All Workplace Learning is Not the Same: Effects of Job Control on Learning Activities

SE-2

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1. Introduction

Adults engage in a remarkable number of learning activities. In Canada the majority of adults have a form of post-secondary certification (Statistics Canada, 2005), at least one-third are engaged in formal training courses outside of registered school programmes (Statistics Canada, 2004) and 85% are involved in some form of informal learning (Livingstone, 2005). This learning occurs across the inter-related spheres of volunteer work, unpaid housework, general interest, and paid employment as adults actively seek answers and solutions to daily problems and challenges. Fully understanding the paid workplace component of this learning is important because of increased emphasis on keeping the workforce current and leveraging the intellectual capital of workers. A key starting point is that adults engage in targeted learning where they learn what they need to know when they need to know it. As such, the workplace environment and job structure play considerable roles in the motivation to engage in learning behaviour. Two workplace factors are often reported to influence learning: the level of demand in one's job, and the level of discretionary control that one holds over that job. However, the reports from these studies (discussed subsequently) vary because the conceptualizations of learning activity are diverse and sometimes incomplete. Adults take the learning path of least resistance and engage in learning behaviours most suited to their particular problem. For most, this learning is informal in nature, but informal learning in the workplace has largely been overlooked due to the focus on traditional formal learning such as educational attainment and employer-sponsored training.

This research used the Work and Lifelong Learning (WALL) dataset which was compiled through a cross-Canada telephone survey in 2004. This dataset is distinctive because it was designed specifically to capture a wide-range of adult learning behaviours and the social and technical relations of work environments. Therefore, the dataset allowed me to expand a model

of job characteristics and workplace learning and better describe the learning in which workers are engaged and the conditions under which specific learning occurs. The framing model is the Job Demand-Control (JDC) model (Karasek, 1979) which has often been used to link job demand and worker control to health-related outcomes. The learning dimension of the model has been underutilized in the literature and some measures of learning and control have not been clear or nuanced enough to fully capture the dynamic of work and learning relations.

I expand and clarify predictions surrounding the effects of job demand and job control on learning by: (1) focusing on direct measures of learning behaviour that include formal, and informal activities; (2) unpacking job control into its social and technical dimensions; and (3) including and discussing important alternative predictor variables such as prior schooling, age, tenure, and union status. As such, this study documents a wide range of learning behaviour and the workplace and worker characteristics that are associated with increases in these specific learning behaviours. This information can help organizations to create workplace and job structures that encourage and recognize a full range of learning activities and support workers in their learning needs.

The paper is arranged as follows: Section 2 provides the conceptual framework regarding learning, job demands and social and technical control. Section 3 presents general literature on the factors that affect learning. Section 4 presents an overview and empirical tests of the JDC model, a description of the expanded model and the hypotheses to be tested. Section 5 outlines the data and Section 6 contains the results and discussion. Section 7 provides a conclusion including limitations of the study and suggestions for future research.

2. Conceptual Framework

2.1 Expanding Learning: Definitions, Distinctions and Implications

Knowledge and abilities are still traditionally defined (and therefore acquired and rewarded) via a formal and institutionalized system of teachers and learners. However, this formal learning is only the tip of the iceberg of adult learning activities (Livingstone, 1999). Like developing children, adults are continuously learning as they engage the changing landscapes in which they live. For a growing number of people a portion of learning will take place within formalized institutions and systems, but for all adults the larger portion of learning is a constant and sometimes unconscious part of everyday life. It is important to delineate these learning spheres because there is growing evidence of a lack of correspondence between formal and informal learning activities. The degree of difference permeates all levels and includes, for example, the value placed on types of learning activity by society and by individuals in particular situations, the recognition and reward that accompanies types of learning, and the incidence of one type of learning versus another (see Burns, 1999; Colardyn and Bjornavold, 2004; Gereluk, Briton and Spencer, 1999; Kusterer, 1978; Livingstone, 2005; Livingstone and Sawchuk, 2004; Livingstone and Scholtz, 2006).

Due to the uniqueness of learning types, this paper examines work-related learning in terms of its formal and informal components. *Formal* learning includes employer-sponsored training and other courses, workshops, seminars or on-line modules that rely on a set curriculum and/or teacher. *Informal* learning includes informal education (i.e., mentoring and tutoring) as well as non-taught learning such as individual or group learning experiences that occur without the presence of a set curriculum or identified teacher. These activities can be intentional acts of learning or unintentional and tacit experiences of daily life (see Colardyn and Bjornavold, 2004;

Colley, Hodkinson and Malcolm, 2003; Livingstone, 2001, 2005; Livingstone and Scholtz, 2005).

The WALL dataset provides a unique opportunity to address the incidence of, or engagement in, learning activity (formal and informal) rather than the outcomes (learning as a product) or the process of learning. This expansion of the learning variable and the focus on direct engagement in learning activity differentiates this study from others in this area.

2.2 Unpacking the Concept of Job Control: Social and Technical Aspects

Another distinction that differentiates this study is the explicit use of job control as a multi-dimensional construct. The bulk of research in this area defines job control one-dimensionally with the essence of the construct being the decision latitude or freedom that workers hold in their jobs as measured by the amount of control or discretion that they have over their own or others' work activities (Karasek, 1985; Karasek, 1979; Van der Doef and Maes, 1999). Such use potentially confounds two distinct aspects of job control: social control and technical control. This distinction follows from the recognition of the labour process as one involving both social and technical relations of production that can work singularly and together to dictate the landscape of work environments (see for example, Braverman, 1974; Giddens, 1973; Zimbalist, 1979). In their study on perceived class consciousness, McNamee and Vanneman (1983) distinguish between the influence of social relations and the influence of technical relations and provide a review of related studies that make similar distinction. They adopt Poulantzas' (1974) three dimensions of social relations: economic (ownership), political (authority), and ideological (the distinction between mental labour and manual labour - managerial) and also use two dimensions of technical relations: symbolic (workers' relationships to information) and material (workers' relationships to machines). As such, social and technical relations are actually

manifests of social and technical control. Social control is defined as control over people and the larger work system and encompasses ownership, authority and managerial roles. Technical control is the control over tools and tasks and includes the discretion workers have to shape and perform their own work. This distinction is made throughout the rest of the paper and these definitions are revisited when the variables for this study are discussed.

