

# **E-LEARNING FOR CONSTRUCTION SAFETY TRAINING IN THE AUSTRALIAN CONSTRUCTION INDUSTRY**

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## **ABSTRACT**

This paper investigates the current level of application of e-learning approaches for safety education and training in the Australian construction industry. The key issues discussed include the extent of uptake, its effectiveness, possible barriers and future implications of e-learning for construction safety training. Telephone interviews and case studies were used with regulatory bodies, teaching institutions and trade associations to collect relevant data. An action research methodology was adopted in which the authors trialed e-learning packages in order to draw comments. It was found that both face-to-face and e-learning are being used as training methods with an increasing trend towards e-learning. High initial cost and lack of IT skill are the main barriers for e-learning development. It is concluded that e-learning is feasible and valuable for most construction safety education and training, but further research is necessary into understanding its effectiveness and worker acceptance as well as learning outcomes.

**Keywords:** E-learning, Construction safety, Training

## **INTRODUCTION AND RESEARCH AIMS**

E-learning for safety training and instruction has not been adopted widely in the construction industry. What factors influence the uptake of this technology?

E-learning has advantages such as flexibility to access the courses from remote locations at convenient times, ability for students to self pace and interrupt the course to suit individual attention spans, easy monitoring of course quality and ability to use the software as a screening and a refresher tool.

Conversely, high implementation cost and limited IT familiarity are issues for a large part of the construction industry. Availability of appropriate internet access, the need for computer literacy and a willingness to accept e-learning are issues for the learners. Teaching organisations require support to be able to make use of this technology. Regulatory authorities are concerned about probity. Opinions about quality of e-learning outcomes are divided among training providers and regulators.

The aim of this research is to understand the feasibility and current state of application of e-learning for construction safety training in the Australian construction industry and identify its potentials.

## **GOVERNMENT TRAINING REQUIREMENTS FOR OCCUPATIONAL HEALTH AND SAFETY (OH&S) IN AUSTRALIA**

The “National Code of Practice for Induction for Construction Work” developed by the Australian Safety and Compensation Council (ASCC) sets a national standard for different types of induction required on construction sites. It specifies the following 3 modes of delivery:

- General induction: 6 hours face-to-face training delivered by Registered Training Organisations (RTOs). Assessment is required.
- Site induction: There is no nominal duration; training should be delivered by a competent person. No requirement for assessment.
- Task-specific induction: Same requirements as for site induction.

Currently most Australian States require construction workers to have completed a general construction induction course prior to commencing work on construction sites. The acceptable format is determined by the states. The courses are extensive and require knowledge tests.

Medium to large organisations use formal site induction processes to train their employees and subcontractors. These inductions often take the form of verbal instructions, video presentations and in more recent times may entail the use of custom-made computer packages. Small employers, who work on small residential construction sites of low complexity are not required to provide formal site inductions, however they must ensure that their workers are adequately instructed which often takes the form of verbal instructions and on-the-job training.

Additionally many task specific training procedures are carried out by employer representatives in various forms such as verbal instructions, hand-outs of Material Safety Data Sheets and Safe Work Method Statements.

## **DATA COLLECTION**

Telephone interviews were undertaken with representatives from the regulatory bodies of WA, QLD, NSW, VIC and SA, registered training organisations and educational institutions in relation to their approved modes of delivery. Case studies were conducted with five organisations' e-learning packages. Action Research Methodology was applied to collect data where the first author trialed e-learning packages in order to obtain first hand information. The key issues investigated in the case studies included "literacy, prior learning, computer literacy, effectiveness of delivery, flexibility, engagement and competency test".

## **RESULTS**

### **General induction training, e-learning versus face-to-face training:**

#### *Government Departments' Perspective and Practice*

Both Western Australian and Queensland authorities have accepted online delivery as an accredited method for their general induction courses for the past three to four years. Other states insist on face-to-face training which is often combined with a video screening or power point presentation delivered by the trainer. Representatives from WorkSafe QLD and WA stated that the reason for the introduction of online delivery for the general induction safety course was the possibility to get workers through the certification process faster.

