MirandaNet Fellowship submission

to the Department for Education

ICT curriculum consultation

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INTRODUCING THE MIRANDANET FELLOWSHIP

The MirandaNet Fellowship, established in 1992, attracts a cross-section of researchers, teachers, senior managers, teacher educators, policy makers and company representatives who want to share experience and expertise about how digital technologies can raise achievement and promote effective learning in all phases of education. The professional organisation which is not-for-profit now has over eight hundred members in eighty countries who share their professional experience and expertise in the search for what works in the classroom, and what does not: see figure 1

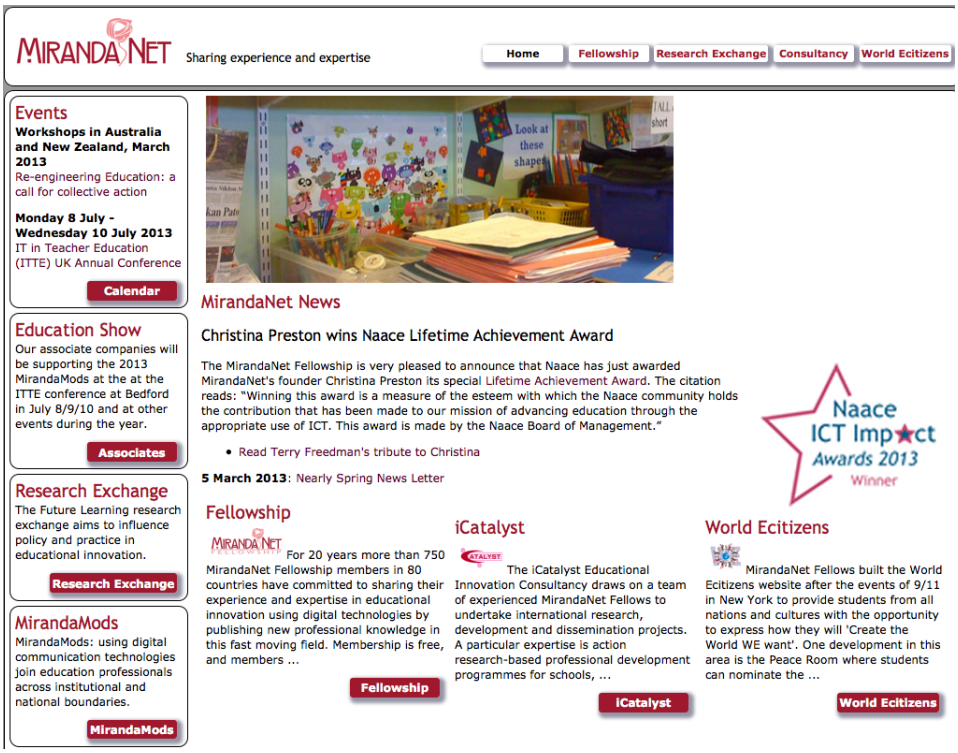

Figure 1. MirandaNet Fellowship front page

This community of practice approach to professional development for teachers has recently been endorsed by Professor of Computing, Tim Bell et al. [29] in reviewing how teachers in New Zealand might keep up with the move towards computing science in their new curriculum for schools; a curriculum and professional development programme that has been widely praised [3].

The members debate online in a professional knowledge creation event that we call a MirandaMod [18] as well as publishing articles, papers, and case studies about theory

and practice to inform educators globally about expert knowledge and experience: see Figure 1.

