HAZ & ZARD: PROMOTING HAZARD IDENTIFICATION, RISK ASSESSMENT AND POSITIVE SAFETY BEHAVIOUR IN THE PETROLEUM INDUSTRY

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ABSTRACT

The Australian Petroleum Production and Exploration Association (APPEA) represents companies exploring for, and producing, oil and gas in Australia. APPEA has a responsibility to the community and an obligation to its membership to improve the health, safety, and environmental (HSE) awareness of new recruits entering the energy sector from schools and to reinforce awareness and safe behaviour amongst experienced personnel. Unfortunately, however, APPEA noted that school-based HSE training was virtually non-existent and much pre-existing lecture-based HSE training was inconsequential because the traditional death by PowerPoint approach did not enable people to think for themselves. In essence, much safety training has failed to capture the hearts and minds of employees. In response, APPEA, with the financial support of ChevronTexaco Australia Pty Ltd and the professional and technical support of An Meá, developed a hazard identification and risk awareness training activity that promotes safety from the heart by actively engaging the minds of students and employees.

The Haz & Zard Safety Awareness Activity is not a lecture or talking-head experience. Haz & Zard is an active process of adult learning that forces trainees and students to think. At a psychological level, Haz & Zard uses a projective technique with computer-generated HSE images across a range of workplace activities. The projective training process enables participants to identify and assess hazards and associated risks, and then define hundreds of appropriate safe behaviours and practices in response. Intra-group discussions further heighten learning and a participant workbook enables the capture and evaluation of training outcomes. To reiterate the main point, there is no place within Haz & Zard for an HSE lecture. Instead, Haz & Zard enables active participation and advanced discussion of a wide range of HSE issues to enhance learning outcomes and motivate positive safety behaviour.

KEYWORDS

Hazard identification, risk assessment, safety training, safe behaviour, attitudes, Q-Methodology, adult learning principles, cognitive skills, thinking.

INTRODUCTION

The history of safety improvement clearly demonstrates that positive safety outcomes resulting from technical and engineering solutions reached a plateau following the Second World War. In response, during the last decade of the 20th century safety practitioners increasingly focussed their attention on the measurement of safety performance in relation to behaviour and other psychological and human factors (Wagenaar, and van der Schrier, 1997). There are now numerous safety culture questionnaires and a wide variety of organisations providing surveys. There is also a variety of trailing indicators in widespread use such as total recordable case frequency (TRCF) and lost time injury (LTI) statistics. Even leading indicators for measuring, reporting and managing positive safety behaviours have become common (Willekes and Hudson, 2000). Job hazard analysis (JHA) and behaviour-based safety programs are two noteworthy examples (Scott-Geller, 2002). While some of this data collection and training has demonstrably improved safety performance, it seems that positive safety improvements resulting from a focus on behaviour has again reached a plateau and many organisations are wondering what to do next with regard to the hearts and minds of their employees (Stirton, 2001, pers.comm., August 2002).

A simple solution is required that refocusses attention on the need for people to be sufficiently motivated to act in a safe manner (safety from the heart) because they have the skills to think before they act (using their minds). This suggestion stems from an earlier analysis of ExxonMobil technical data reported by Toellner (2001). In the case of ExxonMobil, a lack of cognitive ability to recognise hazards and appropriately assess and evaluate associated risks was linked to multiple unsafe behaviours that in turn, were linked to more than 90% of accidents. It seems that previously developed behaviour-based safety (BBS) programs have limited success because they consider only the behaviours of people without regard to the necessary a priori cognitive process of hazard identification and risk assessment. In response to the key shortcoming of BBS, An Meá and APPEA recognised that the cognitive process of active thinking is critical to thorough task-specific hazard identification and risk
assessments for people to then engage positive safety behaviours (Marshall, 2001).

