Technology can help us learn faster, better, deeper …

Here's how:

1. Online support for teachers

Technology allows teachers to take part in **purposeful conversations** – any time, anywhere. Online forums overseen by facilitators can guide and link discussions so that teachers can share ideas, ask questions and seek advice from more experienced colleagues. They can develop their own professional identities, sharpen their subject knowledge and reflect on their experiences. Despite these benefits, teachers can be nervous about integrating technology into their work. The chances of them failing or giving up will be reduced if the mechanisms are in place for them to take advantage of what innovative teachers are doing.

What should we do now?

We should use technology to set up **networked forums** through which teachers can form communities.

This would entail:

- funding for teachers to set them up and to cover small operational costs;
- training facilitators to guide groups of teachers and 'tune them in' to available technologies;
- encouraging more self-organising communities, such as TeachMeet.

What should we do next?

We need to identify the best methods of professional development and use them in the design of **effective support** environments. We also need to know if and how teachers' online activity changes their offline practice.

2. Shedding light on difficult subjects

Well-designed technologies can promote learning in many subjects.

They can do this through:

- microworlds and simulations such as simquest and RoomQuake;
- software, supported by dynamic computational modelling, that adapts to students' responses and can open up the learning process to view, providing **genuinely personalised** teaching. Carnegie Learning's Cognitive Tutors, for example, teach maths using adaptive software based on what we know about how students think and learn; Ecolab, is adaptive software that supports learners' metacognitive skill development by **'opening up' the computational model** for learners to see.
- digital toolkits either for group or personal use can encourage inquiry-based, **active learning**, for example, participate, nQuire;
- games, if carefully designed, can motivate learners, including those who are marginalised or underperforming, for example, UrbanScience, QuestAtantis, ZombieDivision;

- versatile representational spaces to help people to **see things differently.** The MiGen project, for example, uses a visual representation of algebra to help teenagers get to grips with a difficult concept that can trip them up at a crucial time.

Using such technologies can help **language learning** by enabling students to:

- access authentic linguistic and cultural content;
- receive feedback and comments in the target language;
- reflect on and improve how they learn.

For instance, the Alelo 'training system' immerses students in computer game-type simulations which introduce them to the language, culture and social mores of another country. Behind the screen, their learning is guided by innovative technologies such as speech recognition, intelligent tutoring and artificial intelligence. Recent immigrants to Denmark are currently using Alelo to help them settle into their new country.

Mobile technology also offers particular benefits in language learning. Aside from being portable, it can be adapted to personal preferences, allows for continuity between different settings and means students can practice their chosen language while carrying out everyday activities. The American Council on the Teaching of Foreign Languages, for example, offers Hello-Hello, a free interactive language-learning course that runs on mobile phones as well as tablets and computers.

Mobile technology also has uses in science. Structured inquiry toolkits such as nQuire, running on handheld devices, give learners the experience of answering personally meaningful questions, as well as **collecting and analysing real data** from the real world.

What should we do now?

We need to make teachers and learners more aware of the technology that works well and is readily, if not freely, available. They should be encouraged to evaluate it and use it for a variety of purposes.

How digital technologies actually work is a mystery to most people. Spreading understanding of this is important, as is raising awareness of the skills needed to develop personal learning environments.

What should we do next?

- Identify general design principles for adaptive microworlds and simulations.
- Learn to build computational models that stop learners 'gaming the system' and make best use of the latest educational neuroscience research.
- Clarify teachers' role when adaptive software is used to support learners.
- Investigate how to make better use of both students' and schools' technologies in the classroom and the home.
- Design tools that promote personalised, informal science and language learning, taking advantage of existing content and media and new technologies such as smartphones.

3. Blending 'new' and 'old' ways of learning

Technology is **extending the time** people can spend studying by enabling them to work away from their school, college or university, both on their own and collaboratively. For example, mobile devices make **learning 'on location'** perfectly feasible. Technology is also extending access by making it easier for groups such as parents to get involved. However, not everyone can take advantage of these opportunities, with access influenced by age and socioeconomic background. And it is important to remember that students still value 'old-style' face-to-face contact with their teachers as well as printed materials.

