Flexible Learning in Vocational Education and Training for Surveying: Approaches, Lessons, and Directions

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ABSTRACT

This paper's objective is to review emerging training delivery methods for surveyors in the Vocational Education and Training (VET) sector. The introduction of flexible learning as a method of training delivery in the VET sector has resulted in a shift in the student patterns at the Illawarra Institute TAFENSW. Two major cohorts have been identified in the flexible delivery mode. The first are former TAFE students wanting to complete previously attempted qualifications, while the second are relatively recent entrants to the industry who are being encouraged by their employers to become qualified. Methods used to manage these two different groups reflect issues relating to flexible learning. The main issues are ones of self-paced learning, mentoring, recognition of prior learning, and authenticity of evidence. Although some of these issues are the same as those found with traditional 'correspondence' courses, there is the added complexity that web-based learning brings. This paper describes approaches taken at the Illawarra Institute, reviews the lessons learnt from our experiences so far, and presents the directions in which we intend to head. Results are based on experiences in training students in the flexible delivery mode for the past three years. This paper will be of interest to those who have students currently enrolled in flexible learning, or considering staff for such a course.

KEYWORDS: *Surveying, training, flexible, web-based, VET.*

1 INTRODUCTION

The objective of this paper is to review emerging flexible training delivery methods for surveying in the Vocational Education and Training (VET) sector. The education of surveyors in Australia has been a point of recent discussion. While much of the discussion revolves around university education of surveyors (e.g. Hannah, 2012), vocational technical training by TAFE has also been identified as has having an important role (Roberts, 2011).

The surveying profession is experiencing a skills shortage with surveyors included on the 2011-2012 New South Wales skill shortage list (Australian Government, 2012). What has become apparent over the last five years is the demand for flexible delivery in the area of vocational surveying training. The industry driver for flexible delivery options has been supported by the Federal Government's creation of the 'Australian Flexible Learning Framework', an organisation that supports e-learning opportunities with funding, tools and standards. In the case of surveying in NSW, the Consulting Surveyors Association deemed this training method of such importance that it provided funds to support the development of e-learning resources. Additionally, the International Federation of Surveyors' (FIG) Professional Education commission has a 'Learning and Teaching Methodology' working group that has as one of its aims to make recommendations on distance learning. This paper

reviews the approaches and presents lessons learnt and future directions from the flexible delivery program at Illawarra TAFENSW.

Reviewing this emerging delivery method is important because its implementation has resulted in shifts in student patterns in the surveying training area. The mix of learners has changed, the difference in delivery methods has influenced content and assessment, and new design and management methods have had to be developed. This paper includes a background to VET and outlines the flexible surveying programs the Illawarra Institute TAFENSW delivers. The survey methods used to review the Illawarra Institute's program are outlined. The results of the review are presented and discussed, with the major points of interest including the identification of different student cohorts, the differences between length of experience and breadth of experience, foundation skills (numeracy and literacy), and issues of evidence authenticity. Future directions and improvements based of the results of the review are also discussed.

2 BACKGROUND

2.1 VET Training in Australia for the Surveying and Spatial Industry

VET training in Australia uses training packages as their framework. These training packages are nationally endorsed standards and qualifications that are used to define assessment requirements. Training packages are developed by industry and then delivered by Registered Training Organisations (RTOs). Although training packages include descriptions of the competencies, the training and assessment strategies are developed by the RTOs that deliver and assess the qualifications. The training packages include a description of the knowledge and skills that must be demonstrated, the units of competency required for the qualifications, employability skills, and assessment guidelines.

The relevant training package for the surveying industry is Property Services (CPP07). The Construction and Property Services Industry Skills Council is responsible for its development. The Council has a steering committee for the Spatial Information Services sector that provides advice about qualifications related to surveying. The official national register of information on the training packages, qualifications, courses, units, and the RTOs is http://training.gov.au/. This VET database is a joint initiative of Australian State and Territory Governments.

