



TTRO.COM

LOOKING BACK TO SEE THE FUTURE

T H E T R A I N I N G R O O M O N L I N E

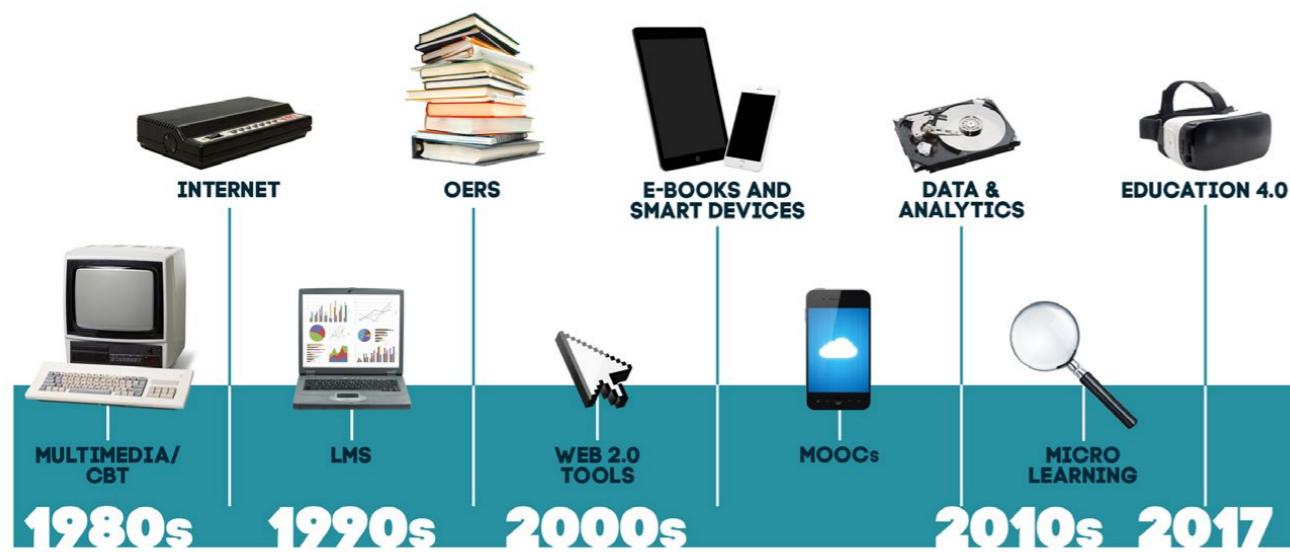


This article reviews some of the major technological developments that have impacted education over the last 40 years, and attempts to show how they contribute to an emerging education model.

This model, which was envisaged nearly two decades ago with the advent of heutagogy (Hase and Kenyon, 2000), is being realised under the banner of 'Education 4.0'. The model makes some suggestions about the role of both learner and teacher as a result of technology-enabled learning environments, and the resulting approaches to learning that these permit.

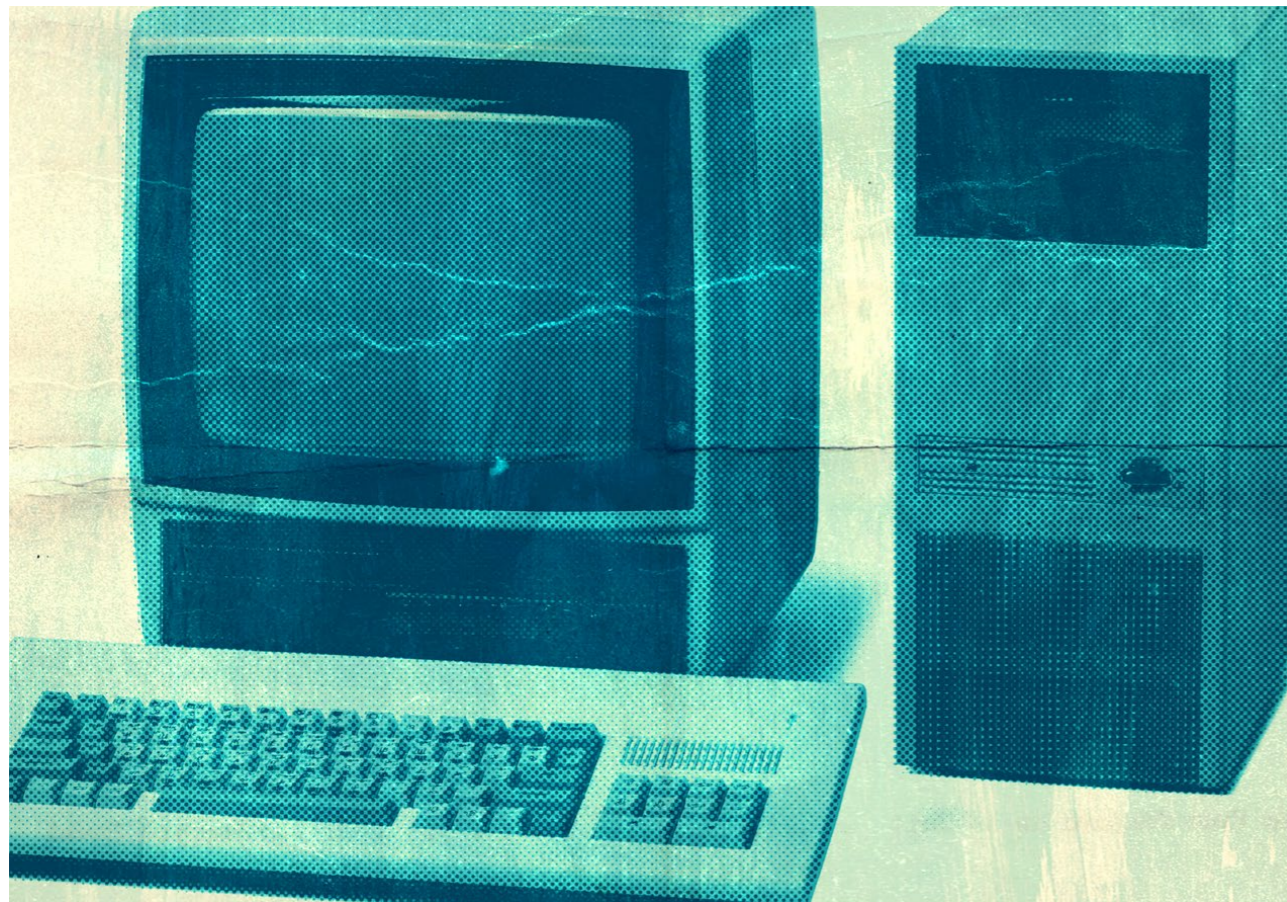
As the concept of 'Industry 4.0' becomes more entrenched in various discussions, it is also gaining momentum as a new educational paradigm. But Education 4.0 didn't simply emerge from a cocoon overnight. Instead, it is an evolution of approaches to teaching and learning made possible through technology-enabled learning environments.

