Royal Society Submission of Evidence

This submission

is by The Learning Machine Ltd (TLM) an Ofqual accredited Awarding Organisation with qualifications endorsed by e-skills, the Sector Skills Council for ICT

The motivation for setting up TLM was a response to many of the shortcomings now being highlighted in schools ICT. We felt such a crisis was inevitable 5 years ago so we went through the bureaucratic pain of becoming an accredited Awarding Organisation because change was unlikely to come from the highly entrenched incumbents. Our aim is to develop qualifications that encourage lifelong learning for teachers as well as learners with an emphasis on self-sufficiency using digital resources that are freely available from the internet. We want to seed a global digital learning community that can contribute to its own learning resources. This work is subject to two EU Transfer of innovation grants, private sector investment and volunteers. We address the call for evidence from this context.

Evidence for the need for change

Three experiences that illustrate wider points.

1. In 1988 I was a member of the Senior Management Team that set up the first City Technology College, a flagship for the use of IT in UK schools. My remit was science and technology, but I ended up doing a lot of IT, arguably because I understood the basic technological principles that are needed for transferable skills, knowledge and innovation. The CTC had a mixture of Acorn Archimedes computers and IBM PS/2s on a token ring network. The Acorn Machines were less than half the price of the IBMs, had drag and drop, outline fonts and a full multi-tasking graphical user interface. The IBMs were running character based Wordperfect on DOS. We were told that we should concentrate on Wordperfect because it is what the children would use in work. Yes we want children to learn skills and knowledge they will use later and we need some work based contexts to motivate but in terrns of what was to come, the conventional wisdom from industry was dead wrong. We have ended up making a religion of a narrow set of applications that most people only ever use in a superficial way. **There is certainly nothing wrong with vocational education but in the 21st Century it needs to prepare people for change because that is the one certainty in the technological world.**

2. I went on from the CTC to the CTC Trust as Curriculum Director for science and mathematics. Again not IT or technology. I provided the technical support for our team and was constantly ending up treading on other people's toes in the IT field simply because I had technical knowledge. I once filled in for a colleague at a meeting for CTC Principals at Apricot Computers. We had a long session on why schools should be moving to IBM compatible PCs because it was what industry used. When we walked through the plant they had Macs for DTP and an Apollo Unix workstation for designing circuit boards. When I asked why they were not using PCs the answer was that they were a special case. This brings me to my second point. **Furthering particular commercial interest is not the same as preparing children for the world of work.**

3. The last government had a grand plan called Curriculum On-line to get schools to use more IT. This provided schools with e-learning credits that they had to spend on certain approved products. We (the tax payers) ended up spending 500 million on this ambitious scheme. Now let's do a bit of arithmetic. Roughly 1000 hours of teaching time in a year, 11 years at school. So taking out lessons where the use of a computer is inappropriate say 10,000 hours. So we have 500 million to spend on 10,000 hours so 50k on IT support for every hour in the National Curriculum through ages 5-16. What have we to show for it? Coherent planning and consistent support for progression pathways freely

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available from the internet? No, mainly it is a set of disjointed and uncoordinated commercially licensed resources which have reinforced a desktop bound proprietary lock-in when the world is moving to open systems and cloud based technologies. A veritable gravy train maintaining the status quo for the IT supply industry at the expense of learners. What we need is hard-headed commercial competition, not government sponsored robbery of the tax payer that entrenches further lock-in to acknowledged monopoly supply. **Government interference that makes change more difficult is madness. We are paying to make things worse.**

Analysis of the problem

4. What each of these three cases highlights is that technology education is weak at all levels, not just in school. Older people clearly lack the capacity to make informed decisions in the light of the likely consequences and they are all too ready to pass these limitations down to the next generation. Those in positions of power are making bad decisions because they are technically clueless and often influenced by commercial lobbyists who reinforce a view that technical knowledge and skills don't matter. Knowledge is power, so leave it with us. This filters down to teachers who have been constantly told that technical knowledge and skills are for the technicians and beneath them. They employ low skilled technicians and then wonder why complex and expensive local area networks fail. They shouldn't need to know how anything works, in the end the technology will be so user friendly it won't matter. This wishful thinking pervades the curriculum. In physics we no longer contextualise science in up to date technological applications. How does a disc drive work? How does a laser/LED printer work? Getting rid of contexts for learning on the grounds they will go out of date too quickly is throwing the baby out with the bathwater and simply provides excuses for low standards. At a fundamental level digital technologies have not changed very much and the more fundamental the understanding the easier it is to cope with change. Context is what gives learning meaning to most people. It is a key motivator. If this all shows anything it is a need for looking at the whole picture, "helicopter vision", rather than tinkering with specifics like the A level Computing syllabus simply because a particular pressure group thinks it is important.

Solution

5. In dynamics it is no use ignoring air resistance if it has a real effect. Any solution to the schools IT problem has to take into account the current political environment. It has to be achievable without major changes in legislation or additional costs or it simply won't happen. In the words of Lord Rutherford, "Gentlemen, we don't have any money we will have to use our brains". This is why this proposed solution might not be perfect but it is optimised to be possible within the existing constraints.

6. There is no doubt that qualifications are at the top of the educational food chain. In schools in KS4 it is virtually impossible to introduce any new curriculum development if it does not lead to league table points and anything that makes getting league table points more difficult is likely to fail. If we assume that these points are here to stay, how can we change their use to be more positive in the ICT and Computing fields?

