

## Is it necessary to provide education and training for workplace safety?

### Introduction

With the many technological inventions used in industry there is an increasing need for employee work related education and training to be able to do the work safely. Many accidents occur when people are new to a workplace if education is not provided on how to work safely.

The following is an example from Australia. As part of giving public service and helping the next generation to learn about working in industry a 15 year old college student was provided with work experience at Tho Services Limited. This student was given a visitors induction at the workplace. The work that the student was asked to do was welding, but he was not given any education or training on how to wear the supplied welding helmet or told about the need to pull down the eye protection visor to protect his eyes while he was welding, so he did the welding with no eye protection. This resulted in the work experience student receiving flash burns to his eyes and losing part of his vision permanently in both eyes (Supreme Court New South Wales, 2016; ABC, 2016). The student now requires visual aids for the rest of his life, he cannot play football or cricket which he previously enjoyed doing as he now cannot see the ball, his future employment prospects are limited and his quality of life is decreased. The employing company was fined \$240,000 by Safe Work New South Wales for breaching section 32/19(1) of the Work Health and Safety Act 2011. The company owners could not pay this amount so the company went into liquidation and all employees lost their job at this company (Supreme Court New South Wales, 2016; ABC. 2016).

This case study highlights some of the reasons that education and training are a prerequisite for knowing how to work safely. In this case the lack of safety education for a work experience student affected a small number of people.

A case where lack of training and education affected the safety of a larger number of people was the Bhopal Methyl Isocyanate (MIC) Pesticide Plant disaster in India on the night of the 2nd to the 3rd of December in 1984.

### Who Needs Education and Training?

The following story of the Bhopal disaster illustrates that everyone who is employed by the company at the workplace, and also people in government and the community, need education related to workplace safety. In 1975 plant operators at the Union Carbide India

Bhopal Methyl Isocyanate Plant had received an average of 18 months safety and work related education and training on how to operate the plant safely. Over the subsequent years the amount of work related education and training that the plant operators received had decreased to less than a month per person by November 1984 (Chouhan, 2005). In 1981, after the technical experts from the United States of America left this Union Carbide Plant because the plant was not making a profit, there was very little work related training and education provided for employees (Bowonder, 1987). In 1984 the remaining plant operators had been trained to use storage tanks that were later modified, but no training was provided to the plant employees on the use of the modified tanks (Weick, 2010). This highlights the need for ongoing employee education, particularly when there are work related changes. On the 3rd of December 1984 the work supervisor ordered the washing with water of the 4 lines to the MIC tank as the tank was not pressurising and the lines were blocked with rust and solid sodium salts (Chouhan, 2005). The supervisor had only worked in the area for one month and had just been given the maintenance responsibilities. To save money the company had eliminated the position of maintenance supervisor (Weick, 2010). The workplace supervisor did not understand the plant operations, had not been told how the equipment at the plant operated or the correct way to do the equipment maintenance. The operator who was washing the lines was a new worker. He did not know that he needed to put a slip blind into the pipe so that the water would not go into the MIC storage tank and cause a chemical reaction (Bowonder, 1987; Weick, 2010). This highlights the need for work related safety education and training for new employee at a company and for employees who are new to an area of work.

When there was a build-up of pressure in the MIC tank due to an exothermic reaction with the water that entered the tank due to the line clearing workers could smell MIC in the air, but chose to ignore this as they did not know what to do (Weick, 2010). An hour later there was a massive explosion. The situation was made worse in that none of the fire and rescue squad members were trained or qualified to deal with this type of accident (Chouhan, 2005).

There was also lack of community safety education about the Bhopal Union Carbide plant and its products. The Government allowed the Union Carbide Bhopal plant to be placed in a residential area and for members of the general population to live in large settlements close to the plant when this plant was manufacturing MIC based pesticides as members of the government did not understand the dangers of this decision. The general population also did not know the dangers of living close to this major hazard facility (Bowonder, 1987). This highlights the need for education related to major hazard facilities to be provided to decision makers in government and to the general population.