If we briefly review some of the key technological innovations that have impacted teaching and learning over the past few decades we can form a picture that reveals how this evolution has progressed, and where it may lead in its next phase.



1980'S

Multimedia & Computer Based Training



Information and Communication Technologies have been incorporated into educational contexts for teaching since the 1980s, often referred to back then as Computer-Based-Training or CBT.

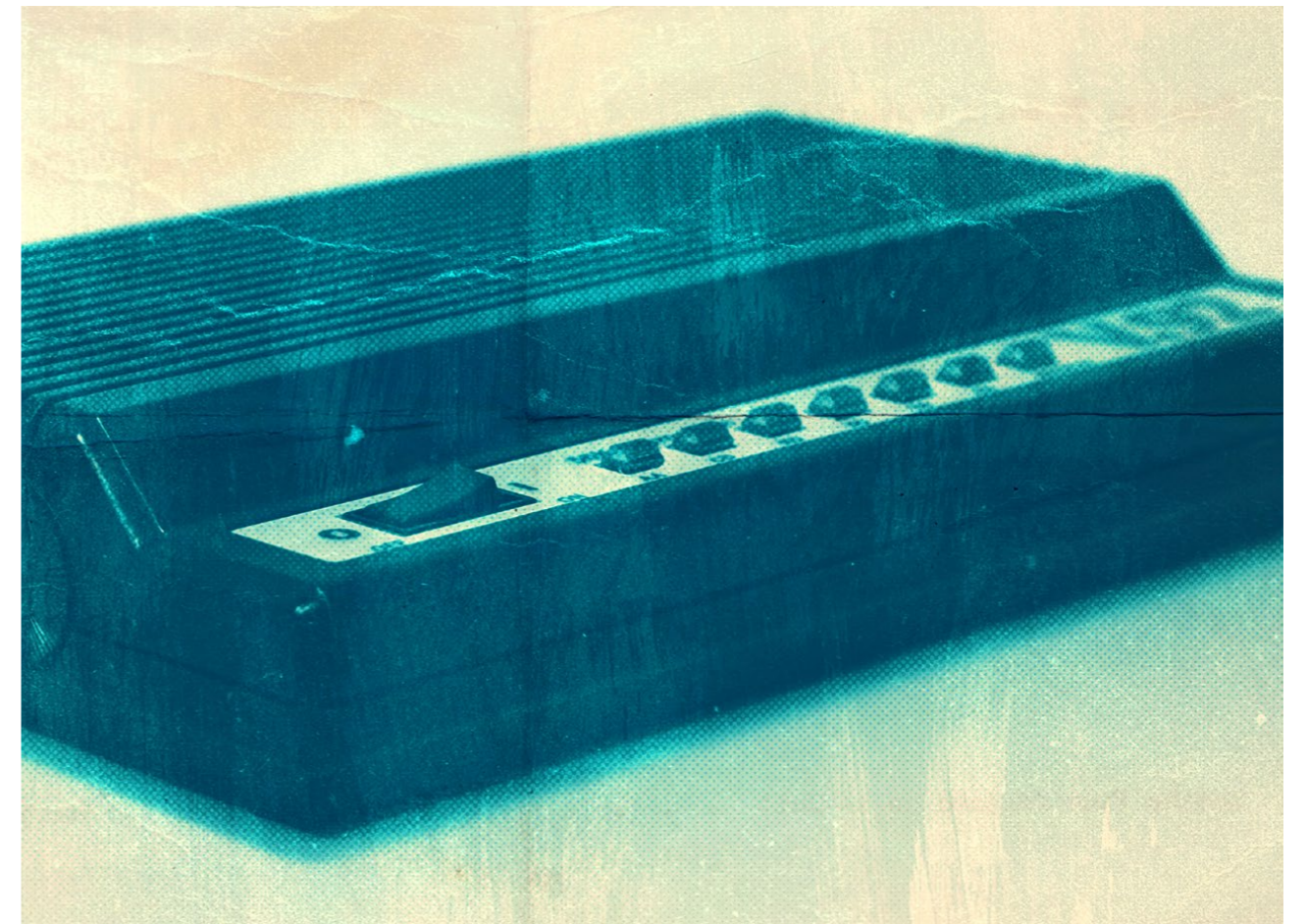
The personal computer was the main technological innovation. This approach tended to be based on a behaviourist theory of programmed instruction. The main concept here was that knowledge was objective, and needed to be transmitted from an expert to a novice by taking the learner through a series of pre-determined steps.

It was typically highly scripted and the 'one size fits all' approach was considered sufficient for all learners. This kind of **automation** introduced various advantages, especially where the material being studied was very procedural.

Consequently this basic model survives today; however, the approach falls short when the subject area includes content that is less clear-cut, and doesn't have 'right or wrong' answers.

Early 1990'S

The Internet



In 1993 the internet became available for use to the public on a royalty-free basis.