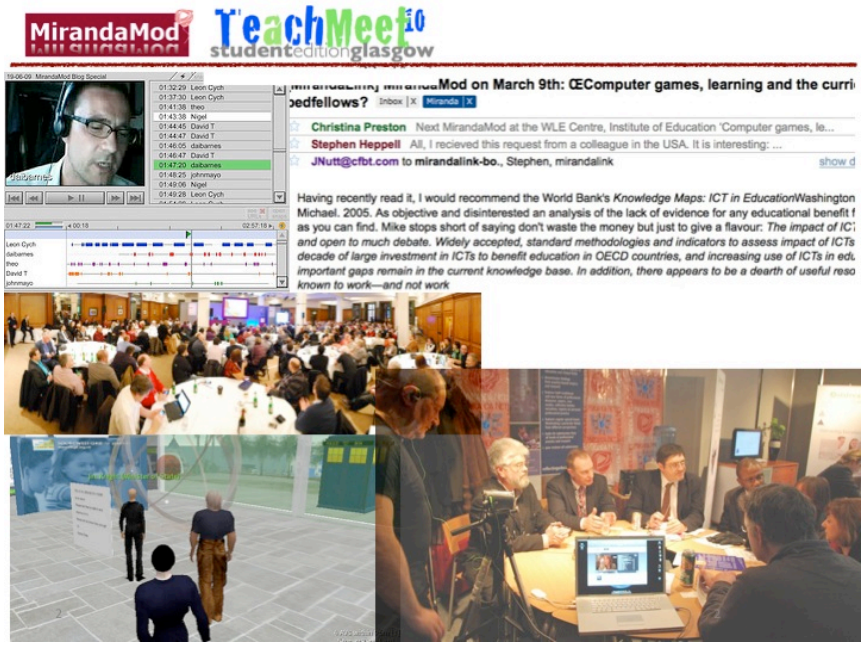

Figure2. MirandaMods held in a variety of professional development contexts

The MirandaNet Fellowship, an acknowledged stakeholder in the ICT field, has also produced a range of publications about ICT with a particular emphasis on teacher education [18]. A key strategy based on research shows that teachers learn best when they conduct action research experiments in their own schools. The MirandaNet Fellowship is free to members and but is supported by overheads from consultancy projects and annual subscriptions from company associates who also engage members as co-researchers in developing and evaluating digital educational products and services. In this MirandaNet model teachers learn from active professional development paid for by the companies [18]. This MirandaNet professional development programme is called iCatalyst and concentrates on the role of teachers in developing more effective learning using digital technologies. MirandaNet practitioner publish a range of case on the MirandaNet website for other teachers to share.

This submission is based on a six-week internal MirandaNet debate that has involved 800 members in 80 countries: meetings have been held face-to-face and online and this final document has been submitted to the members for approval. This submission focuses on the relationships between government and ICT professionals as well as democratic processes more than on the detailed content of the ICT curriculum that other

organisations like ITTE and Naace will cover. The main argument in terms of content is not about the introduction of Computer Science concepts but about what kind of balance is the most effective between Computer Science, Information Technology and Digital Literacy. Education is not only about producing good employees in the future, but also about educating thoughtful citizens with an understanding of the responsibilities of democracy – an area where a good grounding in the ethics and values underlying the use of digital technologies is already very important to a nation's well being. These considerations are at the centre of preserving the democracy we currently enjoy in England.

ICT PROFESSIONAL DEVELOPMENT

Over the last twenty years a key issue in introducing more computer science into the ICT curriculum has always been the lack of adequately trained teachers. Teachers who are expert in IT are not necessarily drawn to teaching because they can earn more elsewhere. If they do enter the professional there is the problem of updating them on computing languages and other elements of computer science that change rather quickly.

One approach that cuts down professional development costs and is more viable over a long period is to encourage teachers to join a community of practice [14, 31, 32]. I came to this conclusion in the 1980s when computer networks were established in most UK schools and I became an IT adviser. But I quickly found that the one-day computing courses we offered at the Inner London Education Computing Centre (ILECC) were ineffective for many London teachers for three reasons: they had not studied computing in their first degree; they did not own their own computer; and, they were only offered one computing session a year. So in 1992 with like minded colleagues I founded one of the first free online communities of practice, the MirandaNet Fellowship, where teachers, teacher educators, researchers, policy makers and developers could support each other in figuring out the best ways to use computers in schools to enhance learning [18].

