

E-PEDAGOGY & E-ASSESSMENT

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Abstract

Teaching practice has changed little during the last century. It is argued that the classical pedagogies are timeless and not subject to the whims of technological change. The proponents of change argue that the learning environment has fundamentally changed and that pedagogy must evolve to reflect this new reality. This paper explores this argument and examines what, if any, are the implications of an “e-pedagogy” for assessment.

What is pedagogy?

“Pedagogy” is derived from a Greek word meaning “to lead the child”. Its modern usage relates to the art and science of teaching, and includes theories of teaching and learning.

Classic pedagogies

There are numerous theories of teaching and learning. For the purpose of this paper, I will consider three:

1. learning as behaviour (behaviourism)
2. learning as understanding (cognitivism)
3. learning as knowledge construction (constructivism).

Behaviourism

This psychological theory asserts that learning manifests itself in behaviour (either changed or reinforced behaviour), and behaviour can be conditioned through a system of punishments and rewards. Desired behaviours can be encouraged through rewards; undesired behaviours can be suppressed through punishments.

Behaviourism is one of the oldest teaching methods. It is typified by rote learning, drill-and-practice skill acquisition, and a punishment-and-reward system of learning. It is commonly practiced in primary schools and, to a lesser extent, secondary education. Current assessment practice, in all sectors, exhibits a behaviouralist approach – rewarding success (with a “pass”) and punishing failure (by withholding certification).

Behaviourism cares little about the mental processes that take place within the learner, who is considered a black box. Conversely, the teacher plays a central role, being 'master' with responsibility for training the learner.

In the behaviourist model, learning takes place in a highly controlled environment, through drill-and-practice techniques. It manifests itself through changed behaviours such as the acquisition of new practical or mental skills.

Cognitivism

Cognitive learning theories view learning as a process of understanding and internalising facts and concepts about the world around us. In the cognitivist model, knowledge and understanding are represented by discrete mental states; unique synaptic combinations that represent specific knowledge and understanding. Cognitivism takes a data processing approach to learning, with the learner being seen as a computer who inputs, processes and outputs information.

Cognitivism relies on both teacher and learner. The teacher provides content and leads learning (i.e. the creation of specific mental models); the learner is responsible for internalising the material presented by the teacher. In the cognitivist model, learning takes place when the 'correct' materials are available to the learner, and the teacher directs the learning. Cognitivism recognises the individual differences between learners, each having their own pre-conceived ideas and preferred learning styles. But knowledge remains essentially pre-determined, with the role of the teacher being to facilitate learning through a series of learning activities.

Constructivism

According to this theory, knowledge is entirely subjective, uniquely constructed by each learner through a combination of their existing knowledge and beliefs, and new stimuli. Knowledge is actively constructed by learners through a mental process of **development** through which learners build ("construct") meaning and knowledge. Meaning is derived from current knowledge and beliefs, and is individually constructed.

Piaget's (1977) notions of assimilation and accommodation describe how learning takes place. **Assimilation** refers to the integration of perceptions into existing mental models; **accommodation** involves the alteration of mental models to explain perceptions that would otherwise not be understood. Piaget asserts that learning occurs by an active construction of meaning, rather than by passive acceptance. He explains that when we, as learners, encounter an experience or a situation that conflicts with our current thinking, a state of disequilibrium is created. We must then alter our thinking to restore equilibrium or balance. To do this, we make sense of the new information by associating it with what we already know, that is, by attempting to assimilate it into our existing knowledge. When we are unable to do this, which psychologists call a state of **cognitive dissonance**, we accommodate the new information to our old way of thinking by restructuring our present knowledge to a higher level of thinking.

In the constructivist model, the teacher facilitates learning – but does not direct it. S/he creates an environment (which may include learning materials) that is conducive to learning – but does not mandate it. There is no right and wrong; no target state of mind (unlike cognitivism).

