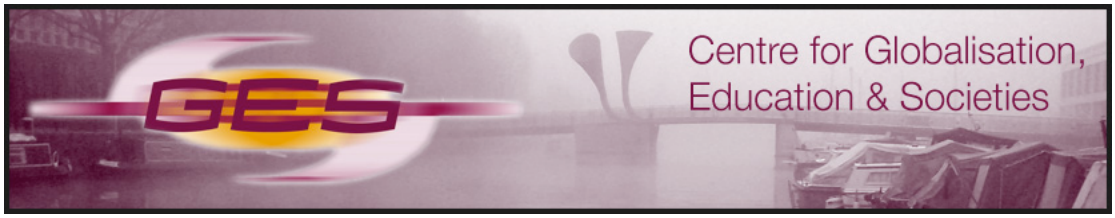


The **Centre for Globalisation, Education and Societies** is based at the University of Bristol and is coordinated by **Professor Susan L. Robertson**.

On-Line Papers – Copyright

This online paper may be cited or briefly quoted in line with the usual academic conventions, and for personal use. However, this paper must not be published elsewhere (such as mailing lists, bulletin boards etc.) without the author's explicit permission.

If you copy this paper, you must:

- include this copyright note.
- not use the paper for commercial purposes or gain in any way.
- observe the conventions of academic citation in a version of the following:

  Robertson, Susan L., *Aliens in the Classroom 2: When Technology Meets Classroom Life*, published by the Centre for Globalisation, Education and Societies, University of Bristol, Bristol BS8 1JA, UK, available: http://susanleerobertson.com/publications/

Aliens in the Classroom 2: When Technology Meets Classroom Life

Susan L. Robertson

Centre for Globalisation, Education and Societies
University of Bristol, UK

Forthcoming in (2007) R. Sutherland, P. John and S. Robertson (eds)
Improving ICT and Learning, London: Gateway Books

Overview

Using a specific classroom case as a starting point, this chapter explores a number of problematic issues surrounding the deployment of new technologies in conventional classrooms. Using the idea of classroom aliens (in this sense both the students with their technological familiarity, and the technology with its challenge to the customs, culture and norms of subject based pedagogy) we ask some fundamental questions about how these new capabilities change the logics the structure contemporary classroom life? These questions are addressed through an exploration of three key concepts: firstly the 'capabilities' of new technologies and, secondly, the 'tipping points' which are reached when these capabilities alter the pace and pattern of interaction, organisation and spatial dynamics of knowledge creation in classrooms. Finally the idea of 'assemblages' is introduced as a useful metaphor for thinking about the fluid, interconnected nature of classroom life in schools. Capabilities are examined through the possibilities of ICTs, while the tipping points focus on the epistemological diversity that accrues in classrooms and the ways in which new technologies can shift the balance of authority in terms of pedagogy and learning. The final section suggests that new metaphors are needed to open up the 'black-boxes' of classrooms and ICTs, making them more readable for teachers as dynamic social formations.

The chapter aims to:

- Highlight the challenges teachers face when new technologies –both embodied in students and emboldened in tools–enter the usual discourses of subject based classrooms
- Evaluate the sorts of disruption to conventions that can occur through the use of the creative potential and capabilities of ICT
- Emphasise the sorts of pedagogical 'tipping points' that can occur when new and sometime fundamentally different forms of knowledge enter classroom situations.

Alien 2

> Meet Andy.[1] Andy is a history teacher at an inner city secondary school with several years of teaching experience behind him. Today he is repeating a lesson to 9C he taught earlier on in the week to 9D. The topic: '*America in the 1920s and 1930s*'. Andy has been experimenting with using computers with his history classes, in part because he feels that if he shows an interest in using digital technologies it might encourage more students to take history seriously. However, there is a niggling doubt in Andy's mind about this other 'alien' in the classroom—the computer. Andy smiled to himself at the thought.
>
> He'd just finished reading a short article by Bill Green and Chris Bigum called *Aliens in the Classroom*.[2] Peter, one of the university researchers working with

[1] Andy's story is a composite of several teachers that we worked with on the Interactive Project. We want to acknowledge the contribution of Tim Shortis who worked on the IntrActive Project as a Research Fellow to thinking about these issues more generally, and to his insights about Andy's case specifically.
[2] Bill Green and Chris Bigum (1994) Aliens in the Classroom, Australian *Journal of Education*, 37 (2), pp. 119-41.

him on a technology and learning project, had urged him to read it. "It's a classic", Peter had told him.