Teachers have a key role in helping learners make more sophisticated use of their technologies, though institutional culture does not always support this. Similarly, schools, teachers and students possess a great deal of technology, but do not always use it to best effect.

It is also important to bear in mind that a student's circumstances can have a huge influence on the effectiveness of the technology they use. It's not much use asking someone to download or stream a documentary if their broadband speed is not up to the task.

What should we do now?

- Make use of the technologies learners and teachers can already access and reassure teachers that their skills and knowledge are still very relevant.
- Bind together existing and emerging technologies to deliver integrated access to appropriate resources.
- Design activities capable of being shaped to suit a student's circumstances.
- Develop cost-effective 'light' blended learning to extend classroom teaching, use technology for **face-to-face** communication, conversations and targeted support for individuals or small groups.

What should we do next?

- Attempt to integrate social networking with formal education for collaborative inquiry-based learning.
- Work out the implications of changed technology practice for the curriculum and preparing learners for life.
- Integrate **smart technology with smart people** to scaffold learners wherever they are.

Consider how to use technology to distribute expert advice so that students can access this as well as their teachers' expertise.

4. Assessment for learning

Well-designed and applied technologies can:

- help teachers provide students in all education sectors with effective and **sensitive feedback**. This can be done in a swift, timely and constructive manner beyond the classroom and using multiple media;

- support the provision of interactive tasks that can be automatically marked;

- offer capacity, flow and pace as well as greater potential for data capture, analysis and dissemination. Information about the work of thousands of students can be analysed using educational data mining techniques;

- enable teachers to **assess what they could not assess before**, such as creativity. They can also exploit new forms of assessment based on existing technologies, for example multimedia submissions;

- offer efficiencies through routine, simple adaptive testing in well-defined subject areas with established question banks for large numbers of students.

What should we do now?

- Offer students' targeted feedback in a variety of ways.

- Engage others in the feedback process, such as peers, employers, parents.

- Use handhelds to capture data: activity logs, timestamps, self-guided learning, learning journals.

- Develop cross-disciplinary projects accompanied by new forms of assessment to **capture the richness of learning** wherever and whenever it happens. Both can be used as evidence of achievement and a source for reflection.

What should we do next?

- Consider how can different forms of study best be assessed.

- Decide how to exploit existing technologies to enable rapid and formative assessment.

- Join up learner assessment across multiple subjects, locations and times.

- Work out how to avoid teaching to the test and plagiarism when seeking efficiency savings.

- Aim to **assess learner autonomy** and the skills that learners need in a technology-rich world.

- Learn how to use data mining techniques to support formative assessment.

Finally, a general point

Involving students and teachers in the development of **digital learning** is a powerful way of securing their engagement and commitment. Such 'participatory approaches' ensure that stakeholders become more aware of the potential benefits of the technologies and of effective strategies for their learning. A key question is: What are the sustainable participatory methods that will engage all stakeholders?

5. Links (ordered as they appear in the document)

TeachMeet- http://teachmeet.pbworks.com/

Simquest - http://www.simquest.nl/

RoomQuake- http://www.evl.uic.edu/moher/Tom_Moher/RoomQuake.html/

Stock Market Game- http://www.smgww.org/

Cognitive Tutors - http://www.carnegielearning.com/

Ecolab - https://sites.google.com/a/lkl.ac.uk/ecolab

Participate - http://www.participateschools.co.uk/

nQuire - http://www.nquire.org.uk

UrbanScience - http://epistemicgames.org/eg/

QuestAtantis - http://atlantis.crlt.indiana.edu/

ZombieDivision - http://zombiedivision.co.uk/

MiGen - http://migenproject.wordpress.com/

Alelo - http://www.tacticallanguage.com/

Hello-Hello - http://hello-hello.com/blog/