2.2 Surveying and Spatial Qualifications

The following qualifications from the Property Services training package are relevant to the surveying and spatial information industry:
- Certificate II in Surveying and Spatial Information Services
- Certificate III in Surveying and Spatial Information Services
- Certificate IV in Spatial Information Services
- Certificate IV in Surveying
- Diploma of Spatial Information Services
- Diploma of Surveying
- Advanced Diploma of Spatial Information Services
- Advanced Diploma of Surveying

The Illawarra Institute currently runs the following three qualifications:
- Certificate III in Surveying and Spatial Information Services
- Certificate IV in Surveying
- Diploma of Surveying

At present only the Certificate III and Certificate IV are offered in the flexible delivery mode, with the Certificate IV flexible offering suspended for Semester 1, 2013. In addition to qualifications delivered as part of the training package, the Illawarra Institute also delivers two graduate qualifications. These are the Vocational Graduate Certificate in Applied Geographic Information Science and the Vocational Graduate Diploma in Applied Geographic Information Science. These two graduate courses are also delivered by flexible methods, but will not be discussed in this paper. The Certificate III in Surveying and Spatial Information Services course currently has the largest student numbers, and results from its delivery will form the majority of the discussion in this paper.

2.3 Qualification Levels

In Australia, there is a national system of qualifications called the Australian Qualification Framework (AQF). Each qualification is allocated an AQF level. For example, the Certificate IV in Surveying is rated at AQF 4, while the Vocational Graduate Certificate is rated at AQF 8. This framework regulates qualifications by describing learning outcomes for each level. The outcomes include standards and expectations for knowledge, skills, application and volume of learning (time taken to complete the qualification).

For levels 3-5, which cover the surveying qualifications delivered at the Illawarra Institute, the following outcomes are described:
- Knowledge: Factual, technical, procedural, theoretical, specialist knowledge, in specific or broad fields of work.
- Skills: Cognitive, creative, technical and communication skills in methods, tools, materials, problem solving and transmitting information.
- Application: Autonomy, judgement and responsibility.

Employability skills are also incorporated into the training packages and include broad advice on industry expectations at each qualification level – and for each unit of competency. These are more industry specific than AQF descriptions. Themes incorporated into the employability skills include communication, teamwork, problem solving, initiative and enterprise, planning and organising, self-management, learning and technology.

2.4 Qualification Design

Each qualification is made up of the qualification requirements, a list of units of competency, and an employability skills qualification summary. The qualification requirements contain the 'packaging rules' for the qualification, which state the number and type of core and elective units required to complete the qualification.

Each unit of competency is broken into sections that must be understood to ensure that teaching and assessment strategies developed by the RTO meet assessment standards. These competency unit sections include:
- The unit descriptor.
- Elements and performance criteria.

- Evidence guide.
- Required skills and knowledge.
- Range statements.
- Employability skills and information.

2.5 Illawarra Institute Approach to Flexible Learning

What is generally meant by the term 'flexible' today is a range of delivery methods that might include distance learning, e-learning, recognition of prior learning, on-the-job training, skills tests and portfolios. At the Illawarra Institute, each qualification incorporates different flexible learning elements based on expected student cohorts and industry needs. For all flexible courses, students must be working full time in the surveying industry. This requirement means that workplace experience is gained and mentoring is possible. The requirement for a minimum of six months fulltime work in the surveying industry, with a preference for one year, is expected to allow the learner to reflect on their experiences as part of the training and assessment process. The structure of the units and the assessment required depends on the focus of the unit in question. For example, field surveying units rely on work-based experiences, while computationally based units are more likely to rely on skills testing. The current pathway for the learner is to begin at the Cert III, which is mostly assessment only, continue into the Cert IV, which is a mix of assessment, training, and recognition of prior learning (RPL). The next qualification is the Diploma, which is still in the design phase. At the time of writing, both the 2013 Cert IV and Diploma flexible courses are suspended pending the outcome of the ongoing TAFENSW budget review process.

3 METHOD

The primary method used to review the flexible training program is based on semi-structured interviews with students, teachers and employers. For the period under consideration here (2010 to mid 2012), 53 students enrolled in the course. Student details, such as current position and years of experience, were collated from the surveys conducted as part of the course application process. Opportunistic feedback was used in addition to 12 targeted interviews. The completion rates of each unit were assessed to ascertain areas for improvement and review. The qualification completion rates of students were analysed in an attempt to identify issues of delivery and content. A group of six students was interviewed from a group who indicated they were not intending to complete the course in order to collect targeted information about their experiences with the training. Four teachers were interviewed to provide their feedback on the course, and five employers were contacted to ask specific questions related to the course. The review themes were based on e-learning research methods (Misko et al., 2004). Themes used during interviews included delivery, assessment, quality, and improving arrangements. The review themes were discussed in terms of key features of success, continuing challenges, and suggestions for improvements.