The main concern voiced by representatives from NSW, VIC and SA authorities with the online delivery of the general induction safety course is that of possible identity fraud by the applicant. In QLD it is a requirement for applicants to sign a statutory declaration stating that the applicant is in fact the person who took the course. Identification checks are also carried out.

Workplace Health and Safety QLD stated that there had been some questions about the online delivery of the general induction course in the past, resulting in a review being undertaken in 2006. The review concluded that the online delivery was acceptable.

Neither WorkSafe WA nor WorkSafe QLD is able to determine what percentage of general induction cards issued is obtained via e-learning.

### *RTO's E-learning Perspective and Practice*

RTOs include training companies, TAFEs, industry associations and group training providers. Telephone interviews were conducted with 12 RTOs delivering general induction training in QLD and WA in relation to their mode of delivery (see table 1).

The three largest training companies interviewed offer online training courses. Their online packages are well received by their clients. Several small training providers reported a reduced demand for face-to-face training.

RTOs offering online courses believe that this type of training produces equal or better results than those achieved in face-to-face situations. Conversely, a group training provider and an industry association don't offer online training for general induction, as they believe face-to-face training is more appropriate and provides a better outcome. A blended approach is offered by another provider, which they see as very successful for applicants with poor English language skills or learning difficulties.

**Table1 Interview Summary of RTOs providing General Induction Training**

RTO	Type of Organisation	Size of Training Organisation	Course options offered			Applicants using online courses	Comments of Training Provider
			Online	face-to-face	blended		
RTO1	Training Company	large	x			100%	Online training is better than face-to-face because the learner can interrupt the online course according to attention span.
RTO2	Training Company	medium	x	x		75%	Online training was introduced 2 years ago and we are very happy with the results.
RTO3	Training Company	medium	x	x		70%	Online is just as good or better than face-to-face, online is more engaging. Face-to-face is better for people with learning or language difficulties.
RTO4	Training Company	medium					The blended approach (students use individual computer packages in the classroom) has the advantage of <ul style="list-style-type: none"> <li>• Learner can progress at their own pace;</li> <li>• Teacher assistance is readily available;</li> <li>• Very suitable for people with English as second language, as they often have more difficulty following oral than written information.</li> </ul> There is a plan to offer remote online courses in the future due to demand.
RTO5	Group Training Provider	small		x			Face-to-face is the better option because: <ul style="list-style-type: none"> <li>• Learners can get better assistance if they have questions;</li> <li>• People with learning difficulties can get better help;</li> <li>• Better knowledge verification</li> </ul>
RTO6	Training Company	small	x	x		70%	This company's online package consists of a scanned manual (author's observation).
RTO7	Training Company	small	x			100%	<ul style="list-style-type: none"> <li>• Online courses are considered as good as face-to-face.</li> <li>• Face-to-face courses discontinued because of lack of demand</li> </ul>
RTO8	Training Company	small		x			Not much demand for the courses any more
RTO9	Training Company	small		x			Don't know enough about online course to comment.
RTO10	Training Company	small		x			Face-to-face is best, dialogue with teacher can't be replaced by a computer package
RTO11	TAFE	Info not available	x	x			Mostly online training, face-to-face classes are offered on demand Online is as good as face-to-face.
RTO12	Industry Association	medium		x			<ul style="list-style-type: none"> <li>• There is insufficient internet coverage,</li> <li>• People in remote communities are not ready to embrace the online technology,</li> <li>• Face-to-face provides a better result than online.</li> </ul>

## **SITE AND TASK SPECIFIC INDUCTION, E-LEARNING VERSUS FACE-TO-FACE TRAINING:**

### **Educational Institute's Perspective and Practice**

In Australia, TAFE colleges play a major part in safety training of apprentices. They provide certified general induction as well as task specific induction. Information on the acceptance of e-learning for task specific safety training by TAFE teachers and students is difficult to determine as safety is integrated in the overall course.

