Safety Science 68 (2014) 250–257

Contents lists available at ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

Why are occupational health and safety training approaches not effective? Understanding young worker learning processes using an ergonomic lens

Marie Laberge [a,b,c,d,f,*], Ellen MacEachen [c,d], Bénédicte Calvet [b,e,f]

[a] University of Montreal, C.P. 6128, succursale Centre-ville Montréal, QC H3C 3J7, Canada
[b] CHU Ste-Justine Research Centre, Marie-Enfant Rehabilitation Centre, 5200 East Belanger Street Montréal, QC H1T 1C9, Canada
[c] Institute for Work & Health, 481 University Avenue, Suite 800 Toronto, Ontario M5G 2E9, Canada
[d] Dalla Lana School of Public Health, University of Toronto, Ontario, Canada
[e] University of Quebec at Montreal (UQAM), Case postale 8888, succursale Centre-ville, Montréal, Québec H3C 3P8, Canada
[f] CINBIOSE Research Group, UQAM, Canada

ARTICLE INFO

Article history:
Received 10 April 2013
Received in revised form 31 March 2014
Accepted 14 April 2014
Available online 8 May 2014

Keywords:
Adolescents
Vocational training
Occupational health and safety skills

ABSTRACT

Young workers are frequently injured at work. Education and awareness strategies to prevent injuries among young workers are common but they are often ineffective. These approaches emphasize teaching, rather than learning strategies, and appear to contradict recent competency-based developments in education science. This study aimed to gain insight into the actual safety skills learning process of adolescents in an internship in a high school vocational training program. The results are based on auto and allo-confrontation interviews from an ergonomics intervention study with nine apprentices and five experienced coworkers involved in the training. This technique is suited to obtaining qualitative data on work activities; it consists of interviewing apprentices and co-workers about videotaped work observations to capture the thought processes behind their action. The findings reveal that learning in an actual situation poses challenges because working conditions and also learning conditions are not always optimal. Such conditions prompt apprentices to develop novel strategies to manage unexpected situations. At times, this involved side-stepping a safety rule in order to meet work demands. The use of an ergonomics actual work activity approach allowed the merging of two research topics rarely found together: the socio-ecological paradigm in education and the development of original interventions to prevent occupational injuries among young workers. This intersection of educational theory and injury prevention strategies provides new avenue for improving vocational training programs and developing primary prevention interventions in occupational health and safety programs that target youth.

1. Introduction

Young workers are more likely to be injured at work than older workers (Breslin and Smith, 2005; Laberge and Ledoux, 2011) and this appears to be related to inexperience. As shown by Breslin and Smith (2006), short job tenure is a stronger predictor of occupational injury than age. Similarly, Sorock et al. (2001) showed that work accidents happen more frequently while the worker is performing an unusual task. Although work injury rates in Quebec have been in steady decline since 2000 (CSST, 2012), certain categories of young workers remain at relatively high risk of work injury: those who leave school early, experience learning difficulties, and who hold manual and unskilled jobs (Breslin, 2008; Breslin and Pole, 2009). Young people with learning difficulties are more exposed to workplace hazards (Breslin and Pole, 2009). Interestingly, workplace factors more strongly explain occupational injuries among young people than do individual and developmental characteristics (Breslin and Smith, 2010). Essentially, epidemiologic models have shown that young people frequently hold manual and unskilled jobs and these are strongly associated with high occupational injury rates (Breslin et al., 2007; Breslin and Smith, 2010). Primary injury prevention for young workers remains important, and research programs targeting this youth subpopulation have been developed.

* Corresponding author at: University of Montreal, C.P. 6128, Succursale Centre-ville Montréal, QC H3C 3J7, Canada. Tel: +1 (514) 343 6111x17354; fax: +1 (514) 343 2105.
E-mail addresses: marie.laberge@umontreal.ca (M. Laberge), emaceachen@iwh.on.ca (E. MacEachen), calvet.benedicte@gmail.com (B. Calvet).

http://dx.doi.org/10.1016/j.ssci.2014.04.012
0925-7535/

Education and awareness strategies for preventing work injuries among young people are widely described in the scientific literature (Burke et al., 2004, Lavack et al., 2008). Safety training curricula targeted to youth tend to be developed on the assumption that their main cause of injury is attitude or behavior (Lavack et al., 2008; Power and Baqee, 2010). Such a focus on "safety culture" among young workers directed a school education movement in Quebec and other educational programs elsewhere in Canada and United States (Quebec Protocol of the ISSA, 2003; MELS, 2010; Power and Baqee, 2010). However, these approaches show mixed results (Burke et al., 2004; Rautiainen et al., 2008; Van der Molen et al., 2008).

Most current occupational health and safety (OHS) training and awareness approaches (Lavack et al., 2008; Ward et al., 2010; Power and Baqee, 2010) are based on a cognitive or a behavioral educational paradigm, which is oriented to shaping the new worker's attitude or behavior so that he or she will follow OHS rules. Those approaches focus on the trainer role and are unidirectional: knowledge exchanges from the trainer to the trainee. These programs emphasize training rather than learning strategies and appear to contradict recent developments in education sciences, which are oriented toward a competency-based pedagogy, involving in situ skill development, and based on activity theory (Vygostsky, 1962; Piaget, 1967; Jonnaert et al., 2007). According to this theory, learning derives from activity and is not a precursor to it. Thus, recent approaches promoted in education, based on a socio-constructivism paradigm, focus on the learner role.

