

Stimulating innovation in education technology

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Background

Barriers to the development of successful education technology

Expectations that digital technology will significantly improve educational provision have not yet been realised. Progress has been inhibited by governments that have tried to lead innovation themselves; that have looked for leadership to non-technical teachers; and that have failed to perceive the need for education-specific, technical innovation of a kind that can only be led by industry.

The role of government

The UK government is currently reviewing its policy in an attempt to find a middle way between government prescription and complete *laissez faire*. This paper responds to that review by proposing policies to promote a competitive and innovative market for education technology, without attempting to pre-judge what such a market will produce.

The importance of interoperability

Many educationalists fail to understand the critical importance to technical markets of interoperability, highlighted by BESA's 2008 *Policy Commission* as a key lever for change. Without the three-pin electrical plug, the market for electrical appliances would not exist.

The iterative, dialogic and adaptive nature of teaching means that education technology is almost wholly dependent on good data interoperability. Neither instructional software nor learning management software can work effectively in isolation: the former requires automatic access to data about students, their past performance, their current proficiency and their future learning objectives; the latter requires access to data describing the outcomes of previous learning activity.

The technical, education-specific standards required for such data interoperability do not yet exist. In these circumstances, there is an increasing realisation that MOOCs have over-promised their ability to deliver adaptive learning systems and useful learning analytics. Meanwhile, uncompetitive markets based on previous bureaucratic procurements perpetuate themselves as key suppliers leverage their dominant positions.

Many attempts have been made to address this problem: all have failed. There is a common misconception that technical standards for interoperability can either be devised and mandated by government or developed through consensual agreement. Such approaches fail because interoperability specifications have a close relationship with product innovation, driven by market competition.

It follows that government should refrain from leading work on technical standards. It should instead reward interoperable outcomes and support processes that decouple the development of initial technical specifications from later standardisation.

Recommended government interventions

Establish a technical specifications incubator

The government should provide seed-funding for a technical specifications incubator. The incubator would provide a governance framework under which self-selecting groups of suppliers could publish open specifications to improve the interoperability of software. After the technical efficacy of specifications had been proved by working demonstrations, the incubator would award badges to compliant products, informing consumers of the benefits that they offered and guaranteeing the reliability of the proposed solutions.

Only when a particular specification had achieved recognition in the market could it proceed to formal standardisation through BSI. By driving international standards, UK industry will gain a head start in an important, emerging, global market.

Establish an online catalogue of education technology products

The Department for Education should provide seed funding for an online catalogue of education technology products. By identifying and describing products authoritatively and transparently, the catalogue would support the provision of associated services, such as:

- certification, as provided by the incubator and other standards organisations;
- online marketplaces and other e-commerce platforms;
- open source communities;
- product review sites.

The catalogue would support a heterogeneous solution to the problem identified by Sebastian James, whose Review of Education Capital called on government to fund “an online price comparison catalogue” for education technology products.

The online catalogue should present a low threshold of entry to new products, allowing reputation rather than regulation to determine their ultimate success.

Stimulate the development of a professional press

Healthy markets require informed consumers. Education currently lacks a professional press for education technology of a type that would:

- provide comparative product reviews;
- discuss the appropriate use of product types in the classroom;
- examine the evidence for the efficacy of product types and their associated pedagogies, linking to academic research where available;
- encourage professional debate about what works best.

The Department for Education should open a conversation with interested media groups to establish what further measures can be taken to stimulate the development of such a press.

Anticipated outcomes

The purpose of the following horizon-scan is not to specify but rather to anticipate the outcomes that will follow from the enabling actions recommended above.

New types of education-specific technology

Current methods of education fail to provide feedback to students at sufficient quality and scale. This weakness will be addressed by new forms of instructional software, that will implement at least three fundamental paradigms to offer feedback:

- by machine feedback (automatic essay marking, quizzes, serious games);
- by exploratory environments (digital simulations, creative tools and “micro-worlds”);
- by digitally mediated and structured peer instruction.

These instructional strategies will be complemented by learning management software that will manage assignment, activity sequencing, learning analytics, and e-portfolios.

New standards of data interoperability

The pivotal requirement for data interoperability is to enable learning platforms to launch individual learning activities and harvest learning outcome data (interactions data, marks and grades, competency statements and artefacts created by the student).

Data will also be shared between different components of the learning management system and between different activities (e.g. a spelling quiz might prioritise words that a student had been getting wrong in recent written work). Adaptive sequences of learning activities will capture proven learning designs in reusable form; and education-specific hardware (such as classroom response systems) will be able to interface to any third-party software, encouraging innovation in learning content.

Anticipated benefits

By delegating the routine aspects of teaching to machines, more targeted use can be made of highly-qualified graduate teachers, whose jobs will become more interesting, more productive and better paid.

The automatic and timely sharing of information about learning will support greater collaboration between members of the teaching team, more specialisation in roles, better supervision and mentoring; as well as encouraging the involvement of parents.

Better monitoring of student progress will deliver more consistent outcomes, while personalised learning pathways will combine academic rigour with the diversity of provision that is appropriate to a technically advanced, liberal society.

The encapsulation of pedagogies in digital form will help disseminate best practice through the profession.

The collection of data to support teaching will also support monitoring and research, providing empirical evidence for what works best, supporting continuous optimisation of pedagogy, and maintaining minimum standards.

Learning analytics systems will compare the predictive reliability of different qualifications, helping to pioneer new more authoritative approaches to assessment that offer greater continuity between formative and summative modes.