



Work stress and work-based learning in secondary education: testing the Karasek model

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Abstract: In this study the Job Demand-Control model was used to study the quality of working life of Dutch secondary teachers. The Job Demand-Control model of Karasek is a theoretical model in which stress and learning are both considered as dependent variables which are influenced by three different task characteristics: job demands, job control, and social support. This model was tested for Dutch secondary teachers ($n = 542$). Results shed light on the relationship between stress and learning, on the one hand, and the effects of task characteristics on work stress and on work-based learning, on the other hand. It is concluded that the relationship between stress and learning is mediated by the amount of job control as the model predicts. However, the results also reveal that the Karasek model is better suited for explaining stress than for explaining learning. To explain work-based learning variables other than task characteristics have to be taken into account.

Keywords: work stress, work-based learning, Job Demand-Control model, school teachers, professional development

Introduction

The Job Demand-Control model of Karasek is originally a model of work stress (Karasek and Theorell 1990). The model proposes that work stress results from the joint effects of the demands of a work situation (job demands) and the discretion permitted to the worker in how to meet these demands (job control). Control refers to the opportunity to act autonomously and independently within the job and to exercise influence over decisions regarding working conditions and organizational issues. The major prediction of the model is that stress will occur when job demands are high and control is low, whereas the second prediction is that learning and growth will occur in situations where both job demands and control are high. Actually, the model is based on the interaction between two social-psychological variables. On the one hand, the assumption is that control is needed to fulfil high job demands; on the other hand, it is assumed that high job demands are a prerequisite for work-based learning. However, to prevent work stress arising from high job demands, control is

considered a crucial factor. From the model, two different hypotheses can be deduced: the strain hypothesis and the learning hypothesis. The first hypothesis is that work stress will occur when job demands are high whereas control is low. The second hypothesis is that learning and growth will occur in situations where both job demands and control are high.

The strength of this model is that it relates stress to learning, whereas both these dependent variables are determined and explained by the same task characteristics. The relationship between stress and learning also played an important role in a recent redefinition of the quality of working life in the Netherlands (Onstenk 1997). In 1990, the Dutch government enacted a new law in which well-being was added as significant third element to this quality, next to health and safety. Well-being was defined as diminishing stress, on the one hand, and enhancing learning opportunities, on the other hand. Moreover, all labour organizations were urged to make interventions in order to ensure that employee well-being was taken care of. As this new law created a need for instruments measuring employees' level of well-being, researchers introduced the Karasek model as a promising approach to investigate and measure the quality of working life in different occupations in the Netherlands (Christis 1992; De Jonge 1992; Van der Krogt 1995; Onstenk 1997). Although this model emphasizes learning as well as stress, the instruments developed were directed only at the measurement and prevention of stress and not at learning (De Jonge 1992).

This also happened in teaching. Two reasons may account for this. First, as the Karasek model offers the dominant perspective in the occupational stress area (Guglielmi and Tatrow 1998), instruments measuring stress are more widely available than those for learning. Second, prevention of stress got high priority as stress levels in teaching were high and were assumed to affect the quality of education (Commissie Toekomst Leraarschap 1993; Abel and Sewell 1999; Guglielmi and Tatrow 1998). Consequently, as a result of this emphasis on preventing stress, the sources of stress are more frequently investigated than the effects of stress. Besides, the theoretical explanation of how stress affects the quality of education remained rather weak. The Karasek model provides an excellent opportunity to investigate the causes of stress as well as the consequences of stress. Because the model explicitly relates stress to learning, it provides an explanation of why and how stress affects the quality of education, as the model predicts that stress prevents teachers' learning. Moreover, the model also implies that the amount of job control is crucial in this. According to the literature, teacher learning may be viewed as a reliable indicator of the quality of education. Teachers ought continuously to improve the quality of service provided to their students in order to improve the quality of education and this quality improvement requires learning processes throughout a teaching career (Eraut 1995; Hoyle and John 1995; Bransford *et al.* 1999).

Testing the Karasek model for teachers in secondary education seems extremely relevant to large educational innovations currently going on in

secondary education, not only in the Netherlands but also in a lot of other countries (Bransford *et al.* 1999). Large educational innovations are taking place aimed at promoting active and independent learning of students (Hargreaves 1997; Bransford *et al.* 1999). Promoting this kind of student learning requires a major change in teachers' pedagogical approaches in the classroom. They can no longer adhere to their traditional roles of transmitting knowledge but have to fulfil a new role by acting as facilitators in students' learning processes. This change in working processes requires teachers to learn, on the one hand, but also causes a lot of stress and uncertainty, on the other hand (Bolhuis 2000; Little 1993). So, high levels of stress as well as high levels of learning are to be expected in secondary education currently. The Karasek model may help to shed light on how stress relates to learning as well as on how task characteristics contribute to both stress and learning.

