How Engineering Real Results (ERR) are Transforming Learning to Lessen the UK Trades Skills Shortage

ERR took two golds for Best Simulation or Virtual Environment and Best E-learning Project - Private Sector, as well as a collection of silver and bronze trophies for Team of the Year and Best Blended Learning. In this case study, we explore how they did it and what we can learn from them.

The skills shortage

Analysis by the Royal Academy of Engineering suggests Britain will need more than a million new engineers and technicians by 2020 – which will require double the current number of annual engineering graduates and apprentices. Without them, any chance of riding on the coat-tails of an infrastructure-led economic revival appears to be wishful thinking. In the UK, it is clear that we have a real skills shortage within the building and construction industry.

Increasing the number of qualified individuals in the field is tougher than it looks. ERR are market leaders in vocational education, training over 6,000 students each year in a variety of trade skills. They are known for providing high quality training, leading to nationally recognised qualifications. Their student base is apprentices and adult returnees. However, despite the clear job opportunities there are significant challenges to providing the practice opportunities these individuals need to become fully qualified.

Supporting adult returnees with blended learning

Many individuals are looking to retrain for the construction industry. They are often working full time, or have family commitments and needed a training programme that was flexible and accessible. ERR have designed a blended learning programme consisting of six key elements:

1. Supported home-based training

Home based training is primarily provided via manuals but individuals are never left alone in their study. Tutor is support via telephone and an in-house built instant messaging from 9 – 8 on a weekday and on Saturday mornings to answer questions. Tutors also proactively engage with those students who they feel may be struggling.

2. Tutor marked assessments

Tutor marked assignments are included at the end of each module which are designed as progress checks, highlighting individuals who may be struggling and in need of a helping hand. The assessments are submitted online and are automatically marked using a system that ERR designed to be intuitive and provides a high level of feedback to support to users. Detailed progress reports are provided at each stage to provide additional feedback.

3. Hands on practical Workshops – with a twist!

Hands on experience is critical for vocational training and students come together at regular intervals for workshops. Traditional workshops can be very expensive to run in the construction industry – every piece of copper pipe cut incorrectly for example can contribute to thousands of pounds of unnecessary expense every year. ERR overcomes this by conducting workshops within a virtual world. Aristotle said "There is nothing in the intellect that was no previously in the senses", it was this philosophy which took ERR on their journey to produce virtual reality which would not only successfully teach skills, but also would employ the senses in order to make learning a physical, as well as an intellectual experience. What's more they have developed practical tools to really help. ERR have developed the award winning Unanomote – a low cost, hand held device with a patented motion-tracking device to help people learn and practice hands on tasks in electrical and plumbing skills. It can become a screwdriver, a drill, a saw, or whatever tool the user needs to employ in order to complete a task. In use since 2011, the Unanomote allows individuals to practice a task as many time as they like, in a realistic but safe environment and without peer pressure and without wasted materials. Tasks are only bound by laws of nature or other real world physical constraints. Only once they are confident do they go into a workshop to perform it effectively.

4. Getting ready for formal Assessment with Vocational Virtual Reality (VVR) training

Part of the National Vocational Qualification (NVQ) requires the student to carry out specific formal Assessments which must be conducted onsite. These Assessments cannot be carried out in a college environment, what's more, completing them is an essential aspect of gaining a trades based NVQ. The lack of opportunity to practice often meant that many potential workers lacked confidence and often failed to complete their entire qualification. This was a major challenge, and one that needed a radical solution that would be accepted by the major Awarding Bodies for the trades industries.

ERR needed to find a way to allow students to practise these onsite Assessments from home. The Unanomote and virtual worlds helped individual skills involved in planning and electrics but pulling these all together in a major project involved another level of application all together and required total collaboration and buy-in from the Awarding Bodies.

The resulting Vocational Virtual Reality training (accessed using a tablet and pen rather than a mouse to engage those who are not regular PC users) provides a realistic environment that fully prepares individuals for their onsite assessments. Elements of the VRR include:

The Blueprint
In creating a realistic environment, the VRR provided a custom build Blueprint system as a natural place to start. Users start by creating the building from the site plans, this ensure that the building they are working on in the VRR is an exact replica of the one they will be working on in the final assessment. All assessments take place in real houses and flats.