Three TAFE colleges were contacted by phone to ascertain their uptake of e-learning for safety.

One TAFE teacher at TAFE-1 (carpentry) said that he was not using e-learning for safety, as that was inappropriate.

The head teacher of carpentry at TAFE-2 commented that all teaching is face-to-face because teachers are not familiar with the technology, a lack of staff development, and older teachers' resistance to the use of e-learning and a lack of resources. He further pointed out that he believes students would respond well to e-learning and teaching could be made more effective by using a blended approach.

A representative from TAFE-3 advised that several TAFEs who are teaching trades in their area are supported in their e-learning by a specialist IT group. The IT group provides the computer expertise while the teachers provide their subject knowledge. Safety training is incorporated in some of their e-learning programs. A blended approach of classroom teaching, e-learning and practical instructions is the preferred teaching method. This program has been in place for two years and is, after initial resistance, now well accepted by teachers.

The above responses suggest continued initial resistance by some TAFE teachers to incorporate e-learning into their courses. Thompson and Lamshed (2006) and Darby (2002) also reported teacher resistance towards the adoption of e-learning.

The example of TAFE-3 indicates that this resistance can be overcome through extensive support provided to teachers in the development and initial usage of the e-learning material.

### **Employer's Perspective**

A number of construction companies were contacted to gain an understanding of the level of online safety training undertaken by this group. Their lack of response has resulted in a literature review together with use of statistical data.

To what extent e-learning is used for site and task specific induction is unclear. Publications by The Australian Bureau of Statistics (ABS) indicate that the construction industry has embraced the use of the internet to a similar extent as other industries. Large employers use online training to a larger extent than small employers; see details in Table 2.

It was not possible to ascertain what the online training was used for. It is conceivable that these figures include very little safety training.

A survey by Bloom (2003) on e-learning in Canada lists the use of e-learning for OH&S as the second lowest of 7 categories used in 570 organisations surveyed.

Table 2 Online safety training in the construction industry by employment size

<b>No of Employees</b>	<b>Online training/learning</b>
0-4 persons	14.2 %
5-19 persons	21.2 %
20-199 persons	30.5 %
200 or more persons	40.2%

Source: ABS 2007a, Table 10

Mack Consulting Group (2007, cited in Callan and Fergusson, 2009) investigated the uptake of e-learning in the small business. They found that on-the-job informal training is predominant in the small business sector. Key factors discouraging the uptake of e-learning by small business include the time, cost, concerns about effectiveness and a perceived lack of relevance to their business.

### DISCUSSION 1 – FEASIBILITY OF E-LEARNING FOR CONSTRUCTION SAFETY

The results indicate that, where the learner has a choice, the online option is increasingly well accepted.

All RTOs providing interactive online training for construction induction said that their packages can be used on dial-up internet, but this would be very slow and non-dial-up was recommended. An examination of various reports by the ABS leads to the conclusion that a significant number of people do not have adequate internet connection at the moment. Groups likely to be affected are people in remote areas and indigenous people.

There are hurdles for small organisations to include high quality online safety training as part of their services as it is expensive to implement and maintain. It requires software expertise, which may have to be brought into the business.

### DISCUSSION 2 – EFFECTIVENESS OF E-LEARNING FOR CONSTRUCTION SAFETY TRAINING

Effective e-learning depends largely on the quality of the package. A well designed e-learning package should:

1. Engage the learner, using a variety of media such as written information, the option of audio delivery, pictures, animations and possibly video clips;
2. Deliver the message effectively using straight forward language, clearly and suitably paced, avoiding complex sentence construction;
3. Acknowledge prior learning by allowing the learner to progress straight to test sections, skipping familiar content;
4. Allow the flexibility to stop and starting the program as required without the need to repeat large sections;
5. Keep the literacy requirement to a minimum;
6. Be easy to use for people with minimal computer knowledge. The navigation should be obvious;
7. Include a meaningful test system, which ensures all parts of the program have been understood and the learner can identify areas requiring revision easily.

