CULTURE, COACHING AND COLLABORATION

HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

Charlynne Pullen and Olivia Varley-Winter

City&Guilds

CITY & GUILDS
CENTRE FOR SKILLS
DEVELOPMENT

CITY & GUILDS CENTRE FOR SKILLS DEVELOPMENT

The City & Guilds Centre for Skills Development (CSD) is a not-for-profit research and development body for vocational education and training. We work to influence and improve skills policy and practice worldwide through an evidence-based approach. We are part of the City & Guilds Group. The desire to integrate evidence into skills policy and practice sits at the heart of what we do. That's why we work closely with policy makers, teachers, trainers and researchers to:

- Provide research that is relevant and practical to policy-makers, teachers, trainers and learners

- Understand current challenges and find evidence-based solutions

- Link research, policy and practice by sharing evidence and good practice

- Deliver skills development projects to test research findings and create good practice models.

If you want to find out more about how we are influencing and improving vocational education and training worldwide, visit our website at **www.skillsdevelopment.org,** and follow us on Twitter **@skillsdev**

ACKNOWLEDGEMENTS

CULTURE, COACHING AND COLLABORATION

HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

Charlynne Pullen and Olivia Varley-Winter

CITY & GUILDS
CENTRE FOR SKILLS
DEVELOPMENT

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

3

CONTENTS:

FOREWORD:

The use of digital technology to help transform how people live, learn and work and open up more opportunities, is both a personal and professional passion of mine. For that reason I am delighted to be able to share this report with you. Published by the City & Guilds Centre for Skills Development, *Culture, Coaching and Collaboration* considers how teachers can use technology to improve teaching and learning, alongside the infrastructure needed and the motivations for doing so.

Digital technology is constantly evolving and every week brings a new discovery with the potential to revolutionise learning. For example we are starting to see simulations and virtual reality used in further education to give students real-life learning experiences se in real contexts. This could really revolutionise how vocational skills are taught and tested.

New technologies provide tutors with an opportunity to be innovative in their approaches and use greater creativity within their lessons. For some, embarking on this journey can seem daunting; but it doesn't have to be. I have witnessed great examples of how the use of technology can improve the quality of teaching and learning and the benefits it brings to both the learner and the provider/institution. Reading College, featured in our report, is just one example of this and it's exciting to hear that the college has continued to innovate in this area.

To realise the possibilities of digital technology in vocational learning we need to create environments that encourage exploration. City & Guilds has a strong role to play in supporting the vocational education sector as it continues to fully embrace learning technology and this research suggests success factors and provides recommendations for policy-makers, senior leaders and teachers. I look forward to the potential of these new technologies to positively disrupt how education and skills are delivered.

Kirstie Donnelly (MBE)
UK Managing Director City & Guilds

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

5

EXECUTIVE SUMMARY

Both the 'digital revolution' and the myth of completely technophobic teachers can polarise a debate which is ultimately about using new technologies to improve teaching and learning. At the City & Guilds Centre for Skills Development we felt there was a need to investigate the advice that teachers are given, the way they approach using new technologies, and an example of how technology and teaching can work together in practice. This research report offers an analysis of how teachers could and do use new technologies (and recommendations on how they can be better supported in this), through a literature review and case study visit to Reading College. The report is not a comprehensive look at every different type of new technology, nor is it a guide on the best technologies to use. It is an initial look at a wide-ranging topic, and one we hope to build on with a more detailed piece of research in the future.

Our research is focused around two main areas – the discord and synergies between traditional teaching and digital learning, and the notion of starting slowly in adopting new technologies.

TRADITIONAL TEACHING VERSUS DIGITAL LEARNING

There are a number of ways that digital learning and traditional teaching can complement each other, rather than be seen on opposite sides of a spectrum.

Personalisation and coaching, particularly in order to differentiate learning is particularly difficult when a teacher is responsible for large groups of learners.

Technology enables learners to be more self-directed, as they can review material themselves. This helps the teacher intervene and coach in a more productive way, and not to continually demonstrate the same task. Typically, however, the material for the lesson needs to be prepared by the teacher in advance, so that learners can work at their own pace.

Access to practical experience is a key component of vocational learning but can be dangerous, or expensive in some settings. Simulations, using digital technologies, as well as low-tech role plays can be an important part of enabling access to practical experience in a safer environment. However, for them to be as realistic as possible, it is important that teachers and employers are involved in the development of materials.

Monitoring and assessment for learning are well-established aims of traditional teaching, and assessment for learning, in particular, was the subject of a well-intentioned, although ultimately lacking, initiative in the 2000s. Technology can be superficially helpful for assessment for learning, providing multiple choice quizzes and the like very easily. These have not yet become high quality in general, although work on blended learning and e-assessment is promising. Other kinds of technology, like filming and more collaborative software like Google Docs, can support self and peer assessment, which can be particularly valuable. In some cases, online collaboration can support the development of communities of learning.

The use of digital technologies can therefore enhance traditional teaching, rather than requiring a complete revolution. In some areas, digital technologies are more advanced than others in supporting teaching, but in general enable teachers to spend more time coaching learners than might otherwise be the case.

STARTING SLOWLY – CONSIDERATIONS FOR COLLEGES

A particular feature of successful use of digital technologies is a permissive learning culture which encourages teachers and learners to alight on new technologies and try them out in the classroom or workshop.

Interactive whiteboards provide a pointed example of the problems of a national roll-out of one specific technology. Most colleges have interactive whiteboards, but few use them well, and those that do have tested a range of different approaches to find the right place for them. While the technology was rolled-out, it was not entirely clear what the stand-out benefit of interactive whiteboards was, and many teachers used and continue to use them in a similar way to chalk boards.

Engaging teachers and learners is a key benefit of new technologies, but not all teachers and learners are very keen on new technologies, and different software and programmes will inevitably be preferred by different teachers and learners. A key role for colleges is to support teachers who are not used to new technologies to build their confidence through leadership as well as supporting teacher peer-learning. The notion of collaboration is particularly important to new digital technologies, so a debate about whether to adopt platforms that learners are currently using, or to find new ways where learners can collaborate specifically on college work, is one that needs to be had within a provider amongst the learners and the teachers to find the right solution for everyone.

Industry currency and remaining up to date with employers is a key argument for the use of new technologies, but does not always ring true where technology is less important than the interaction with the customer. The changing culture of social media however, does represent new challenges, as learners need to be taught 'digital literacy' to ensure they behave in what employers would consider an appropriate way online, particularly on public social media platforms. The ability to use new technologies will inevitably be of benefit to learners for future employment however, regardless of whether future employers have these abilities themselves.

The role of cost in the debate about information technologies has changed dramatically in recent years, as the cost of the infrastructure remains similar, while the cost of software has become much more varied. MOOCs in particular have received a lot of attention, but it is not yet clear how sustainable they are as models of learning. The proliferation of cheap or free software can create a barrier of too much choice, and in this case, the role of a learning culture which enables teachers to try a range of new technologies to find the one that works best for their learners, is of real benefit.

CONCLUSIONS

Our research highlights the importance of a culture of experimentation within a college or provider, to enable teachers to find the best programmes or ideas for their learners, whether digital technology or not. The best resources can often be a result of co-production of digital materials, where teachers have shaped the nature and content of the resource. Digital technologies can both enhance and fundamentally change the role of the teacher, and particularly where an increased focus on coaching and more individual support goes, there is a clear benefit to the learner.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

7

DIGITAL MATERIALS CAN BE USEFUL IN ENSURING THAT MATERIALS MEET THE NEEDS OF TEACHERS AND LEARNERS
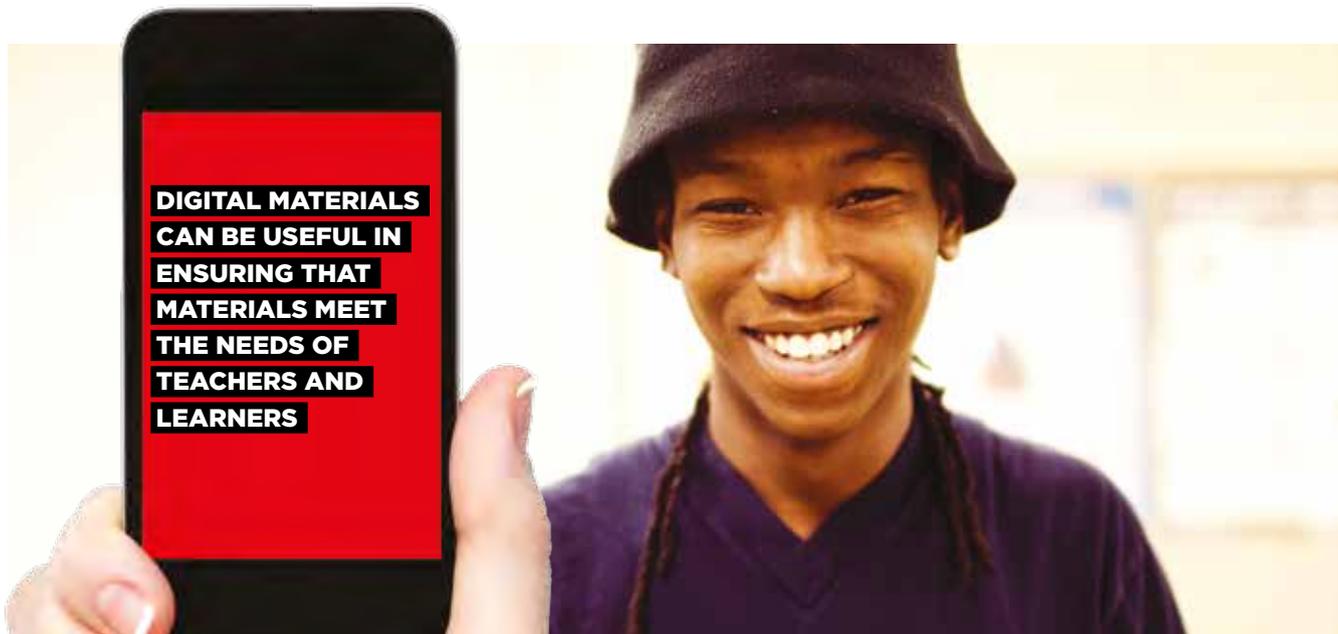
CHAPTER 1:
INTRODUCTION

1.1 TECHNOLOGICAL REVOLUTION?

In recent years, discourse about the technological revolution has developed, also called the digital or information revolution, suggesting that technology and traditional education are mutually exclusive – so teachers can do one or the other, but not both. Books like *Rethinking Education in the Age of Technology: The Digital Revolution and Schooling in America* (2009) by Allan Collins and Richard Halverson set out a choice between the education of the Industrial Revolution and the education of the future – of "uniform learning" versus "customisation", of the "teacher as expert"[1] versus "diverse knowledge sources" (Collins & Halverson, 2009). These incompatibilities are even starker when considering the potential changes technology will bring, both to save lives and destroy reputations, as argued by Eric Schmidt and Jared Cohen in *The New Digital Age* (2013).

Teachers and particularly education policy-makers have always had a strong interest in how to use new technologies in teaching and learning.

[1] *In further and vocational education, the role of teaching is carried out by a number of people: lecturers, trainers, coaches and tutors. Unless referring to one of these specific roles, we use the term "teacher".*

Past experience suggests that predictions like that from Seymour Papert in 1984, "There won't be schools in the future … I think the computer will blow up the school" (cited in Cuban, 1986: p. 72), will not come true, and this should serve to caution claims about the "disruptive" power of technology. In reality such a revolution is highly questionable, but there is pressure for teachers to use the latest technology and tools. In the UK, for example, in a speech to the education inspectorate Ofsted, the Minister for Skills Matthew Hancock stated that:

> "Excellent vocational education and training must keep pace with, and actively develop, new learning technologies. We look to you to support the skills system to embrace these technologies, and to understand the value they bring to learning and the learner experience."
>
> *(Hancock, 2013)*

8

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

The notion of teacher and technology working together to improve teaching and learning is one that has found particular favour among leaders of educational institutions in the USA. In 2012, the President of Williams College, Professor Adam Falk, gave a speech to set out his perspective:

> "Effective (and cost-effective) technologies to support distance education and self-paced learning have been with us for many decades. Printing, television and the postal service are remarkable tools. And, in fact, they have been used since their inventions to enhance and deepen education. What none of them has done is change the fundamental fact that at its heart education is a social activity that takes its highest form within a real community of students and faculty. Neither books nor video nor chat rooms have made colleges obsolete."