In the work context, recent education theories stipulate that learning a new job takes place through the experience of actual activity in workplace settings (Lave and Wenger, 1991). Moreover, there is an emerging consensus that *learning* OHS skills (versus *being taught about* safe work techniques) is a useful way to prevent work injuries. Research priorities proposed recently by Canadian and American experts (Runyan et al., 2012) embrace the socioecological approach of understanding OHS learning process in their actual situation. They strongly suggest integrating injury prevention strategies within the organizational context. For instance, these experts pose the questions: What work conditions and practices of supervisors, co-workers and young workers contribute to safety? How do training, supervision, safety practices, and employer attitudes about young workers vary? What factors facilitate the successful movement of young people to jobs in school-to-work transition programs? They also proposed the development of scientific knowledge about the impact of social relationships at work on OHS and learning. The present study, focused on ergonomics of actual work activity, provides some answers to these questions.

The recent evolution in education science suggests that learning involves skills development through situated action and contact with other persons (Masciotra, 2005; Jonnaert et al., 2007). It is interesting to note that the field of Ergonomics, defined as the *scientific discipline concerned with the understanding of the interactions among humans and other elements of a system in order to optimize human well-being and overall system performance* (IEA definition), has similar theoretical grounds to those in education. In particular, the French approach to Ergonomics, widespread in Europe, Quebec and Latin America, derives its methods and framework from the same developmental theories as found in education, including Vygotsky, Leontiev and Piaget (Daniellou, 2005). Moreover, the field of Ergonomics is often applied to work injury prevention, not necessarily via training, but often by changing work conditions. Since the early 1990', scientists from the field of ergonomics of actual work activity have been concerned with using activity analysis methods to develop new training and learning approaches that consider learning content and also learning conditions (Montreuil and Teiger, 1996). In this paper, this ergonomics and education theoretical lens will be used to understand how young people learn to protect themselves from occupational injury in actual workplace situations. This will lead to a discussion of education paradigms (training vs. learning approaches) and to questions about the effectiveness of dominant training approaches in OHS.

2. Theoretical frame

As early as 1991, when the first symposium on *ergonomic analysis of work activity and training* was conducted at the International Ergonomics Association (IEA), ergonomists recognized that health is not independent from 'professional mastery' (Lacomblez et al., 2007). Guérin et al. (2007) and St-Vincent et al. (2011) propose an innovative approach to explain workplace learning through the '*work activity regulation model*'. This model considers the dynamic interaction between work activity, health and productivity. Work activity corresponds to the deployment of different working strategies based on constantly changing determinant factors and has an impact on health and performance. Determinant factors include external factors, including the conditions and means offered by the organization, tasks and work demands, and the social environment. Internal determinant factors correspond to individual characteristics such as fatigue, pain, experience, age, and gender. To balance performance and health outcomes, workers need adequate adjustment strategies and this requires a sufficient *margin of manoeuvre*. *Margin of manoeuvre* can be defined as the "space" available for self-regulatory process of a person engaged in an activity, or the capacity to self-regulate (St-Vincent et al., 2011). A limited *margin of manoeuvre* forces the worker to adopt safety strategies that can be costly for mental and physical health or productivity. For instance, if a worker has insufficient time to move many boxes, he may try to handle all the boxes in one move, even if this makes the load too heavy. Within the 'work activity regulation' framework, adequate in situ learning leads to workers with increased *margin of manoeuvre*.

This article presents findings from a larger ergonomics study that aimed to develop a tailored OHS training approach adapted to apprentices with learning difficulties who were enrolled in a semi-skilled high school level vocational training program. The objective of this article is to provide insight into the actual OHS learning process of adolescents during a 6–8 month internship. In this analysis, we focus on *auto* and *allo-confrontation* interviews (Mollo and Falzon, 2004) with apprentices enrolled in the program and experienced coworkers involved in the workplace training. Auto and allo-confrontation are methodological devices that allow participants to reflect on and explain their actual work activities, for instance, by discussing a video recording of their work activity (auto-confrontation) or that of others (allo-confrontation). This article further elaborates the activity regulation process model (St-Vincent et al., 2011) by focusing not just on consequences (health and productivity outcomes) but also on constraints and resources that shape these consequences. This article integrates an understanding of the activity regulation process described by St-Vincent et al. (2011) and aims to enrich this model.

3. Study context

In 2007, an educational reform in Quebec, Canada introduced a training program called *Training for a semi-skilled trade* (TST), was offered to 15 to 17 year old students experiencing academic failure or who are at risk of dropping out of high school. This program is offered in all Quebec school districts and the total number of students targeted is estimated at 15% of the total school population of 15–17 year old (MELS, 2009). This one year vocational training program provides job skills for a semi-skilled trade, such as kitchen