The following e-learning packages have been trailed in respect of those aspects.

Table 3 E-learning packages trial results

Provider	A	B	C	D	E
Purpose of Package	<b>General Induction</b>	<b>General Induction</b>	<b>General Induction</b>	<b>Site Induction</b>	<b>Work Activity Training</b>
Type of Provider	Training Company	Training Company	Training Company	Construction Company	Industry Association
Attributes of Training Packages					
1. <b>Level of Engagement</b>	high	very high	fair	very high	very high/low*
2. <b>Effectiveness of delivery</b>	very good	good	fair	very good	good
3. <b>Acknowledgement of prior learning</b>	yes	yes	yes	yes	no
4. <b>Flexibility to stop and start the course</b>	good	very good	fair	very good	good

5.	<b>Level of Literacy required</b>	little	basic	good	basic	good
6.	<b>Level of Computer Literacy required</b>	low	very low	fair	low	very low
7.	<b>Competency Testing</b>	good	good	good	good	fair

\*This package includes an online video. The video is rated “very high”, the online training program is rated “low”

Three of the five packages trailed were of a high standard while the remaining two will benefit from further development.

There are situations where face-to-face delivery is preferable to e-learning, including

- Where the learner prefers face-to-face instructions;
- For students with learning or language difficulties;
- For students in areas with insufficient internet capability;
- Where companies are unable to afford e-learning induction packages;
- Where regulating authorities do not consider e-learning suitable for their general construction induction training.

Some of these issues may not exist in the future. The availability of fast internet connections is likely to improve. Testing procedures for general induction training can be improved by varying test questions from use to use or introducing testing at the RTO’s premises.

E-learning has many positive features which are not found in traditional face-to-face teaching, such as

- Flexibility for learners to access the course from remote locations and to be able to progress through the course at their own speed;
- The course is always available (outside work hours);
- Easy quality control of the course content;
- Once the course is in place, it can be used over and over and become a refresher tool
- Provide large construction companies with an economical way to deliver OH&S training.

Anon.(nd), *John Holland, e-Learning Engagement Project 2006*, states that John Holland identifies cost-effectiveness, flexibility and consistency in training as the main drivers for their decision to implement e-learning for site induction.

E-learning in its current state can further improve its effectiveness by incorporating various language options into the programs. The lack of interaction between student, teacher and other students for long courses can be mitigated by requiring students to attend a short class for the final revision and exam. Another option is the introduction of virtual classrooms which RTO’s could operate at set times.

### **FURTHER RESEARCH - WHERE TO FROM HERE?**

Further research into understanding workers’ attitudes and perceptions towards safety e-learning programs is required as there may be a link between acceptance and effectiveness of the learning methods. Studies into the effectiveness of e-learning by Sankaran et al (2000 cited in Pan et al, 2003) suggest that students with a positive attitude towards web based learning perform better in an e-learning environment than in a face-to-face course.

With this in mind the logical next step from here would be to gather empirical evidence regarding the correlation between acceptance and effectiveness of e-learning for construction safety.

## CONCLUSION

The paper has studied the current state of play of the Australian construction industry in relation to e-learning for construction safety training. It is clear that such ITbased e-learning is suitable for many aspects of safety training either as a stand alone tool or in a blended approach, but more effort is required to fully utilise its potential. E-learning can be used in most situations for most people successfully.

There is no doubt that e-learning can make a valuable contribution to construction safety. The effectiveness of e-learning courses depends largely on the quality of the courses.

If e-learning is to succeed across the construction industry, ways will need to be found to assist small and medium size companies to access generic software for site induction and task specific training. Regulating bodies need to look more closely at the possibilities of overcoming shortcomings of current e-learning approaches for general induction safety. TAFE teachers need continued support to assist them in the implementation and use of this technology.

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