Social constructivism is a variation on this model that focuses on the social nature of learning. It emphasises the importance of culture, language and context in learning, and borrows from Vygotsky's 'zone of proximal development' (1978), which argues that students can master concepts that they cannot understand on their own with the assistance of adults or peers who are more advanced.

Is there a need for a new pedagogy?

Most of the world has been undergoing a cultural revolution during the last 25 years. This revolution has affected the environment in which students learn and, arguably, affected the nature of learners themselves.

The changing technological environment

A crucial aspect of this revolution is technological change. The most recent developments on the Internet are labelled "Web 2.0". Anderson (2007) describes six "big ideas" behind Web 2.0.

Individual production and user generated content.	Users change from consumers (of content) to creators. Services such as YouTube, Facebook and Blogger make it straight-forward to create content.
Harness the power of the crowd.	Users connect with each other to create collective intelligence and facilitate group decision making. Amateurs compete with professionals; reputation becomes more important than title or position. Wikipedia illustrates collective intelligence.
Data on an epic principle.	The Internet makes massive amounts of data available to users. Web 2.0 provides tools to harness this data. For example, search engines allow users to intelligently search the entire Internet; RSS allows users to select specific information sources.
Architecture of participation	Web 2.0 is designed to facilitate mass user participation by making it easy to contribute, comment and edit content. Services such as Wikipedia and, to a lesser extent, Facebook illustrate this idea.
Network effects.	This describes the exponential increase in value of a service as more people participate. Examples of this are search engines (the more pages archived, the more effective searches

will be) and social networking sites (the more members, the more useful the service).

Openness.

This relates to both technical standards and an open attitude towards information sharing.

Perhaps the simplest way to explain Web 2.0 is to describe it as the “read/write web”; a web that facilitates participation and collaboration as well as information dissemination. This contrasts with the original “read only” web (“Web 1.0”) where users were passive consumers of (other people’s) information.

Ubiquitous computing relates to the widespread distribution of computing devices. It is currently at an early stage although mobile technologies (such as smartphones and PDAs) are a clear pre-cursor to a ubiquitous environment, where intelligent devices are routinely embedded in everyday objects (such as clothing and cars). Ubiquitous computing heralds a fundamental shift in society from an analogue world to a digital one.

The changing nature of learners

The wider societal changes that are part of this cultural revolution have affected the attitudes of young learners, who are typically less respectful of authority, less tolerant of poor service, and more self-motivated than previous generations. The shift from factory worker to knowledge worker has resulted in a constant demand for re-training and lifelong learning, leading to a much greater proportion of mature learners entering and re-entering education. These older learners typically demand a flexible and relevant curriculum and one that recognises their existing experience.

New kind of learner

According to some commentators, the combined effect of these technological and societal changes is the emergence of a new kind of learner, variously described as “Millenials” (Oblinger, 2003), “Net Geners” (Barnes *et al*, 2007) and, most famously, “digital natives” (Prensky, 2001).

A common set of characteristics emerges from the literature with respect to their learning styles:

- skilled use of tools
- active learning rather than passive receiving of knowledge
- authentic learning experiences rather than contrived tasks
- construction rather than instruction
- task (not process) oriented
- just in time learning
- search not memorise
- doesn’t know answer but knows where to find it
- Google not libraries

- collaborate not compete.

In his paper *Digital Natives, Digital Immigrants*, Prensky (2001) argues that there has been a fundamental change in students.

“Today’s students have not changed incrementally from those of the past. A really big discontinuity has taken place. One might even call it a singularity – an event which changes things so fundamentally that there is no going back. This singularity is the arrival and rapid dissemination of digital technology in the last decades of the 20th century.”

He goes on to argue: “Our digital immigrant instructors are struggling to teach a population that speaks an entirely new language.” Prensky touches on pedagogy when he describes how teachers must change: “Today’s teachers have to learn to communicate in the language and style of their students... going faster, less step-by-step, more in parallel, with more random access.”

The emergence of e-learning

As part of the technological revolution, the use of e-learning, or blended learning, is increasing. This is particularly true of Higher Education, which offers most programmes partly or wholly online. In the future, e-learning is likely to be more widely used in the tertiary and school sectors. Another driver for e-learning is life-long learning, which requires on-going training and re-training of the adult workforce.