> *(Falk, 2012)*

It is more likely that, as Cuban states in his 1986 book *Teachers and Machines*:

> "The changes teachers have embraced … have solved problems that teachers identified as important, not necessarily ones defined by non-teachers. Moreover, what teachers adopted buttressed their authority, rather than undermining it. Thus, those technologies incorporated into routine teacher practice responded to daily classroom needs without undercutting the teacher's control of the class …Teachers have altered their practice when a technological innovation helped them do a better job of what they already decided had to be done and matched their view of daily classroom realities."

> *(Cuban, 1986: pp. 65-6)*

Co-production of digital materials, where teachers work with those developing materials, can be particularly useful in ensuring that materials meet the needs of teachers and learners. However, there are a number of existing resources available that could be used by teachers, whether in their current form or re-purposed, and could help to improve teaching and learning. Below, we discuss some of the ways that digital technologies can be used by teachers to support their teaching gradually.

Printing, television and the postal service are remarkable tools that have been used since their invention – to enhance and deepen education.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

9

1.1.1 VOCATIONAL PEDAGOGY

Our report *How to teach vocational education: A theory of vocational pedagogy* (Lucas, Spencer & Claxton, 2012), produced in partnership with the Centre for Real World Learning, describes six desired outcomes of vocational education. They are: routine expertise, resourcefulness, functional literacies, craftsmanship, business-like attitudes, and wider skills for growth. We believe that learners, teachers and employers would benefit from using these outcomes as the basis for vocational teaching and learning.

A learner using educational technology alone is unlikely to achieve outcomes in all of these measures. Technology, however, can help teachers in delivering these outcomes. The report discusses ten essential dimensions of decision-making in vocational pedagogy, as shown below. Each end of the spectrum represents a different option for the delivery of teaching and learning. Technology can help to facilitate some decisions, as well as encourage some variety in practice.

For example, when we consider "proximity to the teacher", digital technology clearly has a role in allowing virtual communication and instruction, alongside or instead of face-to-face instruction. It's also the case that with digital technologies, the organisation of time for learning can more easily be extended, whereas in a college it is more "bell-bound" (bound by the school bell). Access to online materials for learning could encourage a questioning attitude to knowledge, while the teacher can also act to encourage certainty and confidence.

|		
Facilitative	Role of the teacher	Didactic
Authentic	Nature of activities	Contrived
Practice	Means of knowing	Theory
Questioning	Attitude to knowledge	Certain
Extended	Organisation of time	Bell-bound
Workshop	Organisation of space	Classroom
Group	Approach to tasks	Individual
High	Visibility of processes	Hidden
Virtual	Proximity to teacher	Face-to-face
Self-managed	Role of the learner	Directed

Figure 8 Vocational pedagogy - ten dimensions of decision-making

Using technology will not fundamentally alter what is required in vocational teaching and learning. It is unlikely to reduce the amount of time and attention needed to develop routine expertise, resourcefulness, functional literacies, craftsmanship, business-like attitudes, and wider skills for growth. We propose that teachers use technology as a tool, to help them to experiment with their teaching.

1.1.2 WHAT SHOULD TECHNOLOGY SUPPORT?

In 2005, The European Commission set out several ways in which learning providers and education stakeholders expected technology to support teaching and learning. These expectations still largely hold true today.

1. **Personalisation.** Technology is expected to give teachers and education institutions more flexibility to personalise their offer to learners. For example technology should help to adapt the pace or content of education to individual learners' progress and needs. Technology is also expected to allow more flexibility as to when and where learning takes place, allowing more open access to education materials, remotely and outside the classroom.

2. **Integrating theory and practice.** Technology can help to compensate for a lack of job-based training by allowing the learner to practise in virtual environments. It helps the learner integrate practical job-based experience with theoretical learning or assessment, by giving more on-the-job access to these materials.

3. **Attracting and motivating students.** Prospective students are considered likely to prefer courses and institutions that are clearly up to date with current technology, and that use technology to enhance the learning experience.

4. **Monitoring students' learning.** By making the time and place of assessment more flexible, and by making the assessment process less resource-intensive and more convenient, technology is expected to allow more monitoring of students' progress.

5. **Preparing students for the job market.** Students who have used modern technology regularly as part of their education are expected to be better prepared for using it in their working life.

6. **Saving time and money at vocational education institutions.** Due to several of the above improvements, technology may make it possible to increase the number of students who can pursue a course, without having to boost the number of teaching hours.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

11

A more recent European Commission working document highlights personalisation, collaboration, and the blending of formal and informal learning as "core" trends for the use of technology across Europe (European Commission, 2013). This update also makes clear that teachers who use digital technology regularly with their learners are still early adopters: only 32 per cent of pupils in schools and initial Vocational Education and Training (VET) across Europe report using ICT in more than one-quarter of their lessons (European Schoolnet & University of Liège, 2013). There is much still to develop and share to support pedagogic excellence in the use of technology.

1.1.3 TEACHERS – MORE IMPORTANT THAN EVER?

Innovative practice in using technologies is developing in asymmetrical ways, with those teachers who have a previous or current interest in technology likely to be at the forefront. "Early adopters" provide evidence of different methods of using digital technologies, helping the education community to understand ways in which they are most effective (Rogers, 2003; Ely, 1999). The power of digital technologies, in comparison to technologies that came before, is the sheer diversity of possibility, providing the teacher with a much greater space to innovate and tailor the tools that they use.

This ability for greater creativity in teaching and learning, as well as the ability to encourage and support learner collaboration, potentially changes the role of teachers. They can become more of a coach with their learners, particularly in a vocational setting, and less the sole source of instruction.

EDUCATION PSYCHOLOGISTS HAVE CONCLUDED THAT SELF-MOTIVATED, ACTIVE INVOLVEMENT IN LEARNING OPPORTUNITIES IS CRUCIAL (SLAVIN, 2005: P. 41).

CHAPTER 2:
TRADITIONAL TEACHING VERSUS DIGITAL LEARNING

2.1 PERSONALISATION

In their book, *Enhancing learning through technology in lifelong learning*, Ingle and Duckworth note:

> "Rather than the transmission of knowledge from expert to novice, to be recalled and reproduced, more contemporary [constructivist] theories of learning place the learner [at] the centre of the educational process, with the role of the tutor to guide and support learners as they actively develop their ability to make meaning and construct deeper understanding."

(Ingle & Duckworth, 2013)

Policies such as entitlement to one-to-one maths and English tuition are in keeping with constructivist ideas about education, based on theories from thinkers like Piaget and Dewey. Jean Piaget studied child development in the early 20th century, and concluded that children learn by building one logical structure of reasoning on top of another. From this educational psychologists have concluded that self-motivated, active involvement in learning opportunities is crucial (Slavin, 2005: p. 41). Meanwhile, in *Experience and Education* (1938), John Dewey emphasised the importance of school students' experience and their interaction with the curriculum. Constructivist theory sees the learner's personal perspective and experience as central to their own learning, and this has informed the current view that self-directed learning should be encouraged as part of good practice. The self-directed learner with a teacher as facilitator can also be considered in a more modern context as the teacher as coach.

2.1.1 COACHING

Jameson (2012) describes coaching as "[helping] people to learn for themselves under the close guidance of an expert", and Collett (2012) finds that in particular, a person is coached to enhance their performance, rather than to teach them the foundations. Coaching is therefore distinct from lecturing or demonstrating to a group, where teachers may adopt more of a "one size fits all" approach. Good coaches not only know what good performance should look like, they also seek to give individual performers the close guidance they need, in a way that they are receptive to. They are keen to see how a learner responds to guidance, and to learn from this.

One of the main expectations of technology use is that it will make education more flexible to be delivered "on demand" outside of set contact hours. Technology is also expected to allow more independent learning: "Allowing student control over the pace of presentation of concepts and the practice of skills." (Laurillard, 2013) If technology allows more "virtual" learning, contact time with a teacher or trainer could therefore be devoted more to interactive work and to formative assessment (feedback on how to improve). There is a range of ways in which technology gives more scope for good-quality coaching.

For example, new digital technologies that enable teachers to film themselves doing a demonstration, particularly of a practical subject, mean that in some workshops and classrooms more time can be spent on individual learners. Prior to or during a session, learners can create demonstrations and can become more self-directed in this regard.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

13

As part of our research for this piece, we visited Reading College in the UK, where one teacher in a carpentry workshop explained how provision of digital learning materials has changed the lessons:

The difference in teaching is that it gives me a bit more time. Learners, particularly those who start with us at 16, learn at very different speeds and this becomes more apparent during the year. Having demonstrations and manuals that all learners can access from their work bench or desk prevents downtime for learners as they wait for the teacher to come round to them.

This is a similar notion to the "flipped classroom" model, where learners are encouraged to view online lectures and demonstrations in advance of the lessons (for an explanation, see *Educause Learning Initiative*, 2012). In a practical vocational setting, online demos can also be made available during class time, allowing learners to view and replay guidance as and when they need them, as described below:

There will always be a physical demonstration of the technique or task at the beginning of the class but those who are unsure can watch the demonstration again on YouTube – this provides them with a useful prompt. While attendance for the classes is still compulsory, putting all the lessons and presentations on Moodle enables the young people to access these resources from home either to see them again, or if they missed the initial lesson.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING
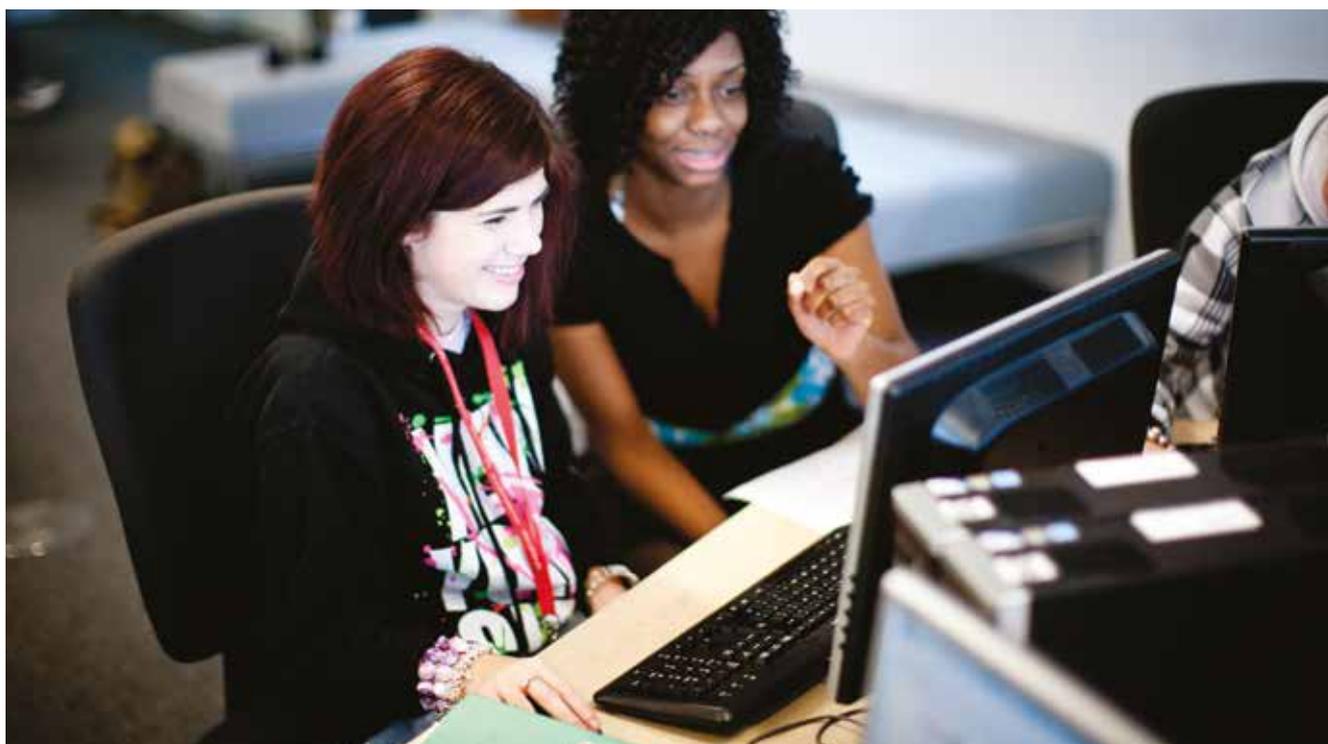
Learners don't have to wait for the teacher to tell them how to complete the next task, or which bit to do next, as they can see it for themselves. They do, however, still need the teacher as a coach, to comment on the work they have done, to advise them on how best to complete different elements and encourage them to do the best work they can possibly produce. The teacher has to help learners to evaluate and act on the knowledge that they have found and that they can see for themselves.

