**INTERNATIONAL JOURNAL OF EDUCATIONAL RESEARCH AND INNOVATION**

*REVISTA INTERNACIONAL DE INVESTIGACIÓN E INNOVACIÓN EDUCATIVA*

## Análisis de visualización bibliométrica sobre el estrés laboral de los docentes

### Bibliometric visualization analysis of teachers' work stress

Meng Zhang

Universiti Sains Malaysia, Penang, Malaysia

X°zhangmeng@student.usm.my

Lilis Surienty

Universiti Sains Malaysia, Penang, Malaysia

lilis@usm.my

Dong Hu

Universiti Sains Malaysia, Penang, Malaysia

hudong@student.usm.my

**RESUMEN**

El estrés laboral de los profesores ha sido motivo de gran preocupación entre los académicos. Con el fin de obtener una comprensión más completa del estado actual de la investigación sobre este tema, es crucial brindar una visión general de la literatura existente al respecto. Mediante un análisis bibliométrico, se examinaron científicamente 212 trabajos sobre el estrés laboral de los profesores, recuperados de la base de datos Scopus. Los análisis estadísticos de la literatura seleccionada revelan una tendencia gradualmente ascendente en los últimos años. La investigación previa se ha centrado en aspectos como la satisfacción laboral, la autoeficacia del profesor y el agotamiento laboral. Además, el agotamiento laboral, la intención de abandono, la resiliencia, los profesores universitarios, el género y el rendimiento laboral emergen como temas de vanguardia en la actualidad. Los análisis econométricos de la literatura sobre el estrés laboral de los profesores pueden arrojar luz sobre el estado actual de la investigación relacionada y revelar puntos clave y tendencias. Este trabajo puede servir como una valiosa referencia para futuros investigadores, ayudándoles a obtener una mejor comprensión de la dirección de desarrollo en este campo y a diseñar estrategias efectivas para gestionar el estrés laboral.

**PALABRAS CLAVE**

Profesores; estrés laboral; bibliometría; VOSviewer; Scimago Graphica.

**ABSTRACT**

Teacher work stress has been a matter of great concern for scholars. To better comprehend the current state of research on teacher work stress, it is essential to present an overview of the literature on this topic. Through bibliometric analysis,

1

212 pieces of literature on teacher work stress retrieved from the Scopus database were scientifically analysed. Statistical analyses of the selected literature indicate that research on teacher work stress has exhibited a gradually increasing trend in recent years. The previous research focuses on job satisfaction, teacher self-efficacy, and job burnout. In addition, job burnout, turnover intention, resilience, university teachers, gender, and job performance are the current cutting-edge themes. Bibliometric analyses of the literature on teacher work stress can provide insight into the current state of related research and reveal hotspots and trends. This study could serve as a valuable reference for future researchers, helping them to gain a better understanding of the field's development direction and to devise effective strategies for managing work stress.Examining bibliometric data on teacher work stress can offer valuable insights into the present status of relevant research and identify key areas of focus and emerging patterns. This study could be a helpful resource for future researchers, both in their comprehension of the field's development trajectory and in the creation of effective ways for handling work stress.

**KEYWORDS**

Teachers; work stress; bibliometrics; VOSviewer; Scimago Graphica.

## 1. INTRODUCTION

With the continuous development of society and rapid economic changes, work stress has become a common phenomenon in the modern workplace. Studies have shown that the increasing issue of work stress, which affects the personal well-being of employees, causes dissatisfaction, affects physical and mental health, and reduces productivity. Ultimately, this can result in low productivity or negligence at work (Chand & Jaswal, 2018). This is because when people are in high-pressure work situations, they tend to develop negative emotions and reactions (Yeasmin et al., 2015). As the detrimental effects of work stress have become increasingly prominent, the topic of work stress has gradually garnered extensive attention from scholars (Romero et al., 2020). Ganster and Schaubroeck (1991) were the first to conduct a comprehensive literature review on work stress and health. They stated that, in the 10 years before their review, there were hundreds of studies on stress. To date, there is even more literature on work stress. However, this literature is dispersed across various academic fields and research journals, which makes it challenging for future researchers to access and benefit from it.

A preliminary search revealed that the research groups currently receiving the most attention in the domain of work stress research are cantered on teachers and nurses (Nowrouzi et al., 2017). This finding indicates that work stress in this professional environment has captured the interest of numerous scholars and therefore deserves further investigation. Education plays a crucial role in social development, and teachers are key contributors to the educational process. However, as a result of continuous societal transformations, the reform of teaching methodologies and education systems, and the increasing demands of society for improved education quality, the work stress of teachers has gradually become a prominent topic closely monitored by researchers and policymakers (Ramberg et al., 2021). According to several studies, teachers encounter diverse degrees of occupational stress throughout their careers (De Nobile & McCormick, 2007; Al-Fudail & Mellar, 2008). Specifically, one-third of educators have reported experiencing high or extreme levels of stress (Thomas et al., 2003; Geving, 2007). During the COVID-19 epidemic, around 41% of educators in OECD countries were confronted with these progressive pressures (OECD, 2020). The results of a substantial amount of empirical research suggest that teachers' work stress can lead to decreased teaching efficacy, a lack of organizational commitment, increased burnout, and reduced job satisfaction (McCarthy, 2009; Klassen & Chiu, 2011; Klassen et al., 2012). However, the related research literature is scattered. It is necessary to conduct a systematic and comprehensive review and analysis regarding the current status of research on

teacher work stress in the literature, given the proliferation of pertinent publications over the last decade.

There are numerous methods available for conducting a literature review, and bibliometric analysis is an efficient method for quantitatively measuring and analysing relevant literature to reveal the structure of the field of study, research dynamics, and research trends. Bibliometric analysis is a method that may precisely and objectively quantify the impact of publications on a particular field of study (Yi & Xi, 2008). Therefore, research scholars can utilize key information from the literature, including authors, countries, journals, research areas, keywords, and citations, to conduct statistical analyses. This, in turn, provides researchers with insights into the development of the discipline, research hotspots, and academic partnerships (Chiu & Ho, 2007; Chuang et al., 2015; Chen & Ho, 2015). Bibliometric analyses have diverse application areas across various disciplines and research fields. They serve as powerful tools for researchers to comprehend academic advancements and formulate research strategies.

Before the formal study, this research utilized the primary search query (titles ('teacher', 'stress', and 'bibliometric'). The search revealed that only one paper has been analyzed using bibliometrics in teacher work stress study: Fernández Aguayo et al. (2017) performed a bibliometric analysis of the literature on positive mindfulness training programmes to assess the effectiveness of positive mindfulness training for teacher stress management. The article focused on analysing the literature on positive thinking training for teachers and did not include a bibliometric analysis of teachers' work stress. Therefore, this finding reinforces the conclusion that conducting a bibliometric analysis of current research on teacher work stress is timely and necessary.

This study used bibliometric analysis to quantitatively examine the available literature on research related to teacher work stress. The study used citation analysis to examine work-related stress in the education sector and pinpoint the most prominent research themes in the field. The study not only identified future research trends needing more exploration but also established a strong foundation for future studies. Therefore, this study attempts to explore the following research questions:

RQ1: What are currently published trends on teacher work stress?