4 RESULTS AND DISCUSSION

4.1 Results Overview

The successes of the flexible training program will not be dealt with in detail. They were generally as expected and are not a main contributor when identifying areas of improvements

for the course. In summary, the identified successes were access to training, opportunities for promotion, and the validation of experience, skills and knowledge via formal qualifications.

The main challenges and improvements that were identified from the review included understanding the cohort groups and their varying requirements, the gaps in foundation skills, the authenticity of evidence and the role of mentoring. Each of these issues is discussed in more detail in the following sections.

4.2 Who Wants Flexible Training?

Students in the flexible program ranged from workers with over 25 years experience working in the industry to those that had recently left school and had been working for less than one year. The reasons given for lack of qualifications by surveyors with considerable experience were also varied and included:

- Starting formal training but not completing a qualification.
- Starting work without qualifications and relying on experience for future positions.
- Difficulties in accessing training with work pressures.
- Difficulties in accessing training due to remote location.

The reasons why flexible training was sought included:

- To apply for a position in a different organisation.
- To move to a higher-level position.
- Address identified missing skills and knowledge in specific areas.
- Wanting staff to be qualified to prove commitment to quality.
- Wanting staff to be qualified to be eligible for tenders.
- Wanting to improve staff morale and provide training opportunities.
- Expected minimised disruption to earnings.

Students, and enquiries for the course, came from both within and outside NSW. Employers included multinational construction firms, mining companies, government departments, local councils and private surveying companies. The need to formalise experience was a clear driver for companies that worked on large infrastructure projects. This appeared to coincide with the tightening of regulation as part of quality assurance programs, not pressure from the surveying industry.

4.3 Differences Between Surveyors

Given the diversity of student experience and background, it was not surprising that designing a specific course was challenging, and that a flexible course would differ significantly from the full-time course run on campus (where knowledge or skills were not presumed). The challenge was how to identify and match experience to the skills and knowledge required for the qualification. The length of experience indicated the amount of time that the student had been working in the industry, while the breadth of experience indicated the amount of exposure to the different aspects of the surveying industry. Some flexible learners had a broad range of experiences within the surveying industry, while others had only worked in a single sub-discipline area. Generally, a greater breadth of experience translated into a student having more skills and knowledge in a greater range of units compared with those with fewer experiences to drawn on. The amount of experience students had mostly reflected their years in the industry, and sometimes their position in the organisation.

The problematic student was the one with experience in terms of length in the industry but not in terms of breadth. This situation seemed to be most prevalent when a student had worked in only one position in the same organisation, doing only a narrow group of survey activities repeatedly. In these cases, students were generally well skilled in selected instruments, and selected survey tasks, but had limited underpinning knowledge of surveying concepts.

A student's industry experiences and their level of experience influenced their approach to flexible learning. This in turn affected our ability to deliver relevant and efficient training. A more experienced surveyor often had greater expectations in regards to a quick completion of the course, while a less experienced surveyor was more likely to be unsure of learning expectations.

Two main cohorts emerged from the review: (1) experienced but not qualified and (2) recent entrants to the industry. The first group was likely to have considerable years of experience, mostly in senior roles. This group was identified as needing a skills gap analysis, and was keen to explore opportunities for RPL. The second group relied heavily on mentoring and needed more support with the self-paced learning process, in particular in the areas of maths and Computer-Aided Design (CAD). A more detailed course entry form has the potential to improve student information data. Capturing both experiences and experience before the commencement of study could help to improve the identification of students that might require extra support, skills gap analysis, mentoring, extra experiences or fast-track options.

4.4 Numeracy and Literacy

Maths was identified as a key concern for both the students and teachers. Students started courses with varying levels of maths, sometimes lacking basic learning skills. The problem with maths reflects the path that some students took into the surveying industry. The role of maths was discussed amongst the teachers with reference back to the qualification's employability skills. This resulted in some maths concepts being moved into the higher Cert IV qualification to reflect the learning outcomes. Flexible learners that did not complete past year 10 would need supplementary studies to meet learning outcomes for the Cert IV and Diploma qualifications.