Following the explosion at the Bhopal Union Carbide plant the company Medical Officer told the Director General of Police and the Mayor of Bhopal that the MIC gas was only a minor irritant and that there was no antidote (Bisarya, & Puri, 2005). In contrast Professor

Gehlawat, who was present in Bhopal at the time, knew that the gas was heavier than air and that he needed to stay inside his hotel room to avoid exposure to this gas. He told all of the hotel guests to '(i) shift to the top floor, (ii) to close all of the windows, (iii) to switch on the ceiling fans and exhaust fans, (iv) to breathe through wet napkins and (v) to wash eyes with water as frequently as possible' (Gehlawat, 2005, p.261-262). Gehlawat knew that milk was an antidote to the gas as casein and other substances in milk absorb toxic substances, minimise entry into the blood stream and minimise the effects on other body systems, so he asked the hotel manager to give milk to all of the hotel guests. He had studied the effects of chemicals for many years so knew what to do to assist with chemical injury mitigation (Gehlawat, 2005).

At a temperature of 200D C (which the MIC did reach) it forms a gas that contains hydrogen cyanide (HCN). The Medical Officer did not know this. The antidote to HCN is sodium thiosulfate which was given to some of the exposed victims and saved their life (Broughton, E. 2005). A German toxicologist came to Bhopal with 50,000 injectable vials of sodium thiosulphate, but was asked by the Government to leave Bhopal and not to provide the antidote to gas exposed people (Bowonder, 1987; Bisarya, & Puri, 2005). The above information, if provided by the Union Carbide Medical Officer to the authorities, could have saved the lives of many of the people who died and would have given authority to the government to allow the provision of the antidote to the people who required it.

The Bhopal plant workers knew to stay indoors and none of these workers died due to the effects of the gas from the explosion. However, as a result of this accident there was the immediate death of 3,787 people in the streets of Bhopal. Trees in the path of the gas lost all of their leaves and many animals died, particularly cattle. The problem of disposing of the dead human and animal bodies became an environmental health problem (Bisarya, & Puri, 2005). A further 3,000 people died within a week (official government figures). Other estimations were that 30,000 people died within a week). The Indian Government has recorded that 47,787 people subsequently died as a result of their exposure to the toxic gas (81,574 government recorded deaths) and 558,125 people were injured with, in some cases, severe and disabling injuries (Gehlawat, 2005; Broughton, 2005; Eckerman, 2005; Bhopal disaster, 2017; Delhi Science Forum, 1985). In 2003 compensation was awarded by Union Carbide to 554,895 people who had permanent severe disabling injuries as a result of their gas exposure on the night of the plant explosion and to 15,310 families where a family member was killed by the gas but at least one other family member survived (Broughton, 2005).

The high number of deaths and permanent disabling injuries was, in part, due to insufficient employee education and work related training, to the lack of knowledge of the company medical officer, to lack of government knowledge about plant related safety, and due to lack of knowledge by the general population of the effects of the products manufactured at the Union Carbide Plant in Bhopal.

This disaster shows that for people to know how to work safely and to understand the dangers in a workplace there should be relevant education for everyone who has decision making and that employees and their supervisors need to be trained in how to perform their work correctly and safely.

Oxford Dictionaries (2019, p.1) define education as ‘the process of receiving or giving systematic instruction’. Business Dictionary (2019, p.1) record that training is an ‘organized activity aimed at imparting information and/or instructions to improve the recipient’s performance or to help him or her attain a required level of knowledge or skill.’ Much of the work related education may be provided through educational institutions, such as the formal degree qualification for a medical practitioner, while the training would be more likely to be provided by people at the workplace, such as instructions by a supervisor to an employee on how to put a slip ring into a pipe and an explanation of why this is required to have a safe work process.