RQ2: Which articles have a significant influence on teacher work stress?

RQ3: Which authors have a significant influence on teacher work stress?

RQ4: Which themes related to teacher work stress are most popular among scholars?

RQ5: What areas involving teacher work stress need further research?

## 2. METHODS

This study endeavours to employ a bibliometric methodology and represents the initial endeavour to visually represent and analyse data derived from the literature on teacher work stress through the utilization of the Scopus database. Burnham (2006) described Scopus as "the largest single abstracting and indexing database ever created" and indeed the greatest advanced search list of bibliography and abstracts (Ahmi et al. 2019; Falagas et al. 2008; Nwagwu 2007). The database offers comprehensive details regarding publications, encompassing the following: document type, subject area, publication year, document language, source title, author, abstract, keywords, country, affiliation, and citations. The Scopus database was chosen to analyse data on the expansion of literature in the field of teacher work stress research globally, covering all years, author collaborations, research institutions, and countries of study. The research protocol for collecting documents for this study is shown in Figure 1. The data were retrieved up to 18th November 2023 by ((TITLE ("work stress" OR "job stress") AND TITLE-ABS-KEY (teacher*)), and the results of the search generated a total of 213 documents. To avoid incorrect counting of documents, we cleaned the data to exclude errors and retracted document types 'Retracted' 1 article. A total of 212 documents were retrieved as the most relevant and representative of the research

field and research objectives. The data visualization and bibliometric analysis were conducted utilizing Scimago Graphica, Harching's Publish or Perish 8, and Microsoft Excel, respectively.

**Figure 1. Flowchart of the search methodology (modified from PRISMA).**
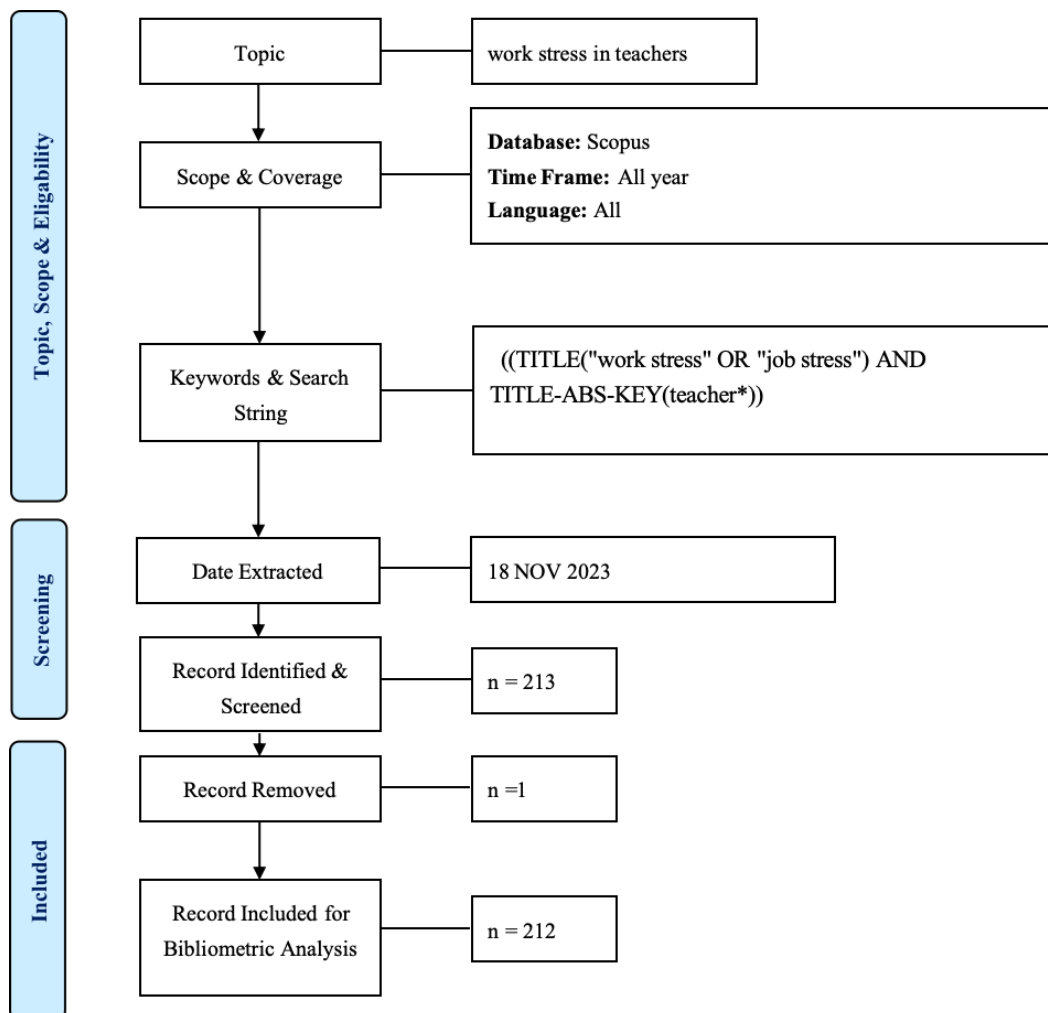


Through a literature review, this study analysed 212 publications in the field of research on teachers' work stress. The content was summarized and categorized to determine the year of publication, source, abstract, research aims, and theoretical perspectives, offering an in-depth analysis of the current studies on teachers' work stress. We then conducted a literature review categorized by year of publication, geographic distribution, and subject area of affiliation to gain an understanding of current research trends regarding teachers' work stress. We subsequently identified the most influential authors and articles in the research field on teachers' work stress using citation analysis. Co-citation references were analysed to comprehend the conceptual foundations of research on teacher work stress, while bibliographic coupling was utilized to grasp the key findings of the present study. Finally, co-occurrence keywords are generated by extracting author keywords to uncover the most popular topics and potential research directions.

## 3. RESULTS AND DISCUSSION

### 3.1. Overview of the publication

#### 3.1.1. Annual and cumulative publications

The present study started by analysing the chronological progression of the literature on tea-chers' work stress. An observation of the total annual publications offers valuable insights into the enduring popularity of the research subjects (Ahmi, A., & Mohamad, R., 2019). A compilation of the data indicates a notable upward trend in the Scopus database of literature about teachers' work stress over time, as illustrated in Figure 2. In particular, the most significant increase in the volume of literature occurred between 2018 and 2022. In 2022, the total number of publications reached a record high of 26. The highest total number of citations (1,339) was recorded in 2010, as determined by aggregating the retrieved literature according to the cited statistics. This indi-cates that 2010 was the year when interest in the study of teacher work stress peaked (see Figure 2). Furthermore, the initial article on teacher work stress was published in 1977. A further review of the literature revealed that this article was written by Brodsky, C.M. The study titled "Long-term work stress in teachers and prison guards" (Brodsky, 1977) from the University of California, USA, was published in the Journal of Occupational Medicine and has received 24 citations. This paper laid the initial groundwork for research on teacher work stress and paved the way for new direc-tions in the field.