THE PROFESSIONAL VOICE

The MirandaNet Fellowship has two main sister organizations in England who, until now, have provided the main professional voice in ICT: ITTE, the teacher educators in IT [12], and Naace [19] for educators, technologists and policy makers. Since the 1990s these three professional organisations have worked closely on designing the various iterations of the national curriculum in ICT in co-operation with the Department of Education. In essence their wide approach for preparing pupils in primary and secondary schools is summed up by Zaki Abu Bakar [1] who advised that even after

school, a balanced ICT curriculum should continue for specialist computer science students in further and higher education who should be 'well rounded and well educated' following a wide curriculum rather than one that only produces industrial specialists in computing science - we need those who understand computational thinking but also have skills in design, marketing and entrepreneurial skills'.

An important contribution was made to the debate about the breadth of the curriculum by UNESCO as early as 1994, updated in 2000[30]. In this global curriculum for schools report the role of ICT in the student curriculum was categorised into four distinct groupings:

ICT literacy –focuses upon curriculum developed from the European Computer Drivers Licence and "covers the use of ICT in daily life in a competent and intelligent way", such as applying ICT tools and applications to a range of personal tasks.

Application of ICT in Subject Areas – covering the application of specific ICT tools which "work within specific subject areas including languages, natural sciences, mathematics, social sciences and art". This approach applies both more generic tools and ICT skills addressed within the ICT literacy classification, and "specific application software that can only be used in a specific subject area (for example mathematical software that only is of use within the area of mathematics)".

Integration of ICT across the curriculum – in this thematic, project based model "examples of projects are described to demonstrate the use of ICT in a combination of subject areas where work is done on real-world projects and real problems are solved".

ICT Specialisation – "designed for students who plan to go into professions that use ICT such as engineering, business and computer science or who plan to advance to higher education".

However, although the UNESCO report covers computing science in excellent detail it does not cover areas like Digital Literacy with a particular reference to e-safety as has been the case in England where the Royal Society (2012) definitions are better known and reach wider [28].

In England we have had a reputation for interpreting ICT more widely than UNESCO resulting in professional development contracts for MirandaNet consultants in countries that include Bulgaria, China, Chile, Czech Republic, England, Friesland, India, Mexico,

Saudi Arabia, South Africa and Syria. Associate companies who have supported action research programmes in schools include: 2Simple, Apple, Microsoft, Inspiration, IRIS Connect, Follett, Light Speed, Promethean, Oracle, Steljes and Tribal. The removal of the Becta websites by the Coalition has made gaining this work abroad more difficult as the government websites were a shop window for British excellence in this area. More consultation about how to make these resources easily searchable after the demise of Becta would have been welcome as these websites contained nearly two decades of research and resources developed by the ICT professionals in this field.

The aim in the Royal Society report is to advocate a more equal balance between three distinct areas: information technology, digital literacy, and computer science. Agreement about what these terms mean, unfortunately is under dispute. The Royal Society definition of information technology is not controversial: the use of computers, in industry, commerce, the arts and elsewhere, including aspects of IT systems architecture, human factors, project management and so on. However, the Royal Society definition of digital literacy seems as limited as they only refer to 'the general ability to use computers, a set of skills rather than a subject in its own right'.

The main dissent, however, turns on how much computer science is possible or desirable in school especially in the early years. The Royal Society defines computer science as a rigorous academic discipline, encompassing, programming languages, data structures, algorithms, and so on. Until this Royal Society report, it was thought better in England by industry and the universities to start these subjects in detail in higher and further education where teachers are more likely to be up to date.