Andy had spent some of his lunch break reading this 'classic', but a thought kept occurring to him; that while Green and Bigum argued kids were the aliens because they have grown up in a computer connected world, half the time for him, as a teacher, it was the technology and more particularly how it intruded into classroom life—or vice versa—that made it feel as if there were 2 aliens in the classroom and not one. Andy refused to believe that it was 'him': the term Luddite was too simple. He'd been using computers to do all sorts of things at home; book holidays, search for material to teach with, e-mail family and friends, the list goes on. At school he kept class records on the office computer, used the school intranet for email, and could search for material for his history classes using the Internet.

He resolved to take some notes after this lesson about the lesson, and use them to talk with Peter.

Andy's lesson with 9C was in 'the computer room'. The room was some distance from *his* classroom. The kids loved it—he knew that, even though it meant two students sharing a computer, and a lot of noise. However, it also meant—and this was the 'rub', he'd spend most of the lesson talking to students's backs as the computers were arranged on benches around the room.

At the end of the lesson, he found himself noting later, he told the students that the group would be "going home to Room 24"- his own classroom. Where had this discomfort come from?

As we can see from Andy's situation, not only did he feel events were racing away from him in the computer room but he also found he was unable to draw upon the repertoire of skills he had mastered since his first un-nerving days in the classroom. Why? Because among other things the dynamics in the classroom changed in ways that meant his repertoire of techniques for managing the pace, content and staging of learning were less than useful. Students were glued to their computer screens and could not see him. There was also another aspect to Andy's discomfort. He was no longer confident about the kind of things young people were learning when they accessed information using the Internet.

Let's go back to Andy's notes and conversation with Peter, for a moment, to look at what actually happened when Andy taught the same history lesson, one located in a dedicated computer room and one in his 'home' classroom.

Andy's notes: 9D – "We are in our own classroom and I worked with several bits of text on prohibition to help explore '*America in the 1920s and 1930s*'. I then asked them to discuss some issues in pairs. The lesson went well; I felt relaxed and I was able to focus on scaffolding the pupils' learning so they would be able to effectively tackle the source-based questions."

Andy's notes: 9C: "I am repeating this lesson in the computer room. I notice that my focus in my teaching keeps shifting away from the History subject discourse to an ICT technical discourse concerned primarily with procedures

> required to carry out the activity, such as how to access the relevant files on the computer. This was evident from the start. The board was filled with instructions about the 'C:\' drive and accessing files! I also found myself constantly checking the kids making sure that they were using the computers for this lesson and not something else. I kept thinking; what's happened to my history lesson?"

In Andy's later discussion with Peter they compare the two lessons. They muse together over how, in Andy's lesson with 9C, an ICT technical discourse had supplanted a subject discourse. It felt like a different logic was at work. In Andy's lesson with 9D in the History classroom, he sat behind his desk and launched the lesson by spending eight minutes reading through two sources, discussing their content, and framing possible ways of answering the first question. In doing this he was modeling the 'History discipline processes' by demonstrating to them. This provided a collective focus of attention for the group. By way of contrast, in the computer room, only three minutes were spent giving a general summary of the Prohibition Era and the nature of the task today before the pupils were sent off to independently access sources using search engines, to read the results of the search and decide for themselves how best to approach the first question. Andy prowled around the classroom, checking the screens and the tabs at the bottom, reassuring himself that the students were doing the tasks he had assigned, like 'searching' for material related to the lesson rather than skiving off in cyberspace. Peter and Andy agreed a neutral observer watching might easily conclude that the pupils were being introduced to two completely different learning activities.