In many cases, e-learning is delivered through a virtual learning environment (VLE), which is a custom built environment designed for online learning. VLEs, such as *Blackboard* and *Moodle*, typically provide all of the software tools required for online learning such as communication and file sharing facilities. These environments are often modelled around the traditional campus, providing ‘virtual staff rooms’ and ‘online student common rooms’. E-portfolios provide the digital equivalent to the traditional paper portfolio; these typically provide online storage for a range of media types (such as drawings, photos and videos). Dedicated e-assessment systems, such as *Questionmark*, facilitate large-scale online testing, providing many of the question types that are familiar to teachers.

Some academics have pointed out the potential of e-learning to improve current practice. Garrison and Anderson (2003) write:

“E-learning has significant potential to alter the nature of the teaching and learning transaction. In fact, it has caused us to face up to some of the current deficiencies of higher education, such as large lecturers, while providing some possible solutions or ways to mitigate these shortcomings. Seen as part of pedagogical solution, e-learning becomes an opportunity to examine and live up to the ideals of the educational transaction described previously.”

New learning opportunities

The changing environment facilitates new kinds of learning. Teachers have traditionally focussed on content; indeed, many consider the identification and

delivery of learning material to be their prime role. It is through this role that they seek to direct learning. But it has been argued that this traditional teaching skill is redundant in today's information-rich learning environment. A handout on the assassination of President Kennedy cannot match the resources that are available online, which typically include original text, audio and video materials. Some of this content is very high quality, even world class. The most talented Business Studies teacher would struggle to match an online master class in business management from Bill Gates.

Some commentators have suggested that the contemporary teacher should be more "guide on the side" than "sage on the stage". The ready availability of information makes *facilitation* more important than *direction*. The pedagogic challenge is not too little information but too much. The contemporary learner does not need to be supplied with information; s/he needs to learn how to select from the vast amount of digital information available online. They need to acquire 'new literacies': digital literacy, media literacy and (particularly) information literacy, the last of which includes the ability to "learn to learn".

The current educational system is highly synchronous. Everything runs to a timetable. But digital learning material is inherently asynchronous. Web pages can be accessed at any time; videos can be watched whenever a student chooses; and podcasts can be listened to on the bus. The efficacy of traditional timetabled content delivery is questionable. "Face time" would be better spent discussing rather than delivering content.

Some writers have even suggested that the use of Web 2.0 in learning questions the meaning of knowledge. In his paper *A Seismic Shift in Epistemology*, Dede (2008) compares the classical concept of knowledge with what knowledge means in the Web 2.0 world:

"In the Classical perspective, knowledge consists of accurate inter-relationships among facts, based on unbiased research that produces compelling evidence about systematic causes. In the Classical view of knowledge, there is only one correct answer... the contents and skills that experts feel every person should know are presented as factual truth."

He contrasts this with Web 2.0 knowledge:

"In contrast, the Web 2.0 definition of knowledge is collective agreement about a description that may combine facts with other dimensions of human experience such as opinions, values and spiritual beliefs. The epistemology that leads to validity of knowledge in Web 2.0 media is peer review from people seen, by the community of contributors, as having unbiased perspectives."

He concludes that this fundamental distinction is not being addressed: "At present, the response of most educators is to ignore or dismiss this epistemological clash."

New learning spaces

The emergence of ubiquitous computing is creating new learning spaces. Location is less important as information is available in almost any location where there is an Internet or 3G connection – ranging from *Starbucks* to the school bus. And it's not just the location of spaces that is changing. The spaces themselves are transforming. Virtual worlds (VWs), such as *World of Warcraft* and *Second Life*, are attracting millions of users, and these worlds offer rich learning environments with a degree of emotional involvement unmatched in traditional settings.