This was revolutionary due to the **unlimited access** it offered to users (learners and educators) and the plethora of resources that became available without any action required on the part of the owner.

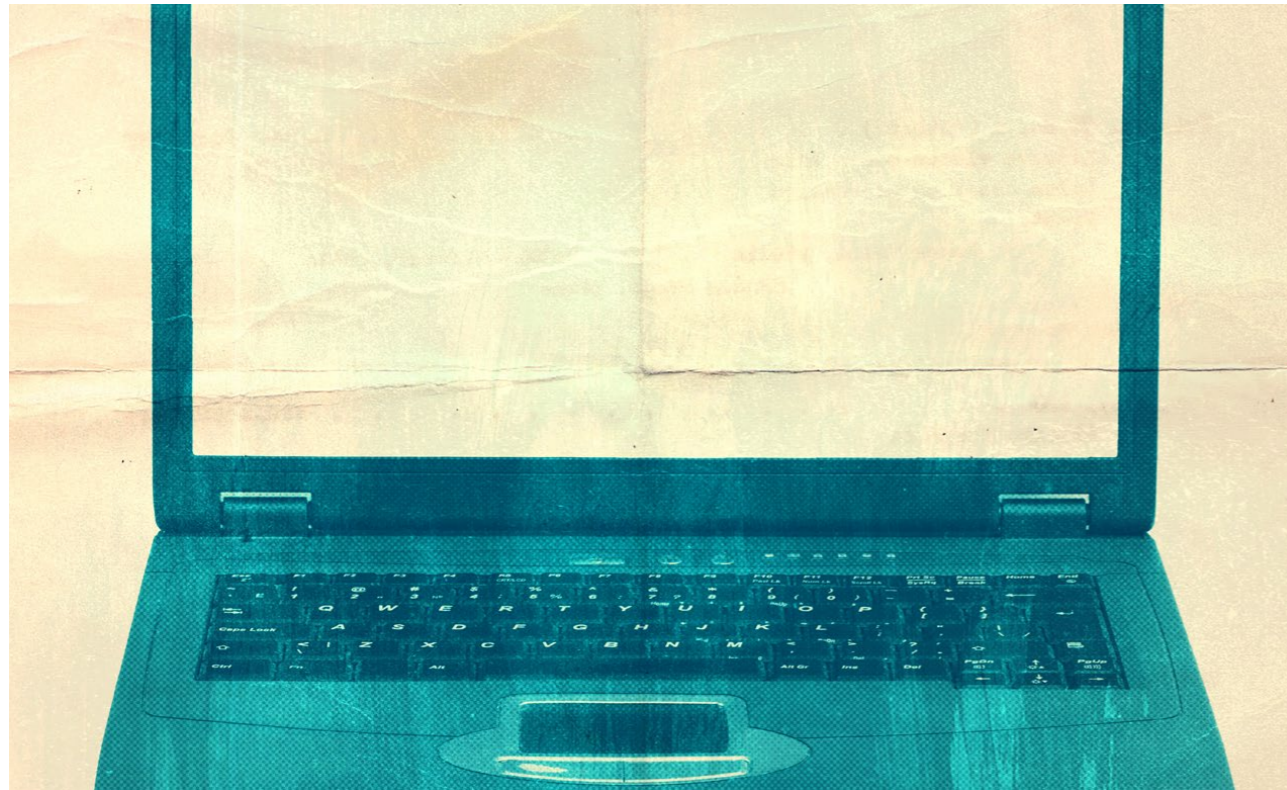
However it also posed a new problem, which was figuring out how to deal with massive amounts of content and information.

It highlighted the need for new skills in a digital era – such as digital literacy skills required by teachers and learners alike.

This arguably marks the beginning of an era of digitally-enabled social learning, in which resources are freely available to all participants. Learners at this stage were however still very much consumers of any content available to them.

Mid
1990'S

**Learning Management
Systems**



Managed Learning Environments (MLEs), Virtual Learning Environments (VLEs), Learning Management Systems (LMSs), Content Management Systems (CMSs) and various other incarnations of learning environments appeared in the mid-90s in order to manage and curate resources, and to enhance communications between administration, faculty, students and parents.