The Installation
Having recreated the building, individuals then transform the Plan into a 3D Vocational Virtual Reality (VVR) environment which they use to carry out the installation. They need to install all fixtures and fittings within the virtual environment just as they would in the actual

building. However, this is a safe environment, and one in which students can practice as many times as needed without wasting equipment or causing damage to the building or injury to themselves.

Throughout the installation the system provides procedural tips and comments on the user's installation techniques.

The Virtual Shop
During the development phase, ERR spoke to NVQ Assessors and trades bodies and learnt that the task newly qualified tradespeople find most difficult is quoting for jobs. Much of their issue relates to correctly identifying the equipment and materials that will be required. A virtual online shop where the users can purchase the equipment and materials needed for their installation was built to address the issue. This

included a cause and effect element; if the student does not purchase the correct equipment and materials, or an insufficient amount, then they will not be able to complete the installation and will need to return to the virtual site to recalculate and then return to the Virtual Shop.

The experience of the VRR fully prepares individuals for their final hurdle – the Onsite Assessment!

5. Onsite Assessments

It is a requirement of the Examination Bodies that the onsite Assessments are carried out on a building site, simulation is not allowed. With blessing of the two main Exam Boards, ERR made a large investment in houses and warehouses throughout the UK and now have a portfolio of fully functional building sites that are used for students to achieve the onsite Units within the NVQ. Once each building has been renovated or converted into flats ERR sell that building and buy another, thereby retaining a sufficient number of properties within the portfolio.

The project relied on each student attending onsite for a short time to complete the onsite Assessments. They need to arrive onsite well prepared, ready to get on and do the job to a high standard. Before being invited on site, students are asked to upload their virtual installation. The work the student has carried out in the virtual building site allows the Assessor to accurately confirm if the student is sufficiently competent to complete the onsite Assessments.

6. Supporting newly qualified individuals

To help newly qualified individuals continue to apply their learning in their working life, ERR also produced an estimate and quote App, drawing on pricing from a choice of wholesalers which can be used to estimate and quote on any installation. The ability to draw pricing from a variety of wholesalers allows the user to compare prices and discounts. The user is then able to calculate the best possible cost of the equipment and materials, add the user's daily rate and the number of days the job will take. The user can order the equipment and materials via the app, as well as produce a formal Quotation which can be printed or emailed to the customer.
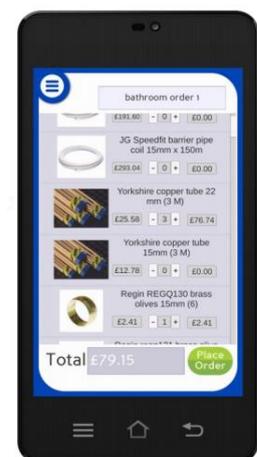
The Results

ERR started their journey of learning transformation with very clear objectives:

›   Provide the facilities for students to complete the entire NVQ and become fully qualified
›   Bridge the gap between class based training and onsite Assessments
›   Engage the user, increase their confidence
›   Decrease peer pressure
›   Provide a safe environment in which to learn the more dangerous elements of trade skills
›   Create fully qualified workers to reduce the trades skills shortage
›   Reduce the shortage of qualified engineers.

Research with individuals after they completed the programme showed that 98% of the students who achieved their qualification using this method secured employment within 6 weeks of qualifying. 54% of those people had the confidence to become self-employed.

They combined the power of virtual reality training using their games platform with strong construction industry knowledge to create products that have revolutionised the way that vocational training is delivered. As a result, they have helped to create employment for many hundreds of people who would otherwise have been left with part of a qualification.

This has to be good news for the individuals and good news for the sector!

Harnessing Technology Appropriately to Build Tangible Skills

6 questions to consider

1. Have you researched hard before investing? – what do learners struggle with both during the programme and once they are back at work?

2. Are you driven by the need not the technology? For example, have you asked:

    ›   What am I looking to achieve through this programme?
    ›   Where can technology help me in accelerating the outcomes of the process?
    ›   What can it help me do that I couldn't do before?
    ›   Where can it add efficiency to the process?

3. Do you have the buy in of key stakeholders? (In this case the Awarding Bodies were all involved in the design and approval of the VRR)

4. To what extent can you redefine assessment gateways using technology?

5. How are you integrating the online experience with any face to face practical application?

6. In what ways are you using technology to support the ongoing application of learning back at work?

Case study written by Laura Overton, as part of the good practice partnership between Towards Maturity and the Learning Technologies eLearning Awards.

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