their specific situations. However, in the situation where remote teaching has not been widely promoted, college teachers had faced many obstacles in lesson preparation and administrative work. Additionally, the lack of information technology skills among teachers decreased student engagement and concentration, and inadequate online teaching infrastructure further contributed to the difficulties in delivering lessons (Liu & Li, 2021) [16]. Teachers had to spend a considerable amount of time preparing for online courses, and the constant trial-and-error and adaptation to remote teaching software and platforms also generate additional stress (Wang & Zhang, 2022) [25].

Job demands

Job demands refer to the physical and mental effort demanded to fulfill specific job duties, resulting in physiological and psychological burdens for individuals carrying out their duties (Schaufeli & Bakker, 2004) [22]. Karasek (1979) [10] categorized work demands into quantitative and qualitative demands. Quantitative demands include workload and time pressure, which can be explained as the inability to complete specified tasks within given timeframes, potentially leading to work burnout. Qualitative demands include role ambiguity and role conflict, which occur when the purpose, scope, and responsibilities of the work are unclear, including uncertainty regarding the types of activities required to be performed in the work environment (Karasek, 1979) [10]. Demerouti *et al.* (2001) [3] have pointed out that Work demands deplete individuals'

resources, leading to compromised health and work fatigue, resulting in low performance and high turnover rates, among other negative outcomes. During the COVID-19 pandemic, college teachers are required to constantly pay attention to and comply with the preventive guidelines and requirements issued by higher authorities, while also preparing for online teaching. In terms of student work, in addition to the preventive measures, it is necessary to establish emergency communication channels with universities, students, and parents to stay connected and address any changes related to the pandemic, thereby increasing the additional workload for teachers (Zhang & Xie, 2021) [30].

Stress

Stress is the feeling of anxiety and threat that humans experience when facing psychologically or physically challenging situations (Chen, 2021) [2]. During the pandemic, the burden of epidemic prevention in schools has increased, resulting in an additional workload for teachers and heightened levels of stress. Moreover, measures such as remote work have created a sense of distance between teachers and others, hindering their ability to effectively communicate and resolve work-related difficulties with colleagues, administrators, and students, thus contributing to the generation of stress (Wang, 2021) [26]. When applying the definition of stress to the context of the COVID-19 pandemic, it can be defined as the physiological, psychological, and behavioral reactions that individuals experience during the interactive process between themselves and the external environment altered by the COVID-19 outbreak.

Job burnout

Farber (1984) [6] used job burnout to describe the negative experiences related to work among individuals in the interpersonal service industry, which appears to be more prominent among teachers. Burnout refers to the state of physical and mental exhaustion and depletion of energy experienced by professionals in the interpersonal service sector (Freudenberger, 1974) [7]. Maslach *et al.* (2001) [20] defined job burnout as a comprehensive phenomenon characterized by emotional exhaustion, depersonalization, and a decreased sense of personal accomplishment among workers. Li and Yang (2008) [15] argued that job burnout occurs when individuals are exposed to long-term and excessive work-related stress. Teachers are employed in the field of education and interact with students, parents, colleagues, and administrators while fulfilling their duties, making them likely to experience job burnout (He *et al.*, 2015) [8]. According to Ding (2019) [4], teacher burnout is a state of physical, psychological, and emotional exhaustion that occurs due to the characteristics of both the teachers themselves and the school organization. Excessive workloads can exacerbate the degree of burnout. Furthermore, this accumulated state of burnout can even lead to health issues among teachers (Schaufeli & Bakker, 2004) [22]. Therefore, it requires immediate attention, prevention, and mitigation to teachers' stress and job burnout.

Methods

To explore the impact of the job demands and stress of distance education on teachers' job burnout during the Covid-19 epidemic period, this study employs structural

equation modeling (SEM) to investigate the impact of new job requirements and stress resulting from the COVID-19 pandemic on teacher occupational burnout. SEM is a statistical technique widely used in social sciences, psychology, and other fields to analyze complex relationships between observed and latent variables, which allows researchers to test and validate hypothesized causal relationships among variables, as well as assess overall model fit (Wu, 2010) [29]. Building upon existing research

and aligning with the objectives of this study, the following hypotheses are proposed, which ultimately form the theoretical model depicted in Figure 1:

Hypothesis 1: Job demands have a significant positive impact on college teachers' stress.

