



INNOVATIVE LEARNING ENVIRONMENTS / OVERVIEW

ILE and Technology



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What is the role of technology in an ILE?

ICT skills are necessary skills for today's workforce. What's more, technology can be very effective in engaging students, leading to an increase in students' engagement, confidence and motivation as a result of ICT use. In the development of Innovative Learning Environments (ILE), technology is often believed to play an important role in transforming pedagogies and practices in line with what is known to be effective in supporting learning for students. Benefits include the ability of technology to increase student agency, encourage deeper learning, better support student needs and enable new approaches to teaching and learning.

Using technology to innovate learning environments

Technology can be an enabler in the strategic design of environments to produce desired changes in pedagogy and learning. However, it is essential to remember that it is how the technology is used rather than the technology itself that impacts learning. Rather than the mere integration of technology into existing teaching practices, technology use within the context of ILE supports attempts to reframe the nature of education in profound ways.

Technology has several important roles to play in supporting innovation. It provides tools and infrastructure as well as access to ideas and opportunities. It has been shown to motivate students and build their capacity and capability to make changes. It is also useful for organising, analysing and presenting large quantities of assessment and evaluative information to inform pedagogical development.

However, the presence of technology is not sufficient in itself to lead to innovation, and simply introducing powerful ICT tools and infrastructure will not trigger meaningful and valuable change. Overall, there is little evidence about the cost-effectiveness of initiatives to incorporate technology into learning environments or their influence on pedagogical change and learning outcomes, which may be due to the fact that the integration of technology is not always linked to transformative practice. It is quite possible to use digital resources to reproduce traditional pedagogies and methods, or simply to 'bolt on' technology to existing practice, creating superficial changes but without incorporating the changes in pedagogy that are important for increasing achievement. Research has demonstrated that teachers often use new technologies within existing ways of thinking about and implementing learning and teaching practices, for example, using data projectors or interactive whiteboards as a replacement for the blackboard or whiteboard within a room layout that reinforces the use of teacher-centred and didactic pedagogy.

While teachers value the potential contribution of ICT to support independent student learning and differentiation, this may be in respect to providing remedial tasks for low-achieving students, and not, for example, for stimulating higher achievers. Applications of technology that stimulate students' information processing skills, or that support cooperative learning, or that bring the 'real world' into the classroom - in other words, that match the principles of ILE - are much rarer in teachers' practice.

<i>Levels of ICT integration</i>		
Enhancement	Substitution for another material of practice (no functional change) for example, substituting screens for pen and paper	Augmentation of a material or practice (some functional change) for example, tasks that cannot be done with pen and paper
Transformation	Modification involving significant task redesign	Redefinition involving the creation of a new learning task that was not possible previously

Although there has been significant investment in digital technologies, and despite teachers' and students' increasing capabilities and confidence in using technologies, it can be difficult for teachers to know how to implement the affordances and opportunities of technologies in ways that enact the principles underpinning effective learning in ILE. The lack of correlation between technology use and innovative pedagogical change is perhaps due to an emphasis on technology-driven initiatives (using technology because it is available) rather than the selection of technologies according to a pedagogical vision. Technology-centred approaches that let the technology determine pedagogy, and impact on students and teachers in non-contextualised ways, have largely failed to deliver significant improvements in outcomes for students. When technology is used as substitute for, or to complement rather than change existing teaching practices, what often results is an emphasis on skill-based applications that fit easily into traditional views of learning and traditional teaching practices. Learning activities need to be situated in the transformation stage to best leverage technology for learning.

In order to ensure an innovative and learning-centred approach to technology, it is important to reflect on and inquire into the potentialities of technology to support visions of pedagogy and learning. Opportunities to develop teacher capacity are crucial, as are opportunities and inspiration for innovation, the reorganisation and creation of new learning materials and activities, and the redesign of curricula models.

New technologies have the potential to support different kinds of relationships between students, between students and teachers, and between students and the material to be learned. Technology-rich learning environments can be used to support students' engagement with other learners, and increase collaboration in learning and reflection on content. Technology might also provide a collaborative space for creating and developing work over time, for individual learners or groups. For example, students can explore an online simulation in teams or co-construct a wiki of terms relevant to the current learning topic. Asynchronous discussion threads and online mind maps can support students to reveal their thoughts and reflections on topics of study. Partnerships, networks and collaboration can flourish through the use of communication technologies and social media.

Technology can:

- support the development of student-driven programmes and personalised learning trajectories
- redefine who counts as a teacher, for example, to include online teachers or connections with experts online
- redefine grouping methods, facilitating different forms of student groupings, that is, rich mixes of small group work, individual study, community visits and virtual groups alongside traditional whole-class teaching
- transform content by introducing new, highly specialised and otherwise inaccessible resources, and enlarging potential resources beyond textbooks
- create digital and virtual spaces for learning that are easily accessible for individual and group access
- redefine assessment, which can be more sophisticated to include more systematic tracking of students' learning and performance, and be shared and worked with in different ways to facilitate individual differentiation
- structure different allocations of time, including lesson-time and homework
- extend teachers' networks to provide them the resources and people required to improve their capacity and skills to support innovative practice
- enable greater collaboration among educators through the sharing of materials, exemplars, evaluations or information about students, as well as practice and experience
- facilitate formative evaluation and change management, through the organisation and presentation of data and feedback
- support the development of innovative curricula by engaging other stakeholders as sources of knowledge

As digital technologies proliferate, there is considerable potential for personalising education, and often students are already creating personalised learning environments for themselves outside of school. Making a menu of teacher-supported digital technologies available to students is likely to create a learning environment flexible enough to adapt to the needs, interests and motivations of each student, and enable both pedagogy and assessment to be personalised. In this way, technologies can support student-driven learning and inquiry as well as personalisation and flexibility. The use of technology, which is often motivating and stimulating in its own right, becomes even more so when linked well with students' interests and curiosities. ICT can also be used to allow students to tailor their own pathways as learners. This requires the support of flexible spaces that can cater for personalised work, and teachers who can deliver a differentiated curriculum and enable a diverse range of learning opportunities. It is important, however, to be mindful of the ways in which online materials and exchanges can be used to standardise learning rather than enhance autonomy and flexibility.