3. Factors Related to Learning Activity

Previous studies have identified covariates of engagement in various types of learning. Lin and Tremblay (2003) reviewed the literature and reported that worker attributes (i.e., gender, age, education, occupation), firm characteristics (i.e., size, industry, innovation activities, technology use) and labour market institutions (i.e., unions, HRM practices, work organization) impact the incidence of employer-sponsored training. Turcotte, Leonard and Montmarquette (2003) extended the literature by including both classroom training as well as on-the-job training. Using the linked 1999 employer-employee datasets of the Workplace and Employee Survey (WES) they reported that both individual and firm-level variables such as hours worked, occupation, use of computer, unionization, tenure with employer, education, gender, age, firm size, industry, region, innovation and technology use show significant correlations with participation in training. These findings indicate that engagement in learning activity depends on both the individual motivations of the employee and the contextual environment in which the employee is situated. As well, Turcotte, et al. (2003) reported that the proportion of employees participating in classroom training differed from those participating in on-the-job training. These differences were quite varied for each of the independent variables with some groups engaging in more classroom training, some engaging in more on-the-job training and others engaging in both. This finding

indicates that the individual or contextual drivers for classroom training (formal learning) may be different than those for on-the-job or other informal learning.

Qualitative research has also considered the personal prerequisites for learning to take place and the contextual factors that facilitate learning. Confessore and Kops (1998) outlined several factors in a literature review of the relationships between self-directed learning and learning organizations. They reported that organizations require certain structures to promote self-directed learning. These include employee input in decision and policy making, a flexible organizational structure, a participative management style, employee autonomy, and innovation. Ellstrom (1997) also reviewed the literature on productive learning environments and isolated task characteristics (complexity and autonomy), participation in goal setting, sufficient scope of action, feedback and opportunities for evaluation and reflection as key factors. Illeris (2003) stated that because adult learners engage only when activities are regarded as immediately relevant to their current jobs or developments, the likely catalysts are changes in work content, organizational form, work re-deployment and other external demands. Wallace (2003) adds the intensification of work, growing precariousness of employment, and technical change as factors that affect workplace learning activity.

3.1 Specific Job Characteristics and Learning

This section focuses on a more detailed account of two particular factors: the level of job demand and the level of job control[1]. These two factors contribute strongly to the social and technical relations at work and, as elucidated above, have been linked to learning behaviour in several studies.

[1] Though this study delineates job control into social and technical aspects, the literature on this topic treats job control as a one-dimensional construct. As such, this literature review refers only to the broad notion of job control.

Activity theory (see Leont'ev, 1978; Vygotsky, 1978; Engstrom, Miettinen and Punamaki, 1999) states that humans are goal directed and learning oriented; they engage in activity (often learning) to achieve goals and solutions. Within this framework a more demanding job has more goals that need to be attained. As workers address these goals through learning activity they use various tools and are influenced by the community (i.e., peers, supervisors), the rules (i.e., social and organizational) and the division of labour (i.e., workplace structures) of their realm of activity. In this way the level of control that workers have over their jobs will dictate how, when, and if they use certain tools and also how they interact with the people, norms and structures around them. "Control offers active engagement with the problem domain on which learning and solutions depend." (Hacker, Skell and Staruab, 1968 as cited in Holman and Wall, 2001, p. 285)

Other researchers have similarly emphasized the importance of job control in learning. Frese and Zapf (1994) reported that workers who have more control have more option to investigate and analyze strategies and then apply the most appropriate one to unique problems. Kohn and Schooler (1978) conducted a longitudinal study in which they found that job complexity (measured by both demands and control) had long term effects on intellectual flexibility. A series of studies used the level of machine uptime of new technologies as a proxy for skill utilization and knowledge development and found links to increased levels of job control (Wall, Corbett, Martin, Clegg and Jackson, 1990; Jackson and Wall, 1991; Wall, Jackson, and Davids, 1992). Livingstone (2001) also reported a connection between the amount of discretionary control that a person holds over a particular form of work and the amount of informal learning time in that sphere. In his analysis, Livingstone compared time spent in paid work, volunteer work and community work and the informal learning time of each. The greatest correlation was found between community work and informal learning related to community work which,

Livingstone argued, is due to the increased levels of discretionary control one has in volunteer activities.

The research discussed above adds to the literature on the effect of job demand and job control on learning, but through varied means. The model discussed below presents a more focused conceptualization of the relationships between job-related demands, control and learning.

4. Model of Learning, Job Demand and Job Control

The Job Demand-Control model (Karasek, 1979, Karasek and Theorell, 1990) is familiar to researchers and practitioners concerned with the relationship between job characteristics and health. In this capacity it has been extensively applied and studied across disciplines (see Schnall, Landsbergis and Baker, 1994; Kristensen, 1995; De Jonge and Kompier, 1997; Van der Doef and Maes, 1999; De Lange, Taris, Kompier, Houtman and Bongers, 2003, for reviews). However, the model also predicts a dynamic relationship between job characteristics (specifically demand and control) and learning activity (Karasek, 1979). This *learning dimension* has been largely overlooked in favour of the *strain dimension*; however, research that tests the learning predictions is emerging.

In this literature, job demand is defined as an independent variable that measures stressors in the work environment such as workload demand, time pressure and role conflict. Job control is most often defined with respect to the aspects of technical control noted previously (Karasek, 1985; Karasek, 1979; Van der Doef and Maes, 1999). Also mentioned earlier, learning has been operationalized using very different measures that are often proxies for learning rather than learning behaviour per se and do not capture all the types of learning.

The general prediction of the model fits with some of the literature already reviewed; situations in which high job demand is matched with high job control may trigger increased learning, motivation and development of skills (Karasek and Theorell, 1990). This quadrant of the model is therefore termed the *active* job. Low job demand and low job control combine to form the *passive* job which involves a decline in activity and motivation (Karasek, 1979), potentially leading to learned helplessness (see Maier and Seligman, 1976) or a reduction in problem solving activity. In both the strain literature and the learning literature there is debate as to whether job demand and job control exert separate main effects on the respective outcomes or whether there is an interaction or moderating effect of one on the other (see Holman and Wall, 2002; Van der Doef and Maes, 1999).

4.1 Empirical Tests of the Learning Dimension

A review of recent studies highlights a problem with testing the learning dimension of the JDC model: the concepts and variables used to operationalize learning are quite varied. As pointed out in the literature, Karasek and Theorell (1990) are themselves unclear as to the concepts that should be used to test the learning dimension (Taris, et al., 2003). The result is burgeoning research that is moving in several directions. Some studies focus on perceived outcomes of learning such as efficacy or mastery (Parker and Sprigg, 1999; Dollard, Winefield, Winefield and De Jonge, 2000; Taris, et al., 2003); others focus on the application of learning such as skill utilization (Holman and Wall, 2002) or the process of informal education such as talking to a supervisor about skill needs (Taris and Feij, 2004); and still others focus on occupation specific measures of learning (Kwakman, 2001). Other studies have used job satisfaction, job involvement and commitment, job challenge, and active coping as, often

inappropriate, outcome variables in studies of the JDC model learning dimension (see Taris, et al., 2003 for a review).