Therefore, research was started to test the assumptions of the Karasek model for teachers in secondary education. In testing the model, criticism based on reviews of the model was taken into account. First, results give rise to questions about the validity of the model (De Jonge 1992). The way the main variables have to be defined and operationalized remains unclear, whereas empirical evidence confirming interaction effects is scarce. Moreover, the amount of explained variance of main effects is rather low in all studies. Although different arguments are given for these disappointing results, it is often stated that the model is too simple and that it lacks a very important variable, in explaining stress and work-based learning, that has to be added to the model: social support (Greenglass *et al.* 1997; Guglielmi and Tatrow, 1998; Schaubroeck and Fink 1998; Griffith *et al.* 1999). So, only main effects were investigated whereas the task characteristic 'social support' was added as a third independent variable.

Eventually, three research questions were addressed:

- 1 What empirical evidence is there for hypotheses derived from the Karasek model for teachers in secondary education?
- 2 What are the main effects of demands, control, and social support on work stress?
- 3 What are the main effects of demands, control, and social support on work-based learning?

Method

Procedure

Data collection took place by means of a survey. A questionnaire was administered to all teachers in ten secondary schools. These ten schools were not randomly selected as schools were just arbitrarily invited to participate in the survey. Most schools participated because of interest in the research topic and

results. Nevertheless, as Dutch schools differ mainly in the level of education provided, the sample was compared with the total population of schools in the Netherlands. Five schools provide all levels of general as well as initial vocational education; three schools provide only general education (at all levels); two schools provide general education at the lowest level as well as initial vocational education. This proportion of different school levels is in accordance with the proportion in the total population of Dutch schools.

Respondents

From the 939 teachers in these schools 542 teachers returned the questionnaire (response rate of 59 per cent). The sample consists of 367 men (68.3 per cent) and 170 women (31.7 per cent). The mean age of the sample is 45.8 years ($SD = 9.0$), whereas their mean working experience is 20.1 years ($SD = 9.8$). With respect to gender the sample is representative for the total population of teachers. However, the majority of the sample is over 40 years (74.7 per cent) which means that in this respect the sample is not fully representative of the total population of teachers in the Netherlands (70 per cent over 40). Considering the subject matter in which teachers deliver most lessons, the group is divided as follows: 174 languages teachers (33 per cent); 99 science teachers (18.8 per cent); 79 social sciences teachers (15 per cent); 76 teachers in arts or physical education (14.4 per cent); 60 teachers in vocational education (11.1 per cent); and 40 teachers in national curriculum subjects (7.6 per cent). No data are available for the total population of teachers in the Netherlands.

Variables

Job demands

Because of the discussion about different types of job demands and the questions raised in reviews of the Karasek model, three types of job demands were included in this research: first, pressure of work, referring to quantitative demanding aspects such as the pace of work and workload; second, emotional demands, as referring to the extent to which the job requires emotional investment; third, job variety, measuring the availability of learning opportunities as well as the amount of diversity the work offers. All three variables were operationalized by means of twenty items derived from a questionnaire of the Dutch Institute of Working Conditions (VBBA) (Van Veldhoven and Meijman 1994). Teachers were asked to indicate to what extent each item was relevant to their job on a 4-point scale (rating from 1 'hardly ever' to 4 'always').

Job control

A lot of discussion is going on in the literature about the meaning of the control variable in the Karasek model (Ganster 1989). In this research, two different aspects of control were included: autonomy and participation. Autonomy refers to the opportunity of the worker to determine different task characteristics such as the pace of work, the method, and work order (De Jonge *et al.* 1994). Participation refers to the influence a worker has over the working environment and the opportunity to take part in decision making (Christis 1992). Both variables were measured with fourteen items derived from the VBBA.

Social support

Support refers to the total amount of helpful social interaction of colleagues and staff that is available within the work context (Karasek and Theorell 1990). Instrumental and social-emotional aspects especially are of importance. Management support and collegial support were each measured by four 4-point items derived from a Dutch questionnaire on organizational stress (VOS-D) (Bergers *et al.* 1986).