INTRODUCING CODING

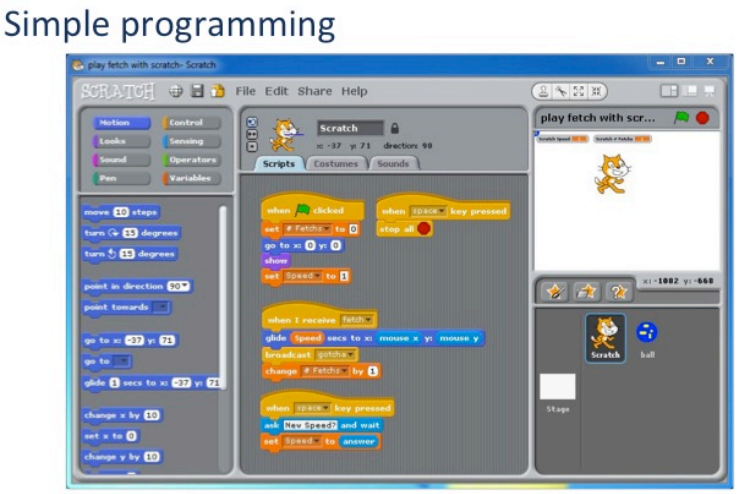

Figure 3. Scratch, a simple visual approach to coding

MirandaNet Fellows now believe that innovative developments in teaching aids means that introducing coding in primary and secondary classrooms is more viable for non-specialist teachers. For example, MirandaNet has published members' examples of using Scratch, a visual approach to a programming, is used to create interactive stories, games, music and art and share them online. See Figure 3. Furthermore, Raspberry Pi, (Figure 4) which is now gaining popularity makes teaching computer science more hands on. This credit-card sized computer plugs into the TV and a keyboard that can be used for many of the things that a desktop PC does such as spread sheets, word-processing and games. Raspberry Pi also plays high-definition video. It is particularly valuable for promoting programming activity and computational thinking.

Figure 4. Raspberry Pi

RECENT HISTORY IN ICT CONSULTATION

Until recently, Korea and Israel were the only places in the world where computer science in the strictest sense has been taught in primary and secondary schools. However, MirandaNet Fellows have seen that the Coalition government is in a rush to introduce more coding earlier in school because Eric Schmidt of Google, criticised the information technology and communications curriculum by observing:

> The country that invented the computer is throwing away your great computer heritage by failing to teach programming in schools. I was flabbergasted to learn that today computer science isn't even taught as standard in UK schools…Your IT curriculum focuses on teaching how to use software, but gives no insight into how it's made [25].

David Cameron, the UK prime minster, has taken Schmidt advice on this point despite his doubts about Google's tax status. In addition, the British Computing Society (BCS) funded by Microsoft, Google, and the UK Committee of Heads and Professors of Computer Science) is also leveraging this change with the teacher organisation, Computing At School (CAS), CAS, a grass roots organization that aims to promote the teaching of Computing at School. This group have become a strong voice very quickly because of

their partnership with the British Computing Society (BCS) through the BCS Academy of Computing. CAS is also in partnership with the Royal Academy for Engineers (RAEng)[27]. The group makes a welcome addition to the professional organisations involved with the design of the ICT Curriculum.

The MirandaNet concern is that, as a result of the opinions of the multinationals and the computer science lobby, the Department for Education has been tasked with introducing the teaching of programming under the banner of computer science almost to the exclusion of digital literacy and information and communications technology (ICT): an approach that is causing significant dissent amongst ICT educators. To an ICT professional in New Zealand, Dr Noeline Wright, it seems that ICT has become 'a political football' in the UK [34].

The change in emphasis was first clarified when Michael Gove, The Secretary of State for Education, told an international audience of 25,000 at the BETT10 exhibition [10] that the current ICT curriculum in England was 'boring'. At a time when England needs to export this comment seemed to be unwise: computers have been in English schools for thirty years with a worldwide reputation for excellence. It may be true that some teachers had interpreted the curriculum as a vehicle for teaching 'Microsoft Office' as they had not had enough professional development to do more, but the curriculum itself was not 'boring': Naace and ITTE will pursue this point in their submission in detail as the general view is that it was not necessary to disapply the existing ICT curriculum- just reemphasis the existing computer science elements whilst a new curriculum was developed. In addition, if this new 'computing' curriculum is introduced without a professional development program the dangers of boring pupils and misinforming them are even greater.