In this chapter we use Andy's experience with what he called this 2nd 'alien' in the classroom as a starting point, to ask where his discomfort comes from and to argue that something quite profound is taking place in the social domain of learning and the social relations of classroom life.[3] We will be suggesting that the introduction of information and communication technologies into the various institutions and spaces of modern and modernizing societies—including schools and homes—is reconstituting these domains and relations socially, politically and culturally. In part it has to do with the 'newness'[4] of the technology itself and, as we will argue, the *capabilities*[5] of the new information and communication technologies. These capabilities, we will suggest, are not simply in the form of hardware and software but in the range of experiences and understandings they enable. The students and the teacher bring with them ICT mediated experiences that, in combination, reconstitute the classroom as a very different kind of learning space. If we imagine each classroom as an 'assemblage'[6] or particular 'ecology of knowledge production'—made up of combinations of elements (such as students, teachers, curriculum, texts, pedagogical practices, community)[7] that are 'fixed' together by cultural

[3] We take this argument in different directions in Susan Robertson, Tim Shortis, Neil Todman, Peter John and Roger Dale (2004) ICT in the classroom: the pedagogical challenge of respatialisation and re-regulation, in Mark Olssen (ed) *Culture and Learning, Greenwich*, Connecticut: IAP.

[4] Latham and Sassen (2005: 1) talk about the 'newness' of information and communication technologies, suggesting that there are novel formations that we have not seen before; for instance cyberspace, multi-media connected communities, and so on. See Robert Latham and Saskia Sassen (2005) *Digital Formations: IT and New Architectures in the Global Realm*, Princeton: Princeton University Press.

[5] See Saskia Sasken (2006) *Territory, Authority, Rights: From Medieval to Global Assemblages,* Princeton: Princeton University Press, p. 7-8.

[6] Assemblage is a term taken from Gilles Deleuze and Felix Guattari (1987) *A Thousand Plateaus: Capitalism and Schizophrenia*, Minneapolis: Minnesota University Press.

[7] See Robin Alexander (2000) *Culture and Pedagogy*, Oxford: Blackwell.

norms, roles, official policies and so on, then each ICT mediated classroom is a unique kind of assemblage with its own ecology of knowledge production practices.

In order to take these ideas forward, we will build on the idea of instrument and instrumentation which was introduced in Chapter Two by linking it to the idea of capability (developed below). In our view, if teachers like Andy have a way of understanding the 'why', 'how' and 'with what consequences for learning' of an ICT-mediated classroom, they will be in a better position to mediate, manage and capitalize on ICT in ways that are productive for learning. We begin this process by opening the technology 'black-box' to understand better the changing form of the technology-society relation. Second, we explore the way in which information and communication technologies are changing knowledge practices using the idea of an attention economy. Third, we to explore the way in which the capabilities of the new information and communication technologies can become like a tipping point, and change the logic of classroom learning through dynamics such as organisation, interaction, and space. This new logic places very different demands on teachers and requires different regulative and pedagogical practices. Finally, we conclude by suggesting that we need a more open way of conceptualizing the fluid and dynamic and connected nature of classrooms life to wider social process if we are to improve learning.

Opening the Technology 'Black-Box'

What is it about information and communication technologies that make them sufficiently powerful they interrupt and disrupt Andy's classroom-based lessons? Writers like Manuel Castells[8] argue that the power of digital technologies lays in the fact these tools enable us to make endless connections between different domains, as well as between the elements and agents of such activities.[9] Take, for instance, a routine task—such as creating an activity sheets for student work—that teachers like Andy might have undertaken in preparation for this lesson. Andy has used the internet (http://www.icteachers.co.uk/teachers/links/thistory.htm) with its links to the BBC history and British Museum websites to check for ideas for his lesson. He has also used 'google.image' to search for images that might brighten up the activity sheets before sending the final 'document' to the office for printing. Andy has not left his office. Instead he has used the school's recent installation of wi-fi technology to rove the world from his laptop before finally sending on the completed worksheet for printing. In Castell's view, information and communication technologies have enabled workers like Andy to labour more efficiently and productively. Castells also argues that information and communication technologies change the way organisations and institutions work as well as the kinds of societies that we inhabit.[10]

It is this latter point about the transformations of societies that we are particularly interested in exploring for a number of reasons. First, the official policy discourse that linked technology to learning was characterized by a high degree of technological determinism.[11] This is all too evident in the UK government's 1997 *National Grid for*