Technology can help to automate some of the feedback. For example, Laurillard (2013) gives one example of this, referring to a software program that assesses students' performance at lighting a stage according to predetermined parameters:

> "[The] program represented a model of different ways of lighting a stage, where students could manipulate parameters such as colour, intensity, angle, etc. to gain an understanding of how to achieve specific effects. With such a model it is possible to automate assessment by setting a goal to achieve a certain effect [and for the program to] give helpful feedback and make a good summative assessment of their knowledge and skill."

(Laurillard, 2013: p.6)

She writes, however, that:

> "The disadvantage of [this] simulation model is that it requires significant initial investment in the design, development and testing of the program. [The investment then] needs to continue if the products are to keep pace with the range of curriculum needs, and with improvements in digital technologies."

(Laurillard, 2013: ibid.)

As we discuss further below, in addition to providing feedback, simulations can also have a number of other advantages. For example, access to practical learning can be greatly improved by well-designed tools and equipment that mimic the "real thing", but are either less dangerous or less expensive. Authentic simulations can help to develop students' practical understanding when direct access to tools in a workplace is not possible.

2.1.2 CHALLENGES

As with much research and development, the initial preparation of technology is both the hardest and the longest part of the process. Then it becomes easier as new solutions develop and other methods are discovered. The growth of mobile apps in particular makes it more likely that a range of solutions will be developed to help teachers reduce their preparation time.

DID YOU KNOW...

Good coaches not only know what good performance should look like, they also seek to give individual performers the close guidance they need.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

15

A teacher at Reading College commented:

The use of digital technologies in the lessons required a lot of teacher preparation time, but this has reduced a lot now the initial work has been done.

There is also a similar need for preparation among learners. Learners' approach to independent learning differs widely and can't always be built up at pace. Opportunities to gain experience should help to build this capability, particularly if the learner can continue to seek guidance from teachers or other role models.

Learners also need to have more advanced work to move on to once they have completed and mastered a particular task or technique. Technology now offers many differentiated activities that can be started as appropriate in a personalised way. There is also an increasing amount of free and open-source material being published online. Nonetheless, teachers from Reading College said they would prefer to develop their own materials to fit around published texts so they can teach in their own style. While technology offers valuable tools that can support good-quality, personalised coaching, by itself it does not provide the same level of stimulating, individualised guidance that a good teacher can provide.

2.2 ACCESS TO PRACTICAL EXPERIENCE

Learning in a practical way is a fundamental tenet of vocational education. Many learners choose vocational areas because they want to "get their hands dirty", make things that they can see and touch, or focus on a specific job or type of work. Digital technology, whether it is accessed through a touch screen or with a screen and mouse, may seem like the opposite of working practically. There are, however, ways that digital technologies can be used for practical tasks. Firstly, they can help vocational learners to access the theory of how to do things and why to do them in that way. Secondly, digital technology can enable more learning through practice to take place.

2.2.1 A DIFFERENT KIND OF PRACTICAL

Learning by practising need not mean hands-on tasks such as doing woodwork and operating machinery, but should involve learning how to develop something which is real and tangible, by simulated means if necessary. In the UK, at Rolls Royce, for example, a digital simulator has been used to train apprentices on tasks such as bending copper pipe and constructing an aeroplane wing (McLoughlin, 2013).

COLLEGES THAT BUILD RELATIONSHIPS WITH EMPLOYERS CAN ALSO ENSURE THAT LEARNERS ARE TRAINED USING TECHNOLOGY THAT IS SIMILAR TO WHAT THEY WOULD USE IN THE WORKPLACE.
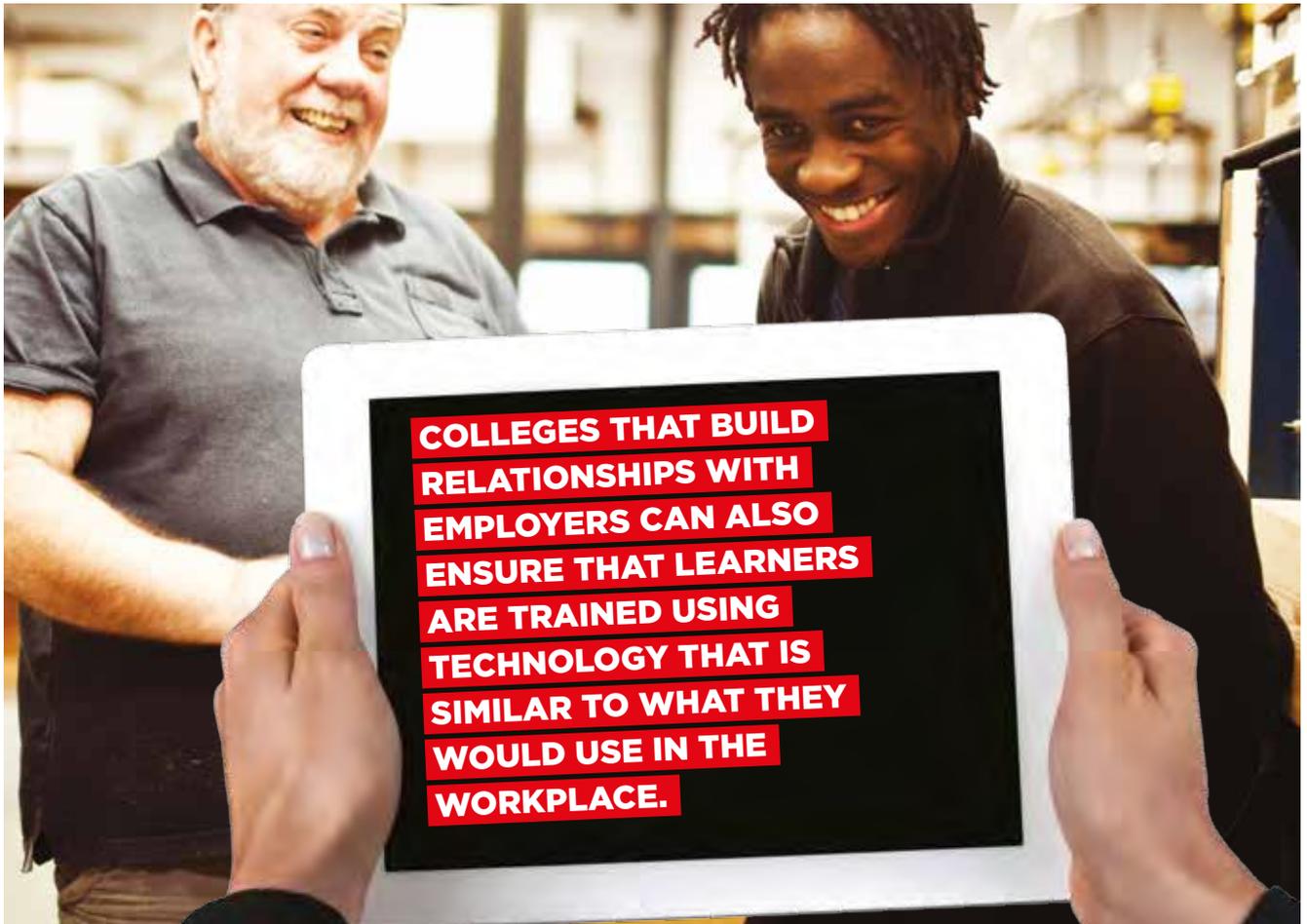
At Mid-Kent College, a welding simulator is used to encourage learners to practise more and to cut down on waste (London Knowledge Lab, 2013: p. 11). Training for apprentices at the Ministry of Defence, which has been widely praised and is currently rated outstanding by Ofsted, includes a simulation of desert situations. This trains new soldiers on particular types of terrain and what to look for in terms of hazards, as well as supporting more strategic training. Internationally, Formula One teams use very expensive simulators and wind tunnels to help their engineers understand the impact of changes to a car, as well as to enable the drivers to "test" a new car and train for each race track. These have to be as realistic as possible, because the sport's governing body places severe restrictions on physical testing on race tracks. Simulated situations are an ideal way to learn how to complete tasks where mistakes would be expensive (copper pipe), or dangerous (Formula One racing).

One challenge in this approach is that realistic simulations are often incredibly expensive and can be well beyond the reach of vocational training centres and colleges. A recent UK report suggests that to make simulations more economically viable, senior leadership teams in colleges need to be willing to make an investment for a long-term pay-off, and that clusters of colleges should be brought together to collaborate on the development of simulations and games (London Knowledge Lab, 2013). This report finds that it is also very important to involve teachers to ensure that digital simulations meet the needs of learners:

"It is clear that the key to advancing digital simulations lies with teachers and trainers who are prepared to be curious and explore their curriculum design, and managers who will actively support them."

(London Knowledge Lab, 2013: p. 19)

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

17

One advantage of simulations is that they can be more easily standardised, as work experience can vary a great deal in terms of the amount of trust placed in the trainee and how much they are allowed to try out. Experienced trainers and training providers have commented that "there is a huge attraction to being able to simulate working environments [that] offer consistency and quality control over the student experience", and "simulation means all learners can try all techniques rather than having them rationed in terms of time and access" (London Knowledge Lab, 2013: p. 8). Simulations can also reveal mechanisms that in real life are hidden from view: "Learners can see the engine moving, and get into the core of how it works." (Ibid.) Simulations like these help the learner not only to practise, but to understand how theory relates to practice.

Of course, work experience with employers also remains very important in offering direct experience of how work is organised as well as access to experienced workers. Colleges that build relationships with employers can also ensure that learners are trained using technology that is similar to what they would use in the workplace.

2.2.2 POTENTIAL FOR WORK-BASED LEARNING

While it is useful to consider the implications of digital technologies in simulating practical tasks, there is also a role for digital technologies in reducing the time spent on theoretical study and on administration. Within the past decade, online contact between learners and training providers has become the norm, with the growth of e-portfolios such as Learning Assistant. The growth of this kind of contact has supported growth in apprenticeships focusing on customer service and administration, as for these kinds of roles the majority of training takes place in the workplace.

The assessor or trainer can keep in touch with the learner online and answer queries or make personalised suggestions. The assessor or trainer is also able to monitor the work the learner is being given through their submissions for assessment and through contact with the learner. They can then use that information to liaise with the employer about the work provided and about when it would be appropriate to complete certain tasks. Summative assessment platforms such as eVolve that enable learners to take "paperless exams" also have a role in supporting work-based learning. The ease of assessment of work-based learning should mean that learners can spend more time gaining practical experience, as they don't have to leave the workplace for assessment purposes.

"THERE IS A HUGE ATTRACTION TO BEING ABLE TO SIMULATE WORKING ENVIRONMENTS [THAT] OFFER CONSISTENCY AND QUALITY CONTROL OVER THE STUDENT EXPERIENCE"

(London Knowledge Lab, 2013: p. 8)

2.3 MONITORING

One principle of good coaching is to maintain an awareness of students' learning, in order to introduce them to new challenges and support them through it (Brown, 2012). In the past few decades, particular support has also been given to the notion of assessment for learning. Assessment for learning is based on some clear principles which were first summarised by the UK Assessment Reform Group (ARG) in 1999 under the leadership of academics such as Professor Dylan William at the Institute of Education (IoE) and Professor Paul Black from King's College London:

"Assessment for learning:
- Is embedded in a view of teaching and learning of which it is an essential part
- Involves sharing learning goals with pupils
- Aims to help pupils to know and to recognise the standards they are aiming for
- Involves pupils in self-assessment
- Provides feedback which leads to pupils recognising their next steps and how to take them
- Is underpinned by confidence that every student can improve
- Involves both teacher and pupils reviewing and reflecting on assessment data."
(William & Black, 1999)

2.3.1 ASSESSMENT FOR LEARNING IN PRACTICE?

Following these principles, the Labour Government developed an assessment for learning strategy in 2008 for compulsory and further education. Despite funding of £150 million for this initiative, the authors of the 1999 report felt it has not led to the effective use of assessment for learning (Stewart, 2012). They highlight that there are many methods of assessment that do not particularly involve learners in self-assessment, or reviewing and reflecting on assessment data, and so cannot be considered effective assessment for learning.

