

# The Job Stress-Job Burnout Relationship among Junior High School Teachers: Ambition as a Moderator

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#### Abstract

Teaching is one of the most stressful occupations. Research on teacher stress has largely focused on student misbehavior, workload, time pressure, and role conflict and ambiguity. This study explores human-related stressors, and finds five key sources: administrators, colleagues, students, students' parents, and the society. This study then examines the relationship between stress from the five stressors and job burnout. Ambition is adopted in this study as a moderator to test whether the positive relationship between stress and job burnout is weaker when teachers have high ambition. Results show that teachers who experience higher levels of stress from administrators, students, and students' parents have higher levels of stress from administrators, students. The positive relationship between stress from the society do not have higher levels of job burnout. The positive relationship between stress from students and job burnout is weaker when teachers have higher levels of job burnout.

Keywords: teacher stress; burnout; ambition



# 1. Introduction

Teaching is an emotional practice (Brackett, Palomera, Mojsa-Kaja, Reyes, & Salovey, 2010). The teaching profession expects individuals who work as educators to play a complex and varied range of roles and to meet the expectations, and demands, of their students' parents and communities (Tatar, 2009). Individuals in service industries face particularly stressful work situations (Hayes & Weathington, 2007). Research on teacher stressors has largely focused on student misbehavior, workload, time pressure, and role conflict and ambiguity. However, teachers work in a complex environment made up of many human factors, including students, students' parents, colleagues, and supervisors, who have many expectations of the teacher. Further, because of an upsurge in students' human rights and a decline in social support, society has become a potential teacher stressor. This study explores human-related stressors, and finds five factors that stress teachers: administrators, colleagues, students' parents, students' parents, and society.

The outcomes of teachers' work-related stress are serious and may include burnout, depression, poor performance, absenteeism, low levels of job satisfaction, and, eventually, the decision to leave the profession (Betoret, 2006; Jepson & Forrest, 2006). However, research suggests that high levels of job stress do not always lead to teacher burnout (Mearns & Cain, 2003). In fact, certain individuals may not only be unimpaired by job stress, but may actually thrive under it (Pithers, 1995). What teacher characteristics have these effects? If teachers can find their initial mindset of "ambition to become a teacher" and have been retained (Yong, 1995), perhaps they will learn to regard the pressure as a challenge and will struggle against stressors. Therefore, this study adopts ambition as a moderator to test whether the positive relationship between stress and burnout is weaker when teachers have high ambition.

# 2. Literature Review

## 2.1 Job Stress

Teacher stress, defined as the experience of negative emotions resulting from a teacher's work (Kyriacou, 2001), is inversely related to teacher self-efficacy (Betoret, 2006; Skaalvik & Skaalvik, 2007) and positively related to poor teacher–pupil rapport and low levels of teacher effectiveness (Kokkinos, 2007).

Teaching is one of the most stressful occupations (Johnson, Cooper, Cartwright, Donald, Taylor, & Millet, 2005; Kyriacou & Sutcliffe, 1977). When teachers feel their investments in their students, colleagues and schools are greater than the outcomes teachers receive, they are likely to experience emotional, psychological and professional consequences (Van Horn, Schaufeli, & Enzmann, 1999; Van Horn, Schaufeli, & Taris, 2001). The more demanding the job is perceived to be, the greater these consequences are (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001).

When stress is viewed as the result of the interaction between the stressor (causative factor)



and the individual, modified by the person's state at the time (Morse & Furst, 1979), it is unreasonable to expect stress to take only one form. Teacher stress is likely to be multifaceted. Thus, one-dimensional measures of teacher stress may obscure understanding of this multifactor construct.

There are a number of classifications of teacher stressors. Klassen (2010) divided teacher stressors into two clusters: stress from workload and stress from student behavior, with the correlation between the two stressors reaching 0.7. Stress from the heavy workload may result from the tasks assigned by administrators, handling student affairs, extra work added by the teacher herself in order to compete with colleagues, and extra work added to meet the requirements of students' parents and society (Boyle, Borg, Falzon, & Baglioni, 1995; Kyriacou, 2001; Greenglass & Burke, 2003; Chaplain, 2008). Among the five stressors in this study, four are identical to those of Greenglass and Burke (2003), including administrators, colleagues, students, and students' parents. The fifth stressor, stress from society, is added by this study. Whatever classification is used, these stressors all appear to come from human factors. Thus, we use five components of teacher stress: stress from administrators, stress from society.

## 2.2 Job Burnout

Burnout consists of the three components of emotional exhaustion, depersonalization, and reduced personal accomplishment. Emotional exhaustion refers to the feelings of being emotionally drained by intense contact with other people. Depersonalization refers to a negative attitude or callous responses toward people. Reduced personal accomplishment refers to a decline in one's sense of competence and of successful achievement in working with people (Maslach, 1986; Maslach & Jackson, 1986). Burnout has been found to be prevalent among human service professionals such as nurses (e.g., Pick & Leiter, 1991), teachers (e.g., Farber, 1991), social workers (e.g., Pines & Kafry, 1978), and mental health workers (e.g., Pines & Maslach, 1982).

Teacher burnout is conceived as a product of occupational stress and is characterized by feelings of exhaustion, powerlessness, alienation, and isolation (Capel, 1987). Teachers who are satisfied with their work typically display higher levels of motivated behavior and performance as well as lower levels of stress, anxiety, and burnout (e.g., Brouwers & Tomic, 2000; Caprara, Barbaranelli, Borgogni, & Steca, 2003; Caprara, Barbaranelli, Steca, & Malone, 2006; Greenglass & Burke, 2003).

## 2.3 Ambition

Ambition reflects a motivational state (Howard & Bray, 1988). Those expressing a desire to move up many levels are assumed to have more ambition than those who are content where they are at (Judge & Locke, 1993). Ambitions represent the perception that an activity is important as a means to future goals. It reflects individuals' perceptions that it is both possible and desirable to think in future terms and to plan for the future (Quaglia & Cobb, 1996, p. 130). By definition, ambitious individuals set high goals for their career attainment.

