

## FLEXIBLE LEARNING AND ELECTRONICS TRADES TRAINING: A CASE STUDY

Peter Jansen & Don Adams,  
TAFE NSW Hunter Institute & University of Newcastle

### ABSTRACT

This paper presents a case study to investigate flexible delivery and self-paced learning strategies within a complex electronics trades training environment. The paper discusses the advantages to adult learners using this approach, the risks of such approaches and an analysis of the levels of the adult learners under such conditions.

### KEYWORDS

Flexible learning – self direction – vocational education – electronics – blended learning

### INTRODUCTION

The electronics industry and its associated consumer market are continually experiencing technological evolution and thus creating an ever increasing demand for new equipment servicing skills and alternative learning approaches. Increasing numbers of learners in the electronics industry who are pursuing their lifelong learning goals are electing, where available, to enroll in flexible delivery study options at trade and engineering levels in the electronics sectors. Workplace demands have contributed to the need for training using flexible learning approaches. Often this has placed difficulties for the lifelong learner, as many of these courses are only available as mainstream courses from large public sector Registered Training Organizations (RTOs) which have time scheduling patterns which are incompatible with changing industry work-practices, for example, the movement from permanent to part time and casual workers where the RTOs need to provide accessible programs for all workers (Richardson & Liu, 2008).

This paper presents the findings of a small practitioner research project conducted in an electronics trades section of a large public sector RTO in New South Wales (NSW) during 2007, that offered flexible delivery programs. The purpose of the project was to investigate: (1) if flexible learning methods would be feasible for Electronic Trade subjects, (2) what levels of self direction and study ability was present in the current cohort of learners and how this self direction affected lifelong learning and (3) what facilities, resources and levels of skills would be required by learners and staff. The information and findings collected during the observation period are explained in a narrative format.

### THE RESEARCH PROBLEM

The Strategy 2000 Report (ANTA, 2001), describes that Information, Communication and Technology (ICT) based learning systems are continuing to improve. However, anecdotal evidence exists where incorporating ICT based flexible learning methods in trades areas imply that on-line supported learning methods have a consistently significant failure rate unless participants were highly self-directed and self reliant.

Within vocational Electronics Trades course learning environments, little formal research has been undertaken, but anecdotal evidence suggests that the level of self-direction and self-motivation amongst some learners had been traditionally low through inherited poor learning practices. Brookfield (1986) reports from American data that two thirds of adults are self directed learners, however, Nesbit, Leech & Foley (2004) describe that the major challenge of an adult educator is to promote self-directed learning by providing an environment that will allow it to develop. Such findings are also confirmed by Choy and Delahaye (2000) who conclude that TAFE learners aged between 17 – 24 years prefer mostly surface learning practices and exhibit low levels of self-directed learning.

Because such study and learning patterns are not supportive of life-long learning principles (Adams, 2007) and principles of adult learning (Knowles, 1990), concerns have been raised by teachers that self-paced learning methods may perhaps be unsuitable for the current and future intake of Electronic Trades students and also that different methods of learning approaches will be needed.

Adams ((2007) describes the concept of “learner engagement” as being, in part, as the need for the learner to have control over their own learner experiences, understand the learning process and to have empowerment in the process. Knowles (1990) posits that self-directed learning is a core adult learning principle and questions whether it

should be a goal of educators to assist in the development of adult self directed learners. Personal observations and teaching experiences have concluded that flexible learning delivery may be difficult for teachers without a thorough understanding of self directed learners, consistent with the findings of Foley (1992). Additionally, there is a need for learners to have access to a diverse range of learning resources.

Flexible learning strategies appear to be often restricted to a narrow range of subjects for the purpose of making learning easier to manage. As electronic theory subject content continues to increase in diversity and complexity, past learners tended to exhibit increasing levels of drift from andragogy to pedagogy in learning patterns. These issues were overwhelmingly present in the electronic trades training environment and therefore warranted further investigation.

### RESEARCH QUESTIONS:

This research project attempted to address the following research questions:

1. What levels of self-direction and motivation are exhibited by learners?
2. What learning difficulties did the learners experience?
3. Does flexible learning engage students in knowledge sharing
4. How effectively did the learners utilise the available resources?
5. What are the benefits of flexible learning in electronics trades?
6. What are the disadvantages of flexible learning in electronic trades?

### METHODOLOGY

Qualitative approaches were adopted to gather data in order to answer the research questions of this study. These approaches included: learning journals, direct observations, observer diaries and notes, interviews, reflection sessions and learning reviews with the subjects and teaching personnel involved in the research project and personal reflections.

#### Population and Sample

The population under investigation was the cohort of learners undertaking flexible study options. The learners ranged in age between 18 - 60 years old and were enrolled to either gain additional qualifications, or to complete outstanding subjects in order to achieve either the Certificate III in Electronic Trades or other advanced Electronics based qualifications. The majority of the population is employed full time in the electrical / electronics industry. The sample consisted of 15 learners.

### Learner Environment

For the duration of the study, the learning environment was designed and resourced as much as possible to be representative of a well equipped flexible delivery centre. The resources available to students were: a computer lab with web-based learning resources, multiple electronic labs for the purpose of allowing students to have access to electronic lab testing equipment in order to perform learning tasks, learning portfolios and resources, study guides, self-assessment exercises and student assessment guides and access to subject specialist teachers.

### Observation Process and Method

Observational information gathered during the study was collated, and then themes from the data related to the research questions were identified. The themes across each method were then compiled to produce a final set of comprehensive results. A summary of these results are presented in the next section.

### RESULTS

The following findings represent the main themes that emerged from the data.

#### Learner Self-Direction and Motivation

From the very beginning of the project it became apparent that the majority of the learners exhibited low abilities of self-direction and lacked self-confidence and needed to be trained in such skills.

If study resources were given to the cohort earlier than needed, they tended to misplace them or began to exhibit disjointed learning patterns such as jumping too far ahead in learning and missing the underpinning information. Learners often displayed a tendency to begin other activities which looked more interesting and thus failing to study or complete pre-requisite tasks or underpinning information.

When the initial learning contracts and task completion timelines were negotiated two main difficulties emerged. Firstly, learners who lacked confidence were not sure if they would be able to complete the subject modules. Secondly, over-confident learners' were of the opinion that they could complete course modules well ahead of time and could therefore study at an accelerated rate. Such misplaced confidence was often caused by a lack of knowledge of the subject contents and a lack of knowledge of what was expected of them.

As learners levels of skills increased, so did their confidence and degree of self-direction. As learner confidence rose so did their desire and ability to learn. Learners learned best when the

subject material was made highly relevant to their job. The greatest rate of competency achievement was when learners were able to relate learning tasks to their work activities or to knowledge they had gained in previous sessions. Learners which were originally reluctant to attempt complex tasks began to exhibit desires for real challenges and preferred to try difficult tasks in preference to more simple learning tasks and showed a strong preference to undertake theory - and practical skill tests for self-assessment purposes. As learner confidence increased, learners became self-reliant and exhibited increasing signs of abilities in self-direction. Care was taken to ensure that learners were being trained to the required industry skill levels and weren't simply passing competency assessments by rote learning. Most of the students had found review or trial tests to be of considerable advantage, because it permitted self-evaluation of their knowledge and skill levels, as well allowing self-reflection and rapid feedback as to their successes and possible problem areas.

Allowing the learners to perform skills or competency tests using workplace equipment increased learner confidence and gave a more accurate assessment of real learner skills because learner performance was not degraded by having to perform skills tests using equipment they are not familiar with. Such practices also gave confirmation of repeatable skills in different environments (RTO or work-place) and permitted a more accurate benchmarking to current industry standards.

### **Learning Difficulties**

Most of the learners in the sample cohort tended to become frustrated or confused when: failing to understand course material or subject requirements, having insufficient experience in the use of test equipment; and when at times suffering a lack of clear purpose and direction. It was observed that all of the students attending flexible delivery sessions needed guidance and advice on regular occasions, when it came to understanding electronic theory principles and practical circuit construction and problem solving requirements. Learners regularly showed indications of needing clarification of basic English language terms, even though they were born in Australia and English was the language spoken at home.

Additionally, all of the learners revealed during reflection sessions that they had very few opportunities to study at home or during work breaks due to other commitments. Technicians or apprentices with a high workplace demand

displayed highly irregular attendance patterns. The most significant effect of these absences was increased teacher dependence.

### **Use of Learning Resources**

Only two learners from the cohort were observed to show a regular tendency to use textbooks. The majority of learners preferred to use workbooks, lesson handouts and web-based learning resources and preferred to study only what they needed for assigned tasks. Observation at the initial stages of flexible learning sessions indicated that the majority of learners (n=13) showed a strong preference for surface or extrinsic learning. Very few of the learners (n=2) showed any signs of meta-learning styles. The majority of adult learners preferred to use workbooks or web-based material containing weekly lessons, lab sessions and lesson supplements, showed a preference for performance centered, problem solving learning or latent learning styles as opposed to subject learning practices. Fidishun, (2006) tends to confirm that adult learners prefer task or problem learning as opposed to purely theory centered learning. The majority of learners in the test group also exhibited a greater desire to learn if they were given reasons as to why they needed to learn, even if they could not see any particular relevance in the tasks they needed to complete. Giving learners achievable goals at the right time encouraged them to achieve the next set of goals.

The learning portfolios used provided an effective means of guiding students in how they are to progress, which goal achievement were needed and what if any difficulties they encountered. They also assisted the learners when undertaking individual review or reflection sessions. The only difficulty encountered with learning portfolios was the occasional need to remind learners to make entries after each learning session.

### **Knowledge sharing between students**

The provision of a room reserved for discussion and information sharing gave learners the opportunity to practice knowledge sharing, discuss circuit wiring problems and theories, problems or related items of interest. Encouraging such discussions also permitted learners to gain clues from other learners' when they encountered problems they could solve themselves, if given relatively minor assistance from others. Observation showed that more experienced learners passed on to less experienced learners some of their practical and theory knowledge. The practice of peer knowledge sharing was not restricted to age. Younger learners exchanged knowledge with

older learners and older learners shared their knowledge and experiences in areas of their own expertise. Discussions taking place included teachers only, when students had questions they could not solve themselves or when they needed a clarification of concepts or theories. The practice of knowledge and skill sharing in many instances helped students to progress past their zones of proximal development, through interaction with more capable peers, (Wertsch, 1991 cited in Woolfolk, 2004). While such characteristics are mostly observed in much younger learners, adult learners, especially those in the sample cohort exhibited similar proximal zones.

### **Benefits of flexible Learning**

The following benefits were noted during the observation session.

- Learners could study at their preferred or suitable learning pace.
- Learners can be assessed using flexible approaches, meaning they can be assessed where and when they are ready for it, in other words take charge of their learning.
- Assessments can be done at learners' workplace or using workplace equipment.
- Learners can undertake skills challenge or skills assessment tests at any time to determine readiness for final assessment.
- Learning portfolios provided a more accurate tracking of learners' progress, problem areas.
- Learners became more self-reliant and as a result obtain a greater level of laboratory skills and knowledge, because they are required to learn by themselves.
- As learner confidence improved greater signs of adult learning life-long practices emerged, such as willingness to reflect, share knowledge, and the display of learning patterns based on andragogy.
- Using a one person per equipment approach students work on a one to one basis. This practice has led to a much higher practical skill level.
- Students did share knowledge in areas of common interest, if they are given the opportunity to do so.
- Learners did achieve a higher than expected pass rate.

### **Disadvantages of flexible learning**

The following risks emerged during the observation:

- Unless learners are self-directed or learn how to become self-directed they are unlikely to succeed.
- Learners need constant direction and reminders as to when to sit for tests, which tasks are due, what to study and at times be given encouragement.
- Limited time is available for questions or assistance.
- A wide diversity of equipment and room resources needs to be made available.
- Time is required to build a data base of sufficient learning and self-evaluation resources.
- Demands on course supervisors are greater than a normal teaching load and wide subject diversity encountered in some flexible learning sessions require broad levels of subject knowledge on the part of the supervisor.

### **DISCUSSION**

The overall results suggest there was a need for subject material to be improved to suit the flexible modes of delivery from what is employed in face to face learning environments. The learning resources need to be more practical or work task oriented and prepared well ahead of time. This outcome demonstrates that diligent and comprehensive planning for delivery is required in flexible modes. This is consistent with Rowntree (1996) who posits that developers writing and planning flexible delivery courses may need as much as 50 hours of preparation and research time, for each hour of delivery time.

Flexible delivery learning supervisors will need to be able to adapt to flexible learning strategies and develop competence in these strategies. It is apparent that a greater understanding of how adults cope with flexible learning and how to keep them motivated when learning becomes difficult is required. This point reinforces the need for a teacher/ trainer to have a strong understanding of adult learning principles.

Teachers and trainers of adults engaged in lifelong learning may perhaps be more successful if they include methods of Knowles assumptions of andragogy principles in order encourage their potential of growth in learning within adult education (St. Clair, 2002). If learners are given incentives, purpose and direction and reasons for learning then learners are more likely to demonstrate their skills and willingness to learn (Griggs, 2006). Additionally, learners need to be

time and course managed, given appropriate information and provided with consistent timely feedback.

Learners undertaking flexible study pathways need above average self-management and good learning practices in order for them to gain appropriate survival skills, prior to commencing module or competency qualification processes. Unless learners are given or have learned such skills their ability to succeed with flexible learning as well as life-long learning will be impeded. Teachers need to aware that learners even if born in Australia may encounter problems with basic English language terms.

## CONCLUSION

This small research project revealed a greater insight as to how learners are affected in flexible learning environments and what levels of self-confidence and self-management skills they exhibit. Additionally, it reported on the risks and benefits of flexible learning and suggested possible improvements, in the context of an electronics trades training environment. The research also revealed unexpected findings in learning styles exhibited by learners, such as a reluctance to use textbooks and a lack of desire for meta-learning. The research project was restricted to a single group using an observation period duration of a single semester. While current conclusions are that flexible learning options can be a viable option, providing learners are given sufficient study skills, it is advised that further research is needed in order to gain clearer insights into adult learning methods and the underlying causes of low levels of self-direction and poor study methods, a preference for surface learning and lack of desires to use text books.

## REFERENCES

- Adams, D. (2007). Lifelong learning skills and attributes: the perceptions of Australian secondary school teachers. *Issues in Educational Research*, (17. 2). 149-160.
- ANTA. (2001). *Strategy 2000 Report. Evaluation of the Australian Flexible Learning Network*. Retrieved 14/12, 2007, from <http://www.flexiblelearning.net.au/>
- Brookefield, S. (1986). *Understanding and facilitating adult learning*. San Francisco: Jossey Bass.
- Choy, S., & Delahaye, B. (2000). Learning Approaches, Study Orientation and Readiness for Self-Direction of Youth in TAFE. *NCVER*, 1 - 14. Retrieved 20 / 3 / 2008 from <http://www.voced.edu.au/docs/confs/ncver/vetco nf9/tr9choydel.rtf>.
- Fidishun, D. (2006). *Integrating Adult Learning Theory As We Teach With Technology*. Retrieved 23/6, 2007, from <http://www.mtsu.edu/~itconf/proceed00/fidishun.htm>
- Foley, G. (1992). Self-directed learning in vocational adult education. In A. Gonczi (Ed) *Teaching and learning for the productive society*, Adelaide TAFE: National Centre for Research and Development.
- Griggs, R. A. (2006). *Psychology: A Concise Introduction*, New York: Worth Publishing.
- Knowles, M. (1990). *The Adult learner: a neglected species*. Houston: Gulf Publishing.
- Nesbit, T, Leach, L. & Foley, G. (2004). Teaching Adults. In G. Foley ( Ed) *Dimensions of Adult Learning*, (pp74-95), Singapore: Allen & Unwin.
- Rowntree, D. (1990). *Making Materials-based Learning Work: Principles, Politics and Practicalities*. London: Kogan Page.
- Richardson, R. & Liu, P. (2008). Changing forms of employment and their implications for the development of skills. In *NCVER A well-skilled future: Tailoring VET to the emerging labour market*. Canberra: Australian Government: Department of Education, Employment and Workplace Relations.
- St. Clair, R. (2002). Andragogy Revisited. Theory for the 21st Century. *Educational Resources Information Centre*, 19, 1 - 2.
- Woolfolk, A. (2004). *Educational Psychology* (9th ed.), Boston: Pearson, Allyn & Bacon.