[8] See Manuel Castells (1996) *The Network Society*, Oxford: Blackwell.
[9] Castells (op Cit: 66)
[10] Castells (op. Cit: 67)
[11] Technological determinism is a concept used to describe the assumption that it is the technology itself that brings about change rather than the agents who mobilize technologies. The technological determinism of early UK policy on technology was softened following accruing evidence that it was by no means

Learning policy costing GBP£1 billion to create a 'connected society'.[12] Through supplying hardware, connecting more than 30,000 schools to the internet, creating on-line resources for teachers, and offering large scale programmes for teacher professional development— the policy aimed to meet the technological revolution head on. The formula was relatively simple. Simply add ICTs to schools and there will be a transformation in learning. The problem with this simple-minded technological determinism is that the theory of how this was supposed to work—the programme ontology—was one of T (technology) + L (learner) = L_t (transformed learner). What makes it determinist is that T – when applied to L, is regarded as sufficient to bring about L_t.

There are a number of problems with this formulation that are worth taking the time to outline. First, technology is homogenized, yet information and communication technologies are not simply a single resource. They take different forms because of different soft-ware which has different potentials and thus offer possibilities for a range of practices. Second, the formula homogenizes the learner. As a result, there is no way of accounting for the different experiences the learner might have had with ICTs, and nor the levels of expertise these learners might have acquired in other –out-of-school settings that might mediate their engagement with classroom-based learning with ICTs. Third, there is no theory of what it is about ICTs, as a resource, that might enable—or require—teachers like Andy to think about the capabilities they offer and then to use this knowledge to build up lessons rather differently. In other words, ICTs tend to be black-boxed and thus closed off from close analysis. Fourth, the learner is extracted from the classroom and other learners. Yet classrooms are profoundly social spaces and particular kinds of social formations—an insight that Andy must take into every lesson he takes. 9C and 9D are very different groups; not only in terms of social class, gender and race, but streaming practices, different career trajectories of the pupils, and so on. Fifth, the teacher is absent from the formulation above and yet the teacher's own views and experiences with ICTs, their concerns about how to incorporate their subject matter into ICT based learning, experiences as a teacher, along with experiences with different kinds of digital resources, all matter and act the mediate the dynamics. Sixth, (and consequent on four and five) neither the student nor the teacher are given sufficient agency in this crude causal formulation with the result that there is neither a recognition of contingency (not being able to predict exactly what it is that the student will learn) nor the possibility of complexity (not being able to predict the range of outcomes or effects). Here we need to ask: what range of meaning-making activities is taking place? How and for what purpose are these resources mobilised? What kinds of performances/knowledges are being produced? And so on. Finally, this simple policy formula, to bring UK learners into the 21st Century, failed to take into account the policy and management environment that placed real limits on Andy's opportunities for experimentation in his classroom. For instance, Andy's promotion in the profession was dependent upon the 'value-added' his teaching was recorded as contributing to each learner. Andy was unsure, if not skeptical, of the kind of value-added ICT based history teaching offered. There was little research evidence he could find that might inform him. Yet, in a climate of school audits and league tables that characterized the English education system, Andy felt pressured to be very sure about which innovations he incorporated into his classroom. This left little space for experimentation and threatened possible chaos. It also limited the learning he

---

inevitable that such high levels of investment were followed by equal transformations in learning outcomes.

[12] See Neil Selwyn (1999) 'Gilding the grid': the marketing of the National Grid for Learning, *British J of Sociology of Education*, 20 (1), pp. 55-68.

might acquire from failure. In other words, the wider social and political contexts that shape the every-day realities for teachers' and their work in English classrooms are erased in such formulations.

Toward a Local Ecology of Knowledge Production with ICTs

In our research on the InterActive project we began by inserting these absences into our representations of what we might call *a local ecology of knowledge production*. We started by placing the student and the teacher in the classroom with ICTs and called this a social formation. We then nested this social formation within the school, the wider community to include homes and agencies like local education authorities, and finally the national and global domains that are influential in shaping agendas as well as offering the potential for new kinds of connectivity.[13] In its totality, we might view this complex of interconnections as an 'assemblage' – an idea we will return to in the final section of the chapter.