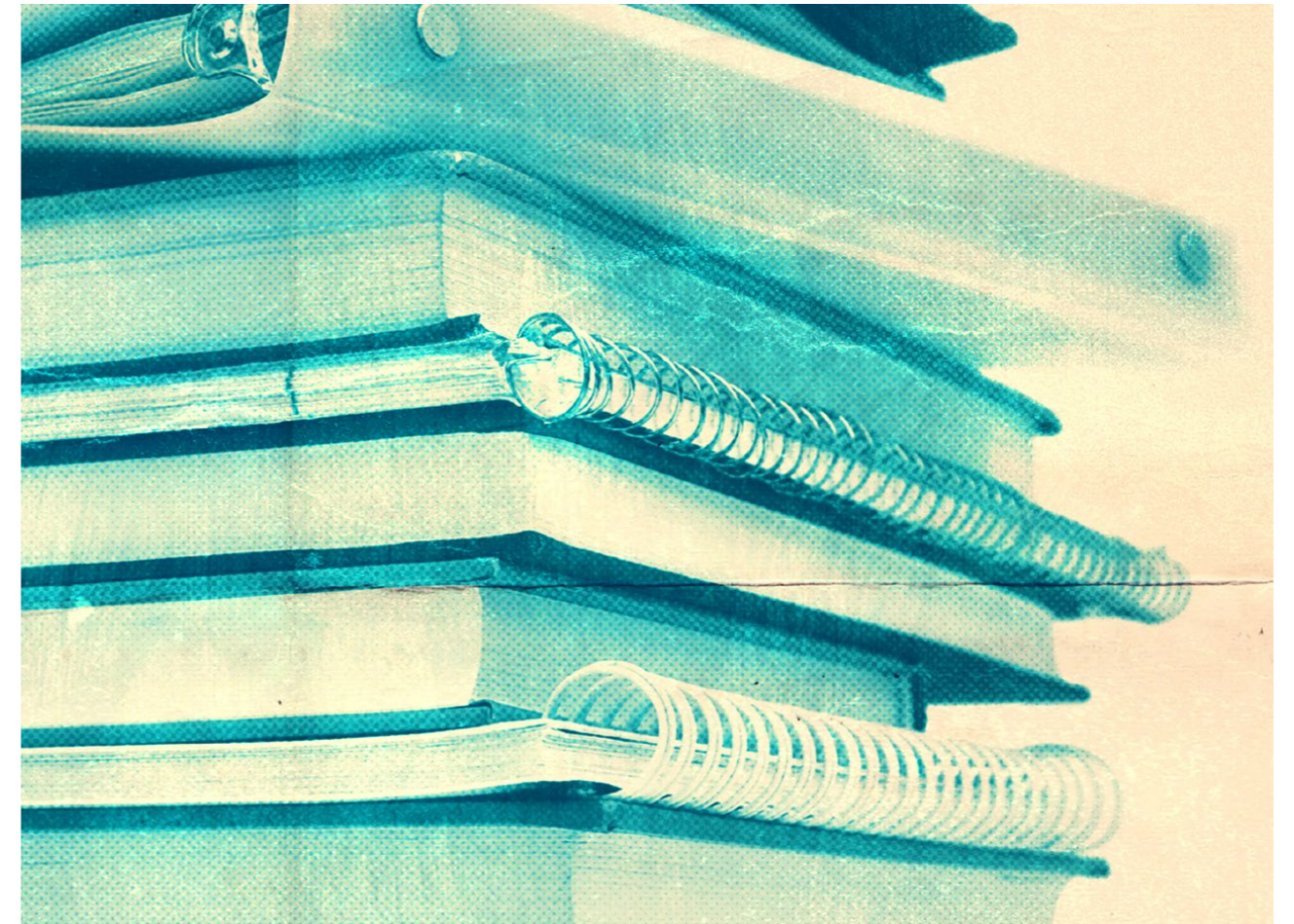
These systems also served as gated communities to help institutions protect intellectual property while serving up education online. In practice, many institutions used these systems as content repositories, and learning approaches were still largely transfer-based.

With the enhanced ability to engage distant learners in online communities, they introduced elements of social constructivism. The data collection made possible through these systems arguably kick-started an era of big data in education.

Consequently this basic model survives today; however, the approach falls short when the subject area includes content that is less clear-cut, and doesn't have 'right or wrong' answers.

Early
2000'S

**Open Educational
Resources**



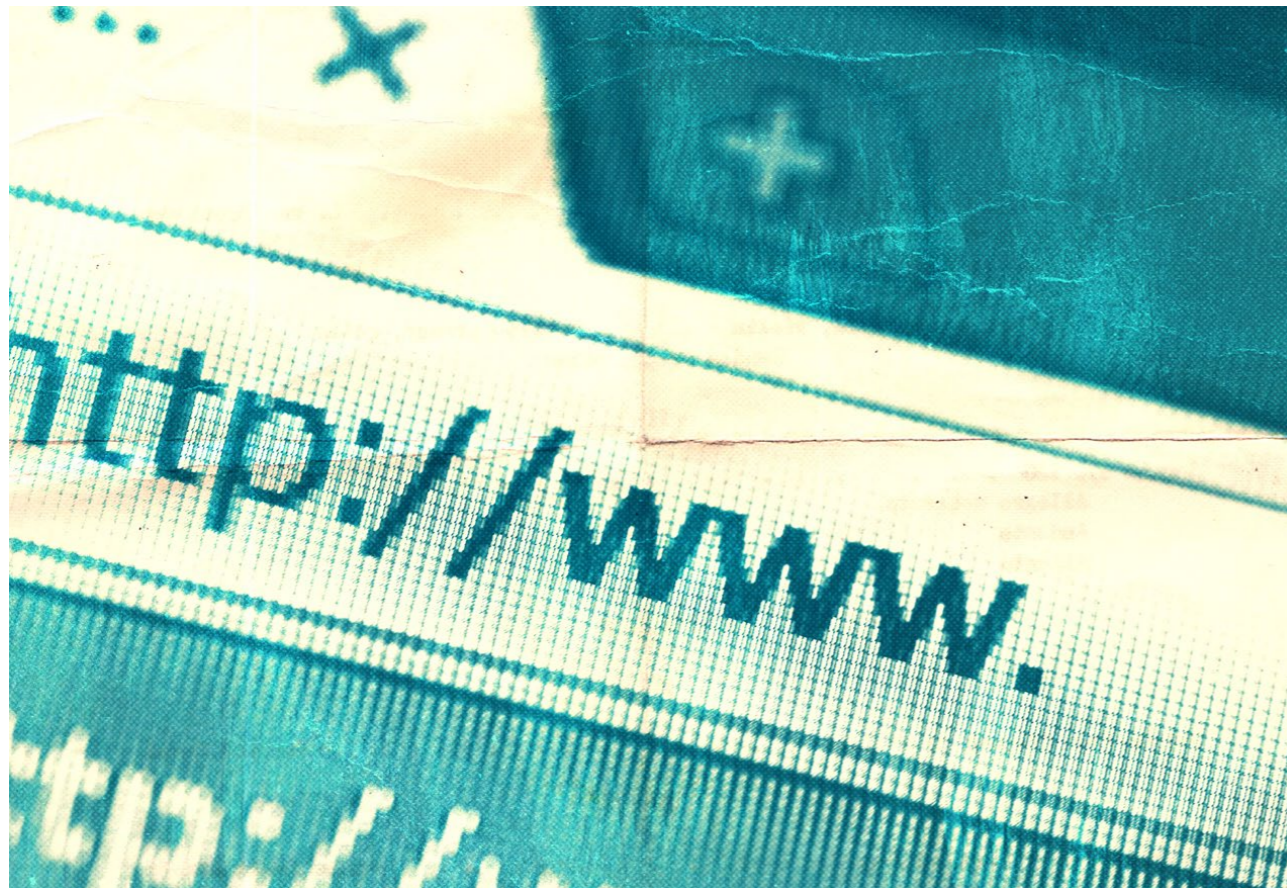
Open Educational Resources (OERs) seize on the potential of the internet as an open access platform for the supply and demand of learning content.