Developments in technological methods of assessment began with a simple move from paper to online, as with the Open University's Computer Marked Assessments that were multiple choice questions marked by a computer. Now, there are much more sophisticated methods of online assessment, which have great potential when combined with the feedback and coaching methodologies within assessment for learning. However, multiple choice quizzes are still popular with teachers as a quick and easy way of gauging learner understanding, as a catering teacher from Reading College said:

Socrative has been really good for assessment of learner understanding, as you can create quizzes and see how learners cope with them. Previously we had been using questioning and a flipchart, so this was useful to be able to monitor how each learner was doing.

The technology, Socrative, makes quiz creation and administration very easy, to the extent that during a fire alarm drill the teacher was able to devise a quiz for the learners on his phone, and ask all the learners to complete the quiz to check their understanding of the lesson so far. This meant there was no wasted time in the lesson, and highlights the flexibility of digital technologies to use every moment.

Audience response systems or "clickers" like Socrative also make it very easy for the progress of each learner taking part in quizzes to be tracked. This can contribute to the teacher's view of how much they are understanding, and can inform the development of a personalised programme for each learner, enabling them to move on to the next topic at their own pace, within the confines of the lessons.

Adaptive learning platforms like CogBooks[2] can provide personalised learning plans that can help the teacher and learner identify any gaps in knowledge and redraw the learner journey if needed. Clearly, if much of the work for a session is online, it is easier to differentiate the work through technology, while bringing new challenges for teachers. A concern for teachers about this kind of technology is that learners are in charge of their own learning and will need the teacher to respond quickly to requests for feedback.

This new use of data is undoubtedly powerful, but unless it is used to involve learners in self-assessment, it is not fully in line with assessment for learning principles which say that learners should be able to review and assess their own progress.

In the training kitchen at Reading College, they support this approach by filming students as they work, having obtained the necessary permission from the learners first. They find that viewing a video back in the company of a teacher can really help to support learning.

The filming of the kitchen in particular helps the learners consider their own role within a kitchen, as they are able to watch themselves back, and see whether they helped others too much or too little, and reflect on the presentation of their dishes. It has been a really useful tool for learners in that sense.

For example, one learner who had watched themselves back on the film discovered that the person standing behind them had been very busy, and reflected that they should have thought to help that person. The next time the learner was in the kitchen, they were more careful to see if they could help, and less likely to focus only on their own task. The filming was key for the learner to recognise that this had taken place, as was the ability to easily view it back and focus just on their own performance (facilitated in this case by software purchased by the college). The teacher also has a role in encouraging this: the first time the learner considered viewing the film was when the teacher suggested it.

This is in line with principles for assessment for learning, set out above, which suggest that teachers and learners reflecting together is important. The use of film in this case – approved by the learners – perhaps gave more of a direct view of strengths and weaknesses than going through a questionnaire or tick-box exercise would have achieved. In the absence of assessment for learning principles, the use of film for continuous assessment could be far less positive: for example, if the teacher graded learners based on what the films were showing on an ongoing basis, without raising issues with them or seeking their involvement.

Teachers at Reading College also use Google Docs for monitoring, for example taking note of when a learner logged in and how much time they spent on a document. The catering teacher said:

We wanted to use technology to help us change the theory element of our teaching, especially the "chalk and talk" part. Now, we use a Google Doc, which can be provided as evidence and has a previous history related to it so we don't lose any work, and the EV [External Verifier] can see what they need. It is also easy to track when people accessed it, what they did and when, so that the learner starts to take real ownership of their own learning.

This type of technology can also make it easier to encourage learners to do their homework before a lesson, by allowing more virtual monitoring of what they've done. This level of oversight mimics to some extent what happens in a workplace, although there could be safeguarding concerns about too much monitoring and how public the information is – this is discussed in the next chapter. Learners who prepare

[2] http://www.cogbooks.com/our-platform.html

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

21

through homework also have an easy means of communicating with the teacher and can ask for more help or information ahead of time if they need it. This is central to the concept of blended learning, which involves a mixture of traditional face-to-face guidance, supported by homework with online materials. One teacher at Reading College said:

The blended element has helped to flag issues as they arise, rather than later on. All the hand-outs and information are posted on Google Communities a few days before the session so learners can develop understanding about the issue and think about a specific area before they get to the lesson. This has really allowed us to hit the ground running in lessons, and we've found learners are reflecting and thinking a lot more in lessons.

Ideally this level of scrutiny will not be used to blame or discourage learners, but to take forward assessment for learning in an effective way, helping people to review their own practice and to understand what's needed to improve their performance. Ideally, learners will be inspired to take responsibility for their learning, and to develop their skills as self-directed learners.

2.3.2 COLLABORATION AND PEER ASSESSMENT

In addition to allowing more formative assessment for learning to take place, digital technology also allows more collaboration on documents, between teachers and learners and among peers.

PART OF THE MOTIVATION FOR COLLABORATION IN LESSONS IS TO ENCOURAGE LEARNERS TO PROOFREAD THEIR OWN AND OTHERS' WORK

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

Part of the motivation for collaboration in lessons is to encourage learners to proofread their own and others' work. This can help to prepare them for academic assignments and timed essays. A teacher at Reading College said:

The collaborative approach encourages the learners to read through and reflect on what they and others have written, and hopefully it becomes a habit to read through what has already been written, whether by others or by themselves.

Other vocational skills can also be supported through online collaboration, as most workplaces require both the ability to be part of a team working together, and to work independently. It is clearly possible to do these tasks without using digital technology. However, as digital technology tends to log different learners' activities, using it collaboratively may mean that such activities can be more easily assessed individually, by keeping a note of each person's independent contribution. A challenge to this is that key aspects of interaction may take place offline but not online. For example a learner might take more of a role in person than they would in online group activities. Capturing both online and offline participation would be a critical part of using this kind of digital technology.

2.3.3 SUPPORTING COMMUNITIES OF LEARNING

For colleges, the use of digital technology can also offer students much-needed support from their fellow learners. At Bridgend College in Wales for example, online activity can build a sense of community for learners that have a long way to travel:

"Our students are not in halls of residence and have no common area, such as a bar or cafeteria to meet up outside of college hours … We found [that using social media] provided a way for the students to create a community of learning. … If a student posted a question on the page and neither of us saw it for a while, what we were finding was that other students would come in and answer the question and start a conversation."

(Adam Richards from Bridgend College, quoted in FE Week, 2013).

Colleges can also take a role in encouraging young people to use social media in supportive ways. The internet is a place of intense debate which can have personal consequences. Tweets of 140 characters are easily written but are heavily scrutinised by others. Providing some form of safeguarding is clearly an issue in this setting, and colleges should be alert to complaints about bullying. Learners who consider others when posting online will have mastered a useful skill. Using a collaborative online platform for teaching and learning may be one way of supporting that socialisation process.

DID YOU KNOW…

Technology can also make it easier to encourage learners to do their homework before a lesson, by allowing more virtual monitoring of what they've done.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

23
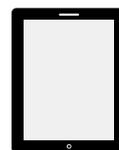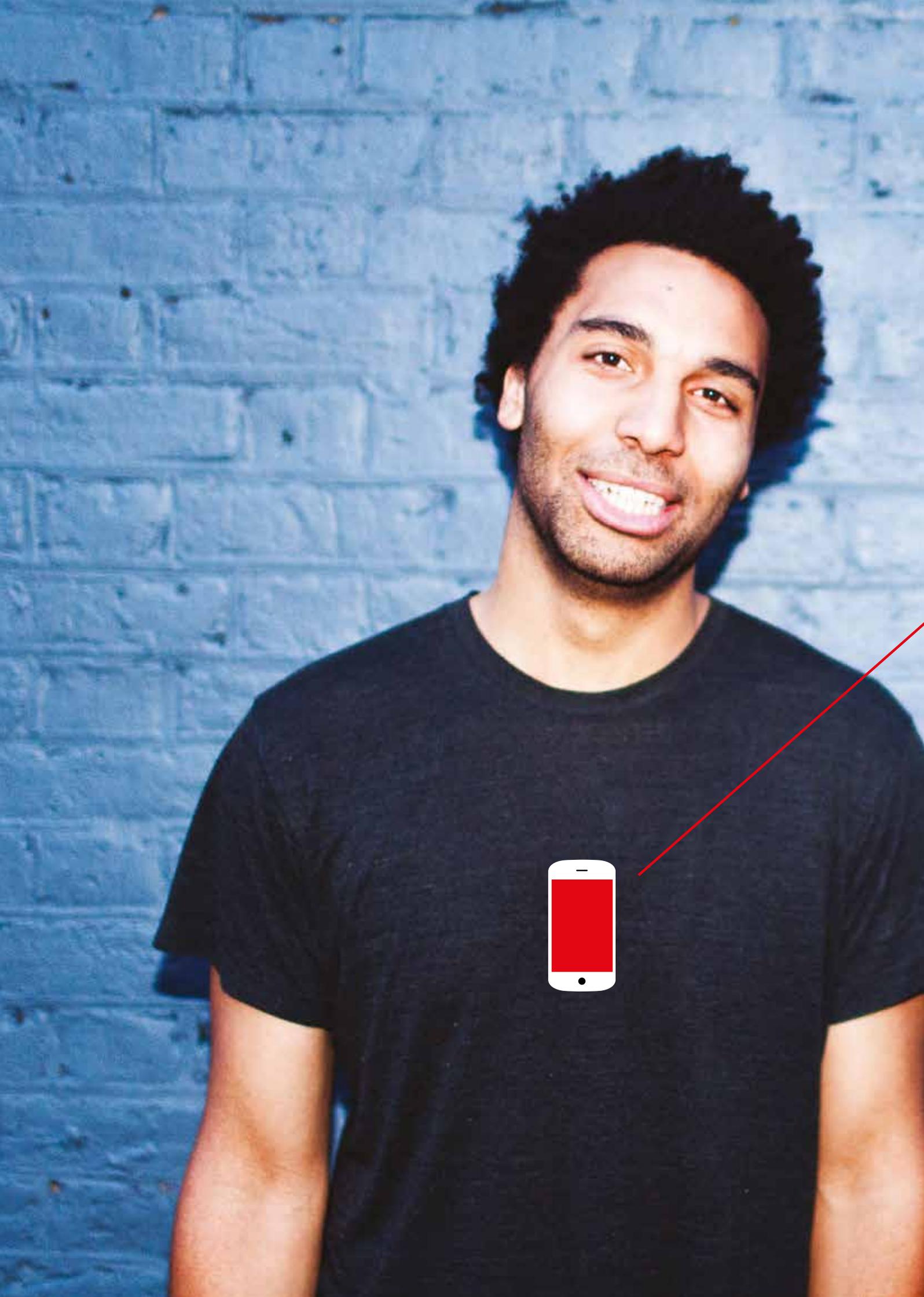
TOP TIP FROM
READING COLLEGE

We wanted to use technology to help us change the theory element of our teaching, especially the "chalk and talk" part. Now, we use a Google Doc, which can be provided as evidence and has a previous history related to it so we don't lose any work, and the EV [External Verifier] can see what they need. It is also easy to track when people accessed it, what they did and when, so that the learner starts to take real ownership of their own learning.
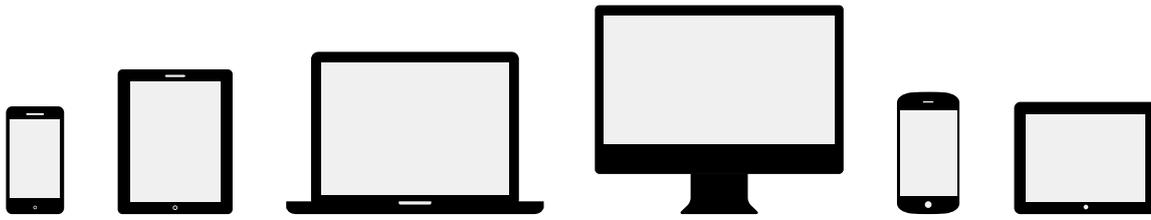
CHAPTER 3:
TRIALLING NEW TECHNOLOGIES - CONSIDERATIONS FOR COLLEGES

From our discussion above it is clear that the use of digital technology for personalisation, to support practical experience, and in monitoring and assessment is already well underway in vocational education. This is particularly the case for teachers and trainers who are confident in its use, and in colleges and institutions that show effective leadership to support technological change. However, it is also the case that the adoption of technology often happens on a piecemeal basis: a teacher or trainer feels able to innovate with particular tool or piece of kit, and is happy to largely ignore the rest. Teachers should feel able to experiment to find effective uses for technology in their practice.