Work stress

This was measured by means of seven items derived from the Dutch version of the Maslach Burnout Inventory for Teachers (Schaufeli *et al.* 1994). Burnout is a metaphor for mental strain, which consists of three different components: emotional exhaustion, depersonalization, and negative feelings about one's competence. In accordance with research findings and reliability of scales, items were selected only from the scales emotional exhaustion and loss of personal accomplishment. Emotional exhaustion refers to the extent in which teachers feel emotionally over-extended, whereas loss of personal accomplishment refers to a decline of feelings of competence and successful achievement in one's job. All seven items are scored on a 7-point scale: 0 = never, 1 = hardly ever, 2 = seldom, 3 = sometimes, 4 = often, 5 = nearly always, 6 = always.

Work-based learning

To measure this variable an extensive review of literature on professional development and school improvement theories was carried out. These theories appeared to provide useful insights in how teachers learn within their working context (Kwakman 1998). First, teacher learning aims at professional development and is self-directed in nature (Eraut 1995). Teachers as professionals have to solve real problems that have direct relevance to them and help them to improve their practice, so to improve student learning (McLaughlin 1997). Second, as a result of this, the main mechanism for professional development

is performance of activities that help teachers question the effectiveness of their daily practice. Thus, these activities may be considered as learning activities that help teachers develop professionally. Characteristic of these professional development activities is that they are connected to daily experiences in the workplace, and that they are collaborative rather than individual in nature (Rosenholtz 1989; Southworth 1994; Little, 1993; Lieberman 1996; Hargreaves 1997). According to the literature, these professional development activities can be subdivided into four categories:

- 1 keeping up with new developments in the professional field;
- 2 putting new developments and insights into practice;
- 3 reflecting on one's own performance;
- 4 collaborating in policy and practical matters.

Next, a qualitative study was carried out to get insight into the range of activities teachers perform in the workplace that they consider to provoke learning (Kwakman 1999). All those activities were categorized within the four categories of keeping up, experimenting, reflecting, and collaborating. From this range of activities only those activities that do not belong to the teaching task itself were selected to include in the questionnaire. A further restriction was made, as only collaborative activities that teachers perform within their own schools were selected. Eventually, this variable was measured by twenty-one items. Teachers were asked to state how often they performed each professional development activity on a 4-point scale (1 = hardly ever, 2 = sometimes, 3 = fairly often, 4 = often).

Analysis

First, factorial analyses were used to construct scales (principal component analysis). To answer the first research question, hypotheses derived from the Karasek model were tested. Therefore, two groups with different combinations of scores on job demands and job control were compared and differences between these groups were tested (t-tests). For an answer to the second and third question, regression analysis was executed to determine the effects of different task characteristics on stress and learning.

Results

Scales

Professional activities

Results of factorial analyses are presented only for the key dependent variable measuring work-based learning, as this was the only variable measured with a new instrument specifically developed in this research. As independence of factors could not be assumed, an oblique rotation procedure (Oblimin) was used. Principal component analysis yielded three different factors that explained 40.5 per cent of the variance. Three items had to be removed: self-evaluation of lessons; sharing of teaching problems with colleagues; and collegial observation. Table 1 shows the factor loadings of different items.

The first factor consists of six professional activities that are all executed collaboratively and are related to extracurricular and organizational tasks. So, this factor was called Task Extension. The second factor includes seven items referring to activities that are performed individually or in interaction with pupils. As all these activities are aimed mainly at keeping up with new information and improving lessons, this factor was named Professional Improvement. The third factor comprises five professional activities which all refer to practical instructional

Table 1 Factor loadings of items representing professional activities

	<i>Factor 1</i>	<i>Factor 2</i>	<i>Factor 3</i>
<i>Task extension</i>			
Give opinion to school management	.80	-.06	-.09
Participate in pupil counselling policy	.73	.05	-.07
Join a committee at the school	.68	.01	-.01
Discuss educational improvement	.62	.12	.11
Share ideas about education with colleagues	.56	.07	.23
Support colleagues in teaching problems	.51	.07	.14
<i>Professional improvement</i>			
Study subject-matter literature	-.14	.66	.15
Read professional journals	.08	.60	.00
Ask for pupils' feedback	.11	.60	-.17
Experiment with new teaching methods	.05	.53	.21
Study teaching manuals	-.11	.51	.07
Adapt way of teaching to pupils' needs	.17	.46	-.18
Teach students' study skills	.15	.45	.11
<i>Instructional practice</i>			
Prepare lessons with colleagues	.10	-.13	.71
Construct teaching materials	-.14	.12	.65
Discuss way of teaching with colleagues	.10	.04	.50
Make agreements about the way of teaching	.33	-.06	.49
Use colleagues' materials in own lessons	-.03	.20	.46

work related to preparing and giving lessons. Therefore, this factor was labelled Instructional Practice (Kwakman 1999).