Despite the varied operationalizations of the learning variables, some consistency does emerge. Parker and Sprigg (1999) presented one of the first tests of the JDC learning dimension using a sample of 268 production workers. Learning was measured using three separate learning-oriented outcome variables: perceived mastery, role breadth self-efficacy, and production ownership. An independent variable representing proactive personality was also included as a proposed moderator to the hypothesized interaction between job demand and job control. For example, the JDC model postulates that an interaction between job demand and job control will occur such that workers with more challenge in their job (high demand) and high control to tackle that challenge will exhibit an increased sense of mastery over their job and tasks (Karasek and Theorell, 1990). Parker and Sprigg (1999) add that proactive employees are more likely to make use of high control than passive employees and will therefore show a further increase in sense of mastery. The results of their study provide no support for the three way interaction of job demand, job control and proactive personality for any of the three learning-oriented outcomes. For sense of mastery, only main effects were found. High job control and proactive personality increased perceived mastery while high job demand decreased perceived mastery. Job control and proactive personality also had positive relationships with role breadth self-efficacy and production ownership. Parker and Sprigg (1999) concluded that the JDC conceptualization of job characteristics seems to fit with proactive employees because on the whole the high demand, high control combination resulted in higher levels of learning-oriented outcomes. With passive employees, however they concluded that the standard JDC model interpretation may not be

appropriate because the low demand and high control combination resulted in higher learning-oriented outcomes.

Kwakman (2001, p. 1) also concluded that the JDC model may not adequately predict learning and stated that "the Karasek model is better suited for explaining stress than for explaining learning." Using a sample of 543 Dutch teachers, Kwakman measured learning in terms of task extension (collaborative work directed at extracurricular and organizational tasks), professional improvement (keeping up with new information and improving lessons), and instructional practice (practical work related to preparing and giving lessons). Job demands were measured with three independent items (work pressure, emotional demands and job variety), and job control with two independent items (autonomy and participation) (2001, p. 493-494). Kwakman's main-effect analyses showed that some factors of job demand (emotional demands and job variety) have a positive effect on all three learning behaviours. Work pressure had a statistically significant and positive relationship with task extension only. The results for factors of job control only showed a statistically significant effect for the positive relationship between participation and task extension. In general Kwakman's results showed that job demand rather than job control is the dominant force in predicting learning-oriented outcomes.

Holman and Wall (2002) on the other hand, advocated the role of control after conducting structural equation modeling and regression analyses on two cross-sectional samples and one longitudinal sample. They also used proxies for learning (skill utilization and self-efficacy) rather than more direct measures of learning processes or behaviour. Holman and Wall (2002) reported no evidence for interactive or moderated models, but did report consistent evidence for the role of control in skill utilization. They stated that, "greater control enables employees to deploy and develop a wider range of skills and that such skill utilization in turn helps them to

cope with demands more effectively…" (Holman and Wall, 2002, p. 297) The authors reported no relationship between demands or control and the learning-oriented outcome of self-efficacy unlike the findings of Parker and Sprigg (1999) summarized above.

Two additional longitudinal studies are relevant in the examination of the relationship between job characteristics and learning. Taris, Kompier, De Lange, Schaufeli and Schreurs (2003) conducted a study of 876 Dutch teachers at two time periods. They used two scales for their measure of learning: one consisted of self-efficacy and mastery components and the other measured learning motivation. They concluded that there is a lagged effect of job characteristics on learning-oriented measures such that lower demand and higher levels of control are positively associated with learning measures. Contrary to the findings of Holman and Wall (2002) the Taris, et al. (2003) study corroborates the findings of Parker and Sprigg (1999); high job demand decreases the sense of mastery and self-efficacy while high control increases that sense. These findings are in opposition to the JDC model in which the active learning job is typified by both high demand and high control.

Taris and Feij (2004) conducted a more recent longitudinal study using 311 newly employed youth who were either machine operators or office technicians in four countries. They used a six-item scale for their learning measure which included self reports on whether workers sought advice from or spoke to their supervisor about training, learning needs and goals, and whether workers were acquiring skills for their job and future positions. As such this measure focused more on the training process and development of knowledge and skill rather than perceptions of learning-oriented outcomes such as mastery and self-efficacy. Taris and Feij (2004) first analyzed the cross-sectional sample and reported results in line with the predictions of the JDC model (high learning for high demand/high control jobs, low learning for low demand/low

control jobs). However, their findings across time showed marked variation in the learning patterns for the four job typologies of the JDC model. Workers in the low job demand, high job control quadrant showed the most learning across time. Taris and Feij (2004) interpreted this result as consistent with the JDC model because low demands are also associated with low strain and it has been postulated and reported that strain inhibits learning (Karasek and Theorell, 1990; Holman and Wall, 2002; Taris and Feij, 2004).

Taken together, this literature suggests that studies of learning-oriented outcomes and studies of learning behaviour may be tapping into two separate but related phenomena. As noted by Kwakman (2001) and Taris and Feij (2004) high demands may increase short term learning behaviour as workers try to meet their immediate challenges, but due to these high demands workers may feel reduced levels of learning-oriented outcomes like self-efficacy because they are overwhelmed by their workload and never 'come out on top' (Parker and Sprigg, 1999; Taris et al, 2003). At this stage high demands may impede long range learning and development goals (Taris and Feij, 2004) while high control acts to increase long-term learning outcomes such as skill utilization (Holman and Wall, 2002).

The current study does not attempt to reconcile each of these research arms; rather, it expands the JDC model to allow more detailed examination of direct and complete measures of engagement in learning and two dimensions of worker control.

4.2 Expanding the Job Demand-Control Model

As outlined above, learning and job control have multiple components and each of these facets must be included separately in analyses to ensure complete and accurate assessments. As Holman and Wall (2002, p. 284) pointed out, it is often difficult to achieve direct measures of knowledge and skill development because, "employees develop knowledge or skill in vastly

different areas," and this development is continually changing over time. However, a more accessible direct measure of learning is the level of engagement in formal and informal learning activities themselves (i.e., whether a worker has taken courses or engaged in self-study on work-related topics). In many ways this measure is more directly applicable to work (re)design and the concept of the learning organization because it connects actual time spent in learning activities with levels of job demand and control.