This was bolstered by MIT's OpenCourseWare concept launched in 2001. Although OERs are not associated with a particular pedagogical approach, they provide a lot of raw material that educators and learners can use in whatever methodology they can apply them to, arguably supporting cognitive and social constructivist approaches to learning.

OERs also provide an essential component for a new learning theory in the shape of connectivism, which proposes that learning occurs in networks – and is a continual process of connecting learning sources. Connectivism, which highlights the need for developing new skillsets and forms of literacy, also emerged as a learning theory in this era.

Mid
2000'S

**Web 2.0 Tools and
Social Media**



With Web 2.0 tools appearing, we see the ability of educators and learners to become producers and distributors, as well as consumers of content.

This trend has continued over the last decade, driving a set of digital skills that were not apparent a generation ago; from blogging to multi-media file sharing, web-site design, and managing an online presence.

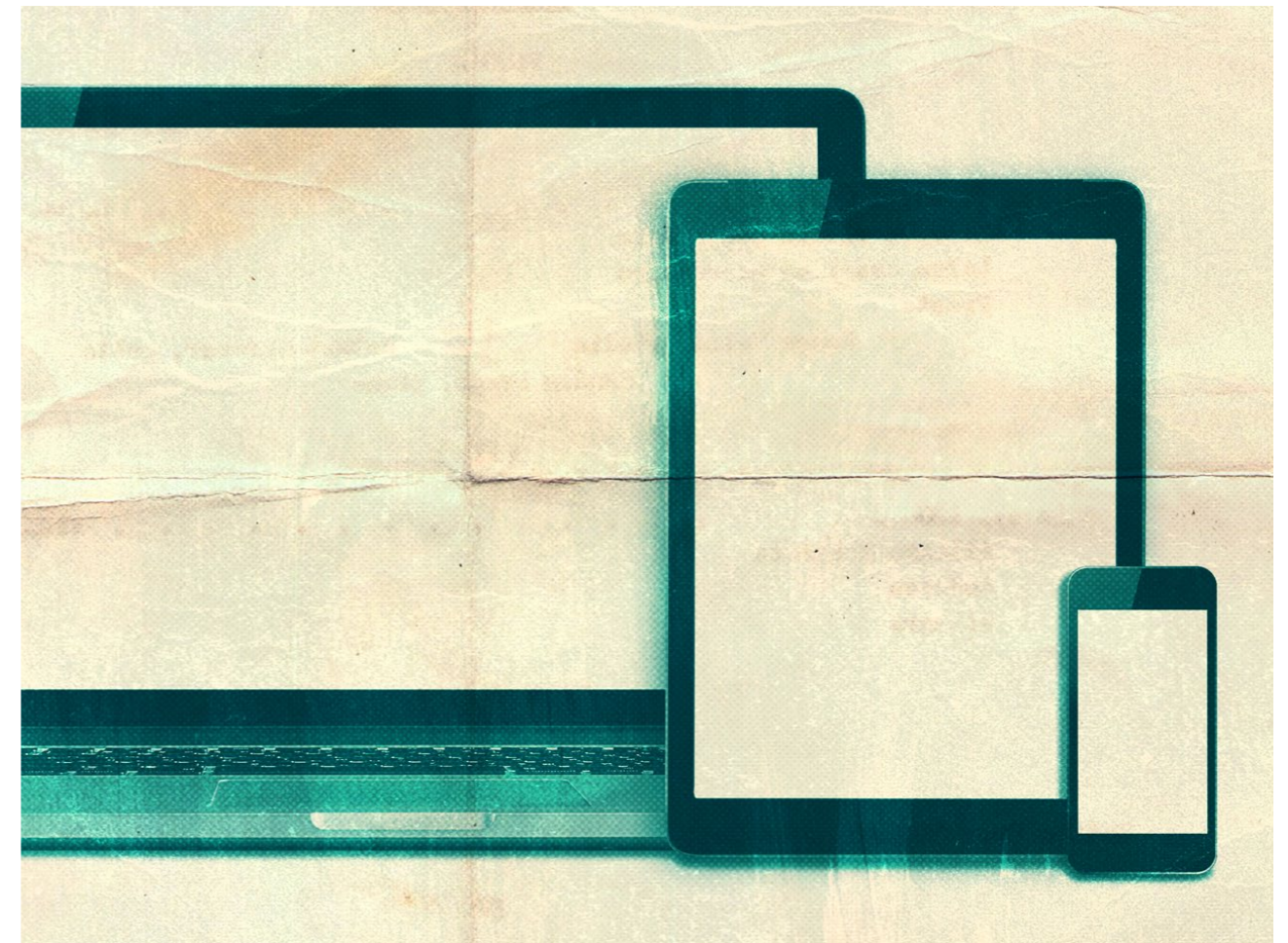
Educational content in the form of podcasts, videos, animations and infographics are now commonplace and no longer the domain of professional publishers.

Teachers and learners alike can **create and contribute**. In addition, social media enabled the implementation of approaches to learning, such as social constructivism and connectivism.

However, cognitive authority at this stage still resided in the institutions that offer qualifications, and experts that design curricula.

Late
2000'S

**E-books & Smart
Mobile Devices**



Although mobile learning had been possible with the appearance of devices like PDAs, it wasn't until mobile devices became mainstream, web-enabled devices that the affordances they offered for learning became widespread.