In the project we were aware that this was a natural experiment and also that teachers would be concerned about their performance and pupil learning. However, our intention was to work with the teachers in our study in such ways where they could begin to ask different questions that might enabled them 'see' and 'mediate' learning with ICT. Only then, we argued, might teachers be in a position to generate a different programme ontology[14]—in other words a theory of how ICTs worked in the classroom. This theory would come from their own experiments and insights following using ICT in real learning settings, as an alternative to crude and pedagogically stifling technological determinism embraced in official policies. This meant that teachers would have to become researchers of their own practice in a process that was facilitated by university-based researchers.

In order to help Andy to open the black box on technology, Peter suggested that Andy look at some of the writings by Manuel Castells, but then use his own experience and discussions with, and observations of, the students to make a list of what it was about ICTs that might make them powerful 'new' tools. "After all", said Peter, "…some writers argue that we can trace complex IT based technologies back to the early 19th Century[15]". Andy jotted down a list of notes in his diary for discussion with Peter:

- lessons and student's work can be taught/presented using a complex mix of text, images, sound, interaction…
- instant feedback e.g. from spelling a word wrong to game playing …
- search engines to access all kinds of information out there in the wider world so that the students are not dependent on what is in the library at school or at home…
- communication….using email, chat rooms…enabling people to get in touch with and places instantly around the world…

[13] See Rober Dale, Susan Robertson and Tim Shortis (2004) "You can't not go with the technological flow. Can you?" Constructing 'ICT', 'teaching and learning', *Jounal of Computer Assisted Learning*, 20 (6), pp. 456-470.

[14] See Ray Pawson (2002) Evidence-based policy: the promise of realist synthesis, *Evaluation* 8 (3) 340-358.

[15] See James Beniger (1986) *The Control Revolution, Technological and Economic `Origins of the Information Society,* Cambridge: Harvard University Press.

- knowledge can now be produced by the students through making their own web-pages, blogs, wikis, small film segments, and so on…the old experts are no long needed…
- classroom is now more linked into the outside world….
- …students can have their own addresses separate from 'home' – eg. gmail.com…
- ……..it does not mean they happen!!

Andy cast his eye down his notes. Several things stood out. *ICTs enable a multiplicity of links with lots of activities taking place around the globe….it was a communication resource…it opened up many very different ways of producing and sharing knowledge.* He then cast his eyes to the final line he had underlined: *it does not mean they happen!!*. The way he saw things, there was nothing predetermined about how any of his students would use ICTs and that was part of the problem as he needed to be in more control than this. Andy also saw a range of attitudes and practices in his classrooms. Some of the students were highly skilled with the computer; they had their own web pages, could do programming, and used software like *AdobePhotoshop* to create and manipulate images.[16] Other students were more ambivalent.

Earlier in the chapter we introduced the idea of capabilities as a heuristic or way of thinking about ICTs. According to Sassen 'capabilities' are "…collective productions whose development entails time, making, competition, and conflicts, and whose utilities are, in principle, multivalent because they are conditioned in the character of the relational systems within which they function" (p. 7-8). This way of thinking about ICTs enables us also to see them as evolving, as socially produced One way in which this becomes evident is where there is competition over which is the better tool (for instance, over which search engine is the best – *google* or *yahoo*); another is exposing conflicting ways of understanding the world, such as through blogs, wikis, and so on. ICTs are also appropriated and re-appropriated for different uses. In other word, actors have 'interpretive flexibility' meaning that different groups of people involved with particular 'socially frozen' moments of a technology can have different understandings of that technology, including understandings of its technical characteristics. Peter reminds Andy of the history of the microwave oven as an example of this; it was a direct descendent of military radar technology used to heat up food in Navy submarines. Initially microwaves were marketed as a 'brown good' to sit alongside hi-fi's and televisions, and was aimed at young males' leisure activities. However, this way of re/presenting the microwave was unsuccessful and was eventually reconstituted as a 'white good' for housewives.[17]

ICTs are thus part of the social and cultural worlds of meaning-making. As a result, their production, distribution and uses are contingent, diverse and dynamic. However, there is also sufficient convergence in students' knowledge and skills in technology and the wider social and cultural dynamics which shape young people's lives, for Andy to understand something of the profound changes that are taking place in students' lives. As Peter pointed out, some young people have never known the text-bound world that their elders have come from – or least not in the same way.[18] For Andy to appreciate this

[16] See also Keri Facer, John Furlong, Ruth Furlong, Ros Sutherland (2003) *Screenplay: Children and Computing in the Home*, London and New York: Routledge.