Unfortunately, ICT teachers and educators find it hard to take seriously the pronouncements of a Secretary of State for Education who said recently, 'those academics who have helped run the university departments of education responsible for developing curricula and teacher training courses …are the enemies of promise'.

> You would expect such people to value learning, revere knowledge and dedicate themselves to fighting ignorance. Sadly, they seem more interested in valuing Marxism, revering jargon and fighting excellence [11].

Writing this polemic in a right-wing tabloid newspaper, the Daily Mail, Miranda assumes that Gove is not seeking the academic vote. He has certainly not taken into account those who voted Conservative. The attack on academics has been increased by Michael Wilshaw, the chief inspector of OFSTED, who shows a lack of understanding of teacher educators' partnerships with schools by calling on them to come out of their 'ivory towers' [33]. This criticism suggests a lack of clear thinking from an ex-head teacher who thought that the most important achievement of the school he ran in a disadvantaged London community was that a few pupils won places at Oxbridge. He believes all pupils should aspire to this level of academic excellence, and yet castigates academics. The profession would hope for a less partisan approach from an inspector.

What is a further serious matter for relationships between government and the ICT profession is the public criticism of teachers by officials who actually need teachers help to ensure that changes in ICT education run smoothly. For example, at the Westminster Forum in February, the co-founder of Code Club, Clare Sutcliffe, told an audience of educators and ICT teachers that the ICT curriculum is 'boring': this is a direct quote from Gove and her implication was that the ICT teachers are failing. The Code Club [6], with Prince Andrew as a patron, is a worthy initiative that has bring in young volunteers to run after school coding clubs in order to supplement the efforts of ICT teachers who are not trained to teach coding. However, it is a matter of concern that these young volunteers also repeat their co-founder's views, using the term 'boring', and worse. They are not sensitive to a situation where ICT educators have attended local Code Club meetings in order to help set them up after school. If Code Club and other similar voluntary initiatives are to succeed there needs to be some careful consideration of the message that is being conveyed about ICT teachers who have done valuable work over the years in a different context. This confrontational approach is not helpful.

The ICT 'academics' soon realised that their professionism is out of political favour when the Department for Education (DfE) asked the new group of teachers, Computing at School (CAS), the British Computing Society (BCS), and Royal Academy of Engineering (RAEng) to design the new primary ICT curriculum without reference to ITTE, Naace and MirandaNet. The draft Programmes of Study (PoS) were sent out for consultation and the ammendments of ITTE, Naace, and MirandaNet appeared to have been accepted. But,

according to the RAEng website, in December 2012, after the agreed text had been submitted to DfE, the RAEng, CAS and BCS were again asked for their advice on how to amplify the computer science component of the draft PoS in order to emphasise that teaching computer science is of paramount importance. Behind closed doors, decisions have been taken to call the curriculum itself *Computing* not *Information and Communications Technology* and to expand the computer science element, specifically coding, to take up more than two thirds of the suggested PoS [28].

QUESTIONS TO GOVERNMENT

From an international debate that has involved the whole membership, the MirandaNet Fellowship has put together series of questions to the Department for Education that have been crowd sourced amongst the members on the *Computing* curriculum under review [4].

In the first place the MirandaNet Fellowship observes that in this new consultation document, the introductory paragraphs read well as a broad curriculum is promoted. But this strategy is undermined by the details in the four key stages that reveal key omissions and a lack of understanding of progression.

This series of questions below should be answered effectively before the extreme changes suggested in the POS are made. The first two questions are about democratic process and the appropriate involvement of all expert partners:

- Firstly, why did the political coalition depart from the democratic process at this consultation stage by placing the design of the ICT curriculum for schools entirely into the hands of organizations that have no experience in designing curricula for schools and excluding those who have? The insight of CAS, RAEng and BCS into computing issues is welcome, but would not an exchange of views with all the experts in schools be more valuable in ensuring that pupil achievement is assured?