Ambition impels leaders to set hard, challenging goals for themselves and their organizations



(Kirkpatrick & Locke, 1991). Brim (1992) defined ambition as "the basic human drive for growth and mastery [or] . . . the general desire to achieve as it is expressed in daily life" (p. 17). Ambitious people are fundamentally dissatisfied with where they are and constantly want to improve the conditions of their job in some significant way (Judge & Locke, 1993). In organizational settings, ambition is perceived as a key to success and as a positive attribute to possess. Ambition drives these individuals to set higher standards for self-satisfaction (Judge, Erez, Johnson, Kennedy, & Washington, 1994).

Kivimäki, Kalimo, and Julkunen (1996) considered ambition to be an element of Type A behavior, which reflects a constructive personal characteristic that leads to a hunt for success. For example, Howard and Bray (1988) found that the strongest predictor of advancement for AT&T managers was individual desire to get ahead. Cox and Cooper (1989) found that successful British executives displayed a high degree of personal ambition. Judge, Erez, Johnson, Kennedy, and Washington (1994) found that ambition was a strong predictor of ascendancy of American executives.

# 3. Research Model and Hypotheses Development

## 3.1 Research Model

Figure 1 presents the conceptual framework guiding our study and the associated hypotheses on which we focus.

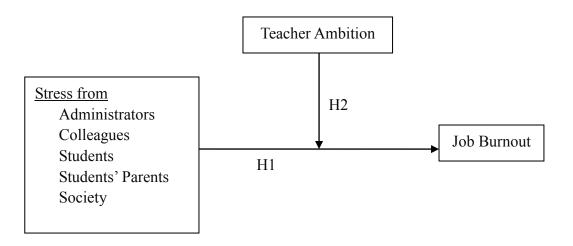


Figure 1. Research Model

## 3.2 Hypotheses Development

## 3.2.1 Stress and Burnout

The outcomes of teachers' work-related stress are serious and may include burnout, depression, poor performance, absenteeism, low levels of job satisfaction, and, eventually,



the decision to leave the profession (Betoret, 2006; Jepson & Forrest, 2006).

Burnout is described as a syndrome of cynicism and emotional exhaustion that is a response to chronic stress, particularly in jobs where individuals work with people (Mearns & Cain, 2003). Klassen, Usher, and Bong (2010) indicated that teaching is often a stressful occupation, with demands from administrators, colleagues, students, and parents compounded by work overload, shifting policies, and a lack of recognition for accomplishments (Greenglass & Burke, 2003).

Stress from administrators is caused by the diversity of tasks required, the lack of resources and affective support, time pressure, and bureaucracy. The Social Ecological Model posits that burnout may be indirectly affected by a hierarchy of organizational factors, ranging from power struggles with school administration to the laws impacting teacher responsibilities. Teachers may feel that poor administrator decision-making results in consequences such as time constraints, unreasonable paperwork deadlines, and inspection regimes in their classes (Grayson & Alvarez, 2008).

Second, teachers and their colleagues sometimes have to work together to accomplish assignments, but in some situations, for example, with respect to students' achievement, there may covert rivalries.

Third, students often goof off or talk while the teacher is teaching. Student behavior and discipline problems are key reasons for teacher stress and burnout (Burke, Greenglass, & Schwarzer, 1996; Friedman, 1995). Such behaviors strain the teacher-student relationship.

Fourth, according to Antonopoulou, Koutrouba, and Babalis (2011), several inconsistencies may explain why parents and teachers fail to establish sincere and truthful communication, despite their good will and intentions, even in cases where circumstances are favorable. If parent support is poor, teachers may become exhausted and overwhelmed with the task of aiding children's development (Grayson & Alvarez, 2008).

Fifth, in our society with its growing awareness of human rights, corporal punishment is prohibited and teachers complain they cannot discipline as in the past. Further, the social status of teachers has fallen, social support declined, and the traditional culture of respect for teachers has changed. Stress coming from these changes in society may result in teacher job burnout.

Based on the above, work-related stress may lead to teacher burnout. Thus, this study proposes:

**H1**. Teachers who experience lower levels of stress will have lower levels of job burnout. Teachers who experience higher levels of stress will have higher levels of job burnout.

H1a. Stress from administrators has a significant positive influence on job burnout.

H1b. Stress from colleagues has a significant positive influence on job burnout.

H1c. Stress from students has a significant positive influence on job burnout.



H1d. Stress from students' parents has a significant positive influence on job burnout.

H1e. Stress from society has a significant positive influence on job burnout.

3.2.2 Stress, Burnout and Ambition

Yong (1995) classified trainees' reasons for choosing teaching as their career into three categories: extrinsic, intrinsic, and altruistic. Under the intrinsic category, the main reason for trainees to opt for teaching was "ambition to become a teacher" (among all the reasons it ranked third). According to Yong (1995), though teaching offers few material benefits, the reasons that the majority of people entering into teaching may incline to altruistic and intrinsic motives such as to fulfill one's ambition or the desire to serve and contribute rather than to recognize extrinsic motives.

While teacher motivation is important for the satisfaction and fulfillment of teachers themselves, the feelings of satisfaction are consistently associated with lower levels of absenteeism and turnover (Jesus & Conboy, 2001). Jesus and Lens (2005) indicated that researchers find that teachers show lower levels of motivation and higher levels of stress than other professional groups (Kyriacou, 1987; Lens & Jesus, 1999; Pithers & Fogarty, 1995).

Ambition reflects a motivational state (Howard & Bray, 1988). It impels leaders to set hard, challenging goals for themselves and their organizations (Kirkpatrick & Locke, 1991). Ambitious people are fundamentally dissatisfied with where they are and constantly want to improve the conditions of their job in some significant way (Judge & Locke, 1993). Ambition provides teachers the motivation to fulfill themselves and feel job satisfaction and leads to lower levels of burnout.

Thus, if teachers are ambitious to obtain the fundamental goals of ambition: power, status, and wealth, they regard stressors as a credential which augments their ability to fulfill ambition. Therefore, we believe ambitious teachers will invest greater effort in fighting stressors and show less burnout syndrome. Thus, we hypothesize that:

**H2**. The positive relationship between stress and job burnout is weaker when teachers have high ambition.

According to Grayson and Alvarez (2008), teachers who are satisfied with the decisions and degree of support provided by school administrators show more positive attitudes regarding their occupation. But if ambitious people are dissatisfied with where they are, they constantly want to improve the conditions of their job in some significant way (Judge & Locke, 1993). Hence, we posit:

**H2a**. The relationship between stress from administrators and job burnout is weaker when teachers have high ambition.

Teacher peer stress is one of teacher stressors (Greenglass & Burke, 2003). If teachers are ambitious, they may set hard, challenging goals for themselves (Kirkpatrick & Locke, 1991). Even if facing colleague stressors, they will fight it. Hence, we posit:

H2b. The relationship between stress from colleagues and job burnout is weaker when



teachers have high ambition.