For example, *Second Life* provides an environment consisting of millions of real life users who select an avatar that interacts with this world. There are thousands of in-world locations to explore, ranging from a virtual Rome to the dance floor on the *Titanic*. Users interact by text or voice. Streaming audio and video are available in many locations.

The educational applications of these environments are only now being considered. These include role playing and game-based learning. Some academics have argued that VWs could replace VLEs. Writing about the emotional involvement inherent in VWs, Bignell (2008) writes: "Traditional VLEs lack this engagement. By fostering the learning experience we can utilise the virtual world to produce amazingly effective teaching." He is confident about the future of such learning environments:

"Is Second Life better than 2D web-based virtual learning [VLEs]? Not yet. Will it be better? Yes, almost certainly, because the interactions are richer, the content easier to provide, the platform cheaper, the students can be engaged more readily, the technology is more efficient, assessment is easier, playful learning is afforded and tailored learning environments can be constructed for specific learning outcomes."

Towards an e-pedagogy

While the tools for teaching and learning have changed dramatically during the last 20 years, the methods of teaching and learning have not. Traditional teaching methods have been applied to these new learning environments. The reasons for this are two-fold: firstly, there is no need to change the tried-and-tested pedagogies; and, secondly, there are no alternative methods. The proponents of change challenge both of these assertions.

Problems with traditional approaches

The critics of existing approaches to teaching and learning make two arguments: (1) they're not working; and (2) they misunderstand the nature of the technological change.

There are numerous critics of the *status quo* with respect to learning within higher education. Garrison and Anderson (2003) summarise many of the criticisms when they write:

“To realise the potential of e-learning it is essential that we rethink our pedagogy. Education is about ideas not facts. Moreover, students in higher education are not receiving the educational experiences they need to develop the critical and self-directed high education skills required for lifelong learning. The current passive-information-transfer approaches to Higher Education are contrasted with the interactive and constructive potential of e-learning.”

Twist and Withers (2006) contrast the way teachers imagine students learn with the real way they learn. They call the ways in which young people actually learn the “hidden curriculum” – the “informal digital spaces”, such as Facebook and MSN, which students routinely use for social and educational purposes.

Although school and university pass rates are improving (DfES, 2007), employers complain about the quality of school-leavers and graduates. Many employers claim that they are not properly prepared for the modern workplace, lacking the communication and collaborative skills needed in the contemporary working environment.

The second problem relates to faculty’s view of new technology – as an educational tool, entirely separate from pedagogy. Some educationalists have claimed that this view is fundamentally flawed; that you cannot separate the medium (ICT) from the message (pedagogy). Cousin (2003) argues: “Pedagogies never live independently of the prevailing media. Technologies work dynamically with pedagogies, not for them, and in the process they become mutually determining.” She was particularly critical of contemporary VLEs: “VLE environments (*sic*) tend to be skewed towards the simulation of the classroom, lecture hall, tutor’s office and the student common room”; their adherence to existing pedagogy (the “primacy of pedagogy” as she puts it) and focus on enhancing existing practice offered “false protection to academics because they promise a stable transition in an inherently unstable process of change from one media age to another.”

The educational applications of virtual worlds illustrate this view. VWs are not just another educational tool – they provide unique opportunities for teachers and learners, offering unprecedented levels of motivation and emotional engagement. But they also present a challenge to teachers, who would have to play a new educational role – such as the role of an “actor” in a scene within a virtual world – and one for which there is no existing pedagogy.

New pedagogies and learning styles

A number of new pedagogies have been proposed, all of which directly address the learning opportunities afforded by e-learning. Perhaps the best known of these is *connectivism* or *network learning*.

Connectivism

George Siemens introduced this theory in his paper *Connectivism: Learning as network creation* (2004) to address “the shortcomings of behaviourist, cognitivist and constructivist ideologies”.

Connectivism conceptualises knowledge and learning as a network, consisting of nodes and connections. Knowledge, at any point in time, is a particular (probably temporary) configuration of nodes and connections (a sub-network). Learning creates new connections between existing nodes (changes to existing knowledge) and/or creates new nodes (entirely new knowledge). Learning, therefore, is about network (node and connection) creation.