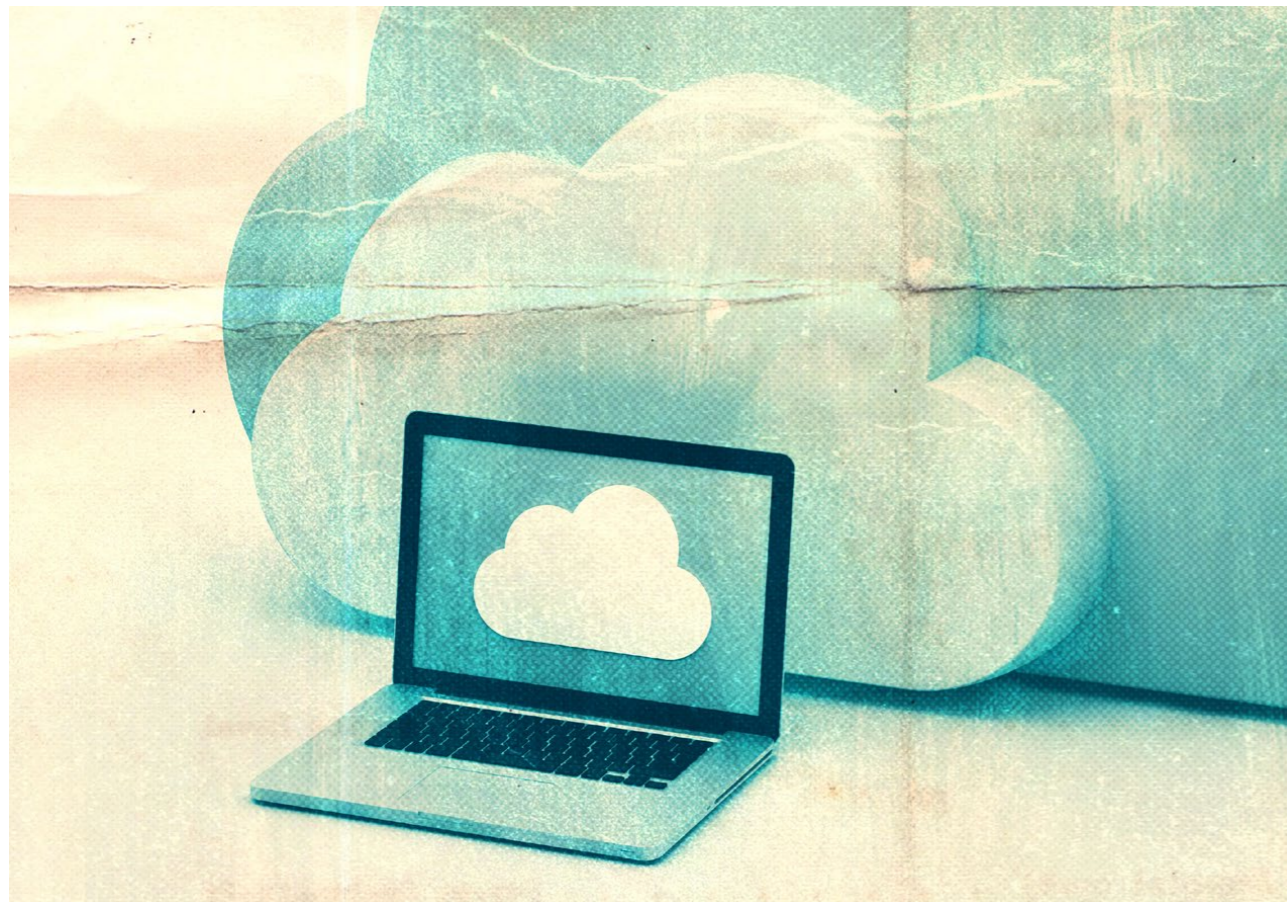
With the availability of laptops, smartphones and then tablets, this became a reality. Mobile devices are now pervasive in society, and education has responded by enabling content for **mobile consumption**.

While its multiple advantages have been widely published, (e.g. see Baran, 2014) mobile learning also presents challenges to learners, educators and administrators, in the form of things like cyber-bullying, tracking analytics, archiving and record keeping, the proliferation of fake news and so on.

Once again this highlights the need for a set of digital skills to include things like cyber security and search and hypertext literacies.

Late 2000'S

MOOCs



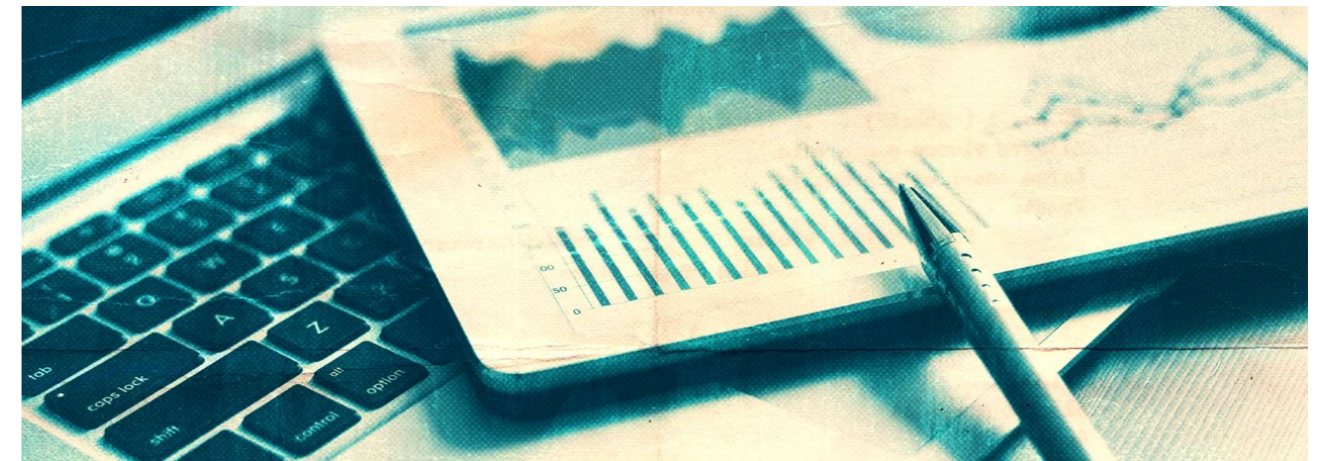
Due to technological advances, we have seen an increase in the popularity of distance learning. This has allowed students who were previously excluded to participate in educational courses.