According to Hepburn and Brown (2001), teachers who are able to maintain positive relations with their pupils are also more likely to remain motivated, enthusiastic, and enjoy their workplace. Ambition reflects a motivational state (Howard & Bray, 1988). Hence, we posit:

**H2c**. The relationship between stress from students and job burnout is weaker when teachers have high ambition.

According to Grayson and Alvarez (2008), those teachers who are highly content with their support from students' parents may have lower reactions to negative stressors in their work environments, such as poor student attitudes. Perhaps ambition would drive these teachers to set higher standards for self-satisfaction (Judge, Erez, Johnson, Kennedy, & Washington, 1994). We thus posit:

**H2d**. The relationship between stress from students' parents and job burnout is weaker when teachers have high ambition.

Teacher autonomy is directly related to job satisfaction as well as to self-efficacy and emotional exhaustion (Skaalvik & Skaalvik, 2010). But if they feel too much intervention from society, they may experience burnout. According to Quaglia and Cobb (1996), ambition reflects an individual's perceptions that it is both possible and desirable to think in future terms and to plan for the future. We thus posit:

**H2e**. The relationship between stress from society and job burnout is weaker when teachers have high ambition.

# 4. Research Methodology

## 4.1 Measurement

We used three multiple-item scales adapted from previous studies to measure the three research constructs. The measurements of the three constructs of stress, burnout, and ambition are modified from previous studies that reported high statistical reliability and validity.

#### 4.1.1 Stress

The items of stress scale in this study were drawn from three sources. First, we used the Questionnaire of Teacher Stress (QTS) designed by Kyriacou and Sutcliffe (1978). Second, this study adopted a revised version of Betoret's (2006) scale. Third, we adopted the shortened 20-item version of the Teacher Stressor Scale (TSS) based on Chan (1998) and Hui and Chan (1996). This study classified teacher stress into 5 human factors, including stress from administrators, colleagues, students, students' parents and society. Based on previous research, this study exclusively selected related stressors from the above scales and developed a pool of items for each construct. Participating teachers were requested to indicate



their level of stress in five subscales. Ratings were made on a six-point Likert-type scale ranging from 1 (no stress) to 6 (extreme stress).

## 4.1.2 Burnout

Burnout was measured using the Maslach Burnout Inventory-Educators Survey (MBI-ES; Maslach, Jackson, & Leiter, 1996). The scale includes three subscales: emotional exhaustion (EE), depersonalization (D), and personal accomplishment (PA). All items were measured on a six-point Likert-type scale. Participants were requested to respond to each item by indicating their feelings ranging from 1 (fully disagree) to 6 (fully agree). Items from the PA scale were reversed before averaging the items. Thus, higher scores on the EE, PA, and D scales represent higher burnout.

## 4.1.3 Ambition

This study adopted the two-item Professional Ambition Scale of Desrochers and Dahir (2000), the single-item general measure of ambition of Hansson, Hogan, Johnson, and Schroeder (1983), and the five-item scale of Duckworth, Peterson, Matthews, and Kelly (2007) to measure ambition. In addition, we revised the five items of the Ambition for a Managerial Position scale from Annelies (1999). Participating teachers were requested to indicate their feelings. Ratings were made on a six-point Likert-type scale ranging from 1 (fully disagree) to 6 (fully agree).

# 4.2 Data Collection

Our research subjects were public junior high school teachers in Tainan. Stratified purposive sampling was adopted and a total of 600 samples were delivered. The data were gathered over a one-month period beginning in mid February of 2011, and ending in mid March of 2011. Out of 600 questionnaires, a total of 485 (81%) were returned. However, 37 questionnaires were invalidated, leaving 448 questionnaires for analysis. The effective response rate was about 75%.

Demographically, 71% of the respondents were female; 46% were aged between 31 and 40; and 30% were aged between 41 and 50. Forty-eight percent of the respondents had a master's degree or above. In terms of the seniority, 63% of the respondents have been teaching for 6 to 20 years. About 71% of the respondents were in the position of tutor teachers.

# 5. Data Analysis and Results

## 5.1 Analysis of the Five Stressors

There were twenty-five separate questions addressing five stressors on the five subscales of administrators, colleagues, students, students' parents, and society. The item means of "stress from administrators" ranged from 2.84 (SD = 1.46) to 3.31 (SD = 1.54). The item means of "stress from colleagues" ranged from 2.16 (SD = 1.29) to 2.67 (SD = 1.33). The item means of "stress from students" ranged from 3.48 (SD = 1.37) to 4.11 (SD = 1.42). The item means of "stress from students" parents" ranged from 3.16 (SD = 1.38) to 3.31 (SD = 1.64). The



item means of "stress from society" ranged from 4.19 (SD = 1.36) to 4.50 (SD = 1.44).

Past researches indicated that student misbehaviors are the main teacher stressor. After we added society stressor to the teacher stress scale, the most stressful factor becomes the society stressor. In addition, this study found that teachers do not appear to experience stress from their colleagues. Our findings differ from those of several previous studies.

Following, we first tested the reliability and validity of the measurement model by conducting confirmatory factor analysis (CFA). We then performed the chi-square difference test to verify whether constructs under analysis were distinct and discriminately valid. Structural Equation Modeling (SEM) was then estimated for hypotheses testing. The models were assessed by the maximum likelihood method using LISREL 8.80.