[17] See Judy Wajcman (2002) Addressing technological change: the challenge of social theory, in *Current Sociology*, 50, pp. 353.

[18] See Susan de Castells and Jennifer Jensen (2004) Paying attention to attention: new economies for learning, in *Educational Theory*, 54 (4), pp. 381-97.

more fully in his teaching, Peter has suggested Andy think about the wider social settings in which young people live and learn,[19] and to draw on the students' capabilities developed through using ICT outside school; to re/structure learning activities in the classroom.

For Andy, this meant thinking about teaching and technology more broadly; to take account of the 'mutually constitutive' relationship between technology and society. The point of doing this is to enable Andy to make more explicit the links between classroom life and wider social, political and economic processes. It is helpful, Peter suggests, in order to see better the relationship between technology and society as a fluid, dynamic co-constitutive process— it shapes us and we shape it.

New Economies of Knowledge Production

So what is it about the way in which ICTs are reshaping social domains and social relations that is particularly important for how teachers use ICTs in their classroom? We have argued so far that it is a powerful too because of its scale and speed capabilities; capabilities that make it stand apart from other technologies. In this section we want to focus on how these elements, in combination, alter knowledge production, its distribution and use in a number of profound ways.

A number of writers have begun to argue that ICTs are involved in a new economics of 'attention'.[20] Given that attention is a key means for teachers' engaging pupils in learning, and given the importance of viewing classroom life as one moment in a wider set of social relations, it is important we examine these claims in order to shed light on how students' identities and social practices might be changing. Drawing upon an earlier insight by economist Herbert Simon[21], that information is dependent upon consumers' attention and that in a virtual sea of information there is a 'poverty of attention', there are new efforts are being put into a range of practices that will structure and grab the viewers attention. [22] There are several different 'takes' on this – which we think are particularly helpful for thinking about the new economies of knowledge production.

In the first approach it is argued that for some information, there is a great deal of attention given, while other information is almost in raw data form. [23] An example of the former might be model answers for various school subjects as resources for students and teachers; an example of the latter the production of a blog, for instance on the daily experiences of an emergency nurse. In both examples it is not possible to see the history or genealogy of attention involved with the result that the viewer is not able to easily determine at what points truth claims are mediated by experts or knowledgeable others.

---

[19] See Keri Facer – chapter in this volume.

[20] Colin Lankshear and Michelle Knobel (2003) *New Literacies: Changing Knowledge and Classroom Learning,* Basingstoke: Open University Press, p. 109

[21] See Herbert Simon (1971) Designing organisations for an information rich world, in M. Greenberger (ed) *Computers, Communication and the Public Interes*t, Baltimore: Johns Hopkins University Press.

[22] Lankshear and Knobel (op Cit: 110)

[23] See Richard Lantham (1994) The economics of attention. Proceedings from the 124th Annual Meeting of Association of Research Libraries, sunsite.berkeley.edu/ARL/Proceedings/124/ps2econ.html.

The second approach to the attention economy focuses on the subject themselves, and on how they pursue attention for their own purposes.[24] That is, when people live in economically advanced societies they are socialized in ways that orient them toward the pursuit of attention and that this pursuit is pleasurable. Andy, for instance, is acutely aware of the fact that the students are so easily drawn away from the task that he has set for the lesson using the internet. This presents all kinds of management problems. He is also aware of the considerable effort spent, and pleasure gained, by students in 'making' websites, blogs and school-presentations in ways that attract attention. This new economy of attention getting sits in sharp contrast to the comparatively dowdy, static and authoritative attention economy of conventional learning settings.