His theory differentiates between data, information, knowledge and meaning:

- **Data:** raw elements or small neutral elements
- **Information:** data with intelligence applied
- **Knowledge:** information in context and internalised
- **Meaning:** comprehension of the nuances, value and implications of knowledge.

“Learning is the process of that occurs when knowledge is transformed into something of meaning.”

Connectivism embraces eight principles:

1. Learning and knowledge rest in diversity of opinion.
2. Learning is a process of connecting specialised nodes or information sources.
3. Learning may reside in non-human appliances.
4. Capacity to know is more important than what is currently known.
5. Maintaining connections is needed for continual learning.
6. Ability to see connections between ideas and concepts is a key skill.
7. Currency (accurate, up-to-date knowledge) is vital in learning.
8. Decision making is itself a learning process.

E-learning 2.0 and Assessment 2.0

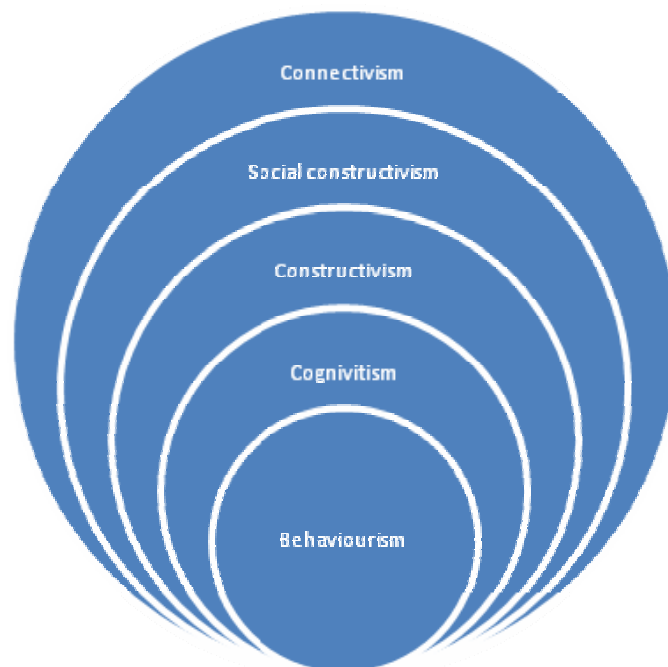
‘E-learning 2.0’ (Downes, 2005) relates to the second phase of e-learning based around Web 2.0 technologies. It proposes that ‘e-learning 1.0’, which consists of VLEs, e-portfolios and other formal environments, be replaced by generic tools such as blogs, wikis, discussion forums and other Web 2.0 services. Similarly, in my paper entitled *Assessment 2.0* (Elliott, 2008), I argue that Web 2.0 services make better assessment tools than formal e-assessment software.

It has been argued that E-Learning 2.0 and Assessment 2.0 are inevitable evolutions of current practice (and will replace it); that 'traditional' VLEs and e-assessment systems are unnatural to students and cannot keep up with the rapid change (and growth) of Web 2.0 tools and services. Were this to happen, it would strengthen the case for connectivism since Web 2.0 can be seen a way of implementing this learning theory by providing the means of creating nodes and connections through such services as blogs, wikis, and social networks.

Is there a need for e-pedagogy?

Revolutions affect all parts of society, and education is not exempt from the on-going cultural revolution, of which technological change is an intrinsic part.

Connectivism isn't the answer – or, at least, not the complete answer. But it does add something to our thinking about teaching and learning in the 21st century. In fact, all four traditional pedagogies can be considered complimentary – even evolutionary. Whatever new theory of learning emerges in the next decade, it will likely build upon these pedagogies.



At present, we are just beginning to establish good practice in the use of basic e-learning tools, such as how best to teach and learn using online communities (see Salmon, 2003). At the other end of the spectrum, the pedagogic implications of virtual worlds are largely uncharted. While some research has been carried out into the most effective strategies for teaching and learning in an online environment, a great deal more will have to be done before we are clear about how best to apply these tools to the education process.