Similarly with job control, most studies have used measures that reflect the technical aspect of control (discretion and autonomy in one's own work), but have largely neglected the social aspect of control (broad decision-making authority and managerial roles) or have confounded the two in a single measure. It is important to acknowledge that a worker could hold power or control over their own technical tasks without occupying a position of social authority and vice versa. A true picture of control and a more accurate model for understanding the associations between control and learning will include separate measures of social and technical control.

It is also important to test the complete concept of the JDC model. Though most of the studies outlined above include tests of the main effects of job demand and job control as well as interaction effects of those variables, several studies do not. It is not clear from early theoretical formulations of the model or from subsequent studies which approach is most suitable. This debate has garnered considerable interest in the literature on the strain dimension and has not yet been satisfactorily resolved (see Beehr and Drexler, 1986; Parkes, 1991; Kasl, 1996; Landsbergis, Schnall, Warren, Pickering, and Schwartz, 1994; Schnall, Landsbergis and Baker, 1994; Van der Doef and Maes, 1999; Beehr, Glaser, Canali and Wallwey, 2001). As such, both should be carried into tests of the learning dimension.

Based on the above discussion, this study tests the traditional predictions for the main effects and the interaction effects for job demand and both social and technical control on: (1) engagement in formal learning, (2) engagement in informal education, and (3) engagement in non-taught learning.

H_1: Job demand will relate positively to all types of learning such that the most learning activity will exist in situations of high demand.

H_2: Both social and technical control will relate positively to all types of learning.

H_{2a}: Both social and technical control will have greater associations with informal learning activities than formal learning.

H_3: Job demand will interact with social control and with technical control with respect to each type of learning activity.

5. Methodology

This research utilized the Work and Lifelong Learning (WALL) dataset[2]. The WALL telephone survey was conducted in 2004 with a large representative sample of the adult (18+) Canadian population (N = 9,063). It is unique and suited for this study in that it provides unprecedented quantitative detail on all spheres of learning, paid work activities, and their inter-relations. This allowed for the creation of comprehensive learning behaviour variables as well as the distinction between social and technical control. Also, it provides a large heterogeneous sample of workers so findings can be applied to the general population. Many other studies that use the JDC model focus on specific occupations or specific sets of workers that represent extremes on the predictor or outcome variables (i.e., nurses, teachers) For this analyses respondents who had never worked for pay or who had not worked for pay in the past twelve

[2] The Work and Lifelong Learning (WALL) research network was funded by SSHRC. See www.wallnetwork.ca for other projects using this dataset.

months were excluded. Self-employed individuals were included in the sample. The final sample population was 5800[3].

Dummy variables for three learning variables were used in separate analyses: (1) engaged in formal training or education primarily or partially related to the job during the past year (formal), (2) sought advice of someone knowledgeable in the past four weeks with the intention of developing job skills (informal education) (Taris and Feij, 2004), and (3) engaged in employment-related informal learning in the past year (non-taught learning). The job demand construct and the social and technical control constructs are multi-item scales. Items for job demand were chosen based on the past empirical work outlined above and those for job control were based on McNamee and Vanneman (1983). The discriminant validity of job demand measures and job control measures was analyzed using the maximum likelihood (ML) option in Comprehensive Exploratory Factor Analysis (CEFA; Browne, Cudeck, Tateneni and Mels, 2004), employing oblique Direct Quartimin rotation to allow for the possibility of correlated factors (Ford, McCallum and Tait, 1986; Conway and Huffcutt, 2003). Using several measures of statistical fit (Conway and Huffcutt, 2003) and confirming the *a priori* factor structure, the three-factor solution was deemed to be the best fit of the data[4]. The item questions, factor loadings and Cronbach alpha tests of internal validity are presented in Table 1. The final scales were constructed by summing the values of each item. In some cases items were transformed to ensure that each item received equal weight in the final scale.

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[3] Mean substitution was conducted on the small number of item non-response missing values (i.e., the largest percent of missing values on a given variable was 2.5).

[4] Three-factor fit statistics: RMSEA = 0.02, 90% CI = 0.02– 0.03; $\chi^2 = 31.16$, p = 1.0; |residual matrix| = 0.007
Two-factor fit statistics: RMSEA = 0.08, 90% CI = 0.07– 0.09; $\chi^2 = 465.81$, p<.01; |residual matrix| = 0.03
One-factor fit statistics: RMSEA = 0.12, 90% CI = 0.11– 0.12; $\chi^2 = 1583.28$, p<.01; |residual matrix| = 0.07

Due to the binary nature of the dependent variables, logistic regression was used to test for main effects and interaction effects. For the interaction terms of demand and both social and technical control, conventional procedures were used for first identifying the main effects for each predictor variable, and then creating an interaction or product term and adding it to the equation.

Each analysis also included several other independent variables to account for individual factors that can affect learning engagement and also to test their associations with different types of learning. First, educational attainment dummies were included because an individual who has already engaged in learning activities is more likely to continue to engage than someone who does not have as much prior experience or exposure (Cross, 1981; Courtney, 1992; see also Lin and Tremblay, 2003; Statistics Canada, 2004; Turcotte, et al., 2003). This is particularly the case for formal learning, but may not hold for more tacit learning. For example, Livingstone (2005) reported that high school drop-outs are only slightly less likely to engage in informal learning than those with higher education and that those who do spend time in informal learning spend the same amount as those with higher education. As well, age and tenure with an organization have been shown to have a negative relationship with engagement in at least work-related learning (Lin and Tremblay, 2003; Statistics Canada, 2004; Turcotte, et al., 2003). Again this refers particularly to formal learning and may be less applicable to informal learning (Livingstone, 2005). Livingstone (2005) and Turcotte, et al. (2003) also report that hours spent in a particular form of work is associated with the hours of informal learning in that sphere. Gender was also included as a control variable (Lin and Tremblay, 2003; Turcotte, et al., 2003). Lastly union status was included because unions often have well developed (formal) labour education for their membership and in some instances have been shown to benefit enrolment in, duration of and

completion of work-related training programmes (Bilginsoy, 2003; Booth, Francesconi and Zoega, 2003).

6. Results and Discussion

Descriptive statistics and a correlation matrix of all variables are provided in Table 2. For both job demand and social and technical control, low and high values on the scale indicate low and high job demand/control, respectively. Regression results for the main effect analyses for each of the three learning variables are presented in Table 3. The interaction models for each analysis were not significant improvements (either statistically or substantively) to the more parsimonious main effect models. For simplicity only the main effect analyses are presented and discussed. Since the logit coefficients are not easy to interpret, marginal effects were also computed. These marginal effects give the effect of a unit change in each explanatory variable on the probability of a positive response (engaging in that type of learning). For binary independent variables the marginal effects represent changes in the probability of the outcome of interest.