# 5.2 Analysis of the Measurement Model

# 5.2.1 Test of Goodness-of-fit of the Individual Construct

First, we followed the procedure recommended by Bagozzi and Yi (1988) to evaluate the fit of the measurement model for each of the nine constructs. As shown in Table 1, a chi-square value with its degrees of freedom in the measurement model of each construct indicates a general lack of fit. However, since the chi-square test is sensitive to sample size, we used the ratio of chi-square to degrees of freedom ( $x^2/d.f.$ ), which fell within the suggested value of 3 or below. In addition, the other indices satisfied the recommended values (NFI = 0.99, GFI = 0.98~0.99, AGFI = 0.95~0.98, CFI = 0.99, and RMSEA = 0.04~0.07). Therefore, there was a reasonable overall fit between the model and the observed data.

Fit Index	Criterion	М	С	S	Т	Y	А	Е	D	Р
$\chi^2$	Not significant ( p>0.05)	0.07	0.05	0.03*	$0.04^{*}$	$0.00^*$	0.14	0.01*	0.01*	$0.00^{*}$
$\chi^2/d.f.$	<3	2.00	2.32	2.48	2.39	3.05	1.68	2.11	2.98	2.28
RMSEA	<0.05 (good fit);	0.047	0.054	0.058	0.056	0.074	0.039	0.050	0.067	0.054
	0.05< RMSEA <0.08									
	(reasonable fit)									
RMR	< 0.05	0.024	0.026	0.019	0.024	0.023	0.022	0.027	0.027	0.023
GFI	>0.90	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.99	0.98
AGFI	>0.90	0.97	0.97	0.97	0.97	0.95	0.98	0.96	0.96	0.96
NFI	>0.90	1.00	0.99	1.00	1.00	0.99	1.00	0.99	0.99	0.99
NNFI	>0.90	1.00	0.99	0.99	1.00	0.99	1.00	1.00	0.99	0.99
CFI	>0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
RFI	>0.90	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
IFI	>0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PNFI	>0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.66	0.50	0.66
PGFI	>0.50	0.53	0.53	0.53	0.53	0.53	0.53	0.59	0.53	0.59

*Note*: 1. \* p<.05

2. M: stress from administrators; C: stress from colleagues; S: stress from students; T: stress from students' parents;

Y: stress from society; A: ambition; E: emotional exhaustion; D: depersonalization; P: reduced personal accomplishment.



# 5.2.2 Test of Reliability and Validity

A separate CFA was performed for each of the nine constructs to test whether all the items are appropriate for each construct. Each construct was evaluated separately by examining the indicator loading, construct reliability, convergent validity, and discriminant validity. All of the loadings of the items on their latent constructs were statistically significant (t-values > 1.96), suggesting that the constructs under analysis have good convergent validity. The reliability assessment was based on the composite reliability (CR) and average variance extracted (AVE). As shown in Table 2, the CRs ranged from 0.90 to 0.95 and the AVEs ranged from 0.63 to 0.79, both above their respective recommended cut-off levels of 0.70 and 0.50.

Finally, discriminant validity was tested. We compute the respective Chi-squares of two constructs under restricted model and the freely estimated model and then compute the difference ( $\Delta \chi^2$ ) between the two models. In the restricted model, we set the covariances of the pair of constructs equal to 1. A significant chi-square difference indicated discriminant validity between the pair of constructs. The results of the chi-square differences ranged from 26 to 185, exceeding 10.83 (p < .001), suggesting that the constructs under analysis were distinct and discriminately valid.

Factor	Measures	Factor loading	t-value	R <sup>2</sup>	CR	AVE
Stress f	rom Administrators					
M1	Administrators display favoritism towards some staff	0.83	21.25	0.70	0.92	0.70
	members.					
M2	Inadequate communication between administrators and	0.85	21.70	0.72		
	teachers.					
M3	Administrators fail to provide adequate resources.	0.81	20.29	0.66		
M4	Administrators reveal bureaucratic attitudes and behaviors.	0.86	22.25	0.74		
M5	Bad administration management delays my work.	0.82	20.79	0.68		
Stress f	rom Colleagues					
C1	Colleagues despise each other.	0.84	21.19	0.71	0.90	0.63
C2	The colleagues lack mutual cooperation.	0.83	20.87	0.69		
C3	Intrigue and class competition between colleagues	0.77	18.64	0.59		
C4	Covering lessons for absent teachers.	0.74	17.51	0.54		
C5	There is bad climate or atmosphere in the school.	0.80	19.66	0.64		
Stress from Students						
<b>S</b> 1	Student learning motivation is low.	0.85	22.08	0.72	0.95	0.79
S2	Student often misbehave.	0.92	25.17	0.84		
S3	Hard to manage my class.	0.90	24.41	0.81		
S4	Constant monitoring of student behaviors.	0.89	23.75	0.79		
S5	Students do not accept my discipline.	0.88	23.24	0.77		



Stress	from students' Parents					
T1	Students' parents have many excessive demands.	0.90	24.36	0.81	0.94	0.77
Т2	Lack of effective communication with students' parents.	0.90	24.37	0.81		
Т3	Lack of parental support brings me stress.	0.89	23.77	0.79		
Τ4	I worry about parental evaluation of me.	0.79	19.87	0.63		
Т5	I still have to satisfy students' parents after school time.	0.89	23.87	0.79		
Stress	from society					
Y1	Our society lacks appreciation for teachers.	0.86	22.59	0.74	0.94	0.75
Y2	Our society expects teachers to fulfill many roles.	0.80	20.28	0.65		
Y3	Low social status of the teachers.	0.89	23.97	0.80		
Y4	Our society misunderstands teachers' occupation.	0.89	23.93	0.80		
Y5	Negative evaluation from our society.	0.87	22.70	0.75		
Ambit						
Al	It is important that I move up in my chosen career.	0.81	20.41	0.66	0.93	0.73
A2	Giving me more responsibility is an affirmation of my ability	0.86	22.31	0.74		
A3	My power in my job is important.	0.86	22.38	0.74		
A4	My position and status in my job is important.	0.89	23.63	0.79		
A5	I pursue success.	0.86	22.51	0.74		
-	onal Exhaustion	0.00	22.01	0.7.		
E1	I feel emotionally drained from my work.	0.83	21.30	0.69	0.95	0.73
E2	I feel fatigued when I get up in the morning and have to face	0.90	24.42	0.81	0.90	0.70
	another day on the job.	0.00		0.01		
E3	Working with people all day is really a strain for me.	0.88	23.45	0.77		
E4	I feel burned out from my work.	0.83	21.21	0.68		
E5	I feel frustrated by my job.	0.90	24.37	0.81		
E6	I feel my work is hard.	0.80	20.15	0.64		
E7	I feel like I'm at the end of my rope.	0.85	22.16	0.72		
-	sonalization	0.00		0.72		
D1	I feel I treat some students as if they were impersonal	0.88	23.41	0.78	0.92	0.71
	'objects'.					
D2	I've become callous toward my job.	0.86	22.27	0.74		
D3	I worry that this job is hardening me emotionally.	0.82	20.89	0.68		
D4	I don't really care what happens to some students.	0.84	21.37	0.70		
D5	I feel discouraged because students blame me for their	0.81	20.45	0.66		
20	problems.	0.01	20110	0.00		
Reduc	ed Personal Accomplishment					
P1	I can easily understand how my students feel about things.	0.84	21.50	0.70	0.94	0.71
P2	I deal very effectively with the problems of my students.	0.82	20.76	0.67	0.9	0.71
P3	I feel I'm positively influencing other people's lives through	0.83	21.25	0.69		
10	my work.	0.00	21.20	0.05		
P4	I can easily create a relaxed atmosphere with my students.	0.85	22.07	0.72		
P5	I feel exhibitiated after working closely with my students.	0.85	22.32	0.72		
P6	I have accomplished many worthwhile things in this job.	0.84	21.62	0.70		
P7	In my work, I deal with emotional problems very calmly.	0.86	22.41	0.74		
1/	ming work, i dour with emotional problems very eanning.	0.00	<i>ц</i> , ті	U./T		