In essence, we have witnessed a move from knowledge hoarding to knowledge sharing. Institutions around the world have joined the movement, and amid open debate about the pros and cons of the MOOC format, we have witnessed a veritable tsunami of MOOC courses become available.

As a result we also see the viability of a drop-in approach to **self-directed learning**. Anyone can take a taster of a course offered by a higher education institution and determine whether they deem it suitable to their needs before they commit to paying for a verified certificate. A concurrent development was the rise of the 'flipped' classroom, making use of technology to drive certain modes of learning outside of the classroom so that actual class time could be used to focus on deeper application activities, and the social aspects of learning.

Early 2010'S

Big-Data, Learning Analytics and Cloud Computing



With an ever-increasing number of digital 'smart' tools and devices at our disposal, the amount of data being collected is increasing exponentially, and has the potential for big pay-offs in the education arena.

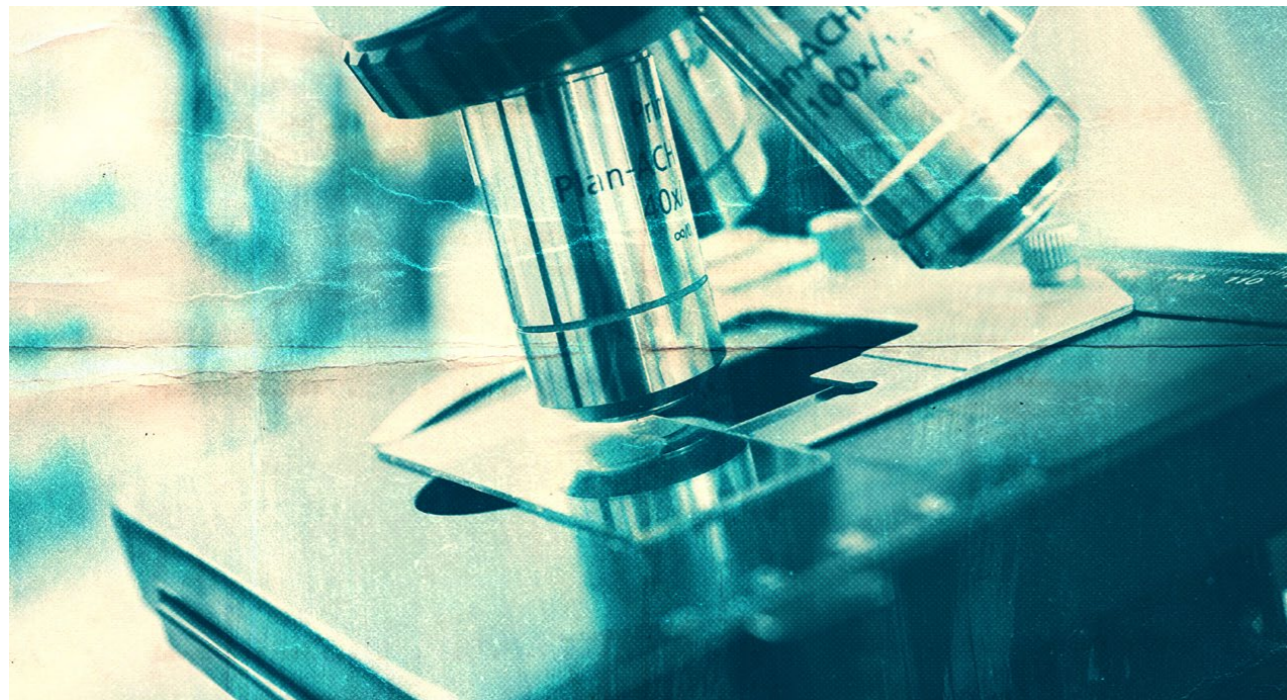
Learning analytics have the ability to expose the digital footprint of groups and individuals, revealing a lot of information about learning habits, competencies, knowledge gaps, and preferences. For example, with the advent of the Experience API (xAPI), we have a means to track all types of learning experiences, whether they were pushed to the learner by an institution, or if the learner directed themselves to it in the open domain.

This can all be collated in a learning record store, which allows for the acknowledgment of informal learning, as well as the personalisation of content and learning experiences, tailored to the individual. Concepts such as **personalised learning** and self-directed learning are fundamental to a relatively new way of viewing instruction and learning, known as heutagogy.

Heutagogy views learners as essentially self-directed and able to manage their own learning. In this paradigm, learning is not linear and pre-determined, but the syllabus is negotiated and depends on the learner's decisions about what to learn. The teacher's role is no longer about designing the learning process and content, but developing the learner's ability to 'learn how to learn' and develop self-efficacy.

With cloud computing now well-entrenched as the preferred method for processing and storing data, digital activity across devices is aggregated 24/7.

Effectively we live in an 'always on' environment and multiple devices are streaming data to a personal learning profile are freely available to all participants. Learners at this stage were however still very much consumers of any content available to them.



Simply put, micro learning is little nuggets of salient information distributed often and customised to the learner.

Micro learning is a technique for delivering content in focused, bite-sized chunks, no longer than five minutes each. Micro learning makes use of spaced repetition to build long-term knowledge retention. Currently, micro learning is situated more in the domain of learning and development within professional practice, but its appeal to younger children is quite obvious.

Higher education may struggle with the concept on a fundamental level, as issues of academic rigour, the need to cope with long texts, and attention span will continue to be debated.