### **History of Work Related Education and Training.**

In the early years (before the industrial revolution) parents and tribe members provided training to their children on how to hunt, gather and later to do farm and other work so that the children did not get sick, injured or killed while working. The most common education and training method used was buddying up an inexperienced worker with an experienced worker so that the experienced person could explain how to do tasks to the learner. In this situation there was individual training and the education provided depended on the knowledge level of the trainer.

Then came the industrial revolution with machinery that could be dangerous to operate, the use of chemicals and other substances that could harm human health, more complicated work processes and the employment of people (employees) for long hours for wages. These workers were employed to make money for factory owners. Many factory owners were just interested in producing products for profit and did not consider their employees work related safety and health. Employees were just part of the production process. Employee collective power was weak at the beginning of the industrial revolution as most employees just wanted to have a wage to be able to support their family. Factory owners provided very little employee work related education.

Working conditions in the 1700s were difficult and often unhealthy in Britain. The first introduced safety and health legislation related to stopping very young children from working. This legislation was the 1788 Chimney Sweepers Act that was based on Dr Percival Potts’s 1775 cancer research. Boys as young as four were being used as chimney sweeps. The chimneys were usually 9 by 9 inches wide so a small person was required to clean them. This Act stated that no boy should be bound as an apprentice before he was eight years old. His parents’ consent must be obtained for the child to be

employed as a chimney sweep, the master sweep must promise to provide suitable clothing and living conditions, as well as an opportunity to attend church on Sundays (Humphries, 2012). In 1882 morals was in the title of the Health and Morals of Apprentices Act introduced by Sir Robert Peel because, once a month, the apprentices were required to attend a religious service to receive moral education. Apprentices were to be prepared for confirmation in the Church of England and must be examined on their religious knowledge by a clergyman at least once a year. Male and female apprentices were to sleep separately and not more than two per bed. Apart from when they attended church and were working in the mill children were locked into their upstairs (above the mill) accommodation. Child apprentices were from poor families and were bound and unpaid until they turned 21 years old. Most of the children working in the mills were between 5 and 8 years old and worked 13 or more hours a day. The local magistrates had to appoint two inspectors known as visitors to ensure that factories and mills were complying with this Act. One inspector was to be a clergyman and the other a Justice of the Peace. These were the 1st workplace inspectors and were unpaid. Very little work related education or training was provided to employees in the 1800s in Britain. Under this Act there was more focus on religious education than work related education and many children died from work related causes (Morrish, 2013).

In Germany in 1871 Chancellor Otto von Bismarck introduced the Employers' Liability Law. At this time in Britain workers were covered by Common Law. Under common law if a worker could be found in any way responsible (contributory negligence) for a work related injury, such as the employee slipped on a workplace floor and broke his or her arm, then it was the employee's fault and no compensation could be claimed by the employee. There was a culture of blaming the victim for their work related injury, ill health or death. If the injury resulted in part from any action, or inaction, of a fellow employee then, under the fellow servant rule the employer was not responsible. To ensure that the employer had no responsibility for any work related injury or ill health when an employee signed a contract of employment then the assumption of risks of harm from doing the work was formalized in many workplaces with the employee abdicating all rights to sue to obtain payment for any work related injury or illness. This was 'known as the "worker's right to die," or "death contracts"' (Guyton, 1999, p. 106). Following the introduction of the Employers' Liability Law in Germany in 1880 the British Parliament passed the Employers' Liability Act. This was the first British legislation in which employers would be required to pay workers' compensation if the accident was caused by the negligence of a manager. It also abolished the 'assumption of risk' that employees previously took when they accepted employment. As there was now a financial consequence for work related injuries that could be traced back to employer management of the work, employers began to provide employee work related training. However accidents were considered by many employers as the results of poorly motivated employees not paying attention to what they

were doing. Safety education was a matter of telling people to be more alert (History of occupational safety and health, 2019, p.17).

In the United States of America many employees were injured, died or developed black lung disease (pneumonconiosis) when working in the coal mining industry. In an effort to improve coal mine safety in 1864 the Pennsylvania Mine Safety Act was brought into law. This was the first workplace safety law in the United States of America and, to cover employers against paying for employee work related injuries, ill-health or a work related death at the same time the first insurance policy was issued in the United States of America. However it was not until 1970 when President Nixon signed into law the Occupational Safety & Health Act that legislation in the United States of America required employers to provide employees with education and training to safely do their work (Braithwaite, 1985).