Other variables

Concerning all other variables in this study, all measured with existing instruments, factorial analyses gave rise to the construction of nine scales in accordance with the assumed multidimensionality of the variables measured. Descriptive statistics (also of the three types of professional activities) are presented in Table 2, whereas correlations between dependent and independent factors are shown in Table 3. The mean scores in Table 2 all point to the same direction: the higher the score, the more this characteristic was perceived to be present in the work situation.

Table 2 Descriptive statistics of scales

	<i>M</i>	<i>Range</i>	<i>SD</i>	<i>Alpha</i>	<i>Number of items</i>
Pressure of work	2.41	1 – 4	.56	.87	7
Emotional demands	2.12	1 – 4	.49	.64	3
Job variety	2.66	1 – 4	.52	.82	7
Autonomy	2.65	1 – 4	.54	.73	5
Participation	2.38	1 – 4	.55	.76	5
Management support	2.95	1 – 4	.69	.87	5
Collegial support	3.21	1 – 4	.55	.79	4
Emotional exhaustion	2.68	0 – 6	1.08	.82	3
Loss of personal accomplishment	2.20	0 – 6	.68	.72	4
Task extension	2.29	1 – 4	.58	.77	6
Professional improvement	2.43	1 – 4	.46	.65	7
Instructional practice	2.25	1 – 4	.49	.58	5

Table 3 Correlations between independent and dependent factors

	<i>Emotional exhaustion</i>	<i>Loss of accomplishment</i>	<i>Task extension</i>	<i>Professional improvement</i>	<i>Instructional practice</i>
Pressure of work	.56*	.13*	.15*	.02	.05
Emot. demands	.40*	.14*	.20*	.16*	.15*
Job variety	-.32*	-.40*	.26*	.26*	.17*
Autonomy	-.29*	-.28*	.08	.08	.04
Participation	-.23*	-.33*	.27*	.12*	.11*
Management support	-.24*	-.28*	.11*	.02	.09*
Collegial support	-.27*	-.29*	.12*	.05	.21*

* significant correlation ($p < .05$, two-tailed)

First research question

To answer the question ‘What empirical evidence is there for hypotheses derived from the Karasek model for teachers in secondary education?’, two hypotheses were tested:

- 1 Teachers who perceive their job as high in job demands but low in job control will report more stress than teachers who perceive their job as high in job demands but high in job control.
- 2 Teachers who perceive their job as high in job demands but high in job control will perform professional activities more frequently than teachers who perceive their job as high in job demands but low in job control.

To test these hypotheses, teachers were first divided into two groups based on both their scores on job control. Teachers with a score of (more than) one standard deviation above the mean on both control factors were considered as having high job control ($n = 161$) and teachers with a score of (more than) one standard deviation below the mean as having low job control ($n = 149$). Next, teachers were further selected based on their scores on job demands following the same procedure for each job demand separately. Thus, only teachers with high job demands were included in the analyses. Eventually, scores of two groups (high job demands with low control versus high job demands with high job control) on stress and professional activities were compared for each type of job demand. When groups differed significantly, the effect was expressed in a measure d (raw difference between means divided by the standard deviation of the total group). For results, see Table 4.

With regard to the first hypothesis, the conclusion is that this hypothesis is confirmed for two types of job demands: in case of high pressure and high emotional demands in combination with low job control, stress is significantly higher than for high pressure and high emotional demands in combination with high control. The measure d indicates that the differences are quite large. With regard to job variety the hypothesis proved to be not valid.

With regard to the second hypothesis, the conclusion is drawn that it is only confirmed for pressure of work and for emotional demands. Only in case of high pressure combined with high control are task extension activities more frequently performed. In case of high emotional demands combined with high control, task extension activities as well as professional improvement activities are significantly more often executed than in combination with low control.

Second and third research question

The research questions on the main effects of demands, control, and social support on work stress and on work-based learning were answered using multiple regression analyses. Results are presented in Table 5.