In raising and reinforcing the cognitive skills required for hazard identification and risk assessment, the current project sought to address the recommendations of the Australian Competitive Energy Workplace Competency Initiative (ACE WCI) and the Australian National Training Authority (ANTA) guidelines for induction training (ACE, 2001; ANTA, 1998). ACE (2001) noted that induction training should be designed to raise employee safety awareness because 'such awareness is necessary in establishing and maintaining safe, environmentally responsible workplaces'. Induction training should promote quality outcomes and be valid, reliable, practical, consequential, and inexpensive (Hudson, van der Graaf, Parker, Lawton, and Verschuur, 2000). It should also enable participants to identify hazards, assess associated risks, and modify their behaviour in response to risks and hazards (Reason, 1998).

Unfortunately, a recent study of the perceptions of safety professionals about induction training indicated that much current training is of poor quality, is lacking formal evaluation of learning outcomes, and is unsuitable in non-Western locations where culture and language barriers exist (Ho, 2001). With regard to quality, the majority of training was said to adopt a non-interactive, lecture-style approach to safety and health awareness, especially when combined in a video format (Ho, 2001). Much pre-existing, lecture-based induction HSE training was said to be inconsequential because it failed to enable trainees to think for themselves and it was unsuitable in locations where education or experience levels and language or culture provided a barrier to learning during the traditional death by PowerPoint (Hudson et al, 2000; Ho, 2001; Fleming and Lardner, 1999; Willekes and Hudson, 2000).

With those points in mind, An Meá, APPEA, and ChevronTexaco Australia Pty Ltd sought to improve the level of health and safety awareness of new recruits entering the energy sector from schools and to reinforce the cognitive skills required for hazard identification, risk awareness and appropriately safe behaviour amongst industry personnel.

In response to the recognised requirement to improve hazard identification and risk assessment skills in the petroleum industry, we developed a new training methodology that actually works. The new methodology promotes consequential outcomes in learning that are valid, reliable, practical, and inexpensive. The new process is called the Haz & Zard Safety Awareness Activity, or Haz & Zard after the two central characters on which it is based. The new training format is a radical departure from tradition because it is based on an interactive activity rather than a lecture (Marshall, 2001). The training also departs from tradition in that it promotes a high degree of trainee participation and interaction, uses visually-based training materials (Hanke, 1998; Walker, 1991) and fosters high-level discussion and debate (Marshall, 1998).

Haz & Zard achieves positive learning outcomes because it engages eight key adult learning principles (Delahaye and Smith, 1998; Scannell and Newstrom, 1994a, 1994b; Woodside Energy Ltd, 2001) within a Q-Methodology framework (Brown, 1980; McKeown and Thomas, 1988). The application of the eight key adult learning principles has been shown to enhance awareness by increasing retention rates and accelerating learning. Adult learning principles are primarily designed for use in training, and they are particularly useful when applied to communicating in cross-cultural situations that are commonly found in the global petroleum industry. The eight principles and how they are demonstrated in Haz & Zard are summarised in Table 1. Q-Methodology is also introduced as the foundation of the Haz & Zard induction process (Taylor, Delprato, and Knapp, 1994; Brown, 1996).

Q-Methodology is designed to investigate people's perceptions about any topic and the instrumental basis of the approach is Q-sorting rather than the standardised questionnaire that is now familiar, even to non-psychologists (Stephenson, 1935, 1853, 1980). Q-sorting conventionally involves rank-ordering a set of statements, pictures or other stimulus materials, known as a Q-sample, from most like my view to most unlike my view, based on the unique perceptions and opinions of any individual participant (Brown, 1986). In its current application to safety training, Q-sorting is based on 21-work tasks, printed as images on playing-card sized sheets. Following convention, the 21 images also include a short descriptive statement and a coding number attached to each card. Amongst others, the images include computer-generated pictures of the Haz & Zard characters working at height, working with electricity, manual handling objects, driving a vehicle, and working with powered and non-powered hand tools. Haz & Zard images are illustrated in Figure 1. The 21 images making up the Q-sample were derived from a larger sample of images and data gathered from varied sources as recommended by McKeown and Thomas (1988). The list of data sources, albeit non-exhaustive, included individual and group interviews, written narratives, literature reviews, archival records, transmitted media information, posters, postcards, purpose-designed images, and the researchers' own consulting experiences. Information on accident frequency rates, categorisation of accidents and incidents, analysis of fatalities, and the experience of a small industry working-group was also drawn upon as a primary source of information for the HSE images. Following the work of Rogers (1995), the open-ended materials and information that were obtained during research were sifted, ordered, and condensed to yield a representative pool of items and propositions about hazard identification, risk assessment, and behaviour change. Reduction of this pool of items was then achieved by a combination of psychological and practical experience as well as pilot testing.