In Australia 1800 to 1911 was the era of social legislation in which Australia had its first occupational safety, health, welfare and workers' compensation laws passed and enforced by the government. 1911 to 1959 was the inspection era where safety inspectors targeted checking guarding, housekeeping and physical conditions. Before the 1970s occupational safety and health legislation in Australia was prescriptive, detailed and hazard specific. Safety was seen as the responsibility of government inspectors. Safety Performance was measured by disabling injuries and employees were not required to have safety education.

In Britain, in 1972, Lord Robens submitted a report on occupational safety and health legislation with recommendations to change from having specific requirements to having a general duty of care which applied to everyone who could affect, or be affected by, workplace safety, including the employer, employees, manufacturers, installers, suppliers of goods and services, to ensure that the workplace, work processes, goods and services were safe and healthy for everyone who came on to the workplace, conducted work processes, and/or who could be affected by the work, goods or services provided (Brooks, 1987; Ochsner, & Greenberg, 1998; Adams, Hede, Holloway & Jackson, 1999; Milgate, Innesb & O'Loughlinc, 2002).

As well as the Robens report findings being the foundation of new British occupational safety and health legislation these findings were taken by the International Labour Organization (ILO) and were published as ILO Convention 155, Occupational safety and health and the working environment. This Convention was ratified by many countries. When an ILO Convention is ratified by a country's government it forms the foundation of the country's law related to what was ratified. One of the countries who ratified ILO Convention 155 was Australia, so the Robens philosophy was incorporated into Australian occupational safety and health law.

As part of the Robens philosophy, which became law in Australia, employers had a responsibility to 'provide such information, instruction, training and supervision of the employees as is necessary to enable them to perform their work in such a manner that they are not exposed to hazards' [Occupational Safety and Health Act, Western Australia 1981, s19(b)]. To meet these requirements the employer had to provide all employees with instruction, training and work related education related to being able to complete their work safely. To check if this was actually happening in industry in 2019 the author asked people who were working in industry if they had received this work related education. Following are two replies.

*"As for my call centre experiences regarding health and safety education all I can say is that the safety person always comes in during the induction, tells you that his door is always open but you quickly learn when you hit the floor that if you want to learn anything about your workplace safety or health or have any complaints and you raise them with your supervisor (who is on a temporary contract also) they won't raise them as they are worried about their job and if you raise any issues or ask for work related safety education then you will find your contract not being renewed at the end of the 3 month period. I guess the main point I was trying to make is that in this society we have such an enriched outsourcing environment where everyone is so worried about their job that they do not spend any time, apart from one orientation lecture, on safety education, employees are afraid to bring up safety issues and these sort of companies prime focus is on making money; not its employees safety education and well-being."*

In this case, although there is a requirement for education and training, the employee feels that, apart from in an orientation lecture, the legal requirements are not being met. In general, in Australia, if an industry is perceived as not being dangerous employees would receive a safety induction and an emergency procedures presentation. In industries where there are more perceived hazards safety education may be given on a daily basis. The following survey reply is related to one such industry.

*"In Western Australia mining used to be one of the most unsafe industries, but this has changed dramatically and it is now one of the safest industries in the world."*

#### The Western Australian Mining Industry

The path for the Western Australian mining industry to being one of the safest industries goes back, in part, to the implementation of the Robens Report recommendations into workplace safety and health legislation. In the United Kingdom (UK) in the Coal Mine Regulation Act 1872, there was a provision for mine workers to be involved in inspecting the mine in which they were working to ensure that it was safe. These employees were called Check Inspectors. Lord Robens saw how effective these Check Inspectors were in

improving workplace safety and health so he included in his report employee involvement in workplace safety and health.

