High-tech theories of human learning

The development of educational technology has always been informed by theories of human learning. Scientific concepts provide ed-tech producers with a language of learning to build into the functionality of their tools. Today, new psychological and neuroscientific theories are helping to reshape understandings of learning and influence ed-tech development.

> Psychological and neuroscientific theories provide ed-tech designers with concepts to build into the functionality of learning tools

Psycho-technologies

Psychological insights have informed educational technology development for a century. In the 1920s Sidney Pressey based his 'teaching machines' on the behaviourist theory that rewarding learners would reinforce desirable learning behaviours.

Behaviourist assumptions persist today in new behaviour management apps. One of the most successful ed-tech products in history, ClassDojo is a free mobile app that allows teachers to award 'positive behaviour' points in the classroom.

The feedback and reward system of ClassDojo is also based on psychological insights into behaviour management associated with increasingly popular concepts of 'growth mindsets.'

Through a partnership with growth mindsets psychologists, ClassDojo rewards personal qualities such as persistence, perseverance, hard work, and effort. Through this system, learners are encouraged to see themselves in terms of incremental intellectual growth, rather than fixed and innate intelligence.

ClassDojo has been designed to reward children whose behaviours are appropriate to the behavioural norms dictated by growth mindsets psychology. It is a psycho-technology of behaviour management that focuses on fixing young people's habits of mind.

ClassDojo is also well-aligned with new US government policies on the measurement of non-cognitive learning. By rewarding non-cognitive qualities associated with a growth mindset, ClassDojo has become a reinforcement technique of government.

> New classroom management apps are designed to reinforce behavioural norms associated with psychological concepts of growth mindsets and government policies on non-cognitive learning

Neuro-technologies

Recently, neuroscientific theories of brain functioning have begun to animate ed-tech development. Wearable 'neurosensors' have been promoted to gather brain information that teachers could use to measure learners' engagement or anxiety in classrooms.

THE UNIVERSITY of EDINBURGH

1965 - 2015
50
E·S·R·C
50 YEARS SHAPING SOCIETY

UNIVERSITY of STIRLING

The global commercial computing company IBM has proposed the development of 'cognitive classrooms' and 'cognitive tutors' that are based on neuroscientific insights. According to IBM engineers, it is possible to create cognitive computing technologies that emulate the brain's capacity for cognition more 'naturally' than programmed software. These neuro-technologies could then be embedded into digital classrooms as a cerebral augmentation to learners' cognitive capacities.

Underlying IBM's aspirations to build brain-based cognitive tutors and cognitive classrooms is neuroscientific knowledge that has itself been generated through IBM's own Brain Lab. Its R&D has helped identify that the human brain consists of 'neural networks' and possesses 'neuroplasticity' and changes through interaction with the environment.

> Neuro-technologies could be embedded in classrooms as a cerebral augmentation to the cognitive capacities of the learner

IBM has mobilized these insights in the design of new kinds of cognitive systems that, like the malleable brain itself, are designed as neural networks that learn and adapt through experience. These brain-based learning systems could then be put into 'natural' interaction with learners.

Educational developments in cognitive computing are based on a computational model of brain functioning. They also treat the human brain in computational terms, as a programmable organ with computable cognition that could be optimized through interaction with smart environments.

IBM's experts hope that such neuro-technological developments will lead to better theories of cognitive neuroscience. The assumption is that

modelling the brain computationally will lead to refined conceptualizations of human cognition and learning.

High-tech theories

With current increases in the collection of educational data, some organizations and individuals have begun to suggest that current theories of learning are inadequate.

The commercial education publisher Pearson has established a research centre to explore the possible applications of big data in educational research and practice. According to the experts of the Center for Digital Data, Analytic and Adaptive Learning, the huge increase in the volume of educational data has revealed a 'theory gap.' There is now so much data available that the development of explanatory concepts to make sense of learning processes, cognitive development and behaviours cannot keep pace.

Pearson is proposing to use its massive financial, technical and methodological resources to fill the theory gap. By harvesting masses of data from millions of users of its e-learning products, Pearson aims to conduct data analyses that might lead to new theories and insights. It would then be well-placed to make use of these insights by building them into the tools that it markets to schools and colleges.

> Advocates of big data analytics argue there is a theory gap between the available data and explanatory concepts to make sense of learning processes, cognitive development and behaviours

While existing psychological and neuroscientific theories continue to influence educational technology development, new advances in data analysis are increasingly seen as the source for new high-tech theories of human learning.