- A key reason for chanting the ICT curriculum is to meet the needs of industry but the intense focus on 'computing' at a young age seems to be in contradiction to

- industry preferences summed up by MirandaNet Fellow, Rachel Jones, recently a MirandaNet industry associate and now the head of the Elliot Academies:

> Thinking back to the *NextGen* report and the previous debates we have had about industry needs, particularly in terms of the

> games industry, developing collaborative problem solving approaches to technical and creative challenges is perhaps regarded as a 'soft skill', but it has high value in practice in the workplace. It is a rare individual that combines outstanding programming, narrative and graphical skills, but a collaborative development team that challenges itself to excel in melding these can achieve a great deal. Starting children off earlier in evaluating what works well across a range of devices, then encouraging them to create, test and redevelop digital products together, and to understand the value of feedback could generate a greater passion for the subject and harness individual creativity to build greater capacity [13].

The other six MirandaNet questions focus on the breadth of computing as a topic that teachers and children should be introduced to in secondary and primary schools:

- Have educators with experience in ICT or industrialists been consulted about the omission of 'creativity' 'criticality', 'design issues' and 'evaluation' from the latest draft of the computing curriculum? What are the research statistics on the numbers of students, especially girls, that change to a two thirds coding content will disaffect? Is there any evidence that this approach will create a pool of programmers? Is it certain that it is only programmers who are required in the computer industry?

- Is there any research that shows that teaching algorithms to five year olds will improve their chances of being good programmers in adult life? How will these activities interface with learning to read and write?

- If e-safety is now omitted from the school curriculum, who will have the responsibility to help young people develop the social skills and discerning understanding about protecting themselves online?

- To what extent is the government sure that "Code Club" volunteers, encouraged by the government and industry sponsored, can compensate for the lack of professional development available to help existing ICT teachers to convert to computer science?

- What plans does the government have either for the retraining of existing ICT teachers or the wholesale replacement of them by computer scientists? Current plans do not appear to address the size of the national crisis that is now imminent.

- What will be the rewards for teachers who undertake significant retraining in computational thinking in order to teach it effectively? Will sabbaticals be available?

- The draft computing curriculum POS are so narrow in focus that schools that follow them will not pass the OFSTED inspections in their current form. Will the inspectorate be consulted on these new plans?

Rachel Jones, again. summed up MirandaNet members' concerns:

> This primary curriculum as it now stands is utilitarian and lacks a development of creative application of information technology. It is focused largely on computational thinking and the development of straightforward computer science skills, both of which are perfectly useful, but overall the key stage content lacks breadth and progression. I would argue that the programme is insufficient to develop the critical awareness, creativity and higher order thinking skills required in our workplace and indeed by individuals [13].

COLLABORATION IN KNOWLEDGE CREATION AND DISSEMINATION

The MirandaNet Fellowship has a final question related to their practice and research over the years into the innovative use of digital technologies in collaborative learning, knowledge creation and analysis of current professional knowledge. This element of learning is not yet impacting in schools but is already current in industry and known to young learners who use their devices outside school. The question is:

- Now that the contribution of digital technologies to social and collaborative learning is omitted how will children and teachers in England know about the innovative ways in which computers facilitate remote collaboration in knowledge building and about how to harness this power ethically?