The third 'approach comes from the advertising field; that is how best to capture the attention of potential consumers of knowledge.[25] These techniques have been translated into a whole range of practices and activities on the Internet, from getting having websites and pages picked up in the search process to how games capture the long term attention of the player. These ideas have direct relevance to teachers' use of the internet for learning activities.

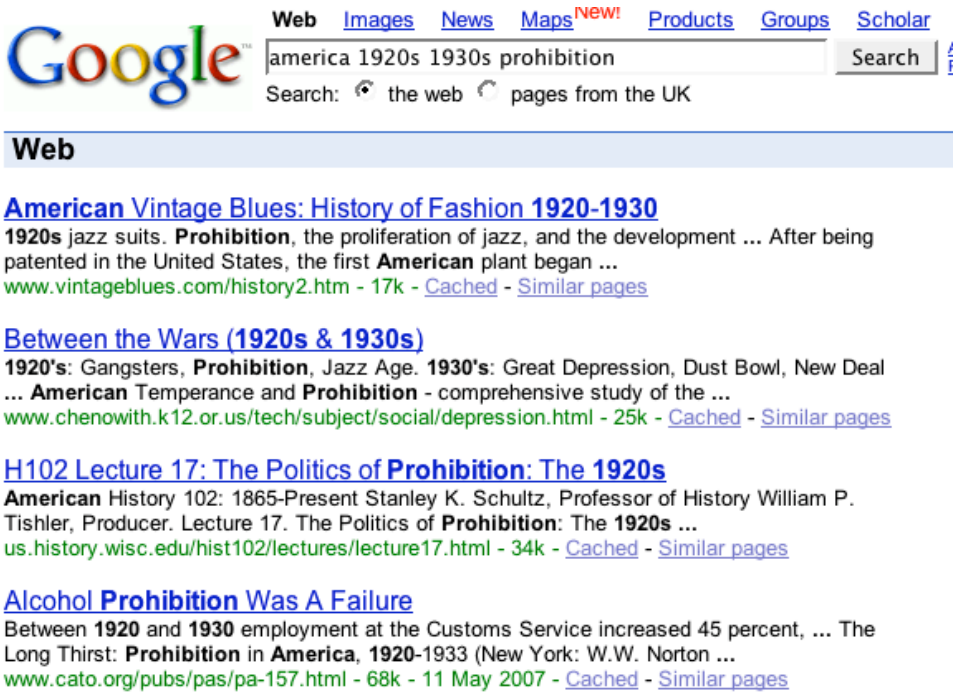
If we return to Andy's classroom, there are two fundamental elements comprising the 'alien-ness' of ICT. They tend to overlap and even disguise each other, but it is important to recognize that they are distinct from each other. One is that when we talk about kids knowing more than teachers, having access to internet and different forms and sources of knowledge, what we are talking about is a new form of *epistemological* diversity introduced into education, curriculum and the classroom. This is superficially similar to the kinds of linguistic and cultural diversity to which we have become accustomed, but the challenges it produces are quite different. They constitute not just different ways of accessing knowledge but different forms of knowledge and different ways of representing knowledge. They generate issues of 'author-ity', for instance, which are fundamental to curriculum, so that when Andy is wondering about what has happened to his history lesson, it is not solely because of technical issues but because of potential problems of comparability and commensurability of the information they may retrieve, which are of a quite different order from that of the different responses they may generate discussing shared texts in pairs. As an example of what this might involve, we put the terms *'America 1920s 1930s prohibition'* into Google (see Google excerpt below – captured 13th May, 2007).

Google came up with 'around 740,000' possible responses. In the image capture we show only the first four results, but even here we find very interesting examples of the kinds of changes we are talking about. The first entry seems to be really quite tangential to the issues, and thus raises precisely questions of what we might call the 'meta-authority' of Google, how Google determines the priority of matches, becomes an important issue. Our normal assumption (learned by us and communicated to our students) might be that the order is determined by 'closeness of fit', perhaps as demonstrated in the coincidence of titles of books or papers with the search terms. At the same time it raises the issues of

[24] Michael Goldhaber (1997) The attention economy and the net, *First Monday*, firstmonday.dk/issues/issue2_4/goldhaber

[25] Richard Adler (1995) *The Future of Advertising: New Approaches to the Attention Economy*, Washington DC: Aspen Institute.