7. First of all we need to consider the teaching resource. There are some very able teachers of ICT and Computing but there are also many that are chronically out of date. Some tend to be at best fairly expert in MS Office and associated technologies but even that is not guaranteed. Many schools ban some of the best free learning resources on the web. One said to me that they banned Wikipedia because children were using it too much! Should we ban books on the same grounds? There are some fantastic free videos on You Tube and TED. We don't ban all books because some are subversive.

8. How do we devise a strategy that will take teachers from where they are to where we want them to be? There is not enough time or resources to retrain all the teachers let alone keep repeating training to keep them up to date. New Opportunities Fund training had very little effect despite costing 10s of millions. We know that approach doesn't work. We need a change to more self-sufficiency and less dependency on external courses that will never satisfy the need. The key is to integrate staff development with on-going curriculum development and assessment in day to day

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classroom practice. We need to make the use of IT unavoidable for teachers but start gently and build. This will result in a system that supports continual development rather than reacts periodically to "falling standards" with very little meaningful change. We need to reward good practice and make it desirable just as we reward children for making good progress and high attainment. We can do this through the existing qualifications frameworks and actually save money but it needs a commitment to changing views of both assessment and more general working practices.

9. All teachers have to assess, all teachers are supposed to cover the National Curriculum and teachers like to get recognition as do their pupils. So let's start with good practice that should be there in any case before trying to invent new systems. A system of progressive ICT certificates that itself uses ICT innovatively to get costs down can provide the focus for continuing development for teachers and learners. Enable learners to self-assess and peer assess providing evidence to their teachers on-line which can be independently externally verified through random sampling. If a teacher is consistent reduce the sampling. If a teacher is inconsistent provide feedback and increased sampling. In rare cases compulsory re-training. This can fit with current legislation and it can be done for considerably less than the cost of many of the vocational qualifications currently being offered by the traditional Awarding Organisations. So we do not need more money, we need to use the money already being committed to formal assessment in a smarter way. Since all the learner evidence is on-line it is very low in admin costs and by using such systems we are practising what we preach. Furthermore, feedback to teachers and response requires them to learn how to use internet based information systems because it is necessary for the administration of their own day to day work. Start with the IT specialists then spread to the core subjects then to the rest of the curriculum. This then incorporates e-portfolios, VLPs etc with qualifications that ultimately provide league table points but which are age independent and recognise learning from Entry 1 (NC level 1) in the national vocational framework through to Level 3 which is the level of A levels. These nationally accredited certificates provide a clear focus and reward system from primary school to university entrance using existing frameworks and can be made to be compatible with the National Curriculum.

Academic/vocational divide

10. It is time to put an end to this artificial demarcation in schools once and for all. Currently the ITQ is the national vocational qualification for IT Users and covers the operational skills needed for work - these are exactly the same skills needed in schools so why not reward their development? The Schools ITQ units include "Improving Productivity Using IT", "Web Site Software", "Using Collaborative Technologies" plus other optional units eg spreadsheets, graphics etc. If an art department wants to teach design using a computer there is a unit to accredit the skills, if the music department wants to it can contribute an audio unit. computer programming is possible through a specialist software unit etc. The ITQ at level 2 is given points equivalent to a GCSE grade B so why not just make this an entitlement for all and have an academic test based on the core units to differentiate the A*s and As? In fact a better solution would be to make the ITQ equivalent to a Grade C and then provide A*, A, Bs through more traditional academic tests and a demonstration of eg programming skills through project work. We can then get rid of Functional Skills as they will be covered more relevantly and more broadly by the ITQ and we have extensions to the higher grades so GCSE can be complementary to vocational pathways. We don't need an IT Diploma, children can choose ITQ units to support learning in their academic subjects without over specialising in vocational IT too early but still achieve the National Vocational Qualification for IT users. If we did this it would actually reduce costs and complexity, providing greater educational coherence and balance.

11. For Level 3 (A levels). Make the Level 3 ITQ equivalent in UCAS points to an A level Grade D. This means we have a common progression route for IT operating skills from primary school to university entrance. We can differentiate Grades A*-C using more academic rigour so that the academic universities who generally specify at least grade Cs in any case can select appropriate students. While the ITQ is more focused on operational skills it can still provide underlying understanding. Building on these practical skills with more in-depth academic understanding is a perfectly practical proposition and it means we don't need two separate routes to higher education. Finally, we have

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most of the technology systems in place to support this approach. We simply have to provide guidance on fitting the ITQ units to A level computing. With the level 3 ITQ there is no real need for A level ICT, It is better to get rid of A level ICT, and provide an academic A level in digital technologies including understanding digital principles, programming and the priorities of higher education computer scientists. Again this will reduce costs and improve focus while maintaining accessibility to a wide range of abilities and interests.

Model for staff development

12. Establish a Principal IT Assessor in each school who accepts responsibility for maintaining standards. The Principal Assessor is trained as an assessor trainer and can authorise suitably skilled colleagues to assess making them accounts on the on-line system for gathering evidence and issuing certificates. Assessors sign an agreement at first login committing them to uphold professional standards. The school is required to have quality assurance procedures internally (This is simply reaffirming what should already be in place and will get checked periodically by OFSTED). There is an annual visit from an external verifier who checks that the procedures for QA are in place and who samples the work of the assessors on-line providing them with feedback to help improvement. Up dates and guidance are provided with links to the assessment criteria on the web site, examples of good practice and further training for the weakest. This has some chance of keeping teachers up to date and can include primary teachers using entry level certificates. A specialist in say music will get relevant support in audio technologies. We know from practical experience that such a system can be supported at around 50% of the cost of doing conventional vocational and academic qualifications. So we can raise standards **and** reduce costs.

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