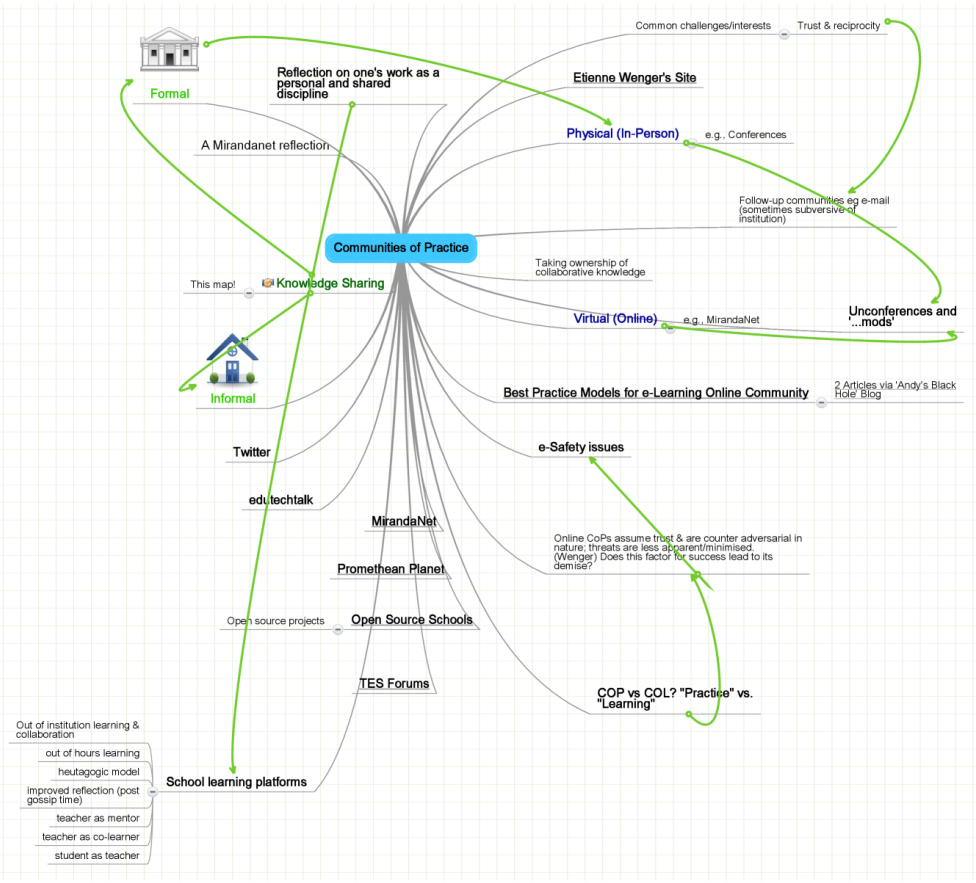

Figure 5. A remotely authored concept map on Mobile learning developed by MirandaNet members. One can also view the map here: http://www.mirandanet.ac.uk/mirandamods/archive/the-role-of-communities-of-practice-in-teaching-and-learning/

We would like to see more attention given in the curriculum to this emerging area of importance that relates to games players engaging remotely in virtual worlds, remotely authored concept maps, social networking and micro-blogging. These democratic collaborative knowledge creation opportunities are causing ripples in social and cultural contexts although they not widely exploited for learning yet. Nevertheless, MirandaNet, like many communities of practice, would find it difficult to operate without wikis, micro-blogging, social networking and videoconferencing tools. Also learning platforms and MOOCs seem to be transforming the ways in which learning is delivered, particularly informal and self-directed learning. See Figure 5.

Greater understanding of these collaborative principles would also be valuable for teachers in schools even though assessment does not value them yet. Young people need guidance in using the power of these tools wisely.

As a long-standing community of practice MirandaNet members first researched these online collaborative learning processes by observing how teachers share ideas on email - a process we called Braided Learning [21,22,23]. As technologies improve, more collaboration on new knowledge construction is possible as we demonstrate in our MirandaMods[18] using Web 2 combining video conferencing, micro-blogging, and remotely authored concept mapping to explore the value of communities of practice. The url has been provided as well as an image of the map as already A4 paper reproduction of knowledge building is inadequate for this kind of collaborative

We have found that a MirandaMod creates a shared liminal space (see Figure 6) that is important to building on professional knowledge: inchoate and chaotic as learners' misconceptions, misunderstandings or simply lack of knowledge clash and co-mingle. 'Liminal space' is a term used generally to describe the dissolution of order in the individual brain that creates a fluid, malleable situation that enables new institutions, new customs and new expressions of commonality to become established.