After the Australian Government ratified the ILO Convention 155 Western Australian mining industry safety and health representatives came into existence in 1995 with the implementation of the Mine Safety Inspection Act 1994. Safety and Health Representatives were employees who were elected by their peers to represent people in their work area on workplace safety and health matters.

Under this law safety and health representatives are legally required to attend a 5 day course to learn how to identify, assess and apply risk management processes to workplace hazards; how to conduct workplace inspections and investigations, apply health & safety legislation, communicate information on safety and health matters in their workplace, how to resolve conflict and issue Provisional Improvement Notices. Safety and Health Representatives are also encouraged to continue to attend other courses to update and improve their occupational safety and health knowledge. The knowledge that these employees gain through this education is then used to improve workplace safety and health. In Western Australia, under the Mine Safety and Inspection Act 1994 and under the and Geothermal Energy Safety Levies Act 2001 a levy is collected from the mining companies and from major hazard facility companies to pay for costs associated with administering and enforcing safety laws. In 2015-2016 the levy collected was \$25,160,000. The mining inspectors, as well ensuring legislation compliance engage with managers and other mining industry employees to provide education related to improving company risk management (Department of Mines and Petroleum, 2016a).

To be a Western Australian mining inspector the employment requirements are to have a Bachelor of Science or other approved Bachelor degree in an occupational health and safety discipline relevant to the resources industry. Qualifications or training in occupational hygiene, noise, environmental health, radiation, ventilation qualification or training in risk management or a related discipline are considered favourably. Demonstrated knowledge and experience of the practical application of occupational safety and health legislation and risk management principles within the resources sector is essential. Experience and skills in investigations managing emerging issues, changes and projects is required. Demonstrated ability to listen, understand and adapt to communication style and message to suit a range of audiences including the ability to negotiate effectively and convey information and structures via written and oral communication is important. Once employed there is also ongoing safety education for Inspectors to keep them up to date with work related knowledge.

As a summary these inspectors need to have completed formal tertiary education qualifications to have the knowledge to do their work, but they need more than this. They also are required to have good communication skills to enable the people who work in the



Western Australian mining industry to learn from their expert safety knowledge. One of the outcomes of the work of the inspectors in sharing their work related safety knowledge is an improvement in the safety practices in the Western Australian mining industry. In Western Australia, in 1900, there were 45 fatal accidents reported. This was a fatality rate of 20% (Gilroy, & Jansz, 2014). In the year 2012 there were no fatalities in the Western Australian mining industry (Jansz, 2012). In 2015-2016 there were four fatal accidents from an average work force of 102,343 workers. This is a fatality rate of 0.0039%. While this fatality rate is low the aim is always to have no fatalities as was the case with the Western Australian mining industry exploration workers (2,223 workers with no fatalities) in 2015- 2016 (Department of Mines and Petroleum, 2016b).

Managers and many other employees who work in the Western Australian mining industry have formal work related education and qualifications. Other education provided is generic occupational safety and health education related to the Western Australian mining industry. Workplace health and safety orientation education can take between one to five days, depending on the company and the work that the employee will do. To keep up to date with occupational safety and health there are workplace

Tool Box Talks that are often presented by the mining industry safety and health representative, by other employees, or by safety professionals. At the start of a work shift in the mining industry there are Safety Shares in which employees share with the rest of their work team any safety related matters from the previous day, and lessons to be learnt (positive or negative) are discussed This is followed by talking about the safety factors that are important for the work in the shift that the employees will commence. Finally there are Safety Stops, usually when employees need to be trained in important safety matters by their supervisor. All of this education has contributed to making the Western Australian mining industry one of the safest industries to work in.

### **Workplace Safety Education**

The first accident prevention model was developed by Herbert William Heinrich who was born in America 1886 and died on the 22 of June in 1962 at the age of 76. Heinrich was an Assistant Superintendent at the Engineering and Inspection Division of the Travellers' Insurance Company when he published his first book called Industrial Accident Prevention: a scientific approach, in 1931. In the 1920s when Heinrich conducted the research on the insurance forms the employers blamed the workers' actions for causing accidents. This was similar to the blame the victim culture in Britain at this time. The five dominos in Heinrich's theory of accident causation were

- 1) Social environment and ancestry.
- 2) Fault of the person.
- 3) Unsafe conditions and / or unsafe act.