The analyses support both Hypothesis 1 and Hypotheses 2 and 2a; however, Hypothesis 3 is not supported. As predicted, job demand has a positive and significant relationship with each measure of learning behaviour. A one standard deviation increase in job demands of 3.17 is associated with an increase of 8 percentage points in the probability of engaging in formal learning (i.e., 3.17*0.025 = 0.08). Alternatively stated this is an increase of 38% relative to the mean of 0.21. The same one standard deviation increase is associated with an increase of 14 percentage points in the probability of engaging in informal education (39% relative to the mean of 0.36) and an increase of 6 percentage points in the probability of engaging in non-taught

learning (8% relative to the mean of 0.79). These findings corroborate other research. Workers who face high job demands engage in more learning, presumably to utilize all their resources to seek new or better solutions to their demands.

Social control also has significant and positive relationships with informal education and non-taught learning, but the association with formal learning is not significant. A one standard deviation increase in social control (2.74) is associated with an increase of just over 3 percentage points in the likelihood of engaging in both informal education and non-taught learning. This translates to an 8% increase relative to the mean of informal education and a 4% increase relative to the mean of non-taught learning. Technical control has a significant relationship only with non-taught learning. This effect is positive such that a one standard deviation increase in technical control (2.06) is associated with an increase of 2 percentage points (2.5%) in the probability of engaging in non-taught learning.

These findings fit with the idea that informal learning is less structured and more interwoven with other daily activities. Workers with more discretion over the organization and content of their work (technical control) and more authority to make decisions or influence organizational or work group decisions (social control) will have more opportunity to engage with their work, confront obstacles and develop potential solutions to those obstacles. Compared to workers who follow rigid work structures, high technical control workers have more opportunity to ask a colleague for assistance, spend some time on-line or with a resource guide, use trial and error, or reorganize the problem/task in order to reach their goals. High social control workers are exposed to a larger problem domain or scope of work and have more opportunity to interact with others, model behaviours and learn from their increased responsibility. It is with added control

that workers can seek their own personalized and experience-based solutions to problems or glitches.

Social and technical control likely do not affect formal learning in the same way because often formal learning is mandated professional development that is tracked and used for performance appraisals rather than a personal choice. As well, technical control refers to how you do your job, how you organize it and plan it out. Workers who have discretion in this area are more likely to rely more on informal, on the spot or situational learning (Hilton, 2001), as they work through daily tasks rather than take time for formal courses.

The finding that technical control influences engagement in non-taught learning, but not informal education while social control influences both is also of interest. It is important to remember that the variable used to measure informal education is whether workers have asked knowledgeable others for advice about developing their skills. The results may be uncovering a distinction between social and technical control and the social or technical abilities that are being acquired through the learning activity. In this sample, workers with more social control are self-employed (owners), managers or supervisors, and/or workers involved in policy and workflow decisions. These people are perhaps engaging in informal education with an eye toward long-range skill development to advance in the social hierarchy. Workers seeking to acquire more social control are more cognizant of their ability gaps and may seek opportunities such as the informal education tested in this study, to clarify and overcome these gaps. This would be more likely to occur for social control than technical control because the everyday freedom to plan and organize daily work activities occurs primarily at the micro level and would be less likely to include such long-range forecasting and planned learning. Additional research is necessary to

further examine the relationship between social and technical control and the content or subject matter of related learning activity.

Age decreases the likelihood of engaging in informal education by 6 percentage points (17%) and non-taught learning by 3 percentage points (4%) per 10 year interval. It does not have a significant effect on formal learning. Tenure also decreases informal education by 6 percentage points (17%) for each 10 years. This result is significant, but the relationships with formal and non-taught learning are not. These results suggest that learning behaviours and the use of certain learning vehicles change over a person's career. Younger and/or newly hired workers are more likely to engage in non-taught learning and they rely more than older employees on the advice of knowledgeable others (informal education) when determining ability and knowledge needs. This may indicate a more organic and informal learning process for new hires than older workers, but also likely reflects the lack of adequate mentors for senior employees. However, it may also be true that age and experience on the job allows older or more tenured workers to overcome problems or changes without resorting to the types of behaviour that they would classify as learning in a self report. Critics of the study of informal learning have noted the difficulty in obtaining an accurate account of each incidence of informal learning because for most people it occurs seamlessly with the completion of other daily tasks. Older and more experienced workers may be more likely to underreport their incidences of self correction and discovery as learning than younger or newer workers more attuned to their ability gaps and the learning process. More detailed research and broader methodologies that can better tap into informal learning experiences are needed to further explain these results.

The effects for the dummy variables of schooling were significant, positive monotonic and large for all learning outcomes. It is widely agreed that the level of previous formal schooling

predicts engagement in other formal learning activities; however, this has not been as clear for informal activities. Livingstone (2001, p. 313) reported that there exists a "much more egalitarian informal 'learning society' hidden beneath the hierarchically structured forms of organized schooling." As alluded to earlier, he also presented tabular data that suggested school drop-outs are only slightly less likely to engage in informal learning than those who achieved secondary and higher levels of schooling (Livingstone, 2005). The present analysis shows that workers with higher levels of formal schooling are significantly more likely to engage in formal learning and both types of informal learning; though, as Livingstone suggested, the effect size of those differences is smaller for both non-taught learning and informal education than for formal learning, particularly beyond the secondary school level (see Table 3). It is important to note that this difference is for engagement in paid work-related learning and may not hold in cases of volunteer or general interest activities where learning among people with lower levels of formal schooling may be more prevalent (see Livingstone and Sawchuk, 2004).

Being female has no effect on engagement in informal education or non-taught learning but women are 3.8 percentage points (18%) more likely to engage in formal learning than men. Similarly, the number of hours worked per week has a significant positive effect on engagement in formal learning (2 percentage points or 10% per 10 hour increase) and no significant effect on the other two learning types.

The relationship between union status and formal learning is positive and significant such that being a union member is associated with a 6 percentage point (29%) increase. This is a considerable benefit to unionized workers and likely reflects union involvement in sponsoring formal education, administering and running courses, negotiating for educational leaves, removing traditional educational barriers and advocating for the general employability of their

members. Union status is not significantly associated with either informal learning type. These findings indicate that, on the whole, unionized workplaces may actually be more learning-centric than non-unionized workplaces because they have similar levels of informal learning, but higher incidences of formal learning. This is worth consideration in light of the increasing hostility towards unions in the global economy.