MirandaNet Fellows, Cuthell, Preston, Cych and Kuechel [7,8] argue at the interface of face-to-face and virtual communicative action, all learners, professional or otherwise, support each other as they traverse liminal space together to reach shared and individual enlightenment and transformation. Professor Mike Sharples, a MirandaNet Fellow, has also been working in the area of innovation in collaborative learning [24]. His Open University team offers two terms that help to describe the learning conditions demonstrated in a MirandaMod: seamless learning and rhizomatic learning. Seamless learning defines the experience of continuity of learning across a combination of locations, times, technologies or social settings. This can be seen as learning journeys that can be accessed on multiple devices, flow across boundaries between formal and informal settings, and continue over life transitions such as school to university and workplace.

Rhizomatic learning is derived from the metaphor of a plant stem that sends out roots and shoots that allow the plant to propagate itself through organic growth into the surrounding habitat. (See Figure 7.) Seen as a model for the construction of knowledge, rhizomatic processes suggest the interconnectedness of ideas as well as boundless exploration across many fronts from different starting points. An educator reproduced this effect by creating a context within which the curriculum and knowledge are

constructed by members of a learning community and which can be reshaped in a dynamic manner in response to environmental conditions.

Figure 6. A rhizome providing a visual image for the way in which knowledge is constructed by self-aware expert communities adapting to environmental conditions

Working with communities of teachers Leask, Preston and Younie, three more MirandaNet Fellows, have shown that teachers in communities can develop new theories and practice that are valuable for influencing policy at many levels [15.16].

There are many questions here for industrialists educators and academics that affect their own learning, the learning of students and the design of digital learning environments. Space needs to be made in the curriculum to ensure that important innovations in learning and democratic processes are acknowledged. Removing references to 'collaboration' in the draft ICT curriculum will not prepare pupils either for further study or the world of work.

To foresee what will matter in learning and knowledge creation in the future successful governments will prepare for new kinds of learning as well as reinforcing traditional approaches. The two are not mutually exclusive.

CONCLUSION

The OECD [20] is warning that *"in many countries, education is still far from being a knowledge industry in the sense that its own practices are not yet being transformed by knowledge about the efficacy of those practices (p.3.)."*

To counter this teachers need much better professional development and more involvement in sharing their knowledge and expertise in the realms of Digital Literacy. The case of Paris Brown indicates how a person's identity can be destroyed from a very young age. Teachers need to understand some complex issues that will be become more

even more complicated with each year. If there is limited knowledge in schools where else will our citizens learn to protect themselves?

These arguments about well-informed citizens are at the core of our submission rather than the debate about the specific content of the ICT curriculum which is largely academic as academies, free schools and private schools do not have to follow the Department of Education advice in England.

Finally, the MirandaNet Fellows think that the curriculum consultation exercise has exposed a lack of respect for the experience and knowledge of professionals that we have never seen before. In this context, we hope that the lack of democracy in the ICT curriculum consultation process so far will be reconsidered.

Our submission is based on the thirty years of experience and research in the value of Digital Literacy and Information Technology of our membership and we would like to have a more active voice in the national debate. In particular we are keen to cooperate in finding ways to support a national professional programme for existing ICT teachers who need to learn Computing Science because we believe that many ICT teachers will be able to deliver Computer Science as well with the right kind of practical support.

We hope that our stakeholder voice will be recognised.

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MirandaMod resources www.mirandanet.ac.uk /mirandamods/

A MirandaNet Scratch project, http://www.worldecitizens.net/literacy-from-scratch/

Publications on teacher's professional development http://www.mirandanet.ac.uk/researchexchange/publications/

The iCatalyst professional development programme

http://www.mirandanet.ac.uk/consultancy/professional-development-programmes/

Examples of consultancy abroad

http://www.mirandanet.ac.uk/consultancy/case-studies/

http://www.mirandanet.ac.uk/consultancy/core-products/

Teachers case studies

http://www.mirandanet.ac.uk/casestudies/

Educators' articles

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