*Note*: p<.05 when the t-value exceeds 1.96.



# 5.3 Analysis of the Structural Equation Model

Structural Equation Modeling (SEM) by means of LISREL8.80 is employed to test the hypothesized model, including direct effects and moderating effects. In order to estimate the latent interaction effect of the independent variable and the moderator on an outcome variable, we adopted the Marsh, Wen, and Hau (2004, 2006) unconstrained approach, and used the matched-pair strategy that they recommended in the construction of interaction indicators. As multiplicative interaction terms give rise to multicollinearity, we followed Marsh, Wen, and Hau (2004) using mean centering all the indicators of independent variables and the moderator.

# 5.3.1 Test of Goodness-of-fit of the Structural Model

The sample covariance matrix of the composite measures of the model constructs, interaction term was used as input to LISREL 8.80 (Jöreskog & Sörbom, 2006). Model fit statistics shown as in Table 3 indicate that the proposed model fits the data relatively well (NFI = 0.95, GFI = 0.84, AGFI = 0.82, CFI = 0.98, and RMSEA = 0.04), except for the GFI. The GFI was below the 0.9 benchmark, but it exceeded the recommended cut-off value of 0.80. Therefore, there was a reasonable overall fit between the model and the observed data.

Fit Index	Criterion	Result	Fit or not
$\chi^2$	Not significant ( p>0.05)	P=0.0*	No
$\chi^2/d.f.$	<3	1.80	Yes
RMSEA	<0.05 (good fit);	0.042	good fit
	0.05< RMSEA <0.08 (reasonable fit)		
SRMR	<0.05	0.04	Yes
GFI	>0.90	0.84	No
AGFI	>0.90	0.82	No
NFI	>0.90	0.95	Yes
NNFI	>0.90	0.97	Yes
CFI	>0.90	0.98	Yes
RFI	>0.90	0.94	Yes
IFI	>0.90	0.98	Yes
PNFI	>0.50	0.87	Yes
PGFI	>0.50	0.74	Yes

#### Table 3. The Goodness-of-fit of the Overall Model

*Note*: \* p<.05

# 5.3.2 Test of Direct Effect

Hypotheses H1a to H1e examine the interrelationships between the five stressors and burnout. An examination of the parameter estimates in Table 4 reveals that stress from administrators exerts a significant positive effect on burnout ( $\gamma$ =0.17, t=3.00). Hence, H1a receives support.



Stress from colleagues exerts a significant negative effect on burnout ( $\gamma = -0.21$ , t= -3.98).

Thus, H1b is not supported. Stress from students exerts a significant positive effect on burnout ( $\gamma$ =0.34, t=6.14). Thus, H1c is supported. Stress from students' parents exerts a significant positive effect on burnout ( $\gamma$ =0.30, t=5.98). Hence, H1d is supported. The direct effect of stress from society on burnout ( $\gamma$ =0.01, t=0.27) is not significant. Thus, H1e is not supported.

#### 5.3.3 The Moderating Effect of Ambition

We used structural equation modeling (SEM) via LISREL8.80 to examine the interaction effect between ambition and stress on burnout. The results of the moderating hypotheses are also shown in Table 4. First, the interaction between ambition and stress from administrators has a negative though not significant impact on burnout ( $\gamma$ =-0.07, t=-1.02). Thus, H2a is not supported. The interaction between ambition and stress from colleagues has a positive though not significant impact on burnout ( $\gamma$ =0.03, t=0.49). Thus, H2b is not supported. The interaction between ambition and stress from students has a significant negative impact on burnout ( $\gamma$ =-0.27, t=-4.53). Thus, H2c is supported. That is, at higher levels of ambition, stress from students will have a weaker effect on burnout. The interaction between ambition and stress from students will not significant impact on burnout ( $\gamma$ =0.04, t=0.71). Thus, H2d is not supported. The interaction between ambition and stress from students has a positive though not significant impact on burnout ( $\gamma$ =0.04, t=0.71). Thus, H2d is not supported. The interaction between ambition and stress from society has a positive though not significant impact on burnout ( $\gamma$ =0.02, t=0.31). Thus, H2e is not supported.