Figure 2. Annual count of publications and citations of teacher work stress research.
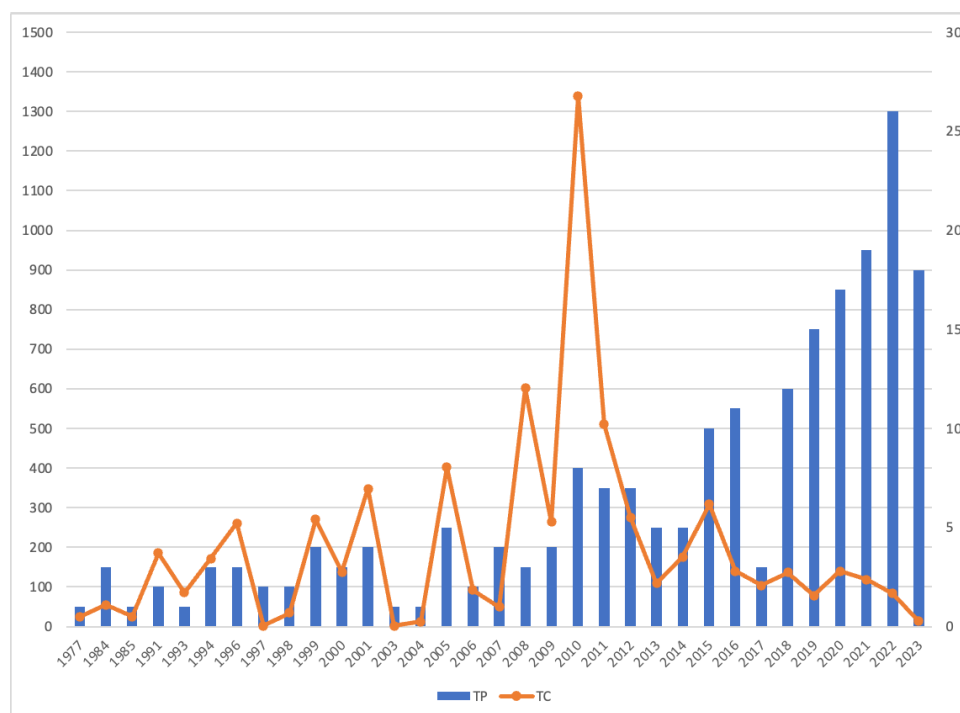


Notes: TP=total number of publications; TC=total citations.

#### 3.1.2. Country Contributions and Collaborations

The analysis of bibliometric statistics for the literature on teacher work stress demonstrates a broad geographical distribution, as it encompasses contributions from scholars hailing from 38 distinct countries. The ten countries with the most contributions to the literature on teacher work stress are listed in Table 1. Among the countries, 57 (26.89 %) were published in China, 12.26 % and

7.55 % were published in the United States and South Korea, respectively. Notably, Asian countries have the highest production of related literature in the field of research on teacher work stress. Asian countries account for nearly half of the top 10 major contributing countries. These findings indicate that Asian teachers are experiencing increased work-related stress. This result aligns with the findings of the Gallup, Inc. data survey in 2022, which revealed that up to 40 % of employees in Asian countries reported experiencing elevated levels of work-related stress (Gallup, 2022).

In addition, Figure 3 illustrates the collaboration between the countries to which the 212 documents belong. Thirty-eight countries are divided into four distinct clusters, with countries of the same colour forming a cluster indicating the level of research collaboration between countries. For example, the UK, Finland, Turkey, Pakistan, and India are clustered in green nodes, indicating that research scholars in these countries collaborate more with each other. China, Australia, and Germany are grouped in blue nodes, while the USA, Canada, and South Korea are grouped in orange nodes. Thailand and Japan are clustered in purple nodes.

**Table 1: Top 10 countries contributing to the teacher work stress research.**

| Country | TP | % | TC | C/P | Continent |
|---|---|---|---|---|---|
| China | 57 | 26.89 % | 1068 | 18.74 | Asia |
| United States | 26 | 12.26 % | 2389 | 91.88 | North America |
| South Korea | 16 | 7.55 % | 187 | 11.69 | Asia |
| Iran | 14 | 6.60 % | 20 | 1.43 | Asia |
| Indonesia | 13 | 6.13 % | 39 | 3.00 | Asia |
| United Kingdom | 12 | 5.66 % | 908 | 75.67 | Europe |
| Canada | 11 | 5.19 % | 2273 | 206.64 | North America |
| Nigeria | 11 | 5.19 % | 66 | 6.00 | Africa |
| Germany | 7 | 3.30 % | 829 | 118.43 | Europe |
| Netherlands | 7 | 3.30 % | 466 | 66.57 | Europe |

Notes: TP=total number of publications; TC=total citations; C/P=average citations per publication.

**Figure 3. Visualization map of teacher work stress research citations by country.**

ARTÍCULOS
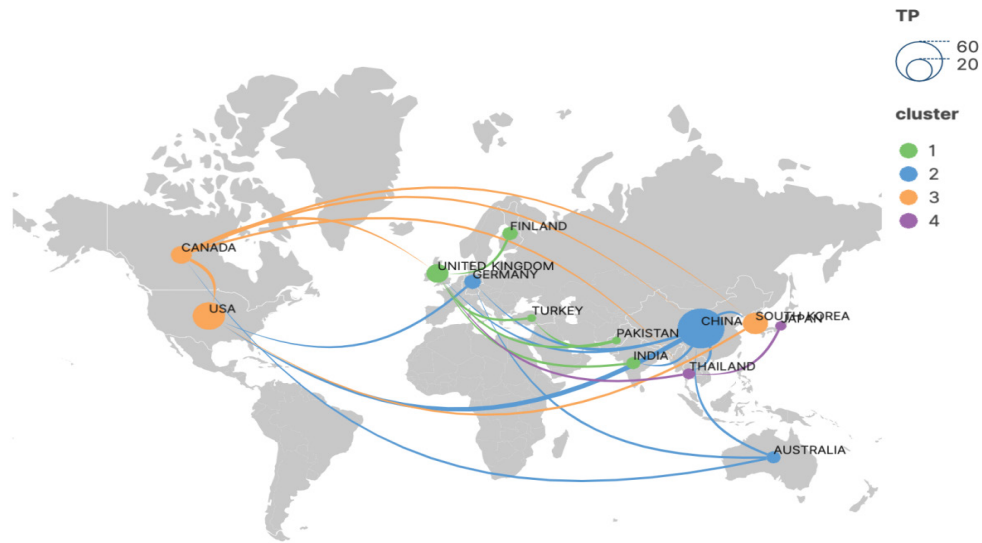


### 3.1.3. Subject area

According to all the literature collected in the Scopus database, research on teacher work stress covers 24 subject areas. These findings indicate that a wide range of research topics are related to teacher work stress. According to Figure 4, from 1977 to 2023, the literature on teacher work stress was concentrated in the fields of social sciences (41.98 %), psychology (38.21 %), medicine (29.25 %), business, management, and accounting (10.38 %). With the accelerated pace of social development and the increasing intensity of work-life conflicts, work stress has become an inevitable social issue for teachers. Thus, in the research of teachers' work stress, the social sciences are now the primary focus of related research, followed by psychology and medicine. This trend indicates that society and academia are increasingly prioritizing research on teachers' stress management and physical and mental health.