7. Conclusion

Talk of the knowledge economy, maintaining the currency of workers' knowledge and abilities, and competing on value added is pervasive in our society. As such it is important to understand the type of learning that is occurring in the workplace and to clearly determine the workplace and job factors and the worker characteristics that contribute to that learning. This research contributes to the study of workplace learning by expanding the Job Demand-Control (JDC) model (Karasek, 1979) to build a more nuanced picture of the factors related to engagement in work-related learning. The Work and Lifelong Learning (WALL) dataset was integral to this study as it provided unparalleled access to quantitative detail about worker engagement in formal learning as well as two types of informal learning. The WALL also contained information on job characteristics that permitted the delineation of traditional measures of job control into social and technical aspects.

The findings suggest that studies of workplace learning and worker control are not accurate representations of the actual relationships unless the multi-dimensional natures of control and learning are taken into account. Workplace and worker characteristics, including social and technical control were differentially associated with different learning types. Job demands is positively associated with all three learning activities, social control does not impact engagement

in formal learning, and technical control only impacts engagement in non-taught learning. Being female, unionized and working more hours per week are associated with higher levels of formal learning, being younger is related to increased non-taught learning and both being younger and being newly hired increases the engagement in informal education. Higher levels of education (relative to primary level) are associated with increases in all three types of learning, though the effect is smaller for informal learning activities.

This study has several implications for organizations. First, workers in demanding jobs rely heavily on all their resources in order to succeed. As such it is necessary to encourage and support a full gamut of learning opportunities through the provision of funding, time and recognition. In this sample 79% of the workers reported engagement in informal non-taught learning related to their jobs, yet it goes largely unrecognized and unrewarded in the workplace. Second, worker engagement in informal learning activities is tied to levels of social and technical control. Increasing the decision-making authority and discretionary control that workers have in their jobs allows for a closer link between learning activities and the work at hand. Increased social and technical control allows learning to take place more easily within demanding jobs and also ensures that the learning is timely, applicable and relevant. As a result, organizations will benefit from increasing the social and technical control of their workforce through increased utilization of worker knowledge and ability.

7.1 Limitations and Future Research

Like most tests of the JDC model this study utilized self-report cross-sectional data that could be susceptible to inflated correlations due to common method bias. However, the correlations of the variables were mixed with a minimum of ± 0.01 to a maximum of ± 0.43, suggesting that this was not a serious problem. A cross-sectional dataset makes discussion of causality problematic

and does not account for changes that may occur over time. Some research is moving into the area of applying longitudinal designs to the JDC model to test for changes over time (see Taris, et al., 2003; De Lange, et al., 2003; Taris and Feij, 2004) and also to link the learning and strain dimensions (Holman and Wall, 2001). Future research could include such longitudinal designs using direct measures of learning behaviour like those used in this study to illustrate how workers differentially utilize learning resources over their career and also how factors such as demand and social and technical control influence different learning activities over time.

References

Beehr, T., & Drexler, J. (1986). Social support, autonomy, and hierarchical levels as moderators of the role characteristics-outcome relationship. *Journal of Occupational Behavior, 7*(3), 207-214.

Beehr, T., Glaser, K., Canali, K., & Wallwey, D. (2001). Back to basics: Re-examination of Demand-Control Theory of occupational stress. *Work and Stress, 15*(2), 115-130.

Bilginsoy, C. (2003). The hazards of training: Attrition and retention in construction industry apprencticeship programs. *Industrial and Labor Relations Review, 57*(1), 54-67.

Booth, A., Francesconi, M and Zoega, G. (2003). Unions, work-related training, and wages: Evidence for British men. *Industrial and Labor Relations Review, 57*(1), 54-67.

Braverman, H. (1974). *Labor and Monopoly Capital*. New York: New York Monthly Review Press.

Browne, M. W., Cudeck, R., Tateneni, K. & Mels, G. (2004). CEFA: Comprehensive exploratory factor analysis, Version 2.00. [Computer software and manual]. http://quantrm2.psy.ohio-state.edu/browne/.

Burns, G. (1999). Dichotomization of formal and informal education, The marginalization of elders and problems of aboriginal education and native studies in the public educational system. In P. Gamlin and M. Luther (Eds.) *Exploring human potential: New directions in facilitating growth in the new millennium*. Toronto: Captus University Press.

Colardyn, D. and Bjornavold, J. (2004). Validation of formal, non-formal and informal learning: Policy and practices in EU member states. *European Journal of Education, 39*(1), 69-89.

Colley, H., Hodkinson, P., & Malcolm, J. (2003). *Informality and formality in learning*. London: Learning and Skills Research Centre.

Confessore, S. J., & Kops, W. J. (1998). Self-directed learning and the learning organization: Examining the connection between the individual and the learning environment. *Human Resource Development Quarterly, 9*(4), 365-375.

Conway, J. M. & Huffcutt, A. I. (2003). A review and evaluation of exploratory factor analysis practices in organizational research. *Organizational Research Methods, 6*(2), 147-168.

Courtney, S. (1992). *Why adults learn: Towards a theory of participation in adult education.* London: Routledge.

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation, 10*(7), 1-9. http://pareonline.net/pdf/v10n7.pdf (accessed April 13, 2006).

Cross, K. P. (1981). *Adults as learners: Increasing participation and facilitating learning*. San Francisco: Jossey-Bass.

De Jonge, J. & Kompier, M. A. (1997). A critical examination of the demand-control-support model from a work psychological perspective. *International Journal of Stress Management, 4*(4), 235-258.

De Lange, A. H., Taris, T. W., Kompier, M. A., Houtman, I. L., & Bongers, P. M. (2003). "The very best of the millennium": Longitudinal research and the Demand-Control-(Support) Model. *Journal of Occupational Health Psychology, 8*(4), 282-305.

Dollard, M. F. Winefield, H. R., Winefiled, A. H., & De Jonge, J. (2000). Psychosocial job strain and productivity in human service workers: A test of the demand-control-support model. *Journal of Occupational and Organizational Psychology, 73*(4), 501-510.

Ellstrom, P. -E. (1997). The many meanings of occupational competence and qualification. *Journal of European Industrial Training, 21*(6/7), 266-273.

Engstrom, Y., Miettinen, R., & Punamaki, R. (Eds.). (1999). *Perspectives on activity theory*. Cambridge: Cambridge University Press.

Ford, J. K., MacCallum, R. C. & Tait, M. (1986). The application of exploratory factor analysis in applied psychology: A critical review and analysis. *Personnel Psychology, 39*(2), 291-314.

Frese, M. & Zapf, D. (1994). Action as the core of work psychology: A German approach. In H. C. Triandis, M. D. Dunnette, & L. M. Hough (Eds.), *Handbook of industrial and organizational psychology* (Vol. 4, p. 271-240). Palo Alto, CA: Consulting Psychologists Press.