Hypothesis 2: Stress has a significant positive impact on college teachers' job burnout.

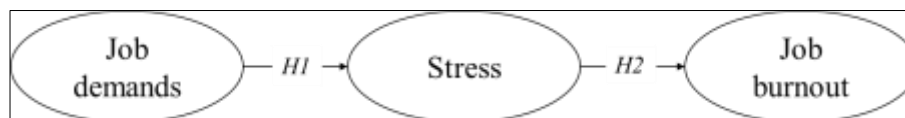


Fig 1: Theoretical model of the impact mechanism of job demands and stress on burnout among college teachers.

Questionnaire of the job demands and stress on burnout among college teachers was distributed through an online survey platform from December 1 to December 31, 2022. During that time, the COVID-19 pandemic situation in that area was relatively severe in China and students were not able to go to school, while teachers were asked to perform online education to complete their teaching schedule. The target population consisted of full-time college teachers engaged in teaching and research in Zhaoqing, Guangdong Province, China.

Pre-survey

In this study, questionnaire was consisted of four parts, including personal information, job demands scale, stress scale, and burnout scale. The job demands scale developed by Li (2015) [13] was simplified, and supplemented with the job demands scale for teachers in the context of the COVID-19 pandemic developed by Kyung (2021) [11] as the measurement tool. This scale consisted of four dimensions: job intensity demand, job skill demand, ambiguity of job requirements, and conflicts with others. It included a total of 11 items, using a 5-point Likert scale. The ratings ranged from “completely disagree” (1 point) to “completely agree” (5 points), where higher scores indicate a higher level of agreement with the statement.

Stress scale developed by Ma (2012) [18] was referenced and partially modified based on the research findings of Sun *et al.* (2021) [23] and Wang (2020) [27], regarding online teaching models in COVID-19 pandemic. The stress scale included four dimensions: teaching stress, technostress, research and interpersonal relationship stress, and family stress. The scale consisted of a total of 14 items, using a 5-point Likert scale. The ratings ranged from “completely disagree” (1 point) to “completely agree” (5 points), where higher scores indicate a higher level of stress.

Job burnout scale for college teachers developed and validated by Liu (2008) [17] was referenced and simplified to measure teacher burnout. The scale consisted of 9 items, including three dimensions: emotional exhaustion, personal accomplishment and Unconcern. The items were scored on a 5-point Likert scale, ranging from “completely disagree” (1 point) to “completely agree” (5 points). However, for the personal accomplishment dimension, the statements of items 5 (“I efficiently handle students' problems”), 6 (“I feel that I positively influence students' lives through my work”), and 7 (“I have a lot of sense of accomplishment in my work”) were reverse-coded during data analysis. This means that

higher scores indicated a more negative perspective from the respondents, reflecting a higher level of burnout.

Data analyses

Reliability and validity of the questionnaire was verified by SPSS 26.0. To construct and analyze the structural equation model of college teachers' job demands, stress, and burnout, AMOS 21.0 was used to examine the relationships among these variables in remote education.

Results

Participants

In this research, a total of 324 electronic questionnaires were collected. After removing 90 invalid questionnaires that had irregular responses or completion time less than 300 seconds, 234 valid questionnaires remained as the analytical sample for this study. The response rate of the questionnaire was 72.22%. Among the respondents, 119 male teachers (50.85%) and 115 female teachers (49.15%) were included and the majority were young and middle-aged teachers aged 40 and below (91.88%), with the majority having teaching experience of over 4 years (76.92%). Most teachers had a primary or intermediate professional and technical level (80.77%), and 62.39% of them held some additional positions.

Descriptive Statistics and correlation results

As shown in Table 1, the descriptive statistics analysis data revealed that most teachers were aware of the high job demands imposed during the COVID-19 pandemic, with an overall mean of 3.445 points. The dimensions of job intensity requirements and conflicts with others related to epidemic prevention showed a high level of agreement, with mean values of 3.847 and 3.806 points, respectively. In contrast, teachers had a clear understanding of their job responsibilities and roles, with a mean value of 2.470 points, causing no significant distress. The standard deviations of the four dimensions ranged from 0.531 to 0.816.