**Figure 4. Subject area of teacher work stress research.**
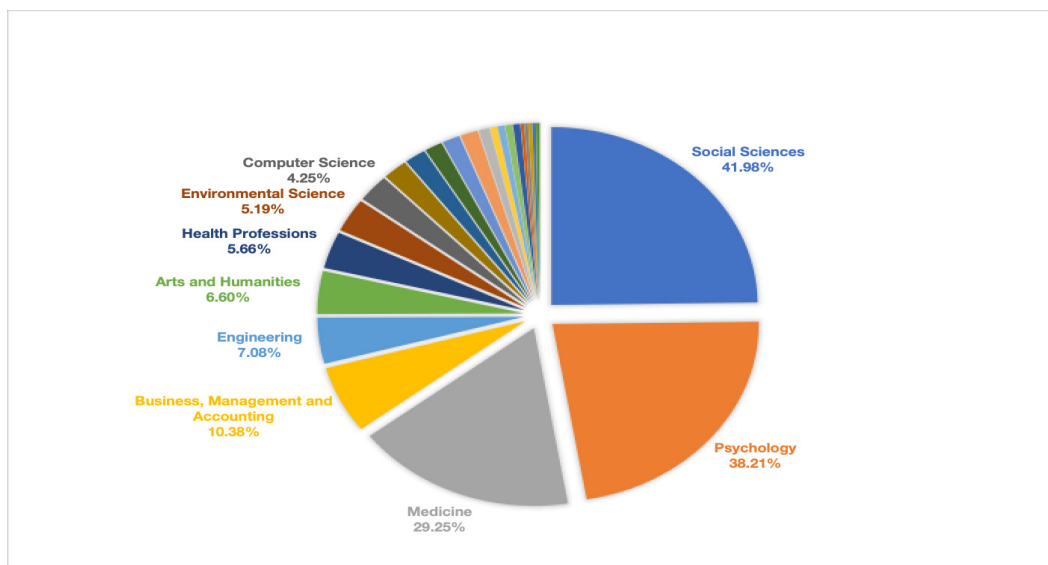
### 3.2. The most influential authors and papers

Subsequently, an analysis of the attributes of the research domain about teacher work stress was conducted through an investigation of the most influential authors and works in the Scopus database. A total of 160 of the 212 documents we retrieved involved research on teacher work stress from 1977 to 2023. The three most influential authors in terms of citations are Klassen, R.M., Schwarzer, R., and Burke, R.J. (as shown in Table 2). Klassen, R.M. is the author with the highest number of publications and citations (5 publications, 1816 citations). He is affiliated with the University of York in the United Kingdom. The correlations between teachers' self-efficacy and job satisfaction and professional commitment and between teachers' self-efficacy and work stress were the focus of his research. Following Schwarzer, R. (3 publications, 899 citations), his study focused more on the effects of teachers' work stress on burnout. Burke, R.J., was an early researcher in the field of teacher work stress, with three publications each in 1993 and 1996, resulting in a total of 340 citations. His exploration of research on teacher work stress provided robust support and assistance to subsequent scholars.

Table 2: Top 3 most influential authors of teacher work stress research.

| Author | Affiliation | Country | Publication Years | TP | TC | C/P |
|---|---|---|---|---|---|---|
| Klassen, R.M. | University of York | United Kingdom | 2010–2014 | 5 | 1816 | 363.2 |
| Schwarzer, R. | Freie Universität | Germany | 2001–2008 | 3 | 899 | 299.67 |
| Burke, R.J. | Schulich School of Business | Canada | 1993–1996 | 3 | 340 | 113.33 |

In addition, identifying the most influential articles in the field of teacher work stress requires conducting a citation analysis of the publications. We therefore compiled a list of the ten most-cited articles on teacher work stress (as shown in Table 3). The 2010 publication in the Journal of Educational Psychology titled "Effects on Teachers' Self-Efficacy and Job Satisfaction: Teacher Gender, Years of Experience, and Job Stress" by Klassen & Chiu is the most cited article in the field of studying teacher work stress, with a total of 1,095 citations. Annual citations rank it as the most influential article to date (84.23 per year). Moreover, the author is Klassen, R.M. He is also the most influential, high-quality, and prolific author, with five of his outstanding works among the top ten most cited articles.

Table 3: Top 10 most highly cited articles of teacher work stress research.

| Rank | Authors | Title | Year | TC | C/P |
|---|---|---|---|---|---|
| 1 | R.M. Klassen, M.M. Chiu | Effects on Teachers' Self-Efficacy and Job Satisfaction: Teacher Gender, Years of Experience, and Job Stress | 2010 | 1095 | 84.23 |

| Rank | Authors | Title | Year | TC | C/P |
|---|---|---|---|---|---|
| 2 | R. Schwarzer, S. Hallum | Perceived teacher self-efficacy as a predictor of job stress and burnout: Mediation analyses | 2008 | 561 | 37.4 |
| 3 | R.M. Klassen, M.M. Chiu | The occupational commitment and intention to quit of practising and preservice teachers: Influence of self-efficacy, job stress, and teaching context | 2011 | 343 | 28.58 |
| 4 | | The Effect of Work Stress on Job Burnout Among Teachers: The Mediating Role of Self-efficacy | 2015 | 137 | 17.13 |
| 5 | S. Liu, A.J. Onwuegbuzie | Chinese teachers' work stress and their turnover intention | 2012 | 170 | 15.45 |
| 6 | R.M. Klassen, E.L. Usher, M. Bong | Teachers' collective efficacy, job satisfaction, and job stress in a cross-cultural context | 2010 | 171 | 13.15 |
| 7 | J.A. Grissom, S. Loeb, H. Mitani | Principal time management skills: Explaining patterns in principals' time use, job stress, and perceived effectiveness | 2015 | 96 | 12 |

| Rank | Authors | Title | Year | TC | C/P |
|---|---|---|---|---|---|
| 8 | R.M. Klassen, T.L. Durksen | Weekly self-efficacy and work stress during the teaching practicum: A mixed methods study | 2014 | 107 | 11.89 |
| 9 | D) Van Der Linden, G.P.J. Keijsers, P. Eling, R. Van Schaijk | Work stress and attentional difficulties: An initial study on burnout and cognitive failures | 2005 | 209 | 11.61 |
| 10 | R.M. Klassen, E. Wilson, A.F.Y. Siu, W. Hannok, M.W. Wong, N. Wongsri, P. Sonthisap, C. Pibulchol, Y. | Preservice teachers' work stress, self-efficacy, and occupational commitment in four countries | 2013 | 100 | 10 |

### 3.3. Knowledge foundations through co-citation analysis

Knowledge foundations of a field may be reflected in analyses based on co-cited references (Donthu et al., 2021). Literature co-citation was first proposed by Small (1973), who argued that when two publications are frequently cited together in an article, it indicates that they are highly relevant. We conducted a co-citation analysis by examining references for which the literature was cited at least three times. As shown in Figure 5, each node represents a cited reference. There is a clear correlation between the frequency of document citations and the node size. The greater the number of citations received by a document is, the larger the node. A line connecting two nodes indicates a co-citation relationship between the literature corresponding to the two nodes. According to the findings of the co-citation analysis, articles in the field of research on teacher work stress drew on previous studies in the five foundational clusters. The most frequently cited red nodes were primarily review articles. One of the most co-cited literature reviews examined future research directions related to teacher stress. The subsequent nodes were as follows: the green node investigated the origins of work stress among teachers; the blue node included research examining the correlation between work stress and teachers' self-efficacy; and the yellow node included studies investigating the association between work stress and teachers' job burnout. Studies in the purple node were related to the research methodology. These fundamental foundation clusters represent the knowledge base in the field of research on teacher work stress.