However, it's interesting to note that even higher education institutions observe principles of micro-learning within the development of online programs such as MOOCs, where it is currently considered best practice to keep videos below 5 minutes.

In this era we have also seen the appearance of providers who are new participants in the education arena. **Collaboration between employers and educators** is evident in programs of study such as Udacity's VR Developer and Robotics nanodegrees, where industry leaders including Google, Samsung and Bosch are involved.





The new paradigm is already taking form and is delivering on many elements for a learner-centered approach to learning and teaching. We see many threads of learning theory brought together into a coherent design for learning that is relevant in today's technology-driven, learner-centered era.

Although heutagogy first envisaged this in the early 2000s, it is the interface between technology and social need that makes the current evolution of this new approach possible. Heutagogy shares many characteristics with a model that is relatively new, termed 'Education 4.0' (e.g. see Fisk 2017), which in turn is seen as a response to the rise of Industry 4.0, or the 4th industrial revolution.

The table below offers a comparison between the legacy approach to teaching and the emergent one.

	Legacy approach to education	Emergent approach to education
Dependence	Learners depend on the teacher and institution in order to demonstrate competence across a curriculum and standardised exams.	Learners are independent. They manage their own learning based on the needs they perceive.
Role of the learner	Passive recipient.	Analyst and synthesizer
Resources for learning	The teacher distributed resources to the learner in a transmission model of learning.	Teachers provide some resources but the learner has some autonomy in the selection of these.
Planning	Learners follow the same curriculum, typically in lockstep.	Learning is not planned in a linear 'one-size-fits-all' approach. It is based on an identified 'need to know'.
Organisation of learning content	Learning is subject centered, curricula are standardised.	Learning based on topics or phenomena that are used to present a range of subject matter, revealing interconnections between disciplines. Learning is project based and problem-solution oriented. Curricula are flexible.
Emphasis on	Standardisation and performance.	Capability, meta-cognition, creativity, innovation.
Motivation	Motivation is often extrinsic – the promise of reward or punishment.	Motivation is more closely aligned with concepts of self-efficacy and accomplishment.
Role of the educator	Designs the learning process. Classroom authority.	Develops the learner's capability to function in the 21st century society. Guides the learner and provides formative feedback.
Location	Learning happens in the institution's physical or virtual premises, timeframe determined by the institution.	Learning is distributed, independent of time and place.
Qualifications	Certificates, diplomas and degrees.	Diverse forms of credentials and reputation markers will be accepted as smaller units of learning and continuous career readiness are acknowledged.

(Adapted from ideas presented by knowledgeworks and Terry Heick)

The table suggests that we are moving away from the model where learning is organised around traditional institutional environments, and instead, it is now embedded in everyday settings and interactions, distributed across a wide set of technological platforms and tools, facilitating personalised, adaptive, and continuous learning experiences.

Classrooms and lecture halls will transform into collaborative spaces, where peer-to-peer learning will flourish. Assessment methodology will shift from periodic grading systems, to continuous feedback models centred on projects and problem-based tasks. The role of teachers will evolve from the assignment of curricula to the curation of content. The focus of education will move away from traditional degree-based programmes, towards a focus on personalised, relevant skills acquisition.



A FINAL WORD

As connective and mobile technologies spread globally, industries are evolving in unprecedented ways. The skills we will need to service these industries will be dramatically different from the past, and so will our approaches to education.

The change is driven both by educational institutions and employers. Educators' roles are changing and becoming more specialised to deal with the demands of personalised and contextualised learning. Employers want employees who are problem solvers, communicators, and adaptors.

They seek employees that require little ramp-up time to productivity when starting new jobs. There is a need to align education with workplace readiness, and for educational institutions to consult with industry in this respect, with an emphasis on how to achieve transfer to the workplace. Heutagogy foresaw this learning evolution, and Education 4.0 is the manifestation of it.

RESEARCH

Baran, E. (2014). A Review of Research on Mobile Learning in Teacher Education. *Educational Technology & Society*, 17 (4), 17–32.,

Retrieved from:
http://www.ifets.info/journals/17_4/2.pdf

Blaschke L.M., Hase S. (2016) Heutagogy: A Holistic Framework for Creating Twenty-First-Century Self-determined Learners. In: Gros B., Kinshuk, Maina M. (eds) *The Future of Ubiquitous Learning. Lecture Notes in Educational Technology*. Springer, Berlin, Heidelberg

Fisk, P. (2017) Education 4.0... the future of learning will be dramatically different, in school and throughout life.

Retrieved from:
<http://www.thegeniusworks.com/2017/01/future-education-young-everyone-taught-together/>

Hase, S., & Kenyon, C. (2000). From andragogy to heutagogy. UltiBase.

Retrieved from:
<http://multibase.rmit.edu.au/Articles/dec00/hase2.htm>

Heick, T. (2015) The Difference Between Pedagogy, Andragogy, And Heutagogy.

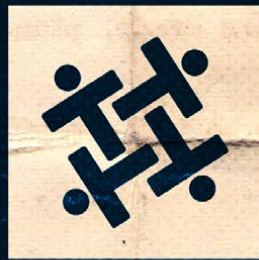
Retrieved from:
<https://www.teachthought.com/pedagogy/a-primer-in-heutagogy-and-self-directed-learning/>

McPherson, M. (2016) Evolution of Learning Technologies, in *The Wiley Handbook of Learning Technology* (eds N. Rushby and D. W. Surry), John Wiley & Sons, Inc, Hoboken, NJ.

<http://education-2020.wikispaces.com/Connectivism>

http://knowledgeworks.org/sites/default/files/A-Glimpse-into-the-Future-of-Learning-Infographic_0.pdf





TTRO.COM

TEL: +27 86 188 7672 EMAIL: INFO@TTRO.COM

GROUND FLOOR KNOWLEDGE PARK III, HERON CRESCENT, CENTURY CITY, CAPE TOWN, SOUTH AFRICA