Several of the selected images were based on BP's golden rules of safety, that in turn, were based on an analysis of 550 fatalities (Rosbrook, personal...
Table 1. Adult learning principles deployed by Haz & Zard.

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<tr>
<th>Principle</th>
<th>Application of principle in Haz &amp; Zard</th>
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<td>1. • Provide opportunities for lots of two-way feedback.</td>
<td>• Ask open questions to check understanding about hazards, risks and safe behaviours; • Use short individual and group exercises to consolidate learning; • Acknowledge and confirm appropriate responses and seek detail by probing with further questions; • Ensure that poorly thought-out responses are corrected by the group; • Look for non-verbal signs of comprehension, such as “nodding”, “smiling”, etc; • Provide frequent opportunities for learners to ask questions and make responses; • Manage the group so that all participants are deeply involved in the tasks.</td>
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<td>2. • Promote active learning through the use of activities.</td>
<td>• Rather than present “information”, Haz &amp; Zard provides the space and opportunity for participants to ask questions of each other in such a way that learners discover the “facts” for themselves; • Participants learn from each other by discussing their hazard identification and risk assessments; • Haz &amp; Zard is an activity rather than a lecture; • Haz &amp; Zard fosters group discussions; • Haz &amp; Zard provide practical opportunities for sharing of information.</td>
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<td>3. • Use appropriate reinforcement, praise and encouragement.</td>
<td>• Praise and recognition of correct answers or positive contributions to discussion; • Reinforce partially correct responses by asking for more information from the group; • Group members ask questions of each other in order to clarify views.</td>
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<td>4. • Make the training meaningful and interesting to participants.</td>
<td>• Tailor-made for operators, contractors and supervisors; • Provides examples of work-tasks that are relevant; • It is interesting and novel and stimulates participation; • It links the training to the workplace with follow-up training involving posters, toolbox talks and supervisor observations.</td>
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<td>5. • Attempt to maximise the use of multiple senses.</td>
<td>• Use of visually-based materials during Q-sorting, involving cards and game boards encompasses the visual sense; • Participants are able to touch and handle the materials; • Participants are able to talk, discuss, ask questions and listen to others.</td>
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<td>6. • Provide opportunities for over-learning</td>
<td>• Asking questions about material presented previously; • Asking learners to compare new HSE images with previous images; • Including the opportunity for review periods and summaries; • Providing the participant workbooks that forces participant recall; • Providing a review session at the end of the course with active participation.</td>
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<td>7. • Provide plenty of opportunities for information summaries.</td>
<td>• Clear introductions and conclusions to each image; • Participants are asked to provide reviews at the end of each HSE image; • Emphasis is placed on the HSE visuals and the Q-sorting activity; • The training is able to provide summaries of learning throughout the session; • The activity and discussion provide an ideal opportunity for repetition of messages—especially in the middle of the training session.</td>
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<td>8. • Chunk information into bite-sized pieces.</td>
<td>• Haz and Zard is purpose-designed to promote ‘chunking’ of material as the 21-HSE images allow for focussed hazard identification, risk assessment, and discussion of appropriate behavioural responses.</td>
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correspondence, April 2001). Further sampling for balance, appropriateness, intelligibility, simplicity, and comprehensiveness resulted in the final selection of 21 relevant images forming the Q-sample.

The Haz & Zard training process is very flexible but it is ideally suited to a 2-4 hour timeframe, involving a maximum of 10–12 participants, and one or two trainers. With regard to the training process itself, training involves individual activities, group-based deliberation and discussion, and a high degree of participant interaction. There is no role for a lecture from the trainer. It is the Q-sorting process, married to a facilitated discussion that provides a learning opportunity for HSE inductions. The activity of Q-sorting together with the process of talking through the HSE issues is what makes the death by PowerPoint lecture redundant. Importantly, the Haz & Zard training process is designed to be delivered in-house by any organisation’s HSE Advisers, or by operators acting as peer-group trainers. There is no requirement for an expensive expert to deliver Haz & Zard. An example of the use of Haz & Zard is illustrated in Figure 2.