In terms of stress, the sudden shift in teaching methods had resulted in increased stress among teachers, with an overall mean of 3.136 points. The dimensions of teaching stress related to online teaching and technostress were more pronounced, with mean values of 3.576 and 3.338 points, respectively. Additionally, due to working from home, teachers had encountered obstacles in their research work and felt pressure in balancing work and family responsibilities. The mean scores for research and interpersonal relationship stress and family stress were

2.965 and 2.665 points, respectively, while standard deviations of the four dimensions ranged from 0.776 to 0.814.

Regarding job burnout, although teachers exhibited a certain level of fatigue, they still held a relatively positive view compared to the previous two scales, with a total mean score of 2.308 points and the standard deviations of the three dimensions ranged from 0.654 to 0.890.

The results of the correlation analysis indicated a significant positive correlation among all variables (Table 2), suggesting the need for further examination of the hypothetical relationships using a structural equation model.

Reliability test and confirmatory factor analysis

Reliability and validity analyses were conducted by using SPSS 26.0 as research tools. As shown in Table 3, in terms of reliability testing, both the Cronbach's α and Combined Reliability (CR) coefficients of the questionnaire in this study were greater than 0.7, which is considered ideal for reliability of the scales, according to Wu (2010) [29]. Regarding validity testing, the factor loadings of each dimension in the scale ranged from 0.567 to 0.923, and the Average Variance Extracted (AVE) for each dimension was greater than 0.5, meeting the requirements (Zhang & Dong, 2013) [31]. The factor analysis results shows that the KMO test values for the job demands, stress, and job burnout scales were 0.763, 0.845, and 0.805, respectively. The Bartlett's test of sphericity was significant ($p < 0.001$), indicating the correlations between the variables and the suitability of factor analysis. Furthermore, the cumulative variance explained by the factors of the three scales were 68.257%, 64.891%, and 69.238%, respectively, indicating that the dimensions included in each scale can explain about 65% to 70% of the variance in the job demands, stress, and job burnout scales, demonstrating good validity and representativeness (Zhang & Dong, 2013) [31]. Overall, the research tools in this study demonstrated satisfactory levels of reliability and validity, making them suitable for further structural equation modeling analysis.

Structural Equation Modeling Analysis

The model fit of the structural equation model was examined using AMOS 21.0 software. First, the model was modified based on modification indices, adding covariances between the residual terms of skill demands and conflicts (e_2, e_4), teaching stress and research and interpersonal relationship stress (e_6, e_8), teaching stress and technostress (e_6, e_7), and technostress and research and interpersonal relationship stress (e_7, e_8). The final model fit and model fit test results are as follows: for absolute fit indices, $\Delta\chi^2(38) = 59.902$, $p = 0.01$, GFI=0.956, AGFI=0.922, SRMR=0.059, RMSEA=0.052; for incremental fit indices: CFI=0.958, IFI=0.959, NFI=0.900, NNFI=0.937; for parsimonious fit indices: PCFI=0.644, PNFI=0.605, PGFI=0.536, CN=233, CAIC for theoretical model=247.107, for saturated model=426.051, for independent model=667.492. The majority of the indices met the requirements (Wu, 2010) [29], indicating the suitability of the analysis of the impact mechanism of job demands and stress on job burnout among college teachers in this study.

The final structural equation model diagram can be seen in Figure 2. The results show that all the path coefficients of the variables were positive. On the path from job demands to stress, the path coefficient is 0.457 ($p < 0.001$), indicating a

highly significant positive impact of job demands on stress among college teachers in remote education, which provided evidence that Hypothesis 1 was supported. On the path from stress to burnout, the path coefficient was 0.676 ($p < 0.001$), indicating a highly significant positive impact of stress on job burnout among college teachers in remote education, indicating that Hypothesis 2 was also supported.

By analyzing the observed variables for each of the latent variables, job demands, stress, and job burnout, it was found that among the job demands of college teachers, the highest level of association was with the dimension of work intensity requirements, with a standardized regression path coefficient of 0.938 ($p < 0.001$). This indicated that college teachers generally perceive a high workload and time pressure during the pandemic, requiring significant effort to meet the universities' expectations, making work intensity requirements the primary burden within job demands.

The association with skill demands ($\beta = 0.511$, $p < 0.001$) and conflicts ($\beta = 0.511$, $p < 0.001$) follows, indicating that during the epidemic, college teachers still need to acquire professional knowledge and improve teaching skills to meet the requirements of remote teaching. Additionally, the epidemic prevention and control work imposed new job requirements on teachers, leading to a sense of burden regarding the various epidemic prevention instructions and related job demands issued by superiors.