We would therefore disagree with a recent conclusion drawn by the London Knowledge Lab (in a paper by academics Patricia Charlton, Eileen Kennedy, Diana Laurillard and others) who state that:

> "The VET system [is] in danger of squandering its teaching talent on local small-scale technology innovation and unsustainable short-term projects. Technology works best on the large scale, tackling the most difficult educational challenges."

(London Knowledge Lab, 2013: p. 21)

We would question this emphasis on large-scale and "sustainable" technology tools. Although it is important to equip teachers adequately, it seems risky to impose particular innovations across a wide range of settings and expect them to have a transformative effect. For teachers and colleges, "local small-scale technology innovation" can be well thought through, and may be a pragmatic response to rapid technological change.

3.1 A LESSON FROM INTERACTIVE WHITEBOARDS

In the mid-2000s, the UK Government and the British Educational Communications and Technology Agency (Becta) widely expected and encouraged further education colleges to adopt interactive whiteboards. They were hailed as a major piece of new technology, and the Government provided funds for schools and colleges to purchase them. The Secretary of State at the time, Charles Clarke, said in 2004 that every school in the future would have an interactive whiteboard (Arnott, 2004). By 2009, the initiative had largely succeeded, as 81 per cent of FE colleges had adopted them *(Becta, 2009: p. 43).*

> Whiteboards in the right circumstances and in the right hands can be used very effectively

However, a number of evaluations found that many teachers used interactive whiteboards in the same way as they had used traditional whiteboards and chalkboards – to present information – and that they did not significantly improve results. An early evaluation conducted by researchers at the IoE in London even found that there was a negative impact on results in maths and science at Key Stage 4 (Moss *et al*., 2007). That is, learners who had been taught using interactive whiteboards achieved lower grades than learners who had been taught without the interactive whiteboards. Subsequent studies found that they did improve results (Somekh *et al*. for Becta, 2007), but, as with much use of digital technology, the decision to use the technology was made because policy-makers and educators thought it might be useful, not because they had evidence to show that it was useful.

In consequence, interactive whiteboards have a rather chequered history, and in many colleges they have fallen into disuse. Yet in the right circumstances and in the right hands they are used very effectively. Reading College has found its interactive whiteboards particularly useful for working with those with learning disabilities or difficulties – LDD learners. A teacher said:

FOR TEACHERS AND COLLEGES, "LOCAL SMALL-SCALE TECHNOLOGY INNOVATION" CAN BE WELL THOUGHT THROUGH, AND MAY BE A PRAGMATIC RESPONSE TO RAPID TECHNOLOGICAL CHANGE.

> *Other departments weren't using them, and it was suggested that they be sent to us. We have incorporated them into lessons, with learners matching words, putting things in the right order, whether words/sentences or numbers. We have found that our learners respond more in lessons when we use [them]. We can also edit response and record feedback. This has been useful when we videoed a day when learners prepared their own lunch – it is much easier and more practical for the learners to do this than to write about what they are doing. The interactive whiteboards mostly came to us from other departments, and it was thanks to [the] IT [department] that we received them.*

The case of interactive whiteboards shows the importance of co-design with teachers to ensure that technologies can be incorporated into existing pedagogy. Also, both technology and pedagogy will change over time: the application of digital technologies will need refining and may suit different groups as their circumstances change.
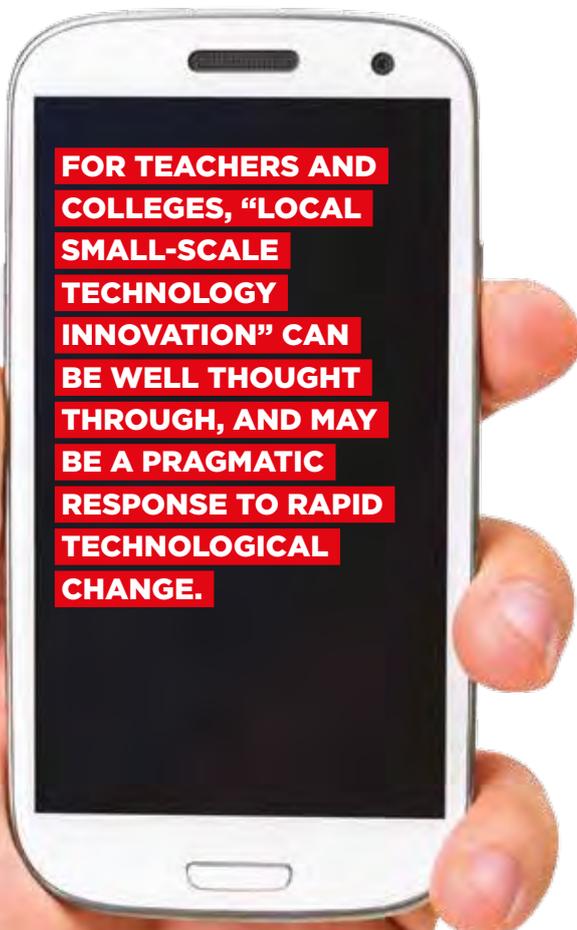
3.2 ENGAGING LEARNERS AND TEACHERS

In the UK and internationally we are part of an increasingly tech-savvy population. Nonetheless, teachers may not feel they have a licence to experiment, and colleges may not give them adequate support to do so. In a review of practices across 102 colleges in 2009, Pittard (for Becta) found that leadership and innovation in technology was the biggest area of concern:

> "Even the most advanced colleges were conscious that they might not be at the leading edge of using technology with learners. They also felt that they did not adequately reward staff leading technology developments."

(Becta, 2009: p. 31)

The same review found that in adult and community learning providers, there were further barriers:

> "Even where the majority of the infrastructure and software investment has been made, the effective engagement of staff to use this technology remains a challenge."

(Becta, 2009: p.33)

This highlights the importance of colleges and staff engaging with each other, as well as with learners, to effectively adopt technology.

3.2.1 BUILDING CONFIDENCE

Some learners and some teachers may need specific training to support their digital literacy so that they can use technology for learning. In the UK, recent surveys have found that all age groups struggle with "digital literacy" of various kinds, and that 21 per cent of adults "never" use the internet (BBC Marketing & Audiences, 2012). Adults in this group are also likely to be the same cohort who are in need of lifelong learning opportunities, as half (50 per cent) of those who did not use the internet did not have a formal qualification.

Rebbeck and Garnett (2012) also comment that the teacher's confidence to use technology is affected by the "e-maturity" of the organisation that they work in, e.g. to what extent the college prioritises technology use and makes technologies available to their staff. At Reading College, a teacher commented that:

TECHNOLOGY CAN BE SEEN AS A RISKY DISTRACTION, RATHER THAN A SUPPORT TO LEARNING.

When the move towards digital technology began nearly two years ago, the IT department struggled to ensure wifi access, and many draconian perspectives on IT in classrooms held, so there was no access to YouTube, Facebook, etc. The implications of allowing access to all these types of social media was challenging both for the IT department and the teachers.

One aspect of the challenge here is that technology can be seen as a risky distraction, rather than a support to learning. There is some evidence to support this view. For example, a recent survey in the United States covering almost 780 students across six colleges and universities found that over 90 per cent admitted using digital devices for non-class activities during class times. The majority (58 per cent) did so at least four times per day, and some (15 per cent) did so more than 30 times per day (Jaschik, 2013). However, the study also found that although the most common use of digital devices was for texting (86 per cent), 49 per cent reported using their devices for related class work.

Reading College's experience has been that as the college encourages the use of technology for learning, most students conform to use it in this way:

The college had previously had a policy of no phones in the workshop, and the use of digital technologies meant teachers have had to be much more liberal about the use of phones by learners. Now, 80-90 per cent of the learners are using their phones correctly within the lessons. Many young people also view the demonstrations on YouTube during the lesson to help them decide what action to take next. They do this mostly on their phones or on the three iPads in the workshop. The teachers also plan for demonstrations or other useful video or presentations to be shown on a large TV so all the young people can access the most relevant information during the session.

College-level leadership on technology is evidently needed to enable this. Teachers also need to take the lead in using technology, as many learners are unlikely to take the initiative in this respect. Rebbeck and Garnett undertook action research with teachers in 2012, and concluded that confidence is crucial to whether teachers take a lead in "owning" technology use in this way, and making it more effective for education. They conclude that: "Teachers who are confident about using technology in their private lives are curious about how they can use that in teaching practice." (Rebbeck & Garnett, 2012) The change for teachers, particularly those who are less confident using digital technologies, has created issues with understanding things like the implication of file sizes. In the context of teachers having the space to try things out, there is clearly a role for IT departments to support teachers to make content available for their learners in an accessible way, particularly if they will be accessed on mobile devices.

DID YOU KNOW...

UK recent surveys found that all age groups struggle with "digital literacy", 21 per cent of adults "never" use the internet (BBC Marketing & Audiences, 2012).

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

29
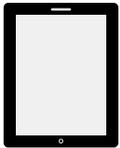
3.2.2 A DIGITAL DIVIDE?

In 2001, American writer and speaker Mark Prensky argued that:

> "The single biggest problem facing education today is that our digital immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language."

(Prensky, 2001. Cited in Ingle & Duckworth, 2013)

In this concept of digital natives and digital immigrants, the younger generation – broadly defined as those born after 1980 and termed "digital natives" – was seen as much more comfortable with new technology compared to the older generation, termed "digital immigrants". This was seen as posing a barrier particularly for working with younger learners, and attracting and motivating them with up-to-date technology.

Recent reviews have tended to take a more nuanced view of who is a "digital native" and who isn't, and where the divide really lies. Although digital literacy undoubtedly needs to be addressed, there are very few people who, having access to technology, are not familiar with some aspect of its use. In vocational and lifelong learning, it may be better to consider what tools people are "native" with and which ones are unfamiliar to them, and most importantly to consider whether their skills are appropriate to work.

3.2.3 VIRTUAL LEARNING ENVIRONMENTS

For example, virtual learning environments (VLEs) are used in schools and colleges to share course materials and other relevant documents online. Research in 2012, supported by Ofsted, surveyed learners primarily in FE colleges and found that one-third (33 per cent) of those that used a VLE said that they only used it because they were instructed to do so by their teacher. However, having been encouraged to use it, learners showed substantial demand: almost half (49 per cent) thought the VLE was essential to their course, two-thirds (67 per cent) used it "to help extend what was covered in the classroom", and 61 per cent thought that it increased their chances of completing the course. (Woodwark, 2012)

Similarly, in our visit to Reading College we found that among teachers the use of Moodle as a VLE is ubiquitous, but the carpentry teacher commented that students at lower levels need strong encouragement to use it.

The level 3 learners tend to use Moodle more as they are used to it after three years, but it is more difficult to encourage the level 1 learners to use it. The aim is for all young people to be on Moodle over the year, and the teacher can check whether they have been on it and what they have accessed.

From these anecdotes it is clear that learners' "native" approach to technology is very likely to differ from what they're offered for learning and for work. The technology used by teachers, such as the college Moodle, is often specific to that college rather than being the same as what learners use socially and in their day-to-day lives. The quality of VLEs varies a great deal: they may be designed primarily for teachers, making them less user-friendly for learners. A college should not be considered to have "gone digital" simply because it has a Moodle, as this is only one option of many.

3.2.4 FINDING THE LEARNER

Some teachers prefer to seek out learners on social media platforms that they already use. At Bridgend College in Wales, teachers set up education forums on Facebook and Twitter, after they found that the college's VLE was "not always effective" for reaching students.

"The students weren't using [the VLE], they didn't live there and they weren't checking it regularly. We decided that instead of forcing the students to come to us, we would go to them."