**Figure 5. Co-citation of teacher work stress research references cited by documents (minimum number of citations of a document = 3).**
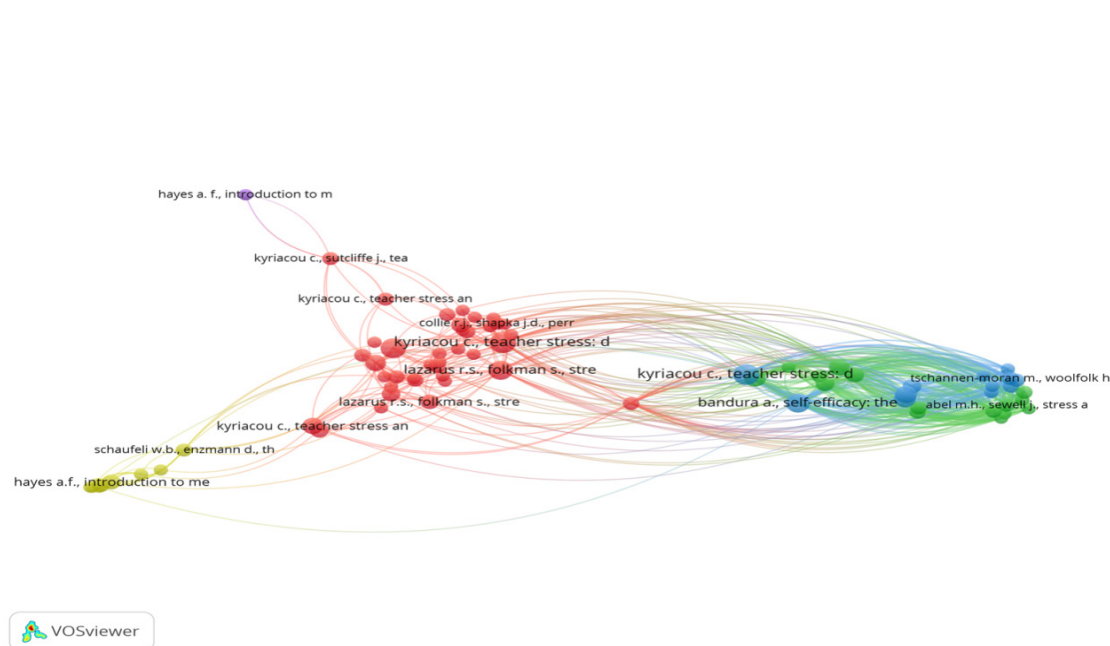
### 3.4. Thematic clusters through bibliographic coupling

Bibliographic coupling reflects the current state of related research in the literature, whereas co-citation analysis provides a synopsis and generalization of prior related research (Garfield, E., 2001). The concept of bibliographic coupling, which Kessler initially introduced in 1963, is predominantly employed to quantify the degree of reference overlap among two or more articles. The theory of bibliographic coupling allows for a clear analysis of the evolution and knowledge structure of research efforts, as well as the impact of knowledge on a topic or field. (Zhao & Strotmann, 2008; Park & Jeong, 2013). Bibliographic coupling has evolved into a fundamental method of analysis in bibliometric reviews (Goodell et al., 2021). Figure 6 shows the main thematic groups of the knowledge structure that come from previous research on teacher work stress, as found by bibliographic coupling. The total number of citations in the literature is denoted by the size of the nodes. The largest cluster of yellow nodes primarily consisted of 22 articles on teacher work stress and teacher self-efficacy.

One of the most cited articles is Klassen and Chiu's (2010) study on "Effects on Teachers' Self-Efficacy and Job Satisfaction: Teacher Gender, Years of Experience, and Job Stress," which has received a total of 1095 citations. This study revealed that teachers with a heavier workload experienced higher levels of stress related to classroom management but also reported greater self-efficacy in this area. In contrast, teachers who encounter greater levels of stress within the classroom environment experience diminished levels of self-efficacy and job satisfaction (Klassen & Chiu, 2010). The article titled "Perceived Teacher Self-Efficacy as a Predictor of Job Satisfaction" by Schwarzer and Hallum (2008) was also determined to be a beneficial resource for teachers who are under significant stress due to their heavy workload. The article "Efficacy as a Predictor of Job Stress and Burnout: Mediation Analyses," which has received 561 citations," was also influential. The relationships between teacher self-efficacy and work stress and burnout were investigated in this article. They argued that teachers' self-efficacy is a personal resource that safeguards them against work stress, consequently diminishing burnout and augmenting job satisfaction (Schwarzer & Hallum, 2008). Second, the red node thematic group is represented by Burke et al. (1996). Their study, "Predicting teacher burnout over time: effects of work stress, social support, and self-doubts on burnout and its consequences," cited 225 times, is an early investigation focusing on teacher work stress. A longitudinal study was performed to examine the effects of teacher work stress from a mental health perspective. Burnout, as it relates to teacher work stress, was the focus of the green node thematic group. Linden et al.'s (2005) article,

"Work Stress and Attentional Difficulties: An Initial Study on Burnout and Cognitive Failures," was cited 209 times.