Standardized hypothesized relationships	Coefficient $(\gamma)$	t-value	Test result
H1a. Stress from administrators $\rightarrow$ burnout	0.17**	3.00	Supported
H1b. Stress from colleagues $\rightarrow$ burnout	-0.21***	-3.98	Not supported
H1c. Stress from students $\rightarrow$ burnout	0.34***	6.14	Supported
H1d. Stress from students' parents $\rightarrow$ burnout	0.30***	5.28	Supported
H1e. Stress from society $\rightarrow$ burnout	0.01	0.27	Not supported
H2a. Stress from administrators*ambition $\rightarrow$ burnout	-0.07	-1.02	Not supported
H2b. Stress from colleagues*ambition $\rightarrow$ burnout	0.03	0.49	Not supported
H2c. Stress from students*ambition $\rightarrow$ burnout	-0.27***	-4.53	Supported
H2d. Stress from students' parents*ambition $\rightarrow$ burnout	0.04	0.71	Not supported
H2e. Stress from society*ambition $\rightarrow$ burnout	0.02	0.31	Not supported

Table 4. Tests of t	the Research Model	and Hypotheses
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*Note*: p < .05 when the *t*-value exceeds 1.96; \*\* p < .01 when the *t*-value exceeds 2.58; \*\*\* p < .001 when the *t*-value exceeds 3.29.



#### 6. Discussions and Implications

This study provided partial support for its research model and for the hypotheses regarding the linkages between the constructs. First, stress from administrators, students, and students' parents positively affected job burnout, which is consistent with Betoret (2006), Jepson and Forrest (2006). That is to say, the outcomes of teachers' work-related stress may include burnout. However, stress from colleagues negatively affected job burnout. This finding differs from those of several previous studies. The relationships between school colleagues are cooperative as well as competitive. Though teachers may have to work together to accomplish designated tasks, with respect to students' achievement, covert rivalries may exist. Therefore, stress from colleagues may be a motivator for teachers. That would explain the negative relationship between stress from colleagues and burnout.

Last, our study added the variable of "stress from society" into its research construct. Among the five stressors, our study found that junior high school teachers feel the most stress from society. However, in previous studies, stress from student behavior was classified as the main component of teacher stress (e.g., Greenglass & Burke, 2003; Chaplain, 2008; Klassen, 2010).

Although teachers feel enormous stress from society, stress from society did not positively affect job burnout. This may occur because society is relatively more distant from teachers. Teachers encounter administrators, colleagues, students, and students' parents on a daily basis, but not society. When the demands which these persons put on teachers exceed teachers' capacity to cope, one of the outcomes of teachers' work-related stress is burnout (Betoret, 2006; Jepson & Forrest, 2006). Given that, although teachers feel enormous stress from society, they may not exhibit burnout symptoms.

In this study, we select the sources of stress from human-related factors. Our study found that ambition negatively moderated the effects of stress from students on job burnout. That is to say, the positive relationship between stress from students and burnout is weakened through ambition. Students are the main target of teacher interactions. When teachers feel their investments in their students are greater than the outcomes teachers receive, they are likely to experience emotional, psychological and professional consequences (Van Horn, Schaufeli, & Enzmann, 1999; Van Horn, Schaufeli, & Taris, 2001). Teachers who suffer stressful situations may show emotional exhaustion, depersonalization, and reduced personal accomplishment. But if teachers are ambitious and can solve problems coming from students, they may show fewer burnout symptoms when facing the same stress. However, our study found that the interaction effects between ambition and stress from administrators, colleagues, students' parents and the society are not significant, which implies that ambition does not moderate the positive relationship between those stressors and burnout. One possible explanation is that the problems between teachers and administrators, colleagues, students' parents and the society are not as simple as those between teachers and students. Only depending on teacher's ambition is hard to solve the problems among adults. Thus, ambition cannot significantly weaken the positive relationship between those stressors (stress from administrators, colleagues, students' parents and the society) and burnout.



In our study, student behavior and discipline problems are the main issues in burnout, followed by students' parents and administrators. The problem of burnout among educators has costly consequences for both the teacher and those with whom they work (Grayson & Alvarez, 2008). Hence, eliminating the three teacher stressors is very important. However, if stress is inevitable, reducing the positive relationship between stress and burnout is worth exploring. Our study has found that ambition may play an important role in the relationship between stress from students and burnout.

#### 7. Conclusions

In this study, stress from administrators, students and students' parents positively affected job burnout. However, stress from colleagues negatively affected job burnout. Although teachers feel enormous stress from society, stress from society did not positively affect job burnout. Our study found that ambition negatively moderated the effects of stress from students on job burnout. That is to say, the positive relationship between stress from students and burnout will be weakened through ambition. In addition, our study found that the interaction effects between ambition and stress from administrators, colleagues, students' parents and the society are not significant, which implies that ambition does not moderate the positive relationship between those stressors and burnout.

## 8. Limitations

This study, while robust with respect to its conclusions, inevitably has several limitations. First, in our study, all stressors come from human factors. However, teachers cannot easily change people's minds and values. Therefore, even if teachers are ambitious and seek to correct parental opinions, this will likely end in failure. Future researchers interested in investigating ambition as a moderator should explore different stressor classifications. Second, the moderating effect of ambition is significant only on the relationship between stress from students and burnout. Other variables, such as demographic variables, should be adopted as potential moderators. Third, stress from society did not positively affect job burnout, yet teachers feel great stress from society. This warrants further attention. Future researchers may investigate the possible outcomes of teacher stress from society. Finally, the characteristics of school are different from those of other organizations, limiting the generalizability of our findings. Although employees also face stress from administrators, colleagues, customers, customers' family, and society, the strength of such stresses and their outcomes may differ from those of teachers.

## References

Antonopoulou, K., Koutrouba, K., & Babalis, T. (2011). Parental involvement in secondary education schools: The views of parents in Greece. *Educational Studies*, *37*(3), 333-344. http://doi.org/10.1080/03055698.2010.506332

- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structure equation models. *Journal of the Academy of Marketing Science, 16*(1), 74-94. http://doi.org/10.1177/009207038801600107
- Betoret, F. D. (2006). Stressors, self-efficacy, coping resources, and burnout among secondary school teachers in Spain. *Educational Psychology*, 26(4), 519-539. http://doi.org/10.1080/01443410500342492
- Boyle, G. J., Borg, M. G., Falzon, J. M., & Baglioni, A. J. (1995). A structural model of the dimensions of teacher stress. *British Journal of Educational Psychology*, 65(1), 49-67. http://doi.org/10.1111/j.2044-8279.1995.tb01130.x
- Brackett, M. A., Palomera, R., Mojsa-Kaja, J., Reyes, M. R., & Salovey, P. (2010). Emotion-regulation ability, burnout, and job satisfaction among British secondary-school teachers. Psychology in the Schools, 47(4), 406-417. http://doi.org/10.1002/pits.20478
- Brim, G. (1992). *Ambition: How we manage success and failure throughout our lives*. New York: Basic Books.
- Brouwers, A., & Tomic, W. (2000). A longitudinal study of teacher burnout and perceived self-efficacy in classroom management. *Teaching and teacher education*, *16*(2), 239-253. http://doi.org/10.1016/S0742-051X(99)00057-8
- 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 and Coping*, 9(3), 261-275. http://doi.org/10.1080/10615809608249406
- Capel, S. A. (1987). The incidence of and influences on stress and burnout in secondary school teachers. *British Journal of Educational Psychology*, *57*(3), 279-288. http://doi.org/10.1111/j.2044-8279.1987.tb00857.x
- Caprara, G. V., Barbaranelli, C., Borgogni, L., & Steca, P. (2003). Efficacy beliefs as determinants of teachers' job satisfaction. *Journal of Educational Psychology*, 95(4), 821-832. http://doi.org/10.1037/0022-0663.95.4.821
- Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. *Journal of School Psychology*, 44(6), 473-490. http://doi.org/10.1016/j.jsp.2006.09.001
- Chan, D. W. (1998). Stress, coping strategies and psychological distress among secondary school teachers in Hong Kong. *American Educational Research Journal*, 35(1), 145-163. http://doi.org/10.2307/1163455
- Chaplain, R. P. (2008). Stress and psychological distress among trainee secondary teachers in England. *Educational Psychology*, 28(2), 195-209. http://doi.org/10.1080/01443410701491858



- Cox, C. J., & Cooper, C. L. (1989). The making of the British CEO: Childhood, work experience, personality and management style. *Academy of Management Executive*, 3(3), 241-245. http://doi.org/10.5465/AME.1989.4274744
- Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demandsresources model of burnout. *Journal of Applied Psychology*, *86*(3), 499-512. http://doi.org/10.1037/0021-9010.86.3.499
- Desrochers, S., & Dahir, V. (2000). Ambition as a motivational basis of organizational and professional commitment: Preliminary analysis of a proposed career advancement ambition scale. *Perceptual and Motor Skills, 91*(2), 563-570. http://doi.org/10.2466/pms.2000.91.2.563
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, 92(6), 1087-1101. http://doi.org/10.1037/0022-3514.92.6.1087
- Farber, B. A. (1991). *Crisis in education: Stress and burnout in the American teacher*. San Francisco, CA: Jossey-Bass.
- Friedman, I. A. (1995). Student behavior patterns contributing to teacher burnout. *Journal of Educational Research*, 88(5), 281-289. http://doi.org/10.1080/00220671.1995.9941312
- Grayson, J. L., & Alvarez, H. K. (2008). School climate factors relating to teacher burnout: A mediator model. *Teaching and Teacher Education* 24(5), 1349-1363. http://doi.org/10.1016/j.tate.2007.06.005
- Greenglass, E. R., & Burke, R. J. (2003). Teacher stress. In M. F. Dollard, A. H. Winefield,
  & H. R. Winefield (Eds.), *Occupational stress in the service professions* (pp. 213-236).
  New York: Taylor & Francis.
- Hansson, R. O., Hogan, R., Johnson, J. A., & Schroeder, D. (1983). Disentangling type A behavior: The roles of ambition, insensitivity, and anxiety. *Journal of Research in Personality*, 17(2), 186-197. http://doi.org/10.1016/0092-6566(83)90030-2
- Hayes, C. T., & Weathington, B. L. (2007). Optimism, stress, life satisfaction, and job burnout in restaurant managers. *The Journal of Psychology*, 141(6), 565-579. http://doi.org/10.3200/JRLP.141.6.565-580
- Hepburn, A., & Brown, S. D. (2001). Teacher stress and the management of accountability. *Human Relations*, 54(6), 691-715. http://doi.org/10.1177/0018726701546001
- Howard, A., & Bray, D. (1988). *Managerial lives in transition: Advancing age and changing times*. New York: Guilford Press.
- Hui, E. K. P., & Chan, D. W. (1996). Teacher stress and guidance work in Hong Kong secondary school teachers. *British Journal of Guidance and Counselling*, 24(2), 199-211. http://doi.org/10.1080/03069889608260409
- Jepson, E., & Forrest, S. (2006). Individual contributory factors in teacher stress: The role of



achievement striving and occupational commitment. *British Journal of Educational Psychology*, 76(1), 183-197. http://doi.org/10.1348/000709905X37299

- Jesus, S. N., & Conboy, J. (2001). A stress management course to prevent teacher distress. *International Journal of Educational Management,* 15(3), 131-137. http://doi.org/10.1108/09513540110384484
- Jesus, S. N., & Lens, W. (2005). An integrated model for the study of teacher motivation. *Applied Psychology*, 54(1), 119-134. http://doi.org/10.1111/j.1464-0597.2005.00199.x
- Johnson, S., Cooper, C. L., Cartwright, S., Donald, I., Taylor, P., & Millet, C. (2005). The experience of work-related stress across occupations. *Journal of Managerial Psychology*, 20(2), 178-187. http://doi.org/10.1108/02683940510579803
- Jöreskog, K. G., & Sörbom, D. (2006). *LISREL 8.80 for Windows* [Computer Software]. Lincolnwood, IL: Scientific Software International, Inc.
- Judge, T. A., & Locke, E. A. (1993). Effects of dysfunctional thought processes on subjective well-being and job satisfaction. *Journal of Applied Psychology*, 78(3), 475-490. http://doi.org/10.1037//0021-9010.78.3.475
- Judge, T. A., Erez, A., Johnson, D. E., Kennedy, D. J., & Washington, S. K. (1994). Employee age as a moderator of the relationship between ambition and work role affect. *Center for Advanced Human Resource Studies*, 1-28.
- Kirkpatrick, S. A., & Locke, E. A. (1991). Leadership: Do traits matter? Academy of Management Executive, 5(2), 48-60. http://doi.org/10.5465/AME.1991.4274679
- Kivimäki, M., Kalimo, R., & Julkunen, J. (1996). Components of type A behavior pattern and occupational stressor–strain relationship: Testing different models in a sample of industrial managers. *Behavioral Medicine*, 22(2), 67-76. http://doi.org/10.1080/08964289.1996.9933766
- Klassen, R. M. (2010). Teacher stress: The mediating role of collective efficacy beliefs. *The Journal of Educational Research, 103*(5), 342-350. http://doi.org/10.1080/00220670903383069
- Klassen, R. M., Usher, E. L., & Bong, M. (2010). Teachers' collective efficacy, job satisfaction, and job stress in cross-cultural context. *The Journal of Experimental Education*, 78(4), 464-486. http://doi.org/10.1080/00220970903292975
- Kokkinos, C. M. (2007). Job stressors, personality and burnout in primary school teachers. *British Journal of Educational Psychology*, 77(1), 229-243. http://doi.org/10.1348/000709905X90344
- Kyriacou, C. (1987). Teacher stress and burnout: An international review. *Educational Research*, 29(2), 146-152. http://doi.org/10.1080/0013188870290207
- Kyriacou, C. (2001). Teacher stress: Directions for future research. *Educational Review*, 53(1), 27-35. http://doi.org/10.1080/00131910124115