(Adam Richards from Bridgend College, as quoted by FE Week, 2013)

Having found and engaged their learners in new technology, a further consideration is how to use it to meet learners' professional needs.

MOODLE ALLOWS THE TEACHER TO CHECK WHETHER STUDENTS HAVE BEEN ON IT AND WHAT THEY HAVE ACCESSED

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

31

"THE INCLUSION OF ICT IN THE WORKPLACE AND AS A MEDIUM TO FIND AND DO WORK POSES CHALLENGES TO OLDER WORKERS OR THOSE WHO ARE NOT 'DIGITALLY LITERATE'."

(Raja, Imaizumi, Kelly, Narimatsu & Paradi-Guilford, 2013)

3.3 EMPLOYMENT

In the European Union over the past decade, policy-makers have increasingly been interested to boost people's professional ICT skills to fill perceived skills gaps in industry. For example, an initiative launched by the European Commission in 2012, titled "opening up education through technologies", aims to support the use of ICT in teaching and learning across Europe. At the launch of the initiative, Androulla Vassiliou (the European Commissioner for Education, Culture, Multilingualism, Sport, Media and Youth) commented:

> "Entire economic sectors, professions, institutions – perhaps even ways of life – are challenged by phenomena like Internet file-sharing, social networking, open access or open source. [This] changes the nature of the skills and competences which education must impart to learners; and it challenges us to harness its power to deliver better ways of teaching and learning. On both dimensions, education and training systems are lagging behind."

(Vassiliou, 2012)

A World Bank working paper on how ICT could help expand employment opportunities, aimed at policy-makers worldwide, similarly emphasises the importance of addressing people's weaknesses so that they aren't at a disadvantage in the job market: "The inclusion of ICT in the workplace and as a medium to find and do work poses challenges to older workers or those who are not 'digitally literate'." (Raja, Imaizumi, Kelly, Narimatsu & Paradi-Guilford, 2013)

Concerns about digital literacy are readily borne out in the UK. For example a recent survey by The Prince's Trust found that even among young people aged 15 to 25, for whom access to computers and the internet is almost total, 12 per cent did not think their computer skills were good enough to use in the job that they want (Prince's Trust, 2013).

3.3.1 STAYING CONNECTED

New technology is also highly relevant with regard to finding new jobs and opportunities. A market research survey of 30,000 graduates, students and early career professionals carried out in 2010/11 suggests that most would like contact with employers online, and that most thought that LinkedIn would be the most appropriate platform, with 48 per cent selecting it as "a place to interact with employers". Employers in the research tended to agree, commenting that LinkedIn and other business networks are appropriate for recruitment purposes. Nonetheless, far fewer of the survey respondents had a LinkedIn profile that they updated regularly, compared to a Facebook account (Potentialpark, 2011). Improving learners' "social media literacy" might tackle some of their reservations about being more visible to recruiters online.

DID YOU KNOW...

Graduates, students and early career professionals thought that LinkedIn would be the most appropriate platform to contact employees online.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

33
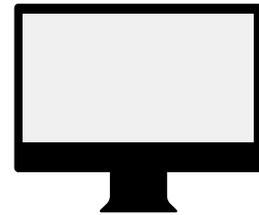
Staying connected through technology can also build a social context for young people to form ideas and aspirations, as their sense of their own future is formed by reference to those they have contact with. According to Bourdieu, social capital built through these relationships is likely to affect young people's life chances (Bourdieu, 2010. Cited in Archer, DeWitt & Wong, 2013: p. 3).

3.3.2 INDUSTRY CURRENCY

When preparing learners for employment, the common conclusion of many studies and commentators is that technology changes very quickly. But just as with other elements of vocational education and training, education and training providers are expected to remain up to date with what employers need.

Research on how to develop "industry currency" (training that is up to date with industry) by the National Centre for Vocational Education Research in Australia offers some reassurance. The researchers spoke to industry experts, employers and associations across three sectors (hairdressing, plumbing and printing). They found that all employers stressed that training should be relevant to industry. Many also recognised that technology is a substantial aspect of change in the workplace, particularly in printing and plumbing. However many also thought it would not be practical for training providers to stay entirely current with a range of different employers' practices.

Employers' main expectations of training providers were that they should prepare students in the "fundamentals" of the industry, and that they should attend to industries' regulatory requirements. They commented that the remainder of industry currency can be developed through placements and work-based training. (Clayton, Jonas, Harding, Harris & Toze, 2013)

Obtaining work placements for learners in the area in which they plan to work, with leading-edge employers, would solve a large part of the battle to prove that they are current with industry. Securing and supporting such placements is not always possible for all vocational learners though, so simulations of workplace tasks and classroom assignments using technology can fill a gap in this regard, and could even be more advanced than what employers currently use. As industry standards often give no long-lasting guidance, however, education and training providers should do more than simply train learners in digital hardware or software. They should also prepare trainees to be digitally literate and adaptable.

At Reading College, a CPD leader commented on the need to "be brave" and lead the way in professionalising learners' use of ICT. With regard to the internet, for example, they referenced the college's use of Google Communities as a means of professionalising students.

The internet is going to be a major part of our learners' experiences of working life, so as teachers we need to be brave and take that leap to start using digital technologies in the classroom or the workshop. In providing comments and feedback on other learners' work [on Google Communities], it was really important for me as their teacher to set the right tone. All these young people use the internet, but social media literacy from a professional perspective is quite a different skill.

EDUCATION AND TRAINING PROVIDERS SHOULD DO MORE THAN SIMPLY TRAIN LEARNERS IN DIGITAL HARDWARE OR SOFTWARE. THEY SHOULD ALSO PREPARE TRAINEES TO BE DIGITALLY LITERATE AND ADAPTABLE.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

35

Although in the UK digital divides in terms of access to technology are much reduced, vocational teachers and colleges are still finding differences and complementarities between professional uses of digital technology and learners' personal experience of using it.

3.4 COST

In addition to expectations of greater personalisation, engagement, support for practical experience, and ease of monitoring and assessment, another common motivation for technology use in teaching and learning is to reduce the cost of delivering education over the long term. In the European Commission's study of motivations for technology use in 2005, many respondents "stressed the possibility of increasing the number of students without having to boost the number of teaching hours" (EU Commission, DG Education & Culture, 2005: p. 37). This has most recently manifested itself in widespread discussion of the disruptive potential of "MOOCs", as we examine below.

3.4.1 THE MOOCS' MOMENT

There is no doubt that digital technology has helped to enrich the development of distance learning. Massively open online courses (MOOCs) have gained a great deal of attention as a new form of low-cost, distance education. MOOCs have included demanding courses, such as a Massachusetts Institute of Technology (MIT) course in circuit electronics, which have been offered for free access online. Lectures are delivered by video, and learners' knowledge and skills are assessed through quiz type assessments, with some peer support on discussion forums. Although the courses do not result in formal accreditation, there is some common acknowledgment at the end, in the form of a certificate that marks the achievement.

Many of the tools and approaches employed in MOOCs are not new. However, they have gained popularity and media interest. Enrolment or viewing rates have been very high. This may be due to the reputation of their host institutions, the fact that the resources are offered as a course package with dedicated assignments and that most have not charged a fee. It should be recognised though that fewer than 10 per cent of the people who register for a MOOC will complete the course. A summary by the UK's Open University of the recent expansion in MOOCs concluded that:

> "[Using MOOCs] works best for people who can cope with the challenge, but not necessarily for those who need support. ... Ways need to be found to support less experienced students and those lacking confidence. ... These pedagogies [could] include materials designed to provide an integrated learning experience, feedback that is customised to meet learner needs, and direct mentoring of learners in difficulties. Some of these are hard to supply in a cost-free model."
>
> *(Sharples et al., 2013)*

As the FE sector takes up such models – as it is expected to some extent it will – limitations and opportunities should both be recognised. MOOCs currently do not provide an "integrated learning experience" with fully customised feedback, so investment will need to continue to be made to support mentoring or coaching of learners. Equally, commentary by enthusiasts such as Donald Clark (http://donaldclarkplanb.blogspot.co.uk/) suggests that MOOCs can bring engagement and new income for teachers and institutions. Clark suggests twenty options for funding and monetising MOOCs, such as certification, donations, fees for proctored assessment on completion of a course, and advertising revenues (Clark, 2013).

As Laurillard (2013) notes, it should be recognised that technology does not always reduce the demands on teachers' time. She finds that: "As long as there are still teaching activities related to each student, such as individual supervision, guidance, feedback, marking etc., [digital technologies] cannot achieve economies of scale." Use of some models such as the "flipped classroom" can also require lengthy preparation time, if the teacher or trainer prepares their own videos for students to watch outside of class time.

3.4.2 NEW AUTOMATION

The key to reducing time-related costs through technology is to use it to automate or speed up elements of teaching activities. A blog on "cloud tutoring" (Ness, 2012) is informative in this regard. The author offers sound-mimicry tutoring online for people learning to speak a new language. The tutor assigns speaking tasks in which mistakes can be easily anticipated and then offers pre-recorded guidance to correct these common mistakes. The tutor boasts that "the automation systems I've established allow me to go through submissions faster than a robot in an assembly line", and argues that this has

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

37

saved significant time and money without compromising the progress that learners make. However, when a learner has more unique misconceptions, or requires more support than a simple correction or a set of instructions, automated feedback is not so much use. Ness comments that: "Nothing will help you along your learning goals quite like the support of another human being whom you trust and respect for their expertise." (Ibid.)

In this cloud tutoring example, technology was an apt solution to the teacher's concerns. He was already coaching learners on a one-to-one basis over the internet and adopted free online software to speed up their formative assessment process. Colleges will have other start-up costs to bear in mind, in terms of embedding the collective use of particular hardware or software, and training and supported to own the process. Nonetheless, there has been a large increase in free and open-source software and learning materials in recent years, and teachers would be well-advised to use it.

3.4.3 MANAGING CHANGE

A review of education technology interventions in affordable private schools in India highlights the application of technology as the first hurdle to making a good investment – staff and learners need to be using technology properly (Campbell, Mehr & Mayer, 2013: p. 7). The review also highlights the need for consistency, cultural adaptation, and allowing sufficient space and time to make the change. It sets out the following problems to look out for:

- Firstly, there may be knowledge gaps among staff that leads to "underutilisation" of the technology provided.

   > "Clear learning goals for technology in the classroom [may not be] established, and rather than focusing on highly marketable computer literacy skills, students use technology in less impactful ways."

   Campbell et al., 2013: p. 7)

- Secondly there may be a lack of long-term investment:

   > "Inconsistent cash flow [makes] it difficult to maintain and maximize the use of ed-tech tools."

   Campbell et al., 2013: p. 7)

   Such limitations are bound to be common in developing countries that lack investment in education. However, they may also be a constraint in the UK currently, where Laurillard notes: "There is likely to be very little investment [to support] innovation."

   (2013: p. 15)
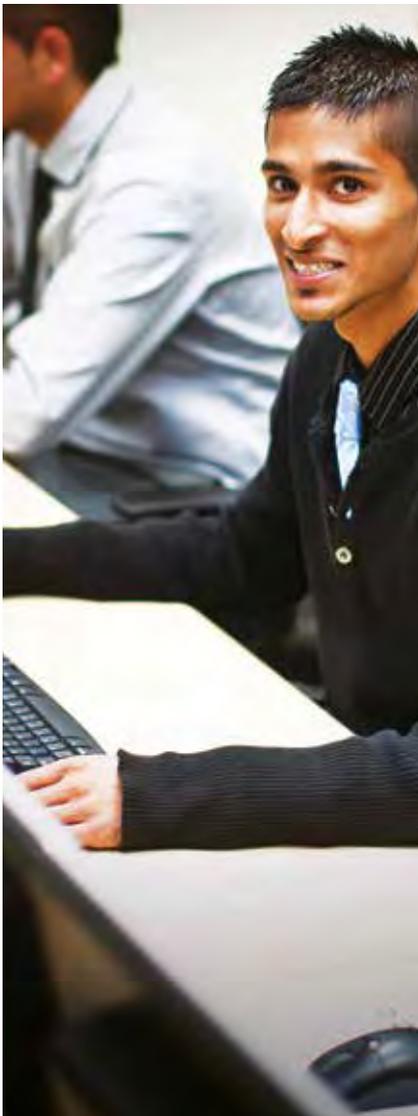
- Thirdly, there can be cultural barriers or misconceptions, in which the use of new technology in teaching and learning is not actually prioritised.