- 4) Accident.
- 5) Injury (Hudson, 2014; Javaid, Isha, Ghazali & Langove, 2016).

This model was important as it formalized the need to prevent accidents from occurring by removing step 3, which were the unsafe conditions and act that occurred in the workplace to cause the accident that resulted in injury (Heinrich, 1931). To assist with the prevention of unsafe acts this model highlighted the need for employee safety education.

An American company that developed formal workplace employee safety education in 1930s, following the publication of Heinrich's accident sequence model, was the Bell telephone company. This company trained its employees on safe work methods on the job and in the classroom. It displayed safety posters on the workplace walls to remind workers to work safely and had printed work procedure instructions. There was learning from workplace incidents and the workplace incident and accident report produced each month was shared and discussed with employees so that they could learn about the causes of accidents and how to prevent them from occurring. This company did more than just have employee education as, to improve work related safety, it included putting safety in the design stage of workplace tools, testing equipment for safety and purchasing equipment that was safe to use (Bell Telephone Company. 1949). In the 1930s this was considered best practice in workplace safety.

In 2000 research was conducted to identify the aspects of organizational management that produce the best business outcomes in health care organizations. The findings of this research identified that what was most important was for the organization to have a mission and a culture of care for everyone who came on to the business premises (Jansz, 2014). This is the same as the conclusion that the Robens report came to and resulted in a general duty of care being included in workplace safety and health legislation. Part of the model developed from the health care industry research included management providing and facilitating employee education and training, and employees being educated and trained in work related tasks. This resulted in minimal employee occupational injuries and sick leave. For private hospitals there was an increase in the number of customers due to a high standard of care being provided and the research identified that this made private hospitals more profitable. For government hospitals there was a decrease in the number of customers due to employees knowing how to work safely and giving correct patient care. Having less customers in government hospitals meant that less of the general population's tax money had to be used to support government provided health care (Jansz, 2014). When employees have work related education they are not only able to work more safely but are also able to work more efficiently and effectively. In contrast to this when employees do not have effective work related education and training major accidents can occur. An example of this is the Longford gas plant accident that occurred in Victoria, Australia.

At the Gas Plant at Longford in 1998 operators worked a 12 hour shift and during that time had to deal with 8,500 alarms so often worked in alarm mode. Through missing an alarm an operator allowed the plant to continue production with the condensate liquid above 100%. This caused the warm oil pumps to shut down. It took several hours for these pumps to be started during which time the metal heat exchanger became very cold (- 50 degrees C). When the warm oil was introduced there was brittle metal fracture and the gas explosion that killed two men, injured eight other people and cut off Melbourne's gas supply for two weeks.

Part of the cause of the accident at Longford was that the Engineers, who knew about brittle metal fracture, had been relocated from the Longford plant to the head office in Melbourne. The Royal Commission, which was held to investigate this accident, found that the control room operator was not to blame for this accident as neither he, nor anyone else at this workplace, understood what caused brittle metal fracture. When hundreds of litres of fluid began flowing on the ground the operators thought that the bolts just needed tightening. Maintenance men were called to re-tension the bolts, but they found that no adjustment was required.

ESSO insisted that they had trained the employees about aspects of operating the gas plant. When tested on-line about what they had learnt some of the employees had ticked the right answer without understanding what their answer meant. For example, an employee had ticked "thermal stress" as a correct answer because that is what the book said was the correct answer. When questioned in the Commission investigation, this employee said he had no idea what "thermal stress" meant. Not understanding what thermal stress was contributed to the employees' decision to re-introduce warm oil into cold pipes which was a cause of the pipes rupturing (Hopkins, 2000). Following this accident the court ordered penalty that ESSO paid for failure to adequately train employees and to adequately train supervisors was \$(A) 2,000,000 ( Hopkins, 2002).