- Kyriacou, C., & Sutcliffe, J. (1977). Teacher stress: A review. *Educational Review*, 29(4), 299-306. http://doi.org/10.1080/0013191770290407
- Kyriacou, C., & Sutcliffe, J. (1978). A model of teacher stress. *Educational Studies*, 4(1), 1-6. http://doi.org/10.1080/0305569780040101
- Lens, W., & Jesus, S. N. (1999). A psychosocial interpretation of teacher stress and burnout. In R. Vandenberghe & A. M. Huberman (Eds.), *Understanding and preventing teacher burnout* (pp. 192-201). Cambridge: Cambridge University Press.
- Marsh, H. W., Wen, Z., & Hau, K. T. (2004). Structural equation models of latent interactions: Evaluation of alternative estimation strategies and indicator construction. *Psychological Methods*, 9(3), 275-300. http://doi.org/10.1037/1082-989X.9.3.275
- Marsh, H. W., Wen, Z., & Hau, K. T. (2006). Structural equation models of latent interaction and quadratic effects. In G. Hancock & R. Mueller (Eds.), *A second course in structural equation modeling* (pp. 225-265). Greenwich, CT: Information Age.
- Maslach, C. (1982). Burnout: The cost of caring. Englewood Cliffs, NJ: Prentice-Hall.
- Maslach, C. (1986). Stress, burnout, and workaholism. In R. R. Kilburg, P. E. Nathan, & R. W. Thoreson (Eds.), *Professionals in distress: Issues, syndromes, and solutions in psychology* (pp. 53-75). Washington, DC: American Psychological Association.
- Maslach, C., & Jackson, S. E. (1986). *The Maslach burnout inventory* (2nd ed.). Palo Alto, CA: Consulting Psychologists Press.
- Maslach, C., Jackson, S. E., & Leiter, M. P. (1996). *Maslach burnout inventory manual* (3rd ed.). Palo Alto, CA: Consulting Psychologists Press.
- Mearns, J., & Cain, J. E. (2003). Relationships between teachers' occupational stress and their burnout and distress: Roles of coping and negative mood regulation expectancies. *Anxiety, Stress and Coping, 16*(1), 71-82. http://doi.org/10.1080/1061580021000057040
- Morse, D. R., & Furst, M. L. (1979). Stress for success: A holistic approach to stress and its management. New York: Van Nostrand Reinhold.
- Pick, D., & Leiter, M. P. (1991). Nurses' perceptions of burnout: A comparison of self-reports and standardized measures. *Canadian Journal of Nursing Research*, 23(3), 33-48.
- Pithers, R. T. (1995). Teacher stress research: Problems and progress. British Journal of<br/>Educational Psychology, 65(4), 387-392.<br/>http://doi.org/10.1111/j.2044-8279.1995.tb01160.x
- Pithers, R. T., & Fogarty, G. J. (1995). Occupational stress among vocational teachers. *British Journal of Educational Psychology*, 65(1), 3-14. http://doi.org/10.1111/j.2044-8279.1995.tb01127.x
- Pines, A., & Kafry, D. (1978). Occupational tedium in the social services. *Social Work, 23*(6), 499-507. http://doi.org/10.1093/sw/23.6.499



- Pines, A., & Maslach, C. (1982). Characteristics of staff burnout in mental health settings. InA. Briggs & A. Agrin (Eds.), *Crossroads: A reader for psychosocial therapy*. Rockville,MD: The American Occupational Therapy Association.
- Quaglia, R. J., & Cobb, C. D. (1996). Toward a theory of student aspirations. *Journal of Research in Rural Education*, 12(3), 127-132.
- Skaalvik, E. M., & Skaalvik, S. (2007). Dimensions of teacher self-efficacy and relations with strain factors, perceived collective teacher efficacy, and teacher burnout. *Journal of Educational Psychology*, 99(3), 611-625. http://doi.org/10.1037/0022-0663.99.3.611
- Skaalvik, E. M., & Skaalvik, S. (2010). Teacher self-efficacy and teacher burnout: A study of relations. *Teaching and Teacher Education*, 26(4), 1059-1069. http://doi.org/10.1016/j.tate.2009.11.001
- Tatar, M. (2009). Teachers turning for help to school counsellors and colleagues: Toward a mapping of relevant predictors. *British Journal of Guidance and Counselling*, *37*(2), 107-127. http://doi.org/10.1080/03069880902728564
- Van Horn, J. E., Schaufeli, W. B., & Enzmann, D. (1999). Teacher burnout and lack of reciprocity. *Journal of Applied Social Psychology*, 29(1), 91-108. http://doi.org/10.1111/j.1559-1816.1999.tb01376.x
- Van Horn, J. E., Schaufeli, W. B., & Taris, T.W. (2001). Lack of reciprocity among Dutch teachers: Validation of reciprocity indices and their relation to stress and well-being. *Work and Stress*, 15(3), 191-213. http://doi.org/10.1080/02678370110066571
- Yong, B. C. S. (1995). Teacher trainees' motives for entering into a teaching career in Brunei Darussalam. *Teaching and Teacher Education*, 11(3), 275-280. http://doi.org/10.1016/0742-051X(94)00023-Y

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