> "Some school leaders view technology as a marketing tool to be preserved rather than an educational tool to be used. There is also a reluctance to try new devices with students which might challenge a teacher's authority as 'the expert in the room'."
>
> *(Campbell et al., 2013: p. 7)*

- Fourthly, there are also logistical challenges such as lack of sufficient space and time to make the changes.

> "Some schools have limited infrastructure and place many academic demands on students. They may have trouble finding a physical room, or adequate time to dedicate solely to the use and adoption of new technology."
>
> *(Campbell et al., 2013: p. 7)*

For colleges, organisational and logistical challenges should be addressed and minimised, as they can prevent significant improvements in the type of technology available, its adoption and its use.

3.4.4 FINDING THE BENEFITS

When making investment decisions, teachers and colleges adopt new technology due to a range of perceived benefits. Cost savings are often not the main consideration here, and nor should they be, as there are other outcomes to consider. The primary benefit should be that learning is enhanced. It's clear that for colleges and teachers, achieving this is about more than just the tools.

In the United States, which is ahead of many countries in terms of developing and testing education technology (The Economist, 2013), success seems to depend not just on the potential of the product, but how much time is spent to embed it. New technology does not offer a quick fix in improving the pace and confidence of learning, compared to what went before (Falk, 2012).

DID YOU KNOW...

"Nothing will help you along your learning goals quite like the support of another human being whom you trust and respect for their expertise." (Ibid.)
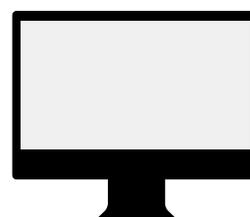
Empirical studies have shown some effectiveness of certain maths training programmes, such as assessments that encourage students to drill and practise (Best Evidence Encyclopedia, 2013). However, in a wide-scale trial of software for literacy and for maths learning across a range of schools and a range of year groups, in the first year the study found no significant improvement in learners' test scores for all 10 products, whereas in the second year one maths product led to significant improvements. (Campuzano, Dynarski, Agodini, Rall & Pendleton, 2009)

For education institutions weighing up their costs, it is clear that the expected benefit of technology needs to be considered against other issues that have an influence on the college's success. In 2011, The New York Times published a series of articles on "grading the digital school", which highlight the extent to which technology investments can compete with other spending, such as staff costs. Out of four US schools featured in the articles, only one school was highlighted as potentially improving its assessment scores due to its investment in technology (Schwarz, 2013).

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

39

CHAPTER 4:
CONCLUSIONS

DID YOU KNOW...

Reading College promotes a culture of experimentation with technology at all levels which helps to develop real innovation.

This think-piece aims to highlight some potential issues and areas of discussion around motivations for using digital technologies in the classroom, and in that context these conclusions are suggestions based on the primary and secondary research we have conducted so far. We plan to complete further research with more colleges and private training providers, interviewing a range of teachers, learners and experts.

Our research suggests a few success factors in using digital technologies as well as some areas for further research. The success factors include: the need to develop a culture of experimentation to allow teachers to start small with technology; changing the role of the teacher to focus on coaching; and co-production of digital materials between teachers and technologists, all taking account of the different challenges faced by different vocational areas.

4.1 CULTURE OF EXPERIMENTATION

From our interviews with staff at Reading College, it was clear that the college promotes a culture of experimentation with technology at all levels. As long as software is free or low cost, the college is happy for staff to use it. By avoiding high-cost software, there is less financial risk associated with trying it out, and teachers can feel more comfortable with making a change if they find something better. There are certainly things to consider within the use of digital technologies including how much young people want to use technologies for learning, how much data is then stored by outside agencies (like Google) and the relevance of the technology for the particular vocational area, before starting to think about the pedagogy. It can be difficult to consider these and how they might work in practice without being able to "dip your toe in the water", so a culture of experimentation helps to develop real innovation.

While a culture of experimentation – much like a culture that prioritises teaching, learning and research – is important, it does need some parameters. At Reading College, they have achieved this through providing specific kinds of hardware, eg iPads, and an enabling infrastructure such as a
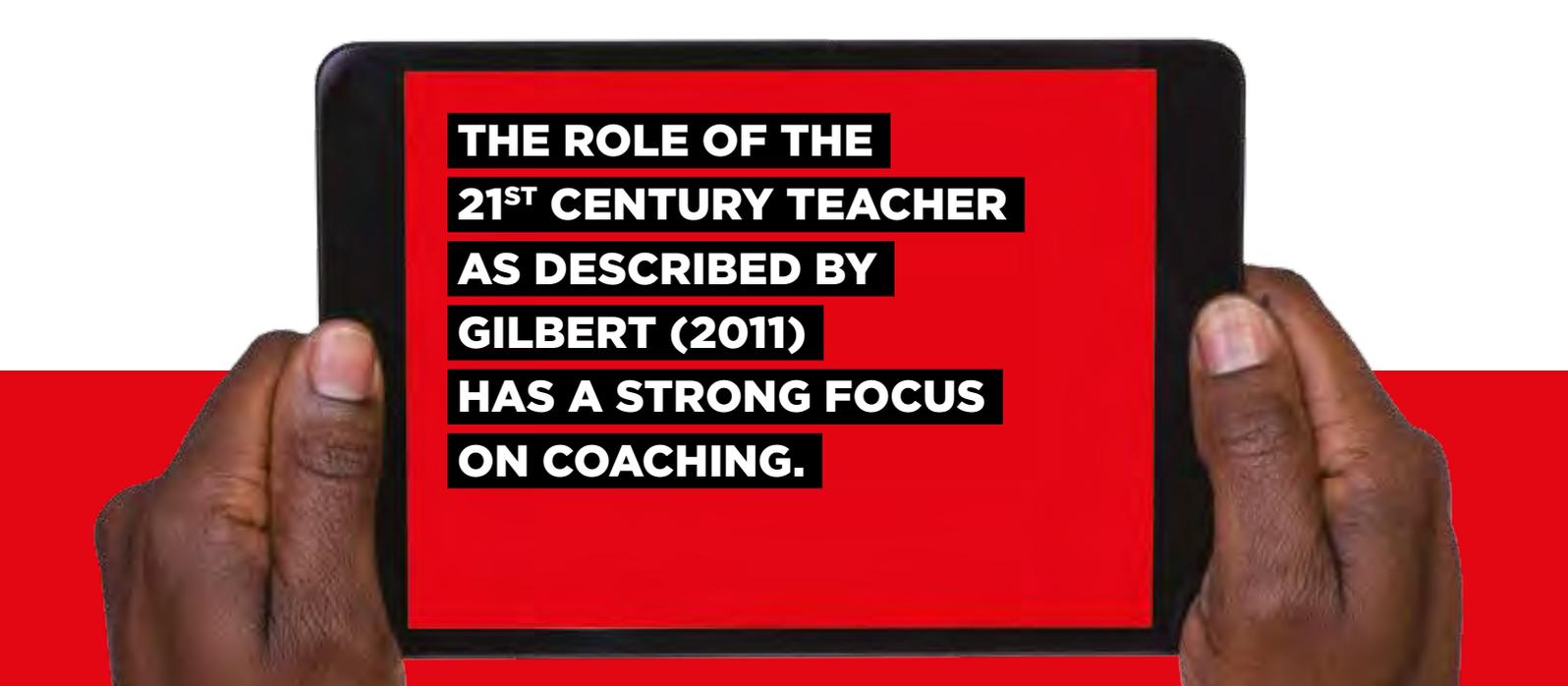
THE ROLE OF THE 21ST CENTURY TEACHER AS DESCRIBED BY GILBERT (2011) HAS A STRONG FOCUS ON COACHING.

wireless connection and removing blocks on Facebook and YouTube. There is already a VLE in the form of a Moodle, as in most other colleges, so there is something to start from for the less confident. They have also focused on training through CPD to support teachers in using the internet, finding tools and using them with learners. This is being done through a peer-learning approach, and has started to break down departmental silos so that teachers from different departments are sharing good practice.

The culture of experimentation relies on both enthusiasm and willingness by departmental heads and frontline staff and leadership from the senior management team to enable and support staff who are experimenting. Without both of these elements it would be very difficult to create a culture of experimentation. If the staff were not enthusiastic or interested in experimenting, the culture could not be imposed upon them without significant resentment. Equally, if the staff were interested in experimenting with digital technologies and senior leaders failed to put in place the hardware or the time to make it possible, it would be restricted to a very small number of teachers.

4.2 CHANGING ROLE OF THE TEACHER

As with other technological developments in the past, most of the initial digital technologies, and indeed many of the current ones, focus on replacing the "instruction" part of a teacher's role. That means a lot of video/audio content or presentations either explaining or demonstrating how to do something. Replacing this "instruction" element of the role of the teacher means that the teacher has more time to be the "expert in the room", as well as providing guidance on evaluating and being more critical about the amount of information learners are faced with. This role of the 21st century teacher as described by Gilbert (2011) has a strong focus on coaching. It relies on the teacher being an expert in their vocational area, as well as an expert in pedagogy, and using different tools for learning, digital and otherwise. This is the notion of the "dual professional" that is common in FE and is a particular campaigning area for the Institute for Learning (IfL). These changes

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

41

to reduce the instruction completed in the lesson will bring new demands to teaching, with more preparation and planning to devise clear learning pathways personalised for learners that they are able to engage with more than has previously been the case. It also involves spending more "quality" time with each learner – coaching them rather than repeating instructions. Teaching young people to critically evaluate information in front of them is a touch challenge. They should be able to recall and retain as much knowledge as before, but also know which sources to trust and which to question. Finally, that understanding should also be apparent in their practical skills. Once learners reach a certain level, they should be able to become more self-directed, but they can only achieve this from a basis of foundational knowledge and understanding. They should also still have an expert to turn to when things go wrong. The notion of facilitated learning is not new, coming originally from the renowned educationalist Carl Rogers almost half a century ago (Rogers, 1968), but is particularly apt in the 21st century, the digital age.

4.3 CO-PRODUCTION OF DIGITAL MATERIALS

One of the main reasons for the failure of previous technological initiatives in education is that they were designed to meet the requirements of policy-makers, but do not meet the needs of teachers and learners. Teachers will only use resources consistently, whether digital or not, which they believe meet the needs of their learners. Many resources which are not appropriately designed may be used in the short term, but will not be used consistently over years if they do not support the teacher. Co-production of materials ensures that the digital resources available are useful to teachers and instil a clear pedagogy.

4.4 RECOMMENDATIONS

This think-piece considers how teachers can use technology to improve teaching and learning in terms of their approach, the infrastructure needed, and the motivations of all concerned. We have developed recommendations targeted at different groups, to enable teachers to use technologies to support teaching and learning.

Policy-makers should consider language when discussing the use of digital technologies. The "digital revolution" does not help those who are considering how to start using digital technologies – it merely highlights how little they know at the moment. The crucial difference that digital technologies can make is to improve the quality of teaching and learning by being used in an appropriate way by a teacher, not by being a digital technology.

Senior leaders in colleges and training providers should consider the benefit they will accrue from enabling teachers to have the time and flexibility to consider and adapt digital technologies for their own use. Clearly some elements are fixed, particularly around the infrastructure and potentially the platform, but allowing teachers to experiment, test and then share effective ways of using digital technologies will spread good practice more easily than if it is imposed on staff.

Teachers are clearly key to the effective use of digital technologies in teaching and learning, so they need to start using them, albeit at their own pace and in a way that will make them most comfortable. Reflecting on their own pedagogy, and considering how to incorporate or adapt digital technologies to best fit with that pedagogy, is an important role for teachers. They need the time and the encouragement to do this, as mentioned above, as well as the peer support and sharing of links.