As an outcome of this accident, and many other work related accidents, it became clear that employees must be education on hazard identification for the hazards or actions in their workplace that can cause harm, be trained in risk assessment, risk control and how to use the hierarchy of risk control measures. If an employee cannot implement risk control measures then they need to be trained to report the hazards that they identify to their immediate supervisor, or to the person who can provide the risk control measures required to make the workplace and work processes safe. As illustrated by the Bhopal case there is a need for the general public to also be provided with safety education.

### **Public Safety Education**

In Australia most of the safety education provided to the general public is related to road safety. This education is provided through the media, through fines and through car

drivers losing demerit points for driving over the speed limit or having unsafe actions when in a car. In Western Australia once the driver has 12 demerit points their license to drive is lost for three months. There are no rewards for driving a vehicle well, except that the person can remain licensed to drive.

According to the Safe Work Australia (Safe Work Australia. 2016) publication on Australian work-related traumatic injury fatalities from the year 2003 to 2015, two thirds (2,081 out of 3207) of work related traumatic fatalities involved vehicle collisions while the employee was performing work duties, most often on a public road, and 60% (803) of bystander (member of the public) work related fatalities were due to a vehicle collision while an employee was working, or the member of the public was hit by a work vehicle. In Australia the work related road transport fatality rate between 2003 and 2015 was eight times higher than the combined fatality rate of all other industry causes (Safe Work Australia. 2016). In 2015, 115 of the 196 work related fatalities involved a vehicle. It was also noted that 187 (96%) of the work related fatalities in 2015 were male (Safe Work Australia. 2016).

For children in Western Australia there have been a series of videos that have been shown on TV to promote children to think of safety before they act. WorkSafe Western Australia has 'Planet Think Safe' as an online educational resource for primary school children. It provides information to help children develop a positive attitude towards, and the skills to be, safe at school, home and in the community. It is part of the educational curriculum in primary schools and has cross-curricular courses and activities that have been organized into three levels; for lower, middle and for upper primary school children.

The Work Safe Smart Move website is a comprehensive occupational safety and health educational resource for senior high school students and for new young workers that are entering the workforce on a work placement, work experience, or as a school-based trainee/apprentice. Features of the Smart Move website include having a Smart Move Certificate program containing one general and fifteen industry modules. High school students must pass and obtain this Certificate before being allowed to do industry work experience. The Smart Move Safety Passport program contains eight progressive online lessons that include videos, online learning activities, printable worksheets and a resource section that contains information sessions on current occupational safety and health topics. This program also has mapping documents and assessment tools for the national competency unit BSBWHS201A, over seventy printable occupational safety and health lesson plans and worksheets that provide over 100 hours of activities for educators.

In Western Australia it is considered that all children need to know the principles of safety and health before they enter the workplace, have an understanding of how to identify

work related hazards, assess the risk, report this risk to their supervisor and refuse to do any work that they do not consider safe for them to do

### Is Education and Training Alone Enough?

It is a start, but there are other factors to consider as is shown in the case of an employee at a Hay Baling business in Narrogin, who worked as a fork lift and press operator. This employee had been trained to drive a fork lift safely and had a High Risk Work License to operate a fork lift. Part of the training and competency assessment included not driving with the forks raised more than 30 centimeters. Following his training this employee had been warned on at least two occasions by his workplace supervisor not to drive with his forks raised.

On 22nd October the employee had loaded hay bales onto a feed table, reversed away from the table and set off in a forward direction with his forks raised at 1.7 meters high. This caused his view to be obstructed and he hit the driver, seated in another fork lift, with the fork prongs piercing the victim's torso and killing him. The employee was fined \$(A)11,000 and had to pay \$1,745 in court costs (Department of Commerce – Work Safe. 2017). In this case the employee had been trained to work safely, had been told by his workplace supervisor to work safely, but did not and, as a consequence, accidentally killed a fellow employee.