epistemology and 'author-ity' we have just mentioned, the 'legitimacy' of literacies other than print, jazz tracks and fashion drawings, for instance.[26]



The second entry is especially relevant. It comes from a school in Oregon, and displays what might be considered as an example of the 'orthodox' means of utilizing ICT to *enhance* the curriculum, with a range of links to other useful sites, presented under sub headings that might be used to structure a course on the topic. However, it could also present different kinds of challenges and opportunities to a classroom teacher like Andy. Will the class be comparing the resources he has brought to the class with those made available by the 'alien'? Will they generate discussions of how American history is seen in the USA and UK?

The third entry is a lecture on the politics of prohibition that had been posted on a university website; the sort of information that Andy might have preferred his students to consult and use. It had the kind of information authority that Andy understood and had learned to respect from his own studies in history and in his teacher training days.

The fourth entry raises a most interesting issue, of a quite different order. It comes from the Cato Institute, which is a right-wing libertarian American think tank, whose view is that any kind of Prohibition may be seen as an infringement of freedom by state authorities. This clearly raises a set of issues that transcend that of the topic being taught. For instance, it is quite conceivable that many history teachers would consider this a very useful resource through which they could introduce a range of such issues. However, in that case, rather than appearing as one among thousands of apparently equivalent a-historical, un-contexted, de-politicising entries, demarcated only by their relevance (to Google), the provenance of the report would be built into the discussion, and possibly balanced by other views, such as by the health profession and so on.

---

[26] Colin Lankshear and Michelle Knobel (2005) *Digital Literacies: Policy, Pedagogy and Research Considerations for Education*, Opening Plenary Address to ITU Conference, Oslo, Norway.

The use of Internet resources also raises issues of originality, plagiarism and indeed what is being rewarded. This is especially significant in an era when accountability of teachers, as judged by the results their students receive, dominates the management of contemporary education systems. This is, of course, perhaps the central point of tension in the introduction of ICT into education, because new technologies afford greater power and rights to children to decide for themselves what they can see, think and do.[27]

This leads to a second basic issue raised by the introduction of ICT to schools. That is, that it challenges deeply embedded orthodox assumptions of pedagogy at a level, and in ways, that make it very difficult to rely on those assumptions as a guide to what ICT will mean and how it can be best used by teachers. In a nutshell, it is qualitatively different from existing approaches to pedagogy. It cannot easily be incorporated into any of them. Introducing ICT in the classroom is not like introducing a new history curriculum or work package, or even like modifying existing work packages to make them more accessible to students from different cultural or linguistic backgrounds.

Empirically what we see in classrooms like Andy's is an attempt to incorporate the new epistemological challenges into the existing curriculum, and the pedagogic capabilities of ICT into existing pedagogic assumptions. We can what is involved in the first of these in the example we gave above. The example from the Oregon school shows the possibility of enhancing the curriculum through quantitatively increasing the range of materials available to students, and we can see the potential for this quantitative enhancement to bringing about qualitative change—that is, to transform our conceptions of history and how it might be taught, rather than add to the range of ways it is taught now.

The obstacle to that development, lies, however, in the second of the problems outlined above; that our existing pedagogic assumptions do not stand alone, as easily detachable and replaceable elements of teaching, like plugging in a new software application. Rather, they are deeply embedded in a wider grammar of schooling[28] that the set of organizational assumptions and practices that have grown up around the development of mass schooling and have come to be seen as defining it, to become, in effect, education as practiced. It frames what is possible in schooling, and acts as a major barrier to significant change in schools. For Tyack and Tobin that grammar of schooling is comprised of a number of interrelated features, such as a structure of subjects; a schedule of classes; a system of age grouping; a given duration of a 'class'; a grading system; and curricular materials.

Within that grammar of schooling the place of, and assumptions about, pedagogy are especially important. To put it over simply, within the grammar of schooling the place and role and importance of pedagogy are framed by the other assumptions (such as the content of schooling and how it is assessed, the role and management of teachers, and the fact that education is compulsory), so that 'teaching' becomes how we were taught, with any variation being seen as an aberration or deviation (witness the outcry whenever 'progressive' modes of teaