International Specialised Skills Institute

Virtual learning tools to support the practical learning requirements of Brickwork apprenticeships

Craig Clayton

(YEAR) Higher Education and Skills Group (formerly Skills Victoria) Overseas Fellowship

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State Government Victoria Department of Education and Early Childhood Development

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i. Executive Summary

Brickwork education in Australia relies on the use of traditional learning techniques, particularly around the theoretical aspects of the trade. This challenges many students who have low literacy and numeracy levels. However our students, irrespective of their ability levels, are becoming more and more technology savvy. As a result students are less likely to engage as fully as we need them to with paper based teaching methods.

Tertiary education institutes in the UK have recognised this issue and have been developing ways to re-engage trade based students in the learning process. A number of UK colleges have developed interactive computer programs that simulate bricklaying techniques and reduce the reliance on the need to read, understand and follow written instructions.

This Fellowship has allowed the Fellow, Craig Clayton, to undertake a study tour of a number of UK colleges to understand how 'virtual bricklaying' learning methods are used to encourage students with low literacy levels to engage fully in the learning process.

The Fellowship focused on three key skill deficiencies; namely a need to understand:

1. The benefits of and opportunities to replace traditional teaching methods with technical based learning resources
2. How to successfully implement virtual learning resources into the trade classroom to realise all potential benefits
3. The limitations of virtual learning resources (VLRs) and any lessons that have been learned from the UK experience.

Clayton visited five further education colleges across the UK, interviewed a number of teachers and students and observed lessons. Clayton gathered appropriate information, knowledge and experience from the Fellowship to enable him to address the skills deficiencies above. In doing so he has been able to draw out a number of practical recommendations for relevant stakeholders to support the successful use of 'virtual bricklaying' learning methods within apprenticeship programs.

There were a number of overarching findings from the Fellowship, namely:

- Introducing technology enhanced learning; it is not about waiting for some 'big initiative' driven by the college. Teachers are responsible for continually improving teaching methods and looking for opportunities to enhance the learning experience for students. In doing so, teachers can build the evidence base for investment and can influence stakeholders for the greater good of students and the industry.
- There are some simple, easy to implement eLearning tools that all colleges should be able to support and implement without the need for significant investment or training.
- It is important that resources bring 'added value' and do not simply 'replicate' paper based teaching methods.

Above all this Fellowship has highlighted that technology enhanced learning tools are becoming a necessity to ensure students develop the rounded skills sets and learning strategies required by today's fast-paced, technology driven world. Skills such as self-directing, collaboration and self-assessment are essential for students' success now and in their future careers. The traditional, classroom based learning environments are no longer enough to fulfill our obligations as educators. This Fellowship has highlighted that it is not just about building a case to support apprentices with low literacy levels but ensuring the learning environment we provide is fit for purpose and delivers the best experience for all students.

The Fellow would like to thank everyone who has supported him to undertake this Fellowship. He has already begun to share his findings and the knowledge and experience gained and will continue to do so over the coming months.

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ii. Abbreviations/Acronyms

ALLS	Adult Literacy and Life Skills Survey
ABS	Australian Bureau of Statistics
CAD	Computer Aided Design
ICT	Information Communications Technology
PIAAC	Programme for International Assessment of Adult Competencies
NMIT	Northern Metropolitan Institute of TAFE
SWOT	Strengths, Weaknesses, Opportunities and Threats
TAFE	Tertiary and Further Education
VET	Vocational Education and Training.
VLR	Virtual Learning Resources

iii. Definitions

eLearning

Learning conducted via electronic media, typically on the Internet

Learning Management System (LMS)

A software application for the administration, documentation, tracking, reporting and delivery of eLearning education courses or training programs. LMSs range from systems for managing training and educational records to software for distributing online or blended/hybrid college courses over the Internet with features for online collaboration. Colleges and universities use LMSs to deliver online courses and augment on-campus courses

Moodle

Moodle (acronym for Modular Object-Oriented Dynamic Learning Environment) is an eLearning platform, also known as a Learning Management System, or Virtual Learning Environment (VLE)

Portal

A web portal is most often one specially-designed web page at a website which brings information together from diverse sources in a uniform way

VET

An internationally applied system of education that focuses on practical skills training and is particularly popular in Australia

VLR

Learning resources that are accessed and delivered using electronic media

1. Acknowledgements

Craig Clayton would like to thank the following individuals and organisations who gave generously of their time and their expertise to assist, advise and guide him throughout the Fellowship program.

Awarding Body – International Specialised Skills Institute (ISS Institute)

The International Specialised Skills Institute Inc is an independent, national organisation that for over two decades has worked with Australian governments, industry and education institutions to enable individuals to gain enhanced skills and experience in traditional trades, professions and leading-edge technologies.

At the heart of the ISS Institute are our Fellows. Under the **Overseas Applied Research Fellowship Program** the Fellows travel overseas. Upon their return, they are required to pass on what they have learnt by:

1. Preparing a detailed report for distribution to government departments, industry and educational institutions.
2. Recommending improvements to accredited educational courses.
3. Delivering training activities including workshops, conferences and forums.

Over 200 Australians have received Fellowships, across many industry sectors. In addition, recognised experts from overseas conduct training activities and events. To date, 22 leaders in their field have shared their expertise in Australia.

According to Skills Australia's 'Australian Workforce Futures: A National Workforce Development Strategy 2010':

> Australia requires a highly skilled population to maintain and improve our economic position in the face of increasing global competition, and to have the skills to adapt to the introduction of new technology and rapid change.
>
> International and Australian research indicates we need a deeper level of skills than currently exists in the Australian labour market to lift productivity. We need a workforce in which more people have skills, but also multiple and higher level skills and qualifications. Deepening skills across all occupations is crucial to achieving long-term productivity growth. It also reflects the recent trend for jobs to become more complex and the consequent increased demand for higher level skills. This trend is projected to continue regardless of whether we experience strong or weak economic growth in the future. Future environmental challenges will also create demand for more sustainability related skills across a range of industries and occupations.

In this context, the ISS Institute works with Fellows, industry and government to identify specific skills in Australia that require enhancing, where accredited courses are not available through Australian higher education institutions or other Registered Training Organisations. The Fellows' overseas experience sees them broadening and deepening their own professional practice, which they then share with their peers, industry and government upon their return. This is the focus of the ISS Institute's work.

For further information on our Fellows and our work see http://www.issinstitute.org.au.

1. Acknowledgements

Fellowship Sponsor

The Victorian Government, Higher Education and Skills Group (HESG) formerly Skills Victoria, is responsible for the administration and the coordination of programs for the provision of training and further education, adult community education and employment services in Victoria, and is a valued sponsor of the ISS Institute. The Fellow would like to thank them for providing funding support for this Fellowship.

Supporters

The following organisations/individuals were involved in and supported the Fellowship application and submission:

» Alan Ross - CEO, Construction and Property Services Industry Skills Council (CPSISC)

» Joanne Whelan - Project Manager, Construction and Property Services Industry Skills Council (CPSISC)

Employer support

North Melbourne Institute of TAFE (NMIT) has generously supported this Fellowship by providing time to travel to undertake the Fellowship and additional mentoring as required. The Fellow particularly acknowledges:

» Andrew Giddy - CEO, NMIT

» David Delany - Associate Director, NMIT

» Michael Callahan - Head of Department, Building Structures and Services,NMIT

» Steve Lee - Bricklaying, Wall and Floor Tiling Coordinator, NMIT

Organisations and Individuals that participated in this Fellowship

The Fellow would like to acknowledge and thank the following UK based organisations and individuals that gave generously of their time and knowledge to participate in the research undertaken as part of this Fellowship:

» Keith Baird - Head of Department, North Glasgow College

» Paul Creig - Senior Administrator, Accrington & Rossendale College

» Chris Holland - Brickwork Teacher, Colchester Institute

» Peter Rumley - Bricklaying Curriculum Manager, Blackpool & Fylde College

» Nick Povey - Head of Construction, Yale College, Wrexham

1. Acknowledgements

Organisations impacted by the Fellowship

The following organisations and industry groups should benefit from the findings of this report:

- Building and construction trade teachers from TAFE sector
- Australian Brick and Blocklaying Training Foundation
- Housing Industry Association
- Skills Victoria
- TAFE Development Centre
- Secondary schools delivery VET in schools program

2. About the Fellow

Name: Craig Clayton

Current employment

- Brickwork Trade Teacher, Northern Melbourne Institute of TAFE (NMIT)

Qualifications

- Certificate of Secondary Education, Blessed Edward Jones High School, Rhyl
- City and Guilds Craft and Advanced Craft with six distinctions, PlasCoch College, Wrexham, UK, 1985
- Ordinary National Certificate in Building with 7 merits, Yale College, Wrexham, UK, 1998
- City and Guilds Teaching Certificate 7307, Yale College,Wrexham, UK, 2001
- Certification of Assessment Accreditation, National Vocational Qualifications, Trowel Occupations and Bricklaying and Construction Operations, City and Guilds (UK), 2001
- Certificate IV in Training and Assessment, NMIT, 2009
- Diploma of Vocational Education & Training Practice, 21697, NMIT, 2010
- Certificate III, Bricklaying and Blocking, CPC30108, 2011

Brief Biography

Clayton is a qualified and experienced Brickwork Trade Teacher and highly skilled craftsperson. He has over 30 years construction industry experience and seven years teaching experience. In his current role, Clayton has particular responsibility as Group Leader for the Certificate II Pre Apprenticeship in Brickwork, and teaches up to and including Level 3 apprentices. His teaching experiences has allowed him to deepen his understanding and appreciation of the learning needs, preferences and challenges of young people entering apprenticeship programs. Clayton is also the Moodle Leader within the Brickwork department at NMIT, which requires him to support his colleagues in the development of online resources to support curriculum development. Above all Clayton is passionate about teaching his trade in a way that creates an engaging learning environment. This, he believes, is critical if Australia is to enjoy the availability of appropriately qualified and quality driven tradespeople.

3. Aims of the Fellowship Program

Brickwork education in Australia relies on the use of traditional learning techniques, particularly around the theoretical aspects of the trade. This challenges many students who have low literacy and numeracy levels. However our students, irrespective of their ability levels, are becoming more and more technology savvy. As a result students are less likely to engage as fully as we need them to with paper based teaching methods.

Traditional apprenticeship methods

Tertiary education institutes in the UK have recognised this issue and have been developing ways in which to re-engage trade based students in the learning process. A number of UK colleges have developed interactive computer programs that simulate bricklaying techniques and reduce the reliance on the need to read, understand and follow written instructions.

This Fellowship has allowed the Fellow to undertake a study tour of a number of UK colleges. The overall aim of the Fellowship was to:

- Understand how 'virtual bricklaying' learning methods are used to encourage students with low literacy levels to engage fully in the learning process.

This overall aim is underpinned by a number of specific questions that aim to fill skills and knowledge deficiencies. In particular:

- How has innovative technology enhanced learning improved the teaching of the bricklaying trade qualifications?

3. Aims of the Fellowship Program

- What has worked well and what lessons have been learned in the implementation of this technology-enhanced learning?
- What has been the impact of technology based learning on student outcomes and retention?
- What are the pre-requisites to ensure technology enhanced learning resources can be used to their fullest extent across trade-based learning?

Over time it is hoped that this Fellowship will:

Reduce our reliance on traditional paper based teaching methods

Help build the confidence and enhance the learning experience of students with low Language, Literacy and Numeracy (LLN) capabilities

Improve the engagement of students over the course of the program and in turn increase student retention and outcomes

Extend student learning opportunities beyond the classroom through external access to interactive web based resources.

4. The Australian Context

There are a number of relevant issues within the Australian context that provide the mandate for this Fellowship. Namely:

1. There is a skill shortage of qualified Bricklayers in Australia
2. The traditional structure of bricklaying apprenticeships is heavily reliant on paper-based resources which apprentices must be able to read, understand and follow
3. Many apprentices struggle with traditional paper based teaching methods due to low levels of literacy and numeracy. This causes frustration and leads to disengagement
4. Rising student to teacher ratios have reduced the amount of time that teachers can give to support apprentices who are struggling
5. The use of technology for personal purposes is the norm for almost all young Australians
6. Research has shown that the creative use of technology based learning resources can help to engage VET learners and improve their learning outcomes.

Each of these issues have been discussed below as a lead in to providing a general Strengths, Weaknesses, Opportunities and Threats analysis (SWOT) of the environmental factors influencing successful implementation of virtual learning methods into Bricklaying apprenticeships.

1. Skill shortage of qualified Bricklayers in Australia:

- The last census showed that 47 per cent of bricklayers were over the age of 40 and 24 per cent were over the age of 50
- Less than 50 per cent of the trade has a bricklaying qualification
- The numbers of apprentices completing their training and gaining a bricklayer qualification is only half the number required to replace bricklayers retiring or leaving the trade
- This shortage is causing construction delays in housing and the commercial market, reducing quality due to unskilled workers entering the trade and increased bricklaying costs.[1]

2. Traditional structure of bricklaying apprenticeships is heavily reliant on paper-based resources which apprentices must be able to read, understand and follow:

- Bricklaying apprenticeships take three years to complete and require students to attend college for 24 weeks over the three years
- 75 per cent of the apprenticeship is based on the development of practical skills and 25 per cent is based on theoretical knowledge
- Students are required to undertake a significant amount of self directed learning by digesting written theory that provides the underpinning knowledge required to build practical models. They must also follow paper-based exercises that set out the instructions of how to build models and underpinning knowledge associated with the subject
- Throughout the course of the apprenticeship students are required to build around 35 models. Each model must be successfully constructed and assessed to complete the apprenticeship.

3. Many apprentices struggle with traditional paper based teaching methods due to low levels of literacy and numeracy. This causes frustration and leads to disengagement:

- The 2006 Adult Literacy and Life Skills Survey (ALLS) conducted by the Australian Bureau of

1 http://www.abbtf.com.au/purpose/

Statistics (ABS) found that in Australia over 40 per cent of adults have literacy levels below what is considered enough to get by in everyday life [2]

- A new ABS literacy and numeracy study, the Programme for the International Assessment of Adult Competencies (PIAAC), is underway and the results will be published in October, 2013. Preliminary results paint a continued poor picture with 44 per cent of Australians aged 15 to 74 with literacy skills at levels one or two (out of five levels) and for numeracy skills, 55 per cent of Australians were assessed at level one or two [3]
- Issues with literacy and numeracy play out in the trade classroom with many students struggling to understand written materials and instructions and/or not spending enough time reading the required material before embarking on building the models
- Students often take several attempts to complete each model and this can require them to spend more time at college
- Students often rely on a lot of teacher input during practical tasks and in most cases do not read the step by step instructions
- This in turn causes them frustration and also frustration from their employers.

4. Rising student to teacher ratios have reduced the amount of time that teachers can give to support apprentices who are struggling:

- Following the funding cuts to TAFEs in 2011 and 2012 there continues to be an increased pressure on TAFEs to reduce costs
- Wide sweeping TAFE reforms are focused on giving more accountability to individual TAFE institutes to allow them to be more commercially focused and masters of their own destiny [4]
- NMIT has responded to the above by increasing student to teacher ratios from 12:1 to 15:1
- Struggling Brickwork apprentices require more one to one time from the teacher to help them to read and understand the written instructions
- The lack of available one to one time only adds to the student's frustration and substantially increases the risk of disengagement.

5. The use of technology for personal purposes is the norm for almost all young Australians:

- Telstra reports that almost one in two Australian mobile phone customers has a smartphone and no doubt this number is rising
- Social networking and the whole online environment have changed the way young people communicate. Research conducted in 2009 showed that 97 per cent of young Australians aged between 16 and 17 were regularly using social networking sites and were using the internet for an average of 6.7 days a week at an average rate of 3.5 hours a day. [5]

2 http://www.informationaccessgroup.com/literacy.html
3 http://www.abs.gov.au/ausstats/abs@.nsf/latestProducts/4228.0Media%20Release2011-2012
4 http://www.education.vic.gov.au/Documents/about/department/modernworkforcefaq.pdf
5 Australian Communications and Media Authority, 2009, Click and Connect: Young Australians' Use of Online Social Media, Australian Communications & Media Authority

6. Research has shown that the creative use of technology based learning resources can help to engage VET learners and improve their learning outcomes:

- The Australian Government has recognised the importance of increasing the use of e- learning by establishing The National Vocational Education and Training ELearning Strategy 2012–2015, as outlined in the Australian Flexible Learning Framework. The aim of the strategy is to:
  1. Strengthen the Australian training sector's use of new learning technologies
  2. Stimulate innovative approaches to increasing participation in training and employment
  3. Improve the skill levels of the Australian workforce. [6]
- A recent paper jointly published by the Australian Flexible Learning Framework and the Foundation for Young Australians reports that there is 'emerging evidence that suggests that the use of ICT may have a significant impact on the education and training outcomes of disengaged young learners' [7]
- The Smith Family describe how the use of ICT led learning resources within education can promote a 'learner mentality' among disadvantaged young Australians – that is it gives young people the confidence and interest to engage or reengage with education. [8]

6 http://www.flexibleLearning.net.au/about.htm, April 2013, Commonwealth of Australia
7 The role of technology in engaging disadvantaged youth, 2011, Australian Flexible Learning Framework, Department of Education, Employment and Workplace Relations and Foundation for Young Australians
8 The Smith Family, 2008, Digital Literacy: Connecting Communities through technology

4. The Australian Context

SWOT analysis of environmental factors influencing the introduction of virtual learning resources within Brickwork apprenticeships:

Table 1: SWOT analysis

Strengths • Less reliant on literacy and numeracy ability • Existing eLearning infrastructure within TAFEs • Allows students to practice practical skills 'virtually' • More effective use of teachers time • Potentially reduces the time to complete apprentices • Students can access resources at all times and continue 'virtual practice' • Students can work at own pace.	**Weaknesses** • Low level of IT skill among Bricklaying teachers • Lack of time to develop resources • No virtual learning tools currently used e.g. SMART boards • Lack of time to develop skills • Lack of funding • Lack of IT development and technical support and assistance.
Opportunities • Use of IT for personal circumstances is the norm • Increase the number of apprentices undertaking training • Improve the quality of training delivery • Sharing of learning resources across TAFEs and within other trade disciplines • Improve engagement of apprentices • Improve retention and completion rates of apprentices.	**Threats** • Resistance to change among Brickwork teachers • Need for additional support services to sustain the use of virtual resources • Funding cuts across the TAFE sector • Strategic direction of TAFE institute may not support investment in innovative Bricklaying learning resources.

5. Identifying the Skills and Knowledge Enhancements Required

The skills deficiencies on which this Fellowship is focused are outlined in this section to allow industry stakeholders to understand the Fellowship context. The major skill deficiency addressed by the Fellowship was a lack of detailed understanding regarding how virtual learning based resources could replace traditional learning methods in Brickwork apprenticeships.

This Fellowship funded a study tour of five further education colleges in the UK to understand and examine:

1. **The benefits and opportunities to replace traditional teaching methods with technical based learning resources**

- Interview teachers and observe lessons in each college to understand the reasons why virtual learning resources were being introduced and what parts of the curriculum the tools were being used for.
- Interview students in each college to explore their experience of using the virtual learning methods and how this has improved their learning experience.

Aim: To gather evidence to support the case for introducing virtual learning methods into the Victorian Brickwork apprenticeship program.

2. **How to successfully implement virtual learning resources into the trade classroom to realise all potential benefits**

- Interview relevant stakeholders in each college to understand how the virtual learning tools were introduced and identify any pre-requisites for successful implementation.
- In particular, understand the level of support required for IT specialists along with staff and student training and any change management approaches that were used.

Aim: Build the necessary knowledge and understanding to support the development of a successful implementation plan for the introduction of virtual learning resources into the Victorian Brickwork apprenticeship program.

3. **The limitations of virtual learning resources and any lessons that have been learned from the UK experience**

   Interview teachers and students and observe lessons to understand any weaknesses or limitations associated with the use of virtual learning resources along with any factors that have prevented the UK colleges from realising the full benefits of such resources.

Aim: To ensure that the Australian context can learn from the UK experience to ensure a realistic and practical approach is taken to the introduction of virtual learning resources in Victorian Brickwork apprenticeships and the benefits are not 'over sold'.

Prior to visiting, all colleges were contacted and briefed on the above aims of Clayton's study tour and topics for discussion and research.

6. The International Experience

The Fellow visited five further education institutes in the UK. During these visits, he used structured questionnaires and prepared lesson observation sheets to gather the necessary information required to address the skills deficiencies. This section provides a record of the findings and outcomes from each visit.

Visit One

Destination: Colchester Institute, Colchester, UK

Colchester Institute is the largest vocational college serving North Essex and Suffolk in the UK. It is committed to providing top quality vocational education and training in a wide range of full-time and part-time courses.

Contact: Chris Holland, Brickwork teacher

Colchester College

6. The International Experience

Objectives:

In researching for this Fellowship, Colchester Institute was identified as a tertiary education institute that was leading the way in re-engaging trade based students in the learning process through the use of virtual interactive learning resources. The objectives of this visit were therefore to:

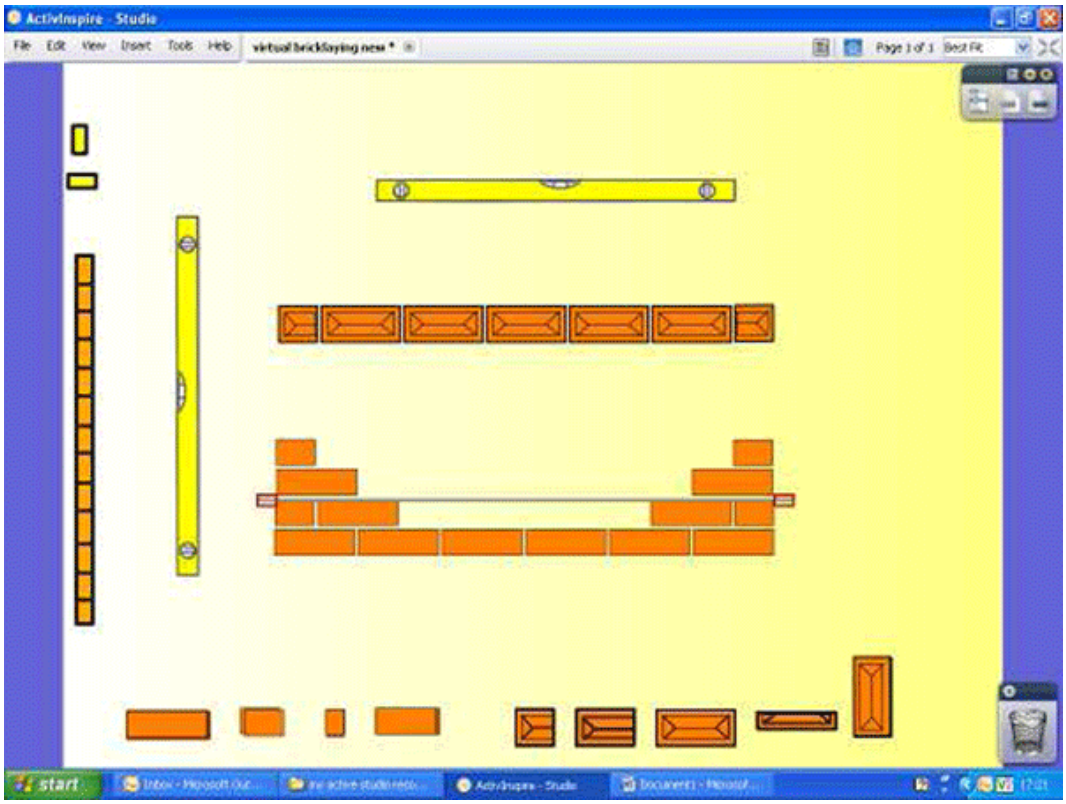
- Experience the interactive resources in action
- Interview Holland, other relevant teachers and students to really understand how innovative technology based learning has improved the teaching of the Bricklaying qualification and learn about strengths and weaknesses and limitations of such resources.

Outcomes:

During the visit to Colchester Institute, Clayton spent time with Chris Holland and Steve Dale, Head of Construction at Colchester. Clayton also interviewed a selection of students and observed lessons being taught to Brickworks students.

What virtual learning resources are being used?

- Activinspire program enables teachers to bring lessons to life with rich, powerful activities blending real-time assessment and real-world experience into the learning process. Activinspire interfaces with smart boards in the classroom to allow students and teachers to be 'hands on' with the content and simulate practical tasks in a virtual, digital environment.
- Interactive smartboards allows teachers to stream and project digital content from their laptops.



Fellowship picture activinspire program

Why introduce virtual learning resources?

Holland has been lecturing in Brickwork for the past five years and is clearly very passionate about teaching and ensuring he provides the best learning experience to his students. About three years ago, prior to the introduction of VLR, he began to notice that his students were becoming more and more bored in the classroom environment. He knew he had to do something to help reengage his students.

"Before I set up the virtual bricklaying course, I had to continually draw diagrams for the students and give them lots of hand-outs. The learners were not stimulated."

With many students lacking technical drawing skills and reliant on handouts, Holland found that learners would end up with unacceptable revision material.

He then decided to set up the virtual bricklaying resource in order to enhance the learning experience for students and to make the classroom a fun and interactive environment.

What was done to support the successful introduction of the virtual learning resources?

Holland has an interest in IT and has developed his IT skills during his own time. He was also undertaking his Certificate of Education, which required him to complete an Action Based Learning project. The classrooms at the College were already equipped with interactive white boards but they were not being used in the Brickwork department. Holland took time to observe teachers using the whiteboards and to research the Activinspire suite of programs that were available within the College for use on interactive whiteboards.

As the Activinspire program was already available within the College and minimal investment was required, he was able to easily gain the agreement from his Head of Department to engage with the IT department to undertake the development necessary to adapt the Activinspire program on the interactive whiteboard to draw various types of bricks, as well as other interactive tools from the building site.

What have been the benefits of the virtual learning resources?

Holland and other teachers interviewed explained that students are now more engaged in the classroom as they can practice cavity walling, block work and setting walls on foundation before they get out in the workplace. Learners using the resource ranged from 14–16 year old school students and full-time 16–19 year olds completing Diplomas in brickwork, to apprentices completing NVQs.

The new resource has been very helpful for practical demonstrations that before could only be done with bricks and mortar. Teachers can immediately demonstrate practical problems more immediately and efficiently rather than spending time setting up and cleaning down tools, equipment and materials.

Holland describes how the students seem more comfortable with a mouse rather than a pen. He believes that the virtual bricklaying resource is more inclusive and benefits the less able student over other methods of learning.

> *"The majority of my students learn better from doing. They prefer being active, they hate being lectured and hate taking notes. Put them in front of a computer and give them a task and you won't hear any moaning at all. The quality of handwriting and drawing is not that great, so it's difficult for them to revise from that."*

> *"First year students switch off very easily and this will stop them from losing interest. With all of the computers in place I think the resource would improve success rates because a lot of the students struggle with the theory side of the subject and skip lessons."*

6. The International Experience

Other teachers interviewed also pointed out that the virtual bricklaying resource also promotes the creative side of brickwork. It helps students to see bricklaying as a craft, rather than just a job, as they have to pay more attention to detail to make the wall look impressive.

In summary the benefits of introducing virtual learning resources in Brickwork apprenticeships at Colchester Institute include:

- Inclusive learning – students don't have to be good at drawing and they can use virtual quarter, half and full bricks rather than drawing them out
- An interactive, fun classroom
- Learning bricklaying crafts – they can lay bricks from various views, including a bird's eye view and two-dimensional view, which helps them to do certain bonds of brickwork
- Better revision (labeling and terminology function) – students can drag the word onto the right tool, brick or building method
- Practice at home – the College has purchased licenses for the Activinspire suite, which allows students to download and use the resource at home.

Colchester Institute did not have any data available on the impact that such tools have had on retention and engagement of students, nor on student outcomes.

The views of students:

The Fellow's interviews with students confirmed the benefits of the virtual learning tools and confirmed how much they enjoyed using the interactive tools over traditional methods. Some comments from students included:

> *"Virtual bricklaying makes it easier to work out a brick wall on a computer before we have to build it in the workshop."*

> *"In the Diploma Level 2, one of the units is heavily related to brick bonding. The use of virtual bricklaying within the classroom helps to explain in detail and makes it easier to demonstrate each brick bond."*

It was clear during interviews and class observations that students were engaged in the learning activities when the VLRs were being used. During the interviews with students, several referred to the fact that learning was fun and that their experience was such that they would recommend the course and College to a friend.

What have been the limitations of the Virtual Learning Resources?

Unfortunately, a lack of in-class room computers and dedicated interactive computer classrooms available to the brickwork department has limited the use of the VLRs. Holland has shared the tools he has developed with other construction departments and everyone, including the Head of IT, is in agreement about the potential for such tools and the benefits they bring.

However he feels he has gone as far as he can with the equipment available. To fully exploit the many benefits will require an injection of dedicated funding and training of other virtual learning champions such as Holland in other departments. This, in his view, would allow the students to be fully self-directed in their learning and ensure his time as a teacher is focused where it is needed most.

> *"If the students could just get on with using the resource and I could go around monitoring them, it would be an active and happy classroom. Students would be teaching themselves as much as they are being taught."*

Visit Two

Destination: Blackpool and Flyde College, UK

Blackpool and Fylde College is one of the UK's largest tertiary Colleges located in the North East of England.

Contact: Peter Rumley, Curriculum Manager

Blackpool & Flyde College

Objectives:

In researching for this Fellowship, Blackpool and Fylde College was identified as a tertiary education institute that was investing in the development of eLearning. The objectives of this visit were therefore to:

- Understand the eLearning resources that were being used in Brickwork apprenticeships and the associated benefits
- Identify how to ensure the implementation of such eLearning resources is successful.

6. The International Experience

Outcomes:

During the visit to Blackpool and Flyde, Clayton spent time with Peter Rumley and interviewed several teachers and students.

What eLearning resources are being used?

All teachers within the construction department at Blackpool and Flyde College are using eLearning tools and resources. The resources used are:

- SkillBOX Web Learning Environment provided by Dales Software: this tool is an off the shelf 'out of the box' package of teaching, learning and resource materials across all construction disciplines including Brickwork. The content is pre prepared by the software developers. It covers the theoretical based aspects of the main Brickwork curriculum areas but does not allow students to 'practice' their practical skills.
- Mind map software: this is a tool that supports idea development, planning and grouping. It is a generic tool to support and facilitate thinking in many contexts and is not specific to particular content. It is used by students to help solve problems and plan tasks and build their own learning notes or resources.
- Interactive white boards: they are available in all construction classrooms and are used to 'project' content from SkillBOX.

Blackpool & Flyde Smart Board in Use

What was done to support the successful introduction of eLearning resources?

The College has invested in in-house capability to successfully support eLearning. There is a focus on eLearning strategies across the College with a real emphasis on being 'eLearning' ready. To that end two full time members of staff have been employed to develop eLearning resources and support staff to navigate around the new resources as well as entering information on the College wide 'Moodle' (learning management system). The School of Construction is able to call on these resources to mentor staff and provide 'on the job' support to ensure staff has the confidence to utilise the various eLearning tools available.

> *"eLearning is not going to go away. We need to be on the front foot as a College and make sure our teachers are competent and supported to make full use of the tools available."*

The College has also invested in staff training. Peter has undertaken a 0.5 day a week development for six months to ensure he is fully competent on the eLearning resources. Brickwork staff are also given time off from teaching so they to can develop more in-depth knowledge of the tools available.

What have been the benefits of the eLearning resources?

The College did not have any information available on the impact the eLearning resources have had on student engagement or outcomes. However, anecdotal evidence suggests that students really enjoy the interactive nature of the SkillBOX resources and how easy it is to navigate around.

Using such resources as SkillBOX has also ensured a consistency in the quality of resources used across Brickwork as well as the Construction department as a whole. This is of particular benefit when casual teachers are called in to cover classes.

> *"We now have a standard set of materials that all teachers can use. SkillBOX has saved us a huge amount of time and makes sure we are all teaching to the same standard. Students can work through content at their own pace and we have more time to support the students who are struggling."*

The view of students

Although students were able to confirm that the eLearning tools were used throughout the curriculum, they did not feel that the eLearning tools that were used enhanced their learning experience to any great extent or made the course more interesting or fun.

What have been the limitations of the eLearning resources?

The main limitations cited were the fact that there was a need to have dedicated expertise available, as there was quite a lot to learn with SkillBOX. Older staff tended to be quite resistant, as they did not have the confidence with IT and lacked basic IT skills themselves. This has been overcome through training and available support.

Due to license restrictions, students were not able to access SkillBOX from home or from their smart phones. This meant that information from SkillBOX had to be printed by the students for home revision purposes.

It was not clear whether SkillBOX could 'talk' to the College learning management system Moodle. At the time of Clayton's visit this was not the case. Therefore any end of module test results had to still be entered manually by the teacher onto the LMS.

6. The International Experience

Visit Three

Destination: **Accrington and Rossendale College, UK**

Contacts: Paul Craig, Senior Administrator

Imram Mohammed, ELearning Coordinator

Accrington & Rosendale College

Objectives:

In researching for this Fellowship, Accrington and Rossendale College was identified as a tertiary education institute that is fully integrating eLearning resources to enhance the student learning experience. In its latest Government inspection the College received a grade one (outstanding) in all areas. This is the best possible grading that any College can achieve, putting it in the top 10 per cent of Colleges in the UK.

The objectives of this visit were therefore to:

- Understand the eLearning resources that were being used in Brickwork apprenticeships and the associated benefits
- Identify how to ensure the implementation of such eLearning resources is successful.

Outcomes:

During the visit to Accrington and Rossendale, Clayton spent time with teachers and Imran Mohammad, eLearning Coordinator. Clayton also spoke with several students.

What eLearning resources are being used?

- Itslearning portal: a Virtual Learning Environment (VLE) that provides students with a personalised online learning community where they can access course materials, electronic journals and have access to the full range of electronic materials and information via the Virtual Library. Itslearning was chosen as it provides a really flexible and integrated approach to managing, delivering and administering programs of learning.
- Interactive whiteboards: available in all classrooms to allow content to be 'streamed' from its learning portal.
- Videos developed by teaching staff and edited down to short, sharp clips of practical tasks running on continuous 'loops' on TV screens in workshops. These videos help to embed the learning for students and support them while they carry out the particular practical task.

What was done to support the successful introduction of eLearning resources?

The College has overcome initial resistance to the introduction and integration of eLearning approaches by appointing eLearning Champions in each department. There have also been a number of staff training days but the eLearning Champions appear to have been particularly successful in supporting older and more change resistant teachers overcome their 'fears' of the eLearning resources. The Champions are also teachers and are therefore able to understand the practical issues and provide a 'teacher and student' voice back to the wider eLearning community across the College.

There also appears to be a really good working partnership between the Construction department and the IT department via the eLearning coordinator, Imran Mohammed. Imran sees his role to understand and identify where eLearning can enhance the student learning experience. He keeps fully abreast of latest eLearning developments through regular networking and conference attendance. He shares his findings back with College staff through regular staff IT forums that he chairs. His aim is to ensure the staff and students are using the most fit for purpose and up to date eLearning resources that require minimal customisation by the teachers.

> *"My role is to partner with the teachers and really understand their needs and where eLearning can bring added value and support a more effective learning experience for students."*

What have been the benefits of the eLearning resources?

The College described a variety of benefits of the itslearning portal. In particular:

- Students are able to undertake practice tests on the itslearning portal. They receive their results immediately and the results are streamed to the teacher's computer at the same time. If particular students do not achieve the necessary pass mark of 80 per cent, the teacher can reset another practice test straight away. Students are able to work through assessments in their own time and teachers are able to manage a class of 12 students with varying abilities effectively and efficiently. This supports students with different abilities and learning styles and also reduces the reliance on student handwriting/literacy skills and the time spent by the teacher marking tests.
- The itslearning portal uploads assessment results directly to the learning management system that houses student results. Although this does not have a direct impact on student learning it does have indirect benefits. It frees up teacher time from administration and therefore allows them more time for lesson planning and delivery.

- Students are also able to access the itslearning portal from home and so have all the resources they need to support their revision.
- Staff also felt that the use of videos repeating practical tasks in the workshops was also a really effective, yet simple way to support students who struggle to take in instructions first time round. The video provides an efficient way for the students to be fully guided at their own pace on the practical tasks while at the same time frees up the teacher to support the students and review the student's work and progress in real time.

The view of students:

Students confirmed the benefits above. Although some had not accessed the itslearning portal in their own time, they agreed that it was useful to know that they could. They liked the fact that the amount of writing they had to do was reduced and they found interacting with the itslearning portal for theory based lessons more enjoyable.

Visit Four

Destination: **North Glasgow College, UK**

Contact: Jim Neil, Brickwork Coordinator

North Glasgow College

6. The International Experience

Objectives:

North Glasgow College is one of the biggest further education colleges in Scotland. Research prior to the Fellowship visit indicated that the College was playing a significant part in the development of virtual learning resources to support students from remote locations to access online apprenticeships. The objective of this visit was therefore to:

- Learn more about the virtual learning strategy that was being developed to allow virtual apprenticeship programs to be delivered and how such thinking could support the wider development of virtual learning resources for Brickwork apprenticeships.

Outcomes:

At the time of the visit the College was still in the early stages of developing a virtual learning strategy for Brickwork apprenticeships.

A Virtual Learning Environment Manager has been appointed and a steering group has been set up to pull together a series of online resources for Construction apprenticeship programs with the aim of capturing the distance learning market available across rural Scotland. The Construction Industry Trade Board, the construction industry training board for the UK, is funding this. However the work has only just started and is expected to take approximately two years.

It is beneficial to know that virtual learning resources have the capability to be developed and used to allow the virtual delivery of an apprenticeship program. This no doubt would fully exploit the capability of such tools and provide many opportunities to think more creatively around how virtual learning resources can be equally exploited to enhance the learning experience and support the different learning styles and preferences for all apprentices.

Similar to other colleges visited, North Glasgow ensures all staff are trained on how to use the smart boards through eight, one hour training sessions. Smart boards are available in all construction classrooms.

It was also interesting to note that when new resources are being developed for uploading onto the learning management system, the Construction department is able to call on the expertise of Computer Aided Design (CAD) teachers to develop the necessary plans and drawings. This is a good example of sharing and partnering across the College to ensure quality delivery.

Visit Five

Destination: **Yale College, Wrexham, UK**

Contact: Nick Povey, Head of Construction

Objectives:

Yale College is one of the largest further education colleges serving a significant geography in North Wales, UK. From previous network contacts in the UK, Clayton was aware that Yale had recently introduced the Aurasma smart phone application to support the delivery of the practical aspects of apprenticeships. Floor Laying department were piloting the program with the intention of rolling out to other Construction disciplines, including Brickwork in the near future.

The objective of this visit was therefore to:

- Experience the Aurasma application and to understand how it was being effectively integrated into the teaching program
- Learn about the benefits associated with such technology, implementation considerations and any potential issues.

Outcomes:

What eLearning resources are being used?

- Aurasmaap: this is a smart phone and iPad application that allows the user to use their phone or iPad to scan and recognise particular 'triggers' that automatically link and launch relevant digital content.
- Interactive smart boards: as with other colleges, Yale uses interactive smart boards to stream and project digital teaching content.

Yale College

- Video clips and large plasma TVs within workshops play repeating videos of practical tasks for students.
- Classroom based laptops allow students to undertake their own online research.

What was done to support the successful introduction of eLearning resources?

Yale appears to have ensured a focused investment in the required technology to support the full exploitation of eLearning and virtual learning resources. All classrooms have smart boards, plasma TVs have been installed in workshops, classrooms have sufficient laptops to allow students to have individual access and funding had recently been signed off to purchase 12 iPads for use in the workshops.

Yale uses a 'test, review, implement' model, that is if a teacher has an idea for technology enhanced learning or a new eLearning resources becomes available, it is 'tested out' by informal champions within a particular department. The benefits and drawbacks of such are then fully understood and any implementation issues uncovered. This then informs the decision to invest in the particular resource or technology.

6. The International Experience

Although there is an IT department within Yale with an eLearning coordinator who helps teachers build and use online resources, the majority of advancements, particularly in relation to smart phone and iPad technologies, have been teacher led. Teachers use their own personal devices to 'try out' and test the applications available. This then creates interest and curiosity among other teachers and provides the necessary 'ground swell' and foundation to build the case for funding and commitment to successful implementation.

What have been the benefits of the eLearning resources?

The Aurasmaap is of particular benefit and is a very impressive piece of technology. The application is set up to recognise particular 'triggers'; for example a bar code on a poster of a practical task. A smart phone is used to scan the barcode and this then automatically launches on the smart phone the digital content associated with the bricklaying operation. As the majority of students now have smart phones and the Aurasmaap is free, this is a really cost-effective way to utilise this novel virtual learning resource. It also allows students to view different digital content, such as videos, at the same time. In doing so it facilitates student centered and self paced learning. Clayton was able to observe videos of practical lessons launching on students' smart phones. These can be saved in their phone to allow them to easily access the content that is specific to their learning and revise when not in College.

The Aurasmaap is quite intuitive to follow and there are many online YouTube video guides to allow people to get the most out of it. It has therefore been introduced with minimal need to invest in the formal development of teachers.

As with Accrington and Rossendale College, staff also felt that the use of videos repeating practical tasks in the workshops was also a really effective, yet simple way to support students who struggle to take in instructions first time round. The videos run for three to five minutes and allow students to observe and refresh the tasks in hand. It provides an efficient way the students to be fully guided at their own pace on the practical tasks while at the same time frees up the teacher to support students who require additional help, review their work and progress in real time.

The view of students

During the lessons Clayton observed, the students were all able to access laptops and undertake their own self directed learning. He noted how well students were engaged and were clearly enjoying the learning experience.

Students described to Clayton how they "love the ap", it's "much better than books" and "it was easier to remember stuff". Some also said that as a result of using the technologies mentioned they were "enjoying the theoretical parts of the apprenticeship more".

What have been the limitations of the eLearning resources?

Yale staff found it difficult to highlight any limitations with the eLearning resources that they were using. If anything, the main issue was that there was so much that could be done with such resources and tools it was more about having the time as teachers to exploit such great technology fully. They were also conscious that the technology is changing all the time and there is a danger that if the apprenticeship programs become too dependent on such technology then stuff may get out of date quickly, technology platforms may become obsolete and troubleshooting may not be supported. Staff at Yale felt it was important that they did not allow their enthusiasm for the technology to 'run away'. They realise it is important to ensure blended delivery that strikes a balance with the important 'hands on, face to face' methods. Teachers described how it was important for employers to continue to identify with the apprenticeship as this helps the College stay connected with the employers and for

the employer to be able to engage with and support the apprentices' learning.

They also felt there was a potential issue with some students 'hiding behind' the technology and for it not to be so easily identifiable when a student was struggling with the content simply because he/she seemed confident with the technology.

> *"We can't allow the technology to fully take over our role as teachers. There is still no substitute for quality face to face teaching and we need to make sure we don't forget that with our students. We need to be good teachers first and foremost and the technology should support what we should already be good at."*

Concluding remarks

In reflecting on the value of this Fellowship, it is appropriate to restate the overall aim of the Fellowship, which was to understand how 'virtual bricklaying' learning methods are used to encourage students with low literacy levels to engage fully in the learning process. This overall aim was underpinned by a number of specific questions that aim to fill skills and knowledge deficiencies. In particular:

- How has innovative technology enhanced learning improved the teaching of the bricklaying trade qualifications?
- What has worked well and what lessons have been learned in the implementation of this technology-enhanced learning?
- What has been the impact of technology based learning on student outcomes and retention?

Wrexham Brickwork Department

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- What are the pre-requisites to ensure technology enhanced learning resources can be used to their fullest extent across trade-based learning?

The Fellow believes the study tour that this Fellowship enabled has allowed him to address the majority of these original aims. It was incredibly valuable to experience first hand the tools and resources that are being used and to appreciate the impact this is having on students' learning experience. The enthusiasm of many of the teachers Clayton met was extremely motivating.

Unfortunately, the study tour did not uncover any quantitative evidence in relation to the impact that technology enhanced learning resources have had on student retention and outcomes.

However, the qualitative responses and anecdotal evidence gathered presents a strong case in favour of these resources enhancing the learning experience of all students and not just students with low literacy levels.

7. Knowledge Transfer: Applying the Outcomes

Overall outcome of the Fellowship for the Brickwork teaching profession and industry:

The Fellowship has highlighted the following overall takeaways for the Brickwork teaching profession and industry:

- Introducing technology enhanced learning it is not about waiting for some 'big initiative' driven by the college. It is about accepting as a teacher that you are responsible for continually improving your teaching methods and looking for opportunities to enhance the learning experience for students. It is not about waiting for someone else to do it – it is the responsibility of teachers to research, find, adapt, share and collaborate on new and improved ways of delivering content. In doing so teachers can build the evidence base for investment and can influence stakeholders for the greater good of students and the industry.
- There are some simple, easy to implement eLearning tools that all colleges should be able to support and implement without the need for significant investment or training.
- The resources that Clayton viewed during the study tour did not, in the main, simply 'replicate' paper based teaching methods. The resources enhanced the learning experience and made it easier for students to digest content at their own pace, provided teachers with more time to support the individual needs of students and improved the consistent quality of teaching resources being used across the curriculum.
- Technology enhanced learning tools are becoming a necessity to ensure students develop the rounded skills sets and learning strategies required by today's fast-paced, technology driven world. Skills like self directing, collaboration and self-assessment are essential for students' success now and in their future careers. The traditional, classroom based learning environments are no longer enough to fulfill our obligations as educators. This Fellowship has highlighted that it is not just about building a case to support apprentices with low literacy levels but ensuring the learning environment we provide is fit for purpose and delivers the best experience for all students.

How the outcomes of this Fellowship will be shared:

Clayton will undertake a number of activities to ensure the outcomes of this Fellowship are disseminated:

- From June 2013, Clayton took up the position of eLearning developer for NMIT Brickwork department and is undertaking formal development on the Moodle, NMIT's learning management system
- By end of 2013 present to the Victorian TAFE Bricklayers Network. This regular networking meeting is attended by Bricklaying teachers from all Victorian TAFEs. It is an ideal forum to share these learnings with an interested and relevant audience. As part of this presentation, Clayton will offer to share this report or follow up with interested TAFE teachers who want to find out more information
- By end of 2013 present this report to the Construction Department at NMIT. Although many of Clayton's colleagues are aware of this Fellowship and the broad findings, a more formal and structured presentation will provide the forum to ensure recommendations as they relate to NMIT can be debated and followed through
- In early 2014, introduce the virtual bricklaying tool used by Colchester Institute ensuring it is adapted to suit the curriculum needs and tools available at NMIT
- Continue to share findings, views and insights informally with colleagues within the NMIT Bricklaying Department to embed learnings and encourage ongoing use of newly developed resources and tools.

8. Recommendations

The skill deficiencies that this Fellowship was designed to address have been provided below along with relevant recommendations for relevant stakeholders.

1. Understand the benefits and opportunities to replace traditional teaching methods with technology based learning resources

This Fellowship has provided clear evidence that there are many benefits and opportunities for technology based learning resources to be used in Bricklaying apprenticeship programs.

Government (Federal, State and Local), Industry and Professional Associations:

- To develop mechanisms and funding strategies that encourage all TAFEs to fully exploit the use of virtual learning methodologies.

Industry and Professional Associations:

- Share 'good news stories' across the sector of where virtual learning methodologies have been successfully implemented in apprenticeship programs
- Host awareness building sessions to share knowledge on the virtual resources available such as Activinspire and Aurasmaap and share learnings and best practice.

The TAFE sector:

- Review the use and availability of virtual learning resources and tools across institutes and identify where there are opportunities to introduce or enhance the use of such resources and tools and the investment and training required
- Ensure eLearning resources and equipment are being fully utilised, fully functional (e.g. in good working order) and equally available across all departments
- Where eLearning resources and equipment are scarce, consider creative ways in which all departments, including Construction, can access what is available
- During student enrolments, consider collecting information on whether students would be willing to use their own smart phone to access applications that can enhance learning along with their ability to access learning resources remotely through personal computers
- Consider the use of simple resources in the first instance such as running videos in workshops to support practical tasks
- The virtual learning tools should enhance the learning experience for students rather than simply provide a repository of information that can be easily accessible for teachers. Tools that the students can fully interact with and provide another learning medium that supports different learning styles and literacy levels will have the greatest impact on student motivation.

The International Specialised Skills Institute:

- Continue to support Fellowships that seek to deepen practical, hands on knowledge of how technology and the digital age can deliver enhanced learning experiences for young Australians following trade based apprenticeships.

2. Ensure an appropriate level of knowledge and support to implement virtual learning resources into the trade classroom to realise all potential benefits

The Fellowship identified common themes in relation to the types of support that is required to successfully implement virtual learning resources.

8. Recommendations

Recommendations:

The TAFE sector:

- Encourage teachers who show an interest in developing eLearning resources to follow their interest through and test out applications in a 'safe' learning environment
- Create an environment where the IT department and teachers can work in partnership to develop virtual learning resources
- Where possible appoint an eLearning coordinator to support the implementation of virtual learning resources
- Ensure teachers are trained appropriately in the eLearning tools available
- Celebrate and publish good news stories relating to eLearning to encourage others to take part
- Consider appointing informal eLearning Champions within departments to support and encourage older teachers to manage the changes to delivery and embrace new technologies
- 'Buy in', if available, commercially produced resources.

It is encouraging to note that since Clayton has undertaken this Fellowship, his TAFE (NMIT) has increased the eLearning team for the VET sector from one member of staff to six. This team will work across the TAFE to ensure a joined up approach to eLearning based teaching.

3. The limitations of virtual learning resources and any lessons that have been learned from the UK experience

Clayton's study tour highlighted some common themes in relation to the potential limitations of virtual learning resources. If the recommendations outlined above are fully implemented, then the TAFE sector will ensure it fully exploits the use of virtual learning resources and tools. In addition, the TAFE sector should also consider:

- Ensure a balanced approach is taken and that virtual learning resources and tools do not 'take over' from the valuable face to face student/teacher interaction
- Where ever possible implement resources and tools that can be accessed remotely by students and ensure students are reminded that this can be done.

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