So we have a long way to go before we will have a unifying theory of e-learning. But one is required. Rote learning of factual information, which typifies behaviourism, is valueless when students are one click away from Google and Wikipedia. The "teacher-knows-best" idiom of cognitivism is questionable in a time of "the wisdom of the crowd". The constructivist

approach (and, particularly, social constructivism) appears to be a better fit for 21st century learning – but needs to be updated to embrace the modern learning environment that includes virtual worlds such as *Second Life*. ‘Connectivism’, ‘E-moderating’, ‘E-Learning 2.0’ and ‘Assessment 2.0’ do not provide the answer – but do highlight the problems with the status quo and the need for a new approach to teaching and learning.

Pedagogy and assessment

Implications of e-pedagogy on assessment

If the contemporary learning environment demands a new skill set for the contemporary teacher, it also demands a new approach to assessment. An “e-pedagogy”, whatever it looks like, will require a complimentary approach to “e-assessment”. And this is not likely to be a traditional e-assessment system, which typically reflects classical pedagogy.

The following table contrasts traditional assessment with “modernised” assessment.

Traditional	Modernised
Given	Negotiated
Done alone	Done collaboratively
Descriptive	Researched/Deep
Text	Text/audio/video
Closed book	Open web
Done in class	Done anywhere
Teacher assessed	Self- and peer-assessed

A pedagogy that fosters deep learning, undertaken in collaboration with fellow learners, would require a commensurate assessment system. Such a system would exhibit some or all of the following characteristics.

- **Authentic:** involving real-world knowledge and skills.
- **Personalised:** tailored to the knowledge, skills and interests of each student.
- **Negotiated:** agreed between the learner and the teacher.
- **Engaging:** involving the personal interests of the student.
- **Recognise existing skills:** willing to accredit the student’s existing work.
- **Deep:** assessing deep knowledge – not memorisation.
- **Problem oriented:** original tasks requiring genuine problem solving skills.
- **Collaboratively produced:** produced in partnership with fellow students.
- **Peer and self assessed:** involving self reflection and peer review.

- **Tool supported:** encouraging the use of ICT.

Not all “assessment 2.0” tasks would embrace all of the above characteristics or media. But a modern assessment should seek to incorporate some of these characteristics and, certainly, permit the use of ICT.

For example, a “traditional” assessment task relating to History might ask students to describe the rise of Nazism in Germany in the 1930’s. The evidence would be an essay, produced alone, under controlled conditions without reference to notes or other support materials. The equivalent “assessment 2.0” task would set the broad area of investigation (the rise of Nazism) but allow each student to choose a specific topic (such as the support given to the Nazi Party by US corporations). The assignment would be done collaboratively, in groups set by the teacher, with each member of the group choosing a specific sub-topic to research (such as the Nazis’ use of IBM computers). The evidence would be in the form of a group blog, where each member of the team would post their findings (which would include hyperlinks to webpages, audio and video material) and the assessment would involve an element of self- and peer-assessment (along with teacher assessment). Unlike the essay, the blog may not require students to make any conclusions beyond reporting their findings via the blog, on the basis that any conclusions reached by the average 16 year old about such a complex period in history are likely to be superficial. This would contrast with the traditional approach, which would require a structured essay that is effectively an academic paper written by a child – and one greatly inferior to that found on Wikipedia (unless it was copied from there).

The assessment tools that best fit this model of assessment are the range of Web 2.0 services that students already use of part of their everyday activities. For example, Wordpress (a blogging service) can be used as assessment log; Wikispaces can be used for group project work; Clipmarks can be used to capture a range of different online media types.

Posterity is likely to view current CAA systems as a transient stage between traditional assessment and the new form of assessment that will be required in the emerging learning environment. Just as pedagogy will rapidly evolve in the next decade, the current range of e-assessment systems will be replaced by Web 2.0 (or 3.0) tools that will better match the changed learning methods.

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