Table 4 Mean scores on stress and professional activities for groups with different combinations of job demands and control, results of t-test, and effects

<i>Combination of job demands × control</i>	<i>Emot. exhaustion</i>	<i>Loss of accomplishment</i>	<i>Task extension</i>	<i>Prof. improvement</i>	<i>Instructional practice</i>
High pressure × low control (n=15)	3.70	2.59	2.31	2.52	2.29
High pressure × high control (n=50)	3.16	1.98	2.61	2.61	2.27
$p = .03$	$p = .00$ $d = .50$	$p = .05$ $d = .90$	n.s. $d = .52$	n.s.	
High emot. demands × low control (n=26)	3.68	2.47	2.35	2.49	2.23
High emot. demands × high control (n=41)	2.71	2.05	2.74	2.75	2.40
	$p = .00$ $d = .90$	$p = .001$ $d = .62$	$p = .001$ $d = .67$	$p = .035$ $d = .57$	n.s.
High job variety × low control (n=9)	2.19	2.03	2.29	2.41	2.25
High job variety × high control (n=42)	2.19	1.75	2.62	2.63	2.20
	n.s.	n.s.	n.s.	n.s.	n.s.

Table 5 Significant results of simultaneous regression results on two stress factors and three types of professional activities ($p < .05$)

	<i>Emotional exhaustion</i>			<i>Loss of accomplishment</i>			<i>Task extension</i>			<i>Professional improvement</i>			<i>Instructional practice</i>		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Work pressure	.82	.08	.43				.15	.05	.15						
Emot. demands	.43	.09	.19	.14	.06	.10	.18	.06	.15	.17	.05	.18	.17	.05	.16
Job variety	-.49	.08	-.23	-.38	.06	-.29	.22	.05	.20	.24	.04	.27	.14	.05	.15
Autonomy															
Participation				-.16	.07	-.13	.28	.06	.26						
Management support															
Collegial support	-.21	.08	-.11	-.19	.05	-.16							.20	.04	.23
R ²	.41			.24			.17			.10			.10		

Noteworthy first is the fact that the factors autonomy and management support show no direct effects on any of the dependent factors. Second, it may be remarked that, in comparison with the correlation analysis (see Table 3), regression analysis in which joint effects are determined gives a better insight into factors which are most important.

Regarding the first stress factor, emotional exhaustion, four factors show some significant direct effects whereas the amount of explained variance is reasonably high. Regarding the direction of effects, higher pressure of work and higher emotional demands relate to more emotional exhaustion whereas higher job variety and collegial support relate to less emotional exhaustion.

Concerning the second stress factor, four effects proved to be significant here too, but the amount of explained variance is much smaller. Higher emotional demands relate to more loss of accomplishment whereas job variety, participation, as well as collegial support relate to lower scores, so to less stress.

With regard to the three types of professional activities, the amounts of explained variances point only to some minor effects. All effects are positive. Whereas emotional demands and job variety affect all three types, pressure of work and participation affects only task extension activities, whereas collegial support affects instructional practice.

Conclusions and discussion

With regard to the first research question it is concluded that hypotheses from the model of work stress are partly confirmed. The results show that there is indeed some relationship between stress and learning which is mediated by the amount of job control. For teachers who perceive their job as having much pressure and high emotional demands, a high level of job control goes along with a lower level of job stress and a higher frequency of some professional activities. On the contrary, teachers perceiving high job demands with low job control report a higher level of job stress and a lower frequency of some professional activities.

Results with regard to the second and third research question show that characteristics of the Karasek model of work stress explain a larger amount of the variance in stress than in professional activities. This means that the Karasek model is better suited for explaining stress than for explaining the performance of professional activities. The addition of social support as third independent variable appears to be worthwhile as it yielded some extra effects for stress as well as for learning. This only accounted for social support of colleagues, as management support did not yield any effect at all.

Although the main effects of the control factors were small, it may not be concluded that these factors are not important in explaining stress or work-based learning. For the group of teachers that perceive their work as high in pressure

and high in emotional demands, the amount of control does make a difference. The conclusion is that this group of teachers is a group at risk that needs more attention and further study. A first step would be to examine why these teachers perceive their task characteristics differently. In general, as this study shows that teachers' perceptions of their task characteristics differ to a very large extent, more research into the origins and influences of these perceptions is needed. As stated earlier, teachers are no homogeneous group (Guglielmi and Tatrov 1998). However, the question of whether these differences in perceptions have to be ascribed to different appraisals of the same task or to the existence of different tasks (carrying varying degrees of demands, control, and support) within the teaching profession remains open.

In sum, to explain work-based learning we have to look further for more variables than just task characteristics. As this study shows, these task characteristics play only a modest role in teacher learning in the workplace. As this result may be regarded as disappointing, it is our conviction that the strength of this survey research is that it provides evidence for exclusion of some of these factors in future research into teacher learning. As teacher learning is a relatively new research topic, this is an important result too in that it helps to take another course. A first next step in discovering more relevant variables would be to apply a qualitative research methodology and so combine qualitative and quantitative research approaches.

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