**Figure 6. Network visualization of teacher work stress research citations by document (minimum number of citations of a document = 5).**
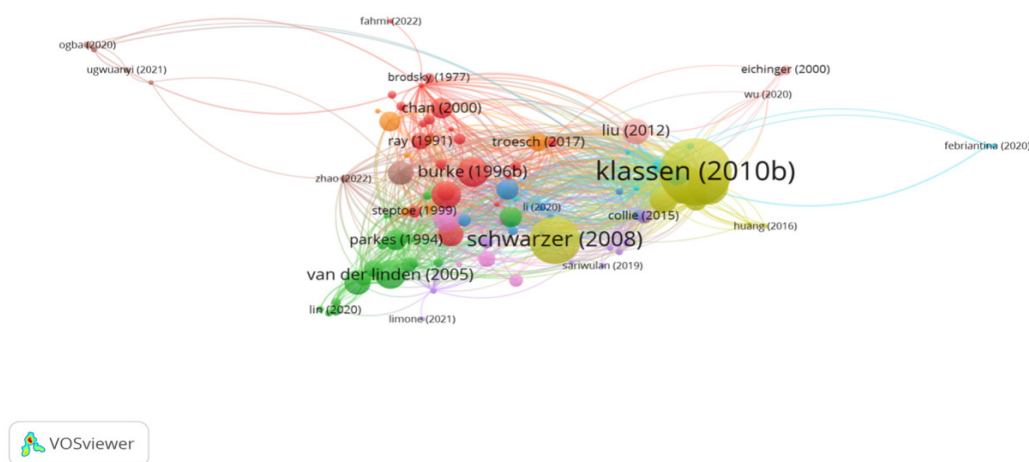


### 3.5. Thematic trends through co-occurrence analysis

The ultimate purpose of this research was to perform a co-occurrence analysis of keywords. By generating thematic networks, keyword-based co-occurrence analysis can assist in the identification of thematic trends in the literature concerning teacher work stress (Zupic & Čater, 2015). Author keywords are comprehensive summaries of articles by the author and can precisely pinpoint the article's essential content (Comerio & Strozzi, 2019). Therefore, we configured the analysis procedure to focus on "author keywords" and identified a total of 465 unique keywords, 32 of which met the minimum threshold of at least 3 occurrences. Undoubtedly, the keyword "work stress" appeared most frequently (n = 70).

After excluding the core keywords "teachers" and "work stress", which were relevant to the search, we conducted co-occurrence analyses on the remaining keywords to test the relationships between them. Figure 7 illustrates the themes in the literature on teacher work stress presented in relation to the time-to-publication dimension. These themes are closely interrelated and are closely associated with teacher work stress. The co-occurrence analysis plot reveals six major clusters, with the most prominent theme being the nexus of job satisfaction. It is associated with keywords including self-efficacy, job burnout, anxiety, and mental health, suggesting that researchers studying teacher work stress have devoted considerable attention to this facet of the investigation. Notably, job burnout, turnover intention, resilience, university teachers, gender, and job performance are represented as yellow nodes in the co-occurrence network graph. The yellow nodes indicate that these topics have been at the forefront of research on teacher work stress in recent years.

**Figure 7. Network visualisation of the author keywords co-occurrence of teacher work stress research (minimum number of citations of a document = 3).**

## 4. DISCUSSIONS

This study employed a method of analysis distinct from that of previous literature reviews. Specifically, bibliometric analysis was utilized to quantify the development of the teacher work stress literature. From the Scopus database, 212 articles on teacher work stress were subjected to bibliometric analysis for this study. It outlined the current research trends in the teacher work stress literature by year, region, and subject area. The study determined the most popular authors and publications in the literature on teacher work stress, and illustrated the knowledge structure and thematic focus of this topic. This visualization demonstrates the present state of research in the field, trends, and major research themes. Future researchers could identify potential research themes, gain a deeper understanding of research trends in the field of teacher work stress, and contribute to the field's body of knowledge.

The first research question of this study explores the current publication trends regarding teacher work stress. Through bibliometric analysis, it was found that the first literature focusing on teacher work stress appeared in 1977. The amount of publications on teacher work stress has constantly risen over time, with the most notable increase occurring in recent years. China, the United States, and South Korea dominate the field of teacher work stress research, with over half of the literature originating from Asian countries. Collaboration among scholars from different countries varies in degree. Research on teacher work stress is mainly focused within the social sciences discipline. Overall, the increasing number of publications on teacher work stress research over the years indicates substantial attention from scholars. Previous studies have also confirmed that teachers have become a profession experiencing high levels of stress in the workplace (Ramberg et al., 2021). Prioritizing teachers' mental health and assisting them in improving working conditions are crucial endeavours.

To address the second and third research questions, a citation analysis was conducted on the retrieved 212 articles to identify the most influential authors and publications in the field of research on teacher work stress. The citation analysis revealed that the most influential author in the field of teacher work stress is Klassen, R.M. from the University of York in the United Kingdom. His research primarily focuses on teacher motivation, teacher recruitment, and educational psychology. His paper titled "Effects on Teachers' Self-Efficacy and Job Satisfaction: Teacher

Gender, Years of Experience, and Job Stress," published in 2010, is also the most influential article, with a total citation count of 1095, averaging 84.23 citations per year.

We investigated the most popular topics of study in the field of teacher work stress using co-citation analysis and bibliographic coupling analysis to answer the fourth research question. The results of the co-citation analysis of the 212 articles' references led us to identify five clusters of connected reference sets, which suggests that the teacher work stress knowledge base has a knowledge structure made up of five characteristics. As previously mentioned, the most co-cited references in the current literature on teacher work stress are review articles on teacher stress. Literature reviews effectively summarize previous research findings and propose future research directions. Additionally, the sources of work stress and the relationship between work stress and self-efficacy, as well as job burnout, are also closely scrutinized by scholars. The results of bibliographic coupling analysis reveal that current research on teacher work stress has conducted more empirical studies based on previous research, confirming that teacher work stress leads to a decrease in teacher self-efficacy and job satisfaction, which are significant contributors to burnout.

Lastly, from a temporal perspective, the co-occurrence analysis of author keywords effectively highlights future research directions and addresses the fifth research question of this study. Job satisfaction remains a focal point in current research on teacher work stress. Job burnout, turnover intention, psychological resilience, university teachers, gender, and job performance have garnered scholars' attention in recent years, emerging as popular research directions in the field of teacher work stress.

Teacher work stress has emerged as a significant global issue affecting educators, with far-reaching implications for individual well-being, organizational effectiveness, and student achievement (Kyriacou, 2001; Herman et al., 2020). The demanding nature of the teaching profession, compounded by factors such as workload, student management, and administrative pressures, contributes to heightened levels of stress among teachers (Borg & Riding, 1991). Left unaddressed, chronic job stress can lead to burnout, diminished job satisfaction, and decreased teaching effectiveness (Hakanen et al., 2006). Hence, there is an urgent imperative to develop and implement effective intervention strategies and support programs aimed at managing teachers' work stress and promoting overall well-being.

Scholars have presented various viewpoints on intervention strategies, whether at the individual teacher level or through organizational and environmental support mechanisms. At the individual level, empowering teachers to enhance their stress coping skills, adopt stress management techniques, and engage in self-care practices such as mindfulness training, relaxation exercises, and time management workshops, is intended to foster resilience, bolster teachers' psychological capital, and mitigate the adverse effects of work stress (Maslach et al., 2001; Skaalvik & Skaalvik, 2018). Organizational support, including peer and leadership assistance, offers teachers opportunities to share experiences, seek guidance, and receive assistance in coping with work-related challenges (Rahman, 2018; Jentsch et al., 2022). Particularly, Employee Assistance Programs (EAPs), as a service model designed to effectively manage employees' psychological well-being and behaviour to enhance productivity, represent an impactful measure to address teachers' stress and mental health concerns (Fan, 2022). Moreover, fostering a positive school climate and organizational culture plays a pivotal role in enabling teachers to effectively manage stress. According to Kyriacou (2001), in order to effectively lessen the negative effects of teachers' work-related stress, it is crucial to foster a supportive organisational culture, honour and reward teachers for their accomplishments, and put in place policies that give priority to work-life balance and mental health support.