Another case where an employee had been trained to work safely happened in Queensland at the construction site for the ROMA liquefied Natural Gas project when Mr Glenn Newport died at work due to having a cardiac arrest brought on by dilutional hyponatraemia due to heat stress. How to work safely in the heat was discussed at the prestart meeting and strategies to work safely in the heat discussed and implemented prior to Glenn commencing his work for the day. There were workplace policies and procedures that employees had been trained to use to work safely in a hot work environment (Office of the State Coroner. 2016). Despite all of the education and training Glenn, who was 38 years old, was still affected by the heat at his workplace and died.

Similarly, Adam Perttula, a Jumbo machine operator, was working in a hot, humid underground gold mine in Western Australia when he collapsed due to heat stress and died. Resources Safety (Resources Safety, 2015) Report No. 232 provided an industry alert on preventative action to be taken using the hierarchy of risk control measures to prevent further work related deaths due to the same or similar causes. The Resources Safety recommendations for working safely were as follows.

- 1) Elimination. So far as is practicable do not have employees working in the heat.
- 2) Isolation. Isolate heat sources through shielding, containment or using remote control machinery to perform the work where practical.

- 3) Engineering controls, such as providing adequate ventilation to achieve a healthy atmosphere and reduce the heat experienced by employees.
- 4) Administrative controls. Use safe work practices such as job rotation.
- 5) Education. Provide training to employees on risk assessment and risk control measures to be taken to avoid any harmful effects from heat.
- 6) Monitor effectiveness of risk control measures used.
- 7) Personal Protective equipment. This is last on the hierarchy of risk control measures and personal protective equipment to protect from the heat is used if the other measures used are not adequate (Resources Safety, 2015).

In this hierarchy of risk control measures it is noted that education and training comes after hazard elimination, isolation, engineering controls and administrative controls. As well as using the hierarchy of risk control measures (Resources Safety Resources Safety, 2015) provides information about the role of managers, supervisors and employees in preventing the heat related death of an employee.

The role of managers and supervisors include firstly to ensure all workers are trained to recognize the symptoms of heat stress (Resources Safety, 2015). Then the supervisor should provide detailed safe work practices that identify the hazards and controls for working in hot and humid conditions and ensure that the risk control measures are implemented. 'If the wet bulb temperature exceeds 25°C, an air velocity of not less than 0.5 metres per second must be provided for underground workplaces or in a tunnel under a surge stockpile. Supervisors must also arrange urgent medical treatment for anyone suspected of suffering a heat-related illness' (Resources Safety, 2015, p. 2).

All employees who have to work in a hot climate must understand the risks and symptoms of heat stress, and report any signs of heat stress to their supervisor. Employees also have the responsibility to ensure that they drink appropriate quantities of water to remain hydrated (Resources Safety, 2015).

Using this case study it is clear that it is the workplace management and supervisor's responsibility to ensure that employees have the education and training to be able to work safely and that the employee has the duty to make sure that they understand how to work safely so that they do not harm their own health or the safety and health of others. However education, while very important, is not the only answer. Where hazards exist the hierarchy of risk control measures should also be used to make the workplace, work processes and actions of people as safe as is reasonably practicable.

## Conclusions

Benefits of having education and training to enable employees to have the knowledge to work safely include minimizing the number of employee workplace accidents, injuries and

work related ill-health and maximizing employee productivity due to the fact that employees know how to perform their work correctly and safely.

Other benefits are reduced legal costs, improved employee work related satisfaction, employee retention, reducing the cost associated with having to recruit and train new employees, reduced employee sick leave and lost work hours, reduced workers' compensation costs, the employer ensuring that they are meeting their legal obligations and responsibility for their employees. The findings of this paper are that work related education and training are a pre-requisite for safety because, as was shown in the Longford Gas Plant disaster, in the Bhopal Union Carbide disaster, and in numerous other accidents, if employees do not have the education and are not trained in how to do their work safety major disasters can occur.

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