Technology, although not essential, can also be highly facilitative of project or inquiry work, providing students with the tools and resources they need to actively inquire into and complete a project. Digital cameras and video recorders might be used to collect real-time data, and laptops and ipads may be used to access online searches and record findings on-the-go. Technology might offer the platform on which inquiry-based learning can be built, for example, in using an online game or simulation as the context which structures the inquiry. ICT offers opportunities to access a wealth of information from multiple information sources which enables information to be viewed from diverse perspectives. It can support higher-order critical thinking and active learning, and enable learning to be developed and sustained over time.

Technology might also be used to support the development of interdisciplinary connections across different subjects, as well as to integrate discrete objects of learning into larger frameworks and themes. This aids students to use learning to address unfamiliar, meaningful and engaging real-life problems that stretch across subject boundaries.

What kind of ICT infrastructure and applications are required?

Technology in schools should be ubiquitous but also invisible, mobile and personal. Where possible, wiring the entire school, even outdoor spaces, means that students can access the network and resources throughout the school space, and providing projectors, screens and sound systems in a number of places, including common spaces, corridors and stairwells, allows students to view and share work. Making technology so pervasive can promote peer collaboration, widen the sphere of learning to extend outside the classroom, and reduce students' dependence on the teacher. One-to-one initiatives, where each student has access to a laptop or tablet for learning, have become popular in schools, but evidence for their effectiveness is limited. It is much more about how technology is used than about the specific technology itself.

Rather than succumb to a technology-driven approach, it is important instead to begin by determining the type of learning experiences that are sought, and then explore which technologies will facilitate those experiences. The selection and use of software by teachers has a significant effect on the learning environment. Software used in schools can be divided into skill-based transmission software and constructivist open-ended software. Skill-based software often focuses on drill and practice exercises, whereas open-ended software can serve as a tool to help students build knowledge.

In ILE, the aim is for technology to be used to amplify learning through activities such as connecting and communicating, collaborating, problem solving and creating enabled by the use of open-ended software and applications. However, it is more common for laptops, tablets and smartphones in school to be used for highly restricted and unimaginative activities related to teaching (transmission and drill exercises) or as motivators and rewards. In order to promote active and autonomous learning that is student-driven, teachers need to look at ways that technology can be employed to move agency to the students, presenting them with authentic tasks and permitting them to explore ideas at a complex level, often beyond the requirements of curricula. This means focusing on the constructivist potentials of technology through an emphasis on the creation of meaningful and complex original work, and on diverse opportunities for students to both consume and create content, as individuals and as groups.

Established and common uses of ICT in schools	New and emerging uses of ICT in schools
Blogs	Augmented reality simulations
Wikis	Digital games
Social networking sites	Console games
Virtual Learning Environments	Remote-response systems
Laptops, netbooks, tablets	Mobile/handheld computing
Interactive whiteboards	Programming applications
Web applications	Pico projectors
'Book creator' for writing	Using QR codes to access websites
Digital cameras, scanners and projectors	Electronic books
e-Learning	AI and personalised learning
Digital portfolios	'Blendspace' for creating digital content for students
Assessment and communication tools shared with parents	

Researchers and practitioners have expressed some concerns about the use of technology in ILE. These include the belief that the use of technology in a learning environment can reinforce inequalities in the education system. Equity of access to technology can be an issue. Virtual learning does not suit every student, and has been linked with failure particularly for students from disadvantaged backgrounds. One suggestion for this has been the lack of non-verbal cues that accompany information in virtual environments, with face-to-face communication being particularly important for culturally diverse groups. Teachers can be concerned about increased workload and time constraints to support students as well as the prevalence of technical issues such as difficulties connecting to wi-fi or supporting students to access resources using different devices and platforms.

Another concern is that students might hold a negative perception of technologies which will affect their achievement. This can be mitigated by explicitly discussing the role that technologies can take in supporting their learning and achievement, as well as using peer models to demonstrate how technologies have supported their learning. What is more, students sometimes do not make sufficient links between the work they complete online and the activities they complete in class. This has also been noted for university students completing blended learning courses. It may be helpful to scaffold skills for student inquiry with the use of the different technologies, and help them to understand how online technologies can influence their achievement.

Tips for implementation:

- Visiting other schools to observe and have professional conversations with educators who are implementing BYOD in their classrooms is encouraged.
- Learning how to use digital devices to support pedagogical practices is a process that develops over time. Teachers will differ in their stages and speed of development. Start in areas you feel most confident teaching, then explore other areas as your confidence grows.
- Students may also need support to develop their digital literacy skills within the classroom programme. This will enable them to develop the knowledge, skills and understandings to work effectively with digital devices, and participate safely within digitally supported environments.

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