At the same time, due to the difference between online teaching and face-to-face teaching in the classroom, and the additional responsibilities of epidemic prevention and control, teachers to some extent felt confused about their scope of responsibilities and roles ($\beta = 0.189$, $p < 0.05$).

In terms of stress, technostress had the highest level of association with the overall perceived stress among teachers, with a standardized regression path coefficient of 0.677 ($p < 0.001$). Faced with unfamiliar online teaching software and platforms, teachers worried about not being proficient in their use or making mistakes during the teaching process. Additionally, due to policies such as maintaining social distance, it is difficult for teachers to receive hands-on technical guidance from experienced colleagues. Instead, they had to rely on subjective experience and limited information technology skills to learn and implement remote teaching. Furthermore, during the implementation of remote teaching, teachers faced challenges in observing students' behavior in the classroom and receiving feedback on effectiveness. Students' irregular daily routines and lack of effective supervision at home can lead to absenteeism. As a result, course assessments cannot be effectively carried out or maybe postponed, impeding the smooth progress of teaching and adding to teachers' stress.

The boundary between work and family life became blurred due to long-term remote work. Changes in the dynamics of interaction with family members can give rise to conflicts and tensions, resulting in significant stress for teachers ($\beta = 0.672$, $p < 0.001$). Some teachers also felt that the pandemic had hindered communication among research team members and limited the conditions for conducting research, leading to interpersonal relationship stress and a delay in research work ($\beta = 0.469$, $p < 0.001$).

In terms of job burnout, emotional exhaustion has the highest level of association, with a standardized regression path coefficient of 0.846 ($p < 0.001$), which was followed by low personal accomplishment ($\beta = 0.586$, $p < 0.001$) and

indifference and lack of concern for others ($\beta=0.240$, $p<0.001$).

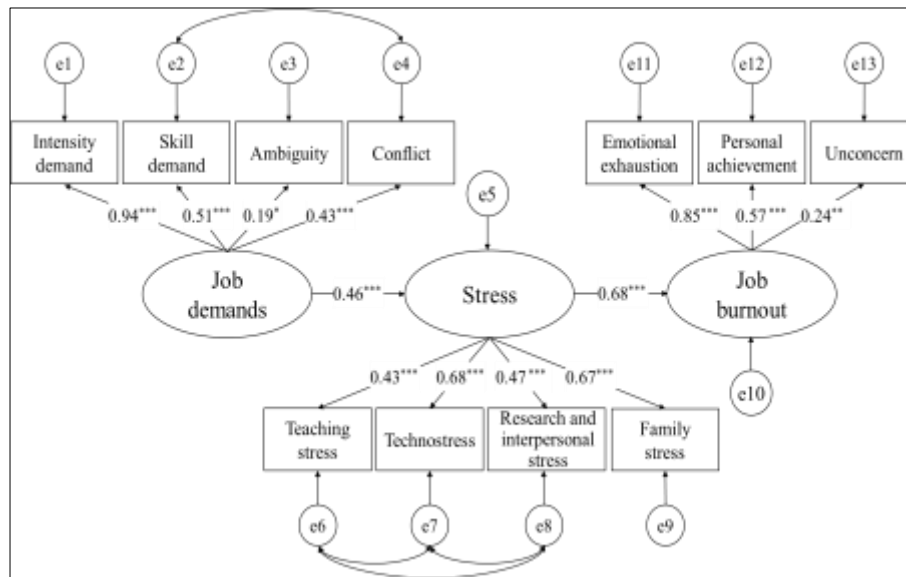


Fig 2: Structural Equation Model of the Impact Mechanism of Job demands, Stress on Job Burnout among College teachers in Remote Education

Note. *** indicates significance at the 0.001 level; ** indicates significance at the 0.01 level; * indicates significance at the 0.05 level.