In process, each participant is asked to consider how the work tasks shown in the 21 images relate to their own job and how the hazards and associated risks of each task can be ranked. Participants are provided with an array chart, in the form of a large flat board with pre-determined columns and rows, together with a scoring key to make Q-sorting easier (Taylor, Delprato, and Knapp, 1994). People also identify the critical positive safety behaviours and attitudes that they can adopt to keep themselves safe. This is an individual activity with all participants being given the opportunity to work on their own to identify their risk perceptions. Participants are encouraged to sort the 21 images by separating the items into a tentative ranking of low-risk, medium-risk and high-risk activities and thereafter, to layout the images on the array chart provided. At all stages, participants may move or exchange the positions of the images until they feel a final best expression of their perception is obtained (Rogers, 1995).

Once participants complete the Q-sort, facilitation encourages the whole group to identify and discuss the hazards and associated risks related to each task. Participants are invited to speak about their ordering of the survey materials, and asked to provide reasons, underlying logic, and other important comments about their own unique Q-sort. Participants quickly identify between 60–100 specific hazards and risks. They also identify the specific behaviours and attitudes that can be adopted to keep them safe when conducting the high-risk activities. Participants can also discuss the barriers and obstacles that prevent them from adopting safe working practices. This additional information can then be used to target structural or systemic problems within the working environment.

The group-work training process fosters awareness of more than 250 easily adopted safe behaviours. Importantly, evaluation of learning is also assessed in the training process when participants use a trainee booklet to capture their individual and group discussions. On completion, the trainee booklet can also be used by the course facilitator to ensure that participants have achieved the stated competency and learning outcomes of the Australian Competitive Energy Workplace Competency Initiative. The trainee booklet enables each trainee to record identified hazards and specific behaviours that can be adopted to minimise associated risks. The process of self-generation—rather than being told about—hazard identification, risk assessments and safety critical behaviours, together with the opportunity to record and capture safety cognitions provides a great opportunity for people to engage a psychological contract (Marshall, 2001) with themselves and a commitment to deploy appropriate behaviours. The deployment of a personal psychological contract is a powerful motivator that encourages the adoption and maintenance of safe behaviours.

In conclusion, An Meá and APPEA have co-developed the Haz & Zard Safety Awareness Activity as an induction training course or stand-alone safety awareness activity that is actually fit for purpose. It integrates adult learning principles to foster the necessary cognitive process of hazard identification and risk awareness prior to
establishing self-motivating behavioural controls. Furthermore, Haz & Zard has been designed to specifically address many of the current barriers that face HSE training and induction within the global energy industry (Fleming, 2001; Alteren, 1995; and Wagenaar and van der Schrier, 1997). The image rather than textual basis of Haz & Zard minimises language and education difficulties and specifically addresses the difficulty in engaging participants in multi-cultural, non-western societies in a positive learning experience. Haz & Zard also promote new knowledge and significant interest amongst people with widely differing levels of experience, from students at school, to green recruits, and to seasoned old-timers. For those reasons, Haz & Zard is an activity-based learning opportunity rather than a lecture and it is also based on Q-Methodology—a step-change psychologically-grounded process that has recently won growing support amongst energy-sector organisations. Providing quality training promoting a real and lasting impact on the hearts and minds of employees is now much simpler because of this new addition to the HSE toolkit.

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Graham Marshall works for An Mea and lives in Western Australia. Graham has completed professional training in psychology with degrees in Bachelor of Arts, Bachelor of Psychology, and Master of Psychology. He will complete his PhD in 2003. He specialises in the promotion of positive safety culture and he brings both a practical and theoretical contribution to his work. He has worked on projects in Canada, Singapore, UK, Russia, the Middle East and all states of Australia.