Gereluk, W., Briton, D., & Spencer, B. (1999). *Learning about labour in Canada*. Working Paper No. 7. Research Network on New Approaches to Lifelong Learnin (NALL). http://www.oise.utoronto.ca/csew/nall/index.htm (accessed February 20, 2006).

Giddens, A. (1973). *The class structure of the advanced societies*. New York: Harper & Row.

Hacker, W., Skell, W., & Staruab, W. (Eds.). (1968). Arbeit-psychologie und wissenshaftlich-technische revolution [Work psychology and the scientific-technical revolution]. Berlin: Deutscher Verlag der Wissenschaften.

Hilton, M. (2001). Information technology workers in the new economy. *Monthly Labor Review, 124*(6), 41-45.

Holman, D. J. & Wall, T. D. (2002). Work characteristics, learning-related outcomes, and strain: A test of competing direct effects, mediated, and moderated models. *Journal of Occupational Health Psychology, 7*(4), 283-301.

Jackson, P. R., & Wall, T. D. (1991). How does operator control enhance performance of advanced manufacturing technology? *Ergonomics, 34*(12), 1301-1311.

Illeris, K. (2003). Workplace learning and learning theory. *Journal of Workplace Learning, 15*(4), 167-179.

Karasek, R. A. (1979). Job demand, job decision latitude, and mental strain: Implications for job redesign. *Administrative Science Quarterly, 24*(2), 285-308.

Karasek, R. A., & Theorell, T. 1990. *Healthy Work: Stress, Productivity, and the Reconstruction of Working Life.* New York: Basic Books.

Kasl, S. V. 1996. The influence of the work environment on cardiovascular health: A historical conceptual and methodological perspective. *Journal of Occupational Health Psychology, 1*(1), 42-56.

Kohn, M. L., & Schooler, C. (1978). The reciprocal effects of the substantive complexity of work on intellectual flexibility: A longitudinal assessment. *American Journal of Sociology, 84*(1), 24-52.

Kristensen, T. S. (1995). The Demand-Control-Support Model: Methodological challenges for future research. *Stress Medicine, 11*(1), 17-26.

Kusterer, K. (1978). *Know-how on the job: The important working knowledge of "unskilled" workers*. Boulder: Westview Press.

Kwakman, K. (2001). Work stress and work-based learning in secondary education: Testing the Karasek model. *Human Resource Development International, 4*(4), 487-501.

Landsbergis, P. A., Schnall, P. L., Warren, K., Pickering, T. G., & Schwartz, J. E. (1994). Association between ambulatory blood pressure and alternative formulations of job strain. *Scandinavian Journal of Work, Environment and Health, 20*(5), 349-365.

Leont'ev, A. N. (1978). *Activity, consciousness and personality*. Englewood Cliffs, N.J.: Prentice-Hall.

Lin, Z., & Tremblay, J.-F. (2003). *Employer-supported training in Canada: Policy-research key knowledge gaps and issues*. Ottawa: HRDC-IC-SSHRC Skills Research Initiative (HISSRI). Working Paper 2003 B-01.

Livingstone, D. W. (1999). Exploring the icebergs of adult learning: Findings of the First Canadian Survey of Informal Learning Practices. *Canadian Journal for the Study of Adult Education*, 13(2), 49-72.

Livingstone, D. W. (2001). Worker control as the missing link: Relations between paid/unpaid work and work-related learning. *Journal of Workplace Learning, 13*(7/8), 308-317.

Livingstone, D. W. (2005). Exploring adult learning and work in advanced capitalist society. PASCAL International Observatory. http://www.obs-pascal.com/resources/davidlivingstoneoctober2005.pdf (accessed November, 2005).

Livingstone, D. W. & Sawchuk, P. (2004). *Hidden knowledge: Organized labour in the information age*. Toronto: Garamond Press.

Livingstone, D. W., & Scholtz, A. (2006, forthcoming). Contradictions of labour processes and workers' use of skills in advanced capitalist economies. In *Work and labour in tumultuous times: Critical perspectives*, W. Clement and V. Shalla (Eds.) Montreal: McGill-Queen's Press (manuscript provided by first author).

Maier, S. F., & Seligman, E. P. (1976). Learned helplessness: Theory and evidence. *Journal of Experimental Psychology-General, 105*(1), 3-46.

McNamee, S. J. and Vanneman, R. (1983). The perception of class: Social and technical relations of production. *Work and Occupations, 10*(4), 437-469.

Parker, S. K. & Sprigg, C. A. (1999). Minimizing strain and maximizing learning: The role of job demands, job control and proactive personality. *Journal of Applied Psychology, 84*(6), 925-939.

Parkes, K. (1991). Locus of control as moderator: An explanation for additive versus interactive findings in the Demand-Discretion Model of work stress? *British Journal of Psychology, 82*(3), 291-312.

Poulantzas, N. (1974). *Classes in contemporary capitalism*. London: New Left Books.

Schnall, P. L., Landsbergis, P. A., & Baker, D. (1994). Job strain and cardiovascular disease. *Annual Review of Public Health, 15*, 381-411.

Statistics Canada. (2005). *Report of the Pan-Canadian education indicators program 2005*. Ottawa: Canadian Education Statistics Council, catalogue no. 81-582-XPE. http://www.statcan.ca/english/freepub/81-582-XIE/2006001/pdf/81-582-XIE2006001.pdf. (accessed April 13, 2006).

Statistics Canada. (2004). Recent trends in adult education and training Canada. *Education Matters: Insights on Education, Learning and Training in Canada, (1)*5, catalogue no. 81-004-XIE. http://www.statcan.ca/english/freepub/81-004-XIE/200412/aets.htm. (accessed April 13, 2006)

Tabachnick, B. G. & Fidell, L. S. (2001). *Using multivariate statistics*. Boston: Allyn and Bacon.

Taris, T. W. & Feij, J. A. (2004). Learning and strain among newcomers: A three-wave study on the effects of job demands and job control. *The Journal of Psychology, 138*(6), 543-563.

Taris, T. W., Kompier, M. A., De Lange, A. H. Schaufeli, W. B. & Schreurs, P. J. (2003). Learning new behaviour patterns: A longitudinal test of Karasek's active learning hypothesis among Dutch teachers. *Work and Stress, 17*(1), 1-20.

Turcotte, J., Leonard, A., & Montmarquette, C. (2003). *New evidence on the determinants of training in Canadian business locations*. Ottawa: Statistics Canada and HRDC. The Evolving Workplace Series, catalogue no. 71-584-MIE.