Discussion & Implications

Education is a long-term endeavor that requires extensive planning and gradual reform compared to other fields. However, the sudden changes in the educational environment caused by the COVID-19 pandemic have forced teachers to quickly adapt to new job requirements. The drastic changes in their daily lives and work environment have brought about numerous pressures for teachers, which is further confirmed by the results of this study above. Job burnout has been found to decrease job satisfaction, work performance, and organizational commitment (Brewer & Clippard, 2010) [1]. In addition to negative impacts on a teacher's physical health, job satisfaction, and self-efficacy, teacher burnout also has negative effects on students' cognition, school adjustment, and academic self-efficacy (Li *et al.*, 2010; Ming & Mei,

2018) [12, 21]. Therefore, the physical and mental health of teachers needs to be recognized and prioritized.

Therefore, this study primarily investigated the phenomenon of teacher burnout resulting from the work demands and pressures of remote education during the pandemic by using quantitative analysis, which provided a theoretical basis for the development of policy support needed for the normalization of educational activities. However, it has also been pointed out by Willower (1987) [28] that there are limitations to elucidating its reality from a specific perspective in the field of education. Therefore, future research could employ a combination of qualitative and quantitative research methods to analyze the impact of job demands and stress in remote education on college teachers' burnout. By examining the research subjects from different perspectives and interpreting social phenomena from various angles, a deeper understanding of the conflict patterns experienced by teachers and the process of overcoming conflicts in the context of the COVID-19 pandemic can be achieved.

Table 1: Descriptive, reliability, and confirmatory factor analysis (N=234)

Scale	Variable	Mean	Standard Deviation
Job demands	Intensity demand	3.847	0.641
	Skill demand	3.655	0.531
	Ambiguity	2.470	0.816
	Conflict	3.806	0.571
Stress	Teaching stress	3.576	0.782
	Technostress	3.338	0.776
	Research and interpersonal stress	2.965	0.802
	Family stress	2.665	0.814
Job burnout	Emotional exhaustion	2.369	0.836
	Personal achievement	2.068	0.654
	Unconcern	2.487	0.890

Table 2: Pearson's correlations of variables.

	1	2	3	4	5	6	7	8	9	10
Job demands										
1. Intensity demand	1									
2. Skill demand	0.48**	1								
3. Ambiguity	0.17**	0.08	1							
4. Conflict	0.40**	0.40**	0.04	1						
Stress										
5. Teaching stress	0.38**	0.24**	0.14*	0.21**	1					
6. Technostress	0.24**	0.11	0.13*	0.07	0.39**	1				
7. Research and interpersonal stress	0.14*	-0.02	0.04	0.08	0.44**	0.57**	1			
8. Family stress	0.24**	0.16*	0.18**	0.16*	0.44**	0.27**	0.31**	1		
Job burnout										
9. Emotional exhaustion	0.25**	0.08	0.38**	-0.03	0.38**	0.23**	0.31**	0.46**	1	
10. Personal achievement	0.09	-0.01	0.15*	-0.14*	0.24**	0.26**	0.21**	0.30**	0.52**	1
11. Unconcern	0.10	0.07	0.10	-0.03	0.12	0.08	0.12	0.14*	0.22**	0.13

Note. * $p < 0.05$, ** $p < 0.01$

Table 3: Reliability test and confirmatory factor analysis (N=234)

Variables	Cronbach's α	Factor loading	CR	AVE	KMO & Bartlett test	Cumulative variance
Job demands	0.770	–	–	–	0.763 $p < 0.001$	68.257%
Intensity demand	0.727	0.619–0.814	0.798	0.501		
Skill demand	0.705	0.740–0.766	0.798	0.569		
Ambiguity	0.731	0.859–0.870	0.855	0.747		
Conflict	0.728	0.755–0.923	0.830	0.711		
Stress	0.859	–	–	–	0.845; $p < 0.001$	64.891%
Teaching stress	0.807	0.637–0.783	0.834	0.503		
Technostress	0.705	0.621–0.800	0.771	0.531		
Research and interpersonal stress	0.770	0.567–0.780	0.800	0.503		
Family stress	0.737	0.796–0.832	0.797	0.663	0.805; $p < 0.001$	69.238%
Job burnout	0.798	–	–	–		
Emotional exhaustion	0.817	0.711–0.797	0.845	0.578		
Personal achievement	0.707	0.672–0.829	0.803	0.578		
Unconcern	0.772	0.874–0.905	0.884	0.791		

Note. CR: Combined Reliability; AVE: Average Variance Extracted.