In conclusion, teacher work stress exerts detrimental effects on both individuals and the education system at large. Effectively managing teachers' work stress, enhancing job satisfaction, and mitigating the adverse impacts of work stress is critical for promoting teachers' overall well-being and enhancing the quality of teaching, thereby ensuring the sustainable development of education.

## 5. CONCLUSIONS

Due to the accelerated pace of life and the rapid development of society in recent years, balancing work and personal life has become an increasingly difficult task, resulting in elevated levels of work stress. As a result, people have gradually come to realize the importance of maintaining both physical and mental health. The sudden COVID-19 health crisis has placed new demands on the education system and the teaching profession. Working from home and online teaching have increased teachers' workload and stress. The number of studies on teachers' work stress has increased over time and across different locations, as evidenced by the results of the present research. As the scope of the research continues to expand, the content of the studies will become richer, and the research fields and topics will become more diversified.

This study has certain limitations that require further refinement. Regarding data sourcing, the bibliometric analysis in this study was exclusively conducted using the Scopus database. In future research, the utilization of multiple databases for literature selection in investigating teacher work stress will be pursued. Broadening the scope of the literature search will augment the comprehensiveness of our review and aid in identifying significant works possibly not indexed in Scopus. Methodologically, there are several approaches for systematically evaluating research on teacher work stress. In this study, bibliometric methods such as co-citation analysis, literature coupling, and co-occurrence analysis were employed to visually depict the statistical trends within the retrieved literature, thereby illustrating the current state and future research trends in this field. Subsequent research endeavours could integrate methodologies like meta-analysis and systematic literature review to further explore teacher work stress research, thereby presenting a more comprehensive bibliometric and knowledge structure. Furthermore, it is crucial to acknowledge variations across different geographic and cultural contexts in the field of teacher work stress research. While this study primarily focused on literature review and econometric analyses, it did not delve deeply into differences in teachers' work stress across diverse cultural settings. Future studies could conduct cross-cultural comparative analyses to compare variations in levels of work stress, major stressors, and coping strategies among teachers across different geographic and cultural contexts. This approach can aid in identifying commonalities and peculiarities across cultures, providing robust support for the development of more effective intervention strategies.

**Declaration of competing interest**

The authors have no competing interests to disclose.

**Authors and Affiliations**

Meng Zhang & Lilis Surienty

School of Management, Universiti Sains Malaysia, Penang, Malaysia

Dong Hu

School of Educational Studies, Universiti Sains Malaysia, Penang, Malaysia

**Authors' contribution**

**Meng Zhang**: Conceptualization; data collection; formal analysis; visualisation; writing -original draft preparation and reviewing & editing. **Dong Hu**: data collection; writing-reviewing. **Lilis Surienty**: Supervision; reviewing & editing.

**Corresponding author**

Correspondence to Lilis Surienty.

## REFERENCES

Ahmi, A., & Mohamad, R. (2019). Bibliometric analysis of global scientific literature on web accessibility. International Journal of Recent Technology and Engineering, 7(6), 250–258.

Ahmi, A., & Mohd Nasir, M. H. (2019). Examining the trend of the research on extensible business reporting language (XBRL): A bibliometric review. Social Science Research Network, 5(2), 1145–1167. https://ssrn.com/abstract=3839843

Al-Fudail, M., & Mellar, H. (2008). Investigating teacher stress when using technology. Computers & Education, 51(3), 1103–1110. https://doi.org/10.1016/j.compedu.2007.11.004

Borg, M. G., & Riding, R. J. (1991). Occupational stress and satisfaction in teaching. British Educational Research Journal, 17(3), 263–281. https://doi.org/10.1080/0141192910170306

Brodsky, C. M. (1977). Long-term work stress in teachers and prison guards. Journal of Occupational and Environmental Medicine, 19(2), 133–138. https://doi.org/10.1097/00043764-197702000-00007

Burke, R. J., Greenglass, E. R., & Schwarzer, R. (1996). Predicting teacher burnout over time: Effects of work stress, social support, and self-doubts on burnout and its consequences. Anxiety, Stress & Coping, 9(3), 261–275. https://doi.org/10.1080/10615809608249406

Burnham, J. F. (2006). Scopus database: A review. Biomedical Digital Libraries, 3(1), 1–8. https://doi.org/10.1186/1742-5581-3-1

Chand, P., & Jaswal, V. (2018). Development of survey instrument for software professionals' job stress: A factor and confirmatory factor analysis approach. International Journal of Business Innovation and Research, 17(3), 394–416. https://doi.org/10.1504/ijbir.2018.10016528

Chen, H., & Ho, Y.-S. (2015). Highly cited articles in biomass research: A bibliometric analysis. Renewable and Sustainable Energy Reviews, 49, 12–20. https://doi.org/10.1016/j.rser.2015.04.060

Chiu, W.-T., & Ho, Y.-S. (2007). Bibliometric analysis of tsunami research. Scientometrics, 73(1), 3–17. https://doi.org/10.1007/s11192-005-1523-1

Chuang, K. Y., Huang, Y., & Ho, Y.-S. (2007). A bibliometric and citation analysis of stroke-related research in Taiwan. Scientometrics, 72(2), 201–212. https://doi.org/10.1007/s11192-007-1721-0

Comerio, N., & Strozzi, F. (2019). Tourism and its economic impact: A literature review using bibliometric tools. Tourism Economics, 25(1), 109–131. Sagepub. https://doi.org/10.1177/1354816618793762

De Nobile, J., & McCormick, J. (2007). Job satisfaction and occupational stress in catholic primary schools: Implications for school leadership. Leading and managing, 13(1), 31–48.

Dong, B., Xu, G., Luo, X., Cai, Y., & Gao, W. (2012). A bibliometric analysis of solar power research from 1991 to 2010. Scientometrics, 93(3), 1101–1117. https://doi.org/10.1007/s11192-012-0730-9

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. Journal of Business Research, 133, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of Pubmed, Scopus, web of science, and google scholar: Strengths and weaknesses. The FASEB Journal, 22(2), 338–342. https://doi.org/10.1096/fj.07-9492LSF

Fan, X. (2022). Study on stress management of college teachers based on employee assistance program. Journal of Education, 203(4), 812–817. https://doi.org/10.1177/0022057421996255

Fernández Aguayo, S., Magaña Rodríguez, O., Mondolfi Miguel, M. L. M., & Pino-Juste, M. (2017). Effective mindfulness-based stress reduction in teachers: A bibliometric analysis. The International Journal of Pedagogy and Curriculum, 24(1), 49–62. https://doi.org/10.18848/2327-7963/cgp/v24i01/49-62

Gallup. (2022). State of the global workplace report. In Gallup.com. https://www.gallup.com/workplace/349484/state-of-the-global-workplace-2022-report.aspx

Ganster, D. C., & Schaubroeck, J. (1991). Work stress and employee health. Journal of Management, 17(2), 235–271. https://doi.org/10.1177/014920639101700202

Garfield, E. (2001). From bibliographic coupling to co-citation analysis via algorithmic historio-bibliography [Drexel University]. A Citationist's Tribute to Belver C. Griffith.