Van der Doef, M., & Maes, S. (1999). The Job Demand-Control (-Support) Model and psychological well-being: A review of 20 years of empirical research. *Work and Stress, 13*(2), 87-114.

Vygotsky, L. (1978). *Mind in society*. Cambridge, M.A.: Harvard University Press.

WALL. (2005). Work and Lifelong Learning (WALL) project website. http://www.wallnetwork.ca/index.html (accessed November, 2005).

Wall, T. D., Corbett, J. M., Martin, R., Clegg, C. W., & Jackson, P. R. (1990). Advanced manufacturing technology, work design and performance: A change study. *Journal of Applied Psychology, 75*(6), 691-697.

Wall, T. D., Jackson, P. R., & Davids, K. (1992). Operator work design and robotics system behavior: A serendipitous field study. *Journal of Applied Psychology, 77*(3), 353-362.

Wallace, M. (2003). Internet editorial. *Journal of Workplace Learning, 15*(7/8), 382-384.

Zimbalist, A. (Ed.) (1979). *Case studies on the labour process*. New York: Monthly Review Press.

Table 1:
Factor Loadings for Job Demand and Social and Technical Control Constructs

Item	Factor Loadings		
	Job Demand	Job Control[†]	
		Social	Tech
Thought or attention required of main job	**0.32**[*]	-0.05[*]	0.27[*]
Job often requires you to learn new skills	**0.48**[*]	0.01	0.10[*]
Change in skill level required to perform your job	**0.56**[*]	0.03	-0.05[*]
Change in work techniques and equipment	**0.53**[*]	0.02	-0.06[*]
Participation in policy-making decisions - i.e., the services or products delivered, the number of people hired, budgets (political authority, social control)	0.05[*]	**0.66**[*]	0.08
Measure of self employed and managerial status (economic and ideological, social control)	-0.01	**0.71**[*]	-0.02
Ability to plan or design some aspects of your own or other people's work (symbolic, technical control)	0.003	0.03	**0.68**[*]
Choice in the way you do your job (material, technical control)	-0.03	0.14[*]	**0.58**[*]
Cronbach alpha	0.60	0.70	0.60

Note. Information in parentheses is in reference to McNamee and Vanneman (1983). Factor loadings above the acceptable cut-off point of 0.32 (Tabachnick and Fidell, 2001) are bolded.

*Statistically significant using a 90% confidence interval.

[†]Costello and Osborne (2005) suggest that factors with less than three items may be weak or unstable, however they also note that with large samples (such as in this case) reduced items may still result in strong factors.

Table 2:
Descriptive Statistics and Correlation Matrix of Variables (omitted reference in parentheses)

	Mean (SD)	**Range**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**
1. Formal	0.23 (0.42)	0-1	1.00													
2. Informal education	0.38 (0.48)	0-1	.11**	1.00												
3. Non-taught learning	0.79 (0.41)	0-1	.11**	.21**	1.00											
4. Demand	12.82 (3.17)	0-17	.21**	.26	.20**	1.00										
5. Social Control	4.85 (2.74)	0-8	.07**	.09**	.11**	.24**	1.00									
6. Technical Control	7.64 (2.06)	0-8	.09**	.11**	.13**	.33**	.43**	1.00								
7. Female	0.47 (0.50)	0-1	.02	.01	-.02	-.06**	.15**	-.09**	1.00							
8. Age (yrs)	39.98 (11.74)	17-87	.04**	-.14**	-.08**	.10**	.18**	.11**	-.03*	1.00						
9. Tenure (yrs)	9.12 (9.03)	0-65	.04**	-.12**	-.05**	.11**	.14**	.11**	-.08**	.53**	1.00					
10. Hours/wk	40.25 (13.06)	0-96	.07**	.04	.02**	.16**	.20**	.10**	-.26**	.05**	.08**	1.00				
School(Primary)																
11. Secondary	0.26 (0.44)	0-1	-.05**	-.02	-.01	-.08**	-.06**	-.06**	.35**	-.10**	-.03**	-.08**	1.00			
12. College	0.35 (0.47)	0-1	.04**	.05**	.04**	.09**	-.005	.004	.02	.002	-.02	.002	-.43**	1.00		
13. University	0.20 (0.40)	0-1	.13**	.08**	.08**	.14**	.10	.10**	.008	.02	-.03*	.02	-.29**	-.36**	1.00	
14. Union	0.30 (0.46)	0-1	.05**	-.03*	-.02	-.008	-.30**	-.13**	.01	.06**	.16**	-.05**	-.008	.02	-.01	1.00

Note. SD = standard deviation. The age range does not reflect the typical 18-65 years of the working population because inclusion was based on self-reports of employment status and not a priori assumptions about the age range of working people.
*Statistically significant at the .05 level; ** at the .01 level.

Table 3:
Logit Coefficient Estimates and Marginal Effects for Job Demand and Social and Technical Control on Three Learning Types

Variable	**Formal** (mean = .21) coefficient estimate (t-stat)	marginal effect	**Informal Education** (mean = .36) coefficient estimate (t-stat)	marginal effect	**Non-taught Learning** (mean = .80) coefficient estimate (t-stat)	marginal effect
Demand	.152*** (9.26)	.025***	.190*** (13.09)	.044***	.120*** (7.50)	.019***
Social Control	.015 (.87)	.002	.056*** (3.17)	.013***	.071*** (3.03)	.011***
Technical Control	.026 (1.14)	.004	.028 (1.32)	.006	.066*** (2.82)	.010***
Female	.023*** (2.65)	.038***	.128 (1.61)	.030	-.042 (-.42)	-.006
Age (yrs)	.004 (.92)	.001	-.026*** (-6.47)	-.006***	-.018*** (-3.75)	-.003***
Tenure (yrs)	.001 (.15)	.000	-.026*** (-4.97)	-.006***	-.009 (-1.45)	-.001
Hours/week	.012*** (3.87)	.002***	.001 (.26)	.000	-.002 (-.49)	-.000
School (Primary)						
Secondary	.390** (2.44)	.068**	.252* (1.84)	.060*	.338** (2.38)	.050**
College	.602*** (3.72)	.105***	.389*** (2.76)	.092***	.447*** (2.88)	.067***
University	.969*** (6.22)	.186***	.488*** (3.57)	.116***	.621*** (4.17)	.086***
Union	.353*** (3.62)	.061***	.124 (1.32)	.029	.075 (.66)	.012
Pseudo R^2	.069		.092		.065	
χ^2	225.43**		331.80***		178.67***	

Note. N=5800. t-stat for marginal effects = those reported for coefficient estimates.
*Statistically significant at the .10 level; ** at the .05 level; *** at the .01 level.