Conclusion

Based on the analysis of job demands, stress, and teacher burnout in remote education, this study using quantitative research results from questionnaire surveys and qualitative research results from in-depth interviews, draws the following conclusions:

Firstly, regarding the job demands in remote education, teachers felt that they were handling a large amount of teaching and epidemic prevention work within limited physical time. Despite participants' efforts to allocate work time appropriately, they still felt burdened by excessive workload and high work intensity. In particular, during lesson preparation, the unfamiliarity with platforms and remote teaching equipment led to increased preparation time. Additionally, teachers had to take on additional responsibilities such as epidemic prevention guidance and attendance management, further adding to their burden.

Secondly, in terms of the stress in remote education, in addition to pressures related to teaching, research, and family conflicts, there was a common factor among the participants. Their stress stemmed from reduced communication opportunities and difficulties in forming relationships with students, colleagues, and school administrators due to non-face-to-face interactions. They were unable to receive appropriate support from higher-level departments, leading to a situation where they had to bear various stresses relying solely on their own abilities.

Thirdly, the additional job demands brought about by the COVID-19 pandemic had increased the pressure on

teachers. They were exposed to continuous and long-term stress, resulting in physical, emotional, and psychological exhaustion, leading to a state of burnout characterized by a negative attitude towards themselves and others. The high moral standards imposed by society on teachers created a heavy burden, leading to lower professional identification and feelings of fatigue and emotional decline towards educational work. However, it can also be observed that some teachers had made efforts during the pandemic to engage in self-reflection, seek new adaptability, overcome their state of burnout, and view this as an opportunity for growth. They strived to discover the positive value and self-identity in their educational work.

Suggestions

This study aims to reveal the impact of job demands and stress in remote education caused by the COVID-19 pandemic on teacher burnout. It explored prevention measures and support factors to prevent teacher burnout, providing insights for future policy-making and making remote education more meaningful in the era of the Fourth Industrial Revolution. Based on this, the following recommendations are proposed:

Firstly, it is necessary to establish a support system that provides teachers with appropriate guidance and assistance in adapting to remote education platforms and technology, reducing their technological stress. Schools and educational institutions should prioritize the well-being of teachers by promoting work-life balance, providing resources for stress

management, and fostering a supportive and collaborative work environment. Adequate resources and training should be provided to help teachers enhance their pedagogical skills and adapt to the challenges of remote teaching.

Secondly, schools and policymakers should recognize the additional workload and pressures faced by teachers during the pandemic and provide necessary support and resources to alleviate their burdens. Teachers should be encouraged and provided with opportunities for professional development, self-reflection, and personal growth to enhance their sense of accomplishment and job satisfaction in the field of education.

Thirdly, the ministry of education and relevant departments need to develop unified principles and standard protocols. Teachers have experienced high-intensity job demands and pressure due to constantly changing policies. Therefore, based on the experience of the past few years, principles and standard protocols regarding remote education should be formulated and implemented. Schools should exercise their subjective initiative and discretion in decision-making and implementing matters related to remote education. They should reduce job demands and pressure on teachers and focus on providing social support in terms of happiness and belongingness derived from forming relationships. Preventing teacher burnout, will help ensure the positive mindset of teachers and the quality of education during future repeatable pandemics.

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4. Notes on contributors: Siran Zhang is a doctoral fellow with the School of Food and Pharmaceutical Engineering, Zhaoqing University, Zhaoqing, China. Her research interests include learning analytics and learning sciences.