Literacy was identified as another key concern. Many students selected surveying as an area to work because it does not focus on writing skills. Most flexible students are able to reach the Cert III level based on their current work experience. However, analysis revealed that there would be a problem moving some of the students into Cert IV and the Diploma without extra support as higher levels of literacy are expected for these qualifications.

4.5 CAD

Computer-Aided Design (CAD) was also identified as an area of weakness for some students. Analysis indicated that this in part was due to some students being mostly field based with limited access to office work. Possible solutions to improve this situation included a redesign of self-paced learning resources and increased mentoring in office-based activities. The issue of CAD experience raised questions about the future role of the surveyor. Some students noted that they visited the office rarely, using a laptop and wireless connection in the work truck to send results and download data files. The question then needs to go back to industry, i.e. how important are CAD skills for a surveyor? Is it a matter of which qualification level is required? Maybe CAD is not essential for the Cert III, but expected at levels higher than this?

Is it just a reflection of the different company structure and surveying activities? Is this a reflection of technology?

4.6 Changes in Work Practice

The surveying industry has a history of changing work methods based on the emergence of new technologies, and this brings interesting problems to education and training (Frank, 2008). As new work practices emerge, older ones are dropped. Deciding when to drop the older equipment and methods requires careful consideration as generalisation across the industry cannot be made. Calculators are a good example. Many surveyors do not take a calculator in the field as some instruments have powerful calculating capabilities. So when assessing a student's fieldwork practices, should the use of the calculator be required? The use of an automatic level is another example. In some cases, mentors have had to run special exercises to introduce a student to the automatic level. The issue is easy when face-to-face learning is employed as this type of level is used to introduce levelling concepts. However, it is not easy to decide when assessment is based on the student's work experience. This is another question for industry to answer. Does industry expect knowledge of the automatic level as standard knowledge for a Cert III graduate? The answer could depend on whom you ask in industry. The development of a 'surveying body of knowledge' by the American Congress on Surveying and Mapping in conjunction with FIG and the National Society of Professional Surveyors' (USA) national technician certification process may provide useful guidelines in how to move forward in this area (e.g. Greenfield, 2012).

4.7 Authenticity of Evidence

Authenticity of evidence concerns all distance educators who do not 'see' the student. The units of competency developed by industry for surveying are largely open for interpretation and are considered by some teachers to be vague, thereby making assessment design difficult. Students also generally lack the ability to interpret unit requirements, usually using the title of unit to determine its meaning. This problem with unit interpretation sets up an expectation of RPL without full comprehension of the underlying skills and knowledge that make up that unit. Suggestions for improving authenticity of evidence include the development of detailed assessment guides, video-based assessment, assessment days and workplace visits using evidence checklists.

4.8 Role of the Mentor

The review found that students benefited when mentors were genuinely engaged in the process. This was particularly true of students who were relatively new to the industry. In these cases, mentors were able to give advice, pass on experience and organise internal training sessions. Mentors were sometimes unsure of their role and unfamiliar with the qualification structure. This suggests that mentors need to be engaged earlier in the process and provided with more supporting information to help make their involvement effective. In some cases, the identification of a mentor was difficult if a student was working at a senior level. In these cases, the mentoring role was more likely to involve the verification of experience, skills and knowledge, rather than learning support.

5 CONCLUDING REMARKS

This paper has presented a review of flexible training delivery for training in surveying. Through a review of the program at the Illawarra Institute of TAFE, successes and areas for improvement have been identified. Recommended is the development of streams of assessment to match skill and experience levels to help increase completion rates and, where appropriate, reduce course completion times.

The review has also provided a view of technical surveyors working in this industry. The experience and skill levels of people working in this industry are varied – and this is reflected in the difficulties faced when designing distance-learning programs. The results also highlight the changing nature of the industry and the role that technology is playing in changing work practices. The role of mentoring was identified as an important component of the training program, and one that should be strengthened to help improve the student experience and completion rates.

ACKNOWLEDGEMENTS

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