Geving, A. M. (2007). Identifying the types of student and teacher behaviours associated with teacher stress. Teaching and Teacher Education, 23(5), 624–640. https://doi.org/10.1016/j.tate.2007.02.006

Goodell, J. W., Kumar, S., Lim, W. M., & Pattnaik, D. (2021). Artificial intelligence and machine learning in finance: Identifying foundations, themes, and research clusters from bibliometric analysis. Journal of Behavioral and Experimental Finance, 32(1), 100577. https://doi.org/10.1016/j.jbef.2021.100577

Hakanen, J. J., Bakker, A. B., & Schaufeli, W. B. (2006). Burnout and work engagement among teachers. Journal of School Psychology, 43(6), 495–513. https://doi.org/10.1016/j.jsp.2005.11.001

Herman, K. C., Reinke, W. M., & Eddy, C. L. (2020). Advances in understanding and intervening in teacher stress and coping: The coping-competence-context theory. Journal of School Psychology, 78, 69–74. https://doi.org/10.1016/j.jsp.2020.01.001

Jentsch, A., Hoferichter, F., Blömeke, S., König, J., & Kaiser, G. (2022). Investigating teachers' job satisfaction, stress and working environment: The roles of self-efficacy and school leadership. Psychology in the Schools, 60(3), 679–690. https://doi.org/10.1002/pits.22788

Kessler, M. M. (1963). Bibliographic coupling between scientific papers. American Documentation, 14(1), 10–25. https://doi.org/10.1002/asi.5090140103

Klassen, R. M., & Chiu, M. M. (2010). Effects on teachers' self-efficacy and job satisfaction: Teacher gender, years of experience, and job stress. Journal of Educational Psychology, 102(3), 741–756. https://doi.org/10.1037/a0019237

Klassen, R. M., & Chiu, M. M. (2011). The Occupational Commitment and Intention to Quit of Practicing and pre-service teachers: Influence of self-efficacy, Job stress, and Teaching Context. Contemporary Educational Psychology, 36(2), 114–129. https://doi.org/10.1016/j.cedpsych.2011.01.002

Klassen, R. M., Perry, N. E., & Frenzel, A. C. (2012). Teachers' relatedness with students: An underemphasized component of teachers' basic psychological needs. Journal of Educational Psychology, 104(1), 150–165. https://doi.org/10.1037/a0026253

Kyriacou, C. (2001). Teacher stress: Directions for future research. Educational Review, 53(1), 27–35. https://doi.org/10.1080/00131910120033628

Li, L., Ai, H., Gao, L., Zhou, H., Liu, X., Zhang, Z., Sun, T., & Fan, L. (2017). Moderating effects of coping on work stress and job performance for nurses in tertiary hospitals: A cross-sectional survey in China. BMC Health Services Research, 17(1). https://doi.org/10.1186/s12913-017-2348-3

Linden, D. V. D., Keijsers, G. P. J., Eling, P., & Schaijk, R. V. (2005). Work stress and attentional difficulties: An initial study on burnout and cognitive failures. Work & Stress, 19(1), 23–36. https://doi.org/10.1080/02678370500065275

Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. Annual Review of Psychology, 52(1), 397–422. https://doi.org/10.1146/annurev.psych.52.1.397

McCarthy, Christopher J. (2009). The relation of elementary teachers' experience, stress, and coping resources to burnout symptoms. The Elementary School Journal, 109(3), 282–300. https://doi.org/10.1086/592308

Nowrouzi, B., Nguyen, C., Casole, J., & Nowrouzi-Kia, B. (2017). Occupational stress: A comprehensive review of the top 50 annual and lifetime cited articles. Workplace Health & Safety, 65(5), 197–209. https://doi.org/10.1177/2165079916666300

Nwagwu, W. (2007). A comparative study of the productivity of HIV/AIDS literature on Nigeria and south africa in medline and science citation index. African Journal of Library, Archives and Information Science, 17(1), 1–13.

OECD. (2020). TALIS 2018 results (volume II). In TALIS. OECD. https://doi.org/10.1787/19cf08df-en

Park, J. Y., & Jeong, D. Y. (2013). A study on the intellectual structure of library and information science in Korea by author bibliographic coupling analysis. Journal of the Korean Society for Information Management, 30(4), 31–59. https://doi.org/10.3743/kosim.2013.30.4.031

Rahman, Md. S. (2018). Teachers' peer support: Difference between perception and practice. Teacher Development, 23(1), 121–138. https://doi.org/10.1080/13664530.2018.1488765

Ramberg, J., Låftman, S. B., Nilbrink, J., Olsson, G., & Toivanen, S. (2021). Job strain and sense of coherence:

Associations with stress-related outcomes among teachers. Scandinavian Journal of Public Health, 50(5), 140349482110118. https://doi.org/10.1177/14034948211011812

Romero, D. H., Riggs, S. A., Raiche, E., McGuffin, J., & Captari, L. E. (2020). Attachment, coping, and psychological symptoms among military veterans and active-duty personnel. Anxiety, Stress, & Coping, 33(3), 1–16. https://doi.org/10.1080/10615806.2020.1723008

Schwarzer, R., & Hallum, S. (2008). Perceived teacher self-efficacy as a predictor of job stress and burnout: Mediation analyses. Applied Psychology, 57(1), 152–171. https://doi.org/10.1111/j.1464-0597.2008.00359.x

Shann, M. H. (1998). Professional commitment and satisfaction among teachers in urban middle schools. The Journal of Educational Research, 92(2), 67–73. https://doi.org/10.1080/00220679809597578

Skaalvik, E. M., & Skaalvik, S. (2018). Job satisfaction, stress and coping strategies in the teaching profession—what do teachers say? International Education Studies, 8(3). https://doi.org/10.5539/ies.v8n3p181

Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. Journal of the American Society for Information Science, 24(4), 265–269. https://doi.org/10.1002/asi.4630240406

Thomas, N., Clarke, V., & Lavery, J. (2003). Self-Reported work and family stress of female primary teachers. Australian Journal of Education, 47(1), 73–87. https://doi.org/10.1177/000494410304700106

Yeasmin, N., Ara, A., Khan, S. N., & Hossain, Md. M. (2015). Workers occupational stress problem in selected industry. International Journal of Indian Culture and Business Management, 10(3), 318. https://doi.org/10.1504/ijicbm.2015.068495

Yi, H., & Xi, Z. (2008). Trends of DDT research during the period of 1991 to 2005. Scientometrics, 75(1), 111–122. https://doi.org/10.1007/s11192-007-1828-3

Zhao, D. zhi, & Strotmann, A. (2008). Evolution of research activities and intellectual influences in information science 1996-2005: Introducing author bibliographic-coupling analysis. Journal of the Association for Information Science and Technology, 59. https://doi.org/10.1002/asi.20910

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. Organizational Research Methods, 18(3), 429–472. https://doi.org/10.1177/1094428114562629