References

- Brewer EW, Clippard LF. Burnout and job satisfaction among student support services personnel[J]. *Human Resource Development Quarterly*. 2010;13(2):169-186.
- Chen Q. Formation and response mechanism of pressure on college counselors. *Journal of Anyang Normal University*. 2021;23(3):139-141.
- Demerouti E, Bakker AB, Nachreiner F, Schaufeli WB. The job demands-resources model of burnout. *The Journal of applied psychology*. 2001;86(3):499-512.
- Ding CL. Study on the causes and adjustment strategies of teacher job burnout. *Contemporary Family Education*. 2019;7(26):25.
- Ding FX. Analysis and research on the definition and characteristics of distance education at home and abroad: a discussion on the basic concepts of distance education and open learning (2). *China Educational Technology*. 2000;31(6):47-49.
- Farber BA. Stress and burnout in suburban teachers. *The Journal of Educational Research*. 1984;77(6):325-331.
- Freudenberger HJ. Staff burn-out. *Journal of Social Issues*. 1974;30(1):159-165.
- He S, Liu LP, Chen Z. The status quo of young university teacher' job burnout and measures of relieving. *Journal of Southwest Petroleum University (Social Sciences Edition)*. 2015;17(3):107-113.
- Huang YT, Wang Y. Research on the influencing mechanism of undergraduates' learning engagement in blended teaching during the COVID-19: based on the perspective of the community of inquiry. *China Higher Education Research*. 2022;38(3):52-59.
- Karasek RA. Job demand, job decision latitude, and mental strain: implications for job redesign. *Administrative Science Quarterly*. 1979;24(3):285-308.
- Kyung KH. The Impact of Teachers' Job Demands on Job Burnout in the Context of COVID-19: the Moderating Effects of COVID-19 Anxiety and Cognitive Flexibility. Seoul: Korea University; c2021.
- Li JQ, Chen H, Zhan L, Liu YW. Study on the impact of teacher job burnout on students' mental development and countermeasures. *China Science & Technology Fortune*. 2010;13(22):62.
- Li M. A Study on Work Engagement of Secondary School Teachers. Shanghai: East China Normal University; c2015.
- Li YX, Yang SY. Teachers' job burnout and intervention. *Contemporary Education Science*. 2004;29(21):55-57.
- Li YX, Yang X. Research status and prospects on the relationship between burnout and physiological diseases. *Chinese Mental Health Journal*. 2008;22(9):697-700.
- Liu M, Li XQ. The dilemma and countermeasure research of online teaching in colleges and universities in the late period of epidemic. *Journal of Henan Institute of Technology*. 2021;29(2):68-72.
- Liu XL. Compilation of the Scale for Job Burnout on Teacher in Universities. Jinan: Shandong Normal University; c2008.
- Ma DD. A Study on Relationship among Work, Stress, Self-efficacy and Occupational Well-being in University Researchers. Hangzhou: Zhejiang University of Technology; c2012.
- Ma L, Yang M, Chuan A, Zhu ZQ, Chen HL, Zhu MN, et al. The evaluation of the control measures for COVID-19 based on ACP approach. *Chinese Journal of Intelligent Science and Technology*. 2020;2(1):88-98.
- Maslach C, Schaufeli WB, Leiter MP. Job burnout[J]. *Annual Review of Psychology*. 2001;52:397-422.
- Ming LJ, Mei RS. Danger of advisors' job burnout and countermeasures. *Journal of College Advisor*. 2018;10(6):52-56.
- Schaufeli WB, Bakker AB. Job demands, job resources, and their relationship with burnout and engagement: a multi-sample study. *Journal of Organizational Behavior*. 2004;25(3):293-315.
- Sun XJ, Xu YC, Chen JM, Zhang T. Current situation and enlightenment of online teaching of mathematics public courses in colleges under the background of epidemic prevention and control. *Journal of Capital Normal University (Natural Science Edition)*. 2021;42(1):62-69.
- Wang J, Yang XM, Zheng XD. Case study on construction and practice of online teaching mode in

- colleges and universities during the post-epidemic period. *Journal of Open Learning*. 2020;25(5):49-55.
25. Wang SM, Zhang Y. Difficulties and countermeasures of tool rationality of online teaching in universities. *Meitan Higher Education*. 2022;40(3):122-126.
 26. Wang WM. Relationship between Work Interpersonal Stress and Professional Mental Health of Primary and Middle School Teachers during COVID-19. Fuzhou: Fujian Normal University; c2021.
 27. Wang XY. Investigation report on online teaching mode and its advantages and disadvantages during epidemic period-take Anhui Industry Polytechnic as an example. *Science and Information Technology*. 2020;5(30):193-194, 196.
 28. Willower DJ. Inquiry into educational administration: the last twenty-five years and the next. *Journal of Educational Administration*. 1987;25(1):12-28.
 29. Wu ML. Structural equation modeling: operations and applications of AMOS. 2nd ed. Chongqing: Chongqing University Press; c2010.
 30. Zhang DY, Xie HX. The challenges and countermeasures of ideological and political work in universities under normalized epidemic prevention. *Heilongjiang Education (Theory & Practice)*. 2021;9(8):42-44.
 31. Zhang WT, Dong W. Advanced tutorial on SPSS statistical analysis. Beijing: Higher Education Press; c2013.