All these notions combine in the words of one teacher at Reading College:

> *Teachers also started to come up with more ideas about how to use technology in lessons. The whole ethos of using technology is to tailor the technology to how the teachers want to use it. There is more cross-college collaboration because of technology than there was before, and it's great to share our good practice and learn from others.*

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

43

REFERENCES

Arnott, S. (2004). Computers to replace school blackboards. *Computing*, 9 August 2004. [Online] Available from: **http://www.computing.co.uk/ctg/news/1860992/computers-replace-school-blackboards**. [Accessed: October 2013]

BBC Marketing & Audiences (2012). Media Literacy: *Understanding Digital Capabilities.* [Online] Available from: **http://www.bbc.co.uk/learning/overview/research.shtml**. [Accessed: October 2013]

Becta (2009). *Harnessing Technology Review 2009: The role of technology in education and skills,* November 2009. [Online] Available from: **http://dera.ioe.ac.uk/1422/1/becta_2009_htreview_report.pdf**. [Accessed: October 2013]

Best Evidence Encyclopedia (2013). *Mathematics / Effectiveness of Technology.* [Online] Available from: **http://www.bestevidence.org/math/tech/tech_math.htm**. [Accessed: October 2013]

Bourdieu, P. (2010). *Sociology is a Martial Art.* New York: New York Press. Referenced in Archer, L., DeWitt, J. & Wong, B. (2013). Spheres of influence: what shapes young people's aspirations at 12/13 and what are the implications for education policy? *Journal of Education Policy.* [Online] Available from: DOI: 10.1080/02680939.2013.790079. [Accessed: October 2013]

Brown, A. (2012). Nurturing mastery of high level vocational practice through coaching. In City & Guilds Centre for Skills Development. *Insights no. 1: The role of coaching in vocational education and training.* [Online] London: City and Guilds of London Institute, pp. 72-97. Available from: **http://www.skillsdevelopment.org/PDF/Insights-the-role-of-coaching-in-vocational-education.pdf**. [Accessed: October 2013]

Campbell, K., Mehr, H. & Mayer, B. (2013). *Education Technology in India: Designing Ed-Tech for Affordable Private Schools.* [Online: pdf] Ed-Tech India. Available from: **http://edtechindia.wordpress.com/2013/04/03/report-release-education-technology-in-india-designing-ed-tech-for-affordable-private-schools/**. [Accessed: October 2013]

Campuzano, L., Dynarski, M., Agodini, R., Rall, K. & Pendleton, A. (2009). *Effectiveness of Reading and Mathematics Software Products: Findings From Two Student Cohorts, Executive Summary.* [Online] US Department of Education: Institute of Education Sciences. Available from: **http://ies.ed.gov/ncee/pubs/20094041/pdf/20094042.pdf**. [Accessed: October 2013]

Clark, D. (2013). MOOCS: 20 ways to monetise. *Donald Clark Plan B.* [Online: blog] Available from: **http://donaldclarkplanb.blogspot.co.uk/2013/06/20-ways-to-monetise-moocss.html**. [Accessed: October 2013]

Clayton, B., Jonas, P., Harding, R., Harris, M. & Toze, M. (2013). *Industry currency and professional obsolescence: what can industry tell us?* [Online: pdf] Adelaide: NCVER. Available from: **http://www.ncver.edu.au/publications/2622.html**. [Accessed: October 2013]

Collett, K. (2012). What is coaching? In City & Guilds Centre for Skills Development. *Insights no. 1: The role of coaching in vocational education and training.* [Online] London: City and Guilds of London Institute, pp. 8-19. Available from: **http://www.skillsdevelopment.org/PDF/Insights-the-role-of-coaching-in-vocational-education.pdf**. [Accessed: October 2013]

Collins, A. & Halverson, R. (2009). *Rethinking Education in the Age of Technology: The Digital Revolution and Schooling in America.* New York: Teachers College Press.

Cuban, L. (1986). *Teachers and Machines: The Classroom Use of Technology Since 1920.* New York: Teachers College Press.

Dewey, J. (1938). *Experience & Education.* USA: Kappa Delta Pi. Available from: **http://www.schoolofeducators.com/wp-content/uploads/2011/12/EXPERIENCE-EDUCATION-JOHN-DEWEY.pdf**. [Accessed: October 2013]

Educause Learning Initiative (2012). *7 Things You Should Know About™ … Flipped Classrooms.* [Online] Available from: **https://net.educause.edu/ir/library/pdf/ELI7081.pdf**. [Accessed: October 2013]

Ely, D. P. (1999). *New Perspectives on the Implementation of Education Technology Innovations.* [Online: pdf] ERIC/Institute of Education Sciences. Available from: **http://eric.ed.gov/?id=ED427775**. [Accessed: October 2013]

European Commission (2013). *Commission Staff Working Document: Analysis and mapping of innovative teaching and learning for all through new Technologies and Open Educational Resources in Europe.* [Online] Available from: **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2013:0341:FIN:EN:PDF**. [Accessed: October 2013]

EU Commission, DG Education & Culture (2005). *The use of ICT for learning and teaching in initial Vocational Education and Training,* November 2005. [Online] Available from: **http://ec.europa.eu/education/archive/elearning/doc/studies/ict_in_vocational_en.pdf**. [Accessed: October 2013]

European Schoolnet & University of Liège (2013). *Survey of Schools: ICT in education.* [Online] Available from: **http://www.eun.org/observatory/surveyofschools/**. [Accessed: October 2013]

Falk, A. (2012). Technology in Education: Revolution or Evolution. [Speech] The Future of Liberal Arts Conference, Lafayette College, 10 April 2012. Available from: **https://tle.wisc.edu/tleblogs/jhenriqu/technology-education-revolution-or-evolution**. [Accessed: October 2013]

FE Week (2013). Learning and social media. [Article] *Technology in FE and Skills supplement,* 13 September 2013. Available from: **http://lsect.co.uk/Tech-supplement-2013.pdf**. [Accessed: October 2013]

Gilbert, I. (2011). *Why Do I Need a Teacher When I've got Google?: The Essential Guide to the Big Issues for Every 21st Century Teacher*. Oxford, UK: Routledge.

Hancock, M. (2013). *Speech by Matthew Hancock to Ofsted Her Majesty's Inspectors*. 5 September 2013. Available from: **https://www.gov.uk/government/speeches/ofsted-conference-2013** [Accessed: October 2013]

Ingle, S. & Duckworth, V. (2013). *Enhancing learning through technology in lifelong learning.* UK: Open University Press.

Jameson, J. (2012). Coaching as a pedagogical approach. In City & Guilds Centre for Skills Development. *Insights no. 1: The role of coaching in vocational education and training.* [Online] London: City and Guilds of London Institute, pp. 50-71. Available from: **http://www.skillsdevelopment.org/PDF/Insights-the-role-of-coaching-in-vocational-education.pdf**. [Accessed: October 2013]

Jaschik, S. (2013). Texting in class. Inside Higher Ed, 21 October 2013. [Online] Available from: **http://www.insidehighered.com/news/2013/10/21/study-documents-how-much-students-text-during-class#ixzz2iSRVj7U4**. [Accessed: October 2013]

Laurillard, D. (2013). Technology as a driver and enabler of adult vocational teaching and learning: Briefing to the Commission on Adult Vocational Teaching and Learning. [Online] London Knowledge Lab, Institute of Education. Available from: **http://www.excellencegateway.org.uk/node/26515**. [Accessed: October 2013]

London Knowledge Lab (2013). *The Potential to Coordinate Digital Simulations for UK-wide VET.* [Online] University of London: Institute of Education. Available from: **http://www.lkl.ac.uk/cms/files/jce/cavtl_digital_simulations_report_120713.pdf**. [Accessed: October 2013]

Lucas, B., Spencer, E. & Claxton, G. (2013). *How to teach vocational education: A theory of vocational pedagogy.* [Online] City & Guilds Centre for Skills Development. Available from: **http://www.skillsdevelopment.org/PDF/How-to-teach-vocational-education.pdf**. [Accessed: October 2013]

McLoughlin, F. (2013). It's about work… excellent adult vocational teaching and learning. [Presentation] *Launch of the Commission of Adult Vocational Teaching and Learning,* March 2013.

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

45

Moss, G., Jewitt, C., Levacic, R., Armstrong, V., Cardini, A. & Castle, F. (2007). *An Evaluation of the Schools Whiteboard Expansion (SWE) Project: London Challenge.* [Online] Institute of Education, University of London. Available from: **http://eprints.ioe.ac.uk/905/1/ Moss2007whiteboardsRR816.pdf.** [Accessed: October 2013]

Ness, I. (2012). *Cloud Tutoring.* [Online: blog] Available from: **http://www.fluentin3months.com/cloud-tutoring/**. [Accessed: October 2013]

New York Times, The (2011). Grading the Digital School. [Online: article series] Available from: **http://topics.nytimes.com/top/news/ technology/series/grading_the_digital_school/index.html.** [Accessed: October 2013]

Papert, S. (1984). Trying to predict the future. *Popular Computing,* October 1984. Cited in Cuban, L. (1986). *Teachers and Machines: The Classroom Use of Technology Since 1920*. New York: Teachers College Press, p. 72.

Potentialpark (2011). *Talent interaction: Does Facebook beat LinkedIn?* [Online] Available from: **http://www.potentialpark.com/wp-content/ uploads/2011/12/Potentialpark-Social-Media-Release-Europe.pdf.** [Accessed: October 2013]

Prince's Trust (2013). *Digital Literacy Survey Executive Summary* [Online]. Available from: **http://www.princes-trust.org.uk/pdf/ DIGITAL_LITERACY_2013B.pdf.** [Accessed: September 2013]

Raja, S., Imaizumi, S., Kelly, T., Narimatsu, J. & Paradi-Guilford, C. (2013). *Connecting to work: how information and communication technologies could help expand employment opportunities*. World Bank.

Rebbeck, G. & Garnett, F. (2012). The curious and the confident, technology and teaching 2012. *Inside Evidence 13.* [Online: pdf] LSIS, pp. 21-23. Available from: **http://www.excellencegateway.org.uk/ node/627.** [Accessed: October 2013]

Rogers, C. (1968). *The Interpersonal Relationship in the Facilitation of Learning.* C. E. Merrill Publishing Company.

Rogers, E. M. (2003). *Diffusion of Innovations.* 5th Edition. Free Press.

Schmidt, E. & Cohen, J. (2013). *The New Digital Age: Reshaping the Future of People, Nations and Business.* New York: Knopf.

Schwarz, A. (2013). Mooresville's Shining Example. *The New York Times,* 12 February 2013. [Online] Available from: **http://www. nytimes.com/2012/02/13/education/mooresville-school-district- a-laptop-success-story.html?ref=gradingthedigitalschool&_r=1&.** [Accessed: October 2013]

Sharples, M., McAndrew, P., Weller, M., Ferguson, R., FitzGerald, E., Hirst, T. & Gaved, M. (2013). *Innovating Pedagogy 2013: Open University Innovation Report 2.* [Online] UK: Open University. Available from: **http://www.open.ac.uk/blogs/innovating/.** [Accessed: October 2013]

Slavin, R. E. (2005). Educational implications of Piaget's Theory. *Educational Psychology: Theory and Practice.* Eighth Edition. [Companion Website] Available from: **http://wps.ablongman.com/ab_slavin_edpsych_8/38/9951/2547653.cw/index.html.** [Accessed: October 2013]

Somekh, B., *et al*. for Becta (2007). *Evaluation of the DCSF Primary Schools Whiteboard Expansion Project: Report to the Department for Children, Schools and Families.* Education & Social Research Institute: Manchester Metropolitan University. Available from: **http://webarchive.nationalarchives.gov.uk/20101007150244/http://research.becta.org.uk/upload-dir/downloads/page_documents/research/whiteboards_expansion.pdf.** [Accessed: October 2013]

Stewart, W. (2012). Think you've implemented assessment for learning? *TES*, 13 July 2012. [Online] Available from: **http://www.tes.co.uk/article.aspx?storycode=6261847.** [Accessed: October 2013]

Vassiliou, A. (2012). Opening up Education. [Speech] *European Commission,* 10 December 2012. Available from: **http://europa.eu/rapid/press-release_SPEECH-12-933_en.htm.** [Accessed: October 2013]

William, D. & Black, P. (1999). *Inside the Black Box.* Assessment Reform Group: Nuffield Foundation.

Woodwark, E. (2012). *Report for Ofsted: Virtual Learning Environment Survey,* August 2012. [Online: pdf] Youthsight. Available from: **http://www.ofsted.gov.uk/resources/virtual-learning-environments-e-portfolio.** [Accessed: October 2013]

CULTURE, COACHING AND COLLABORATION
HOW TO UNLOCK THE POTENTIAL OF DIGITAL TECHNOLOGY IN VOCATIONAL TEACHING AND LEARNING

47

Scan to access our report
**How to teach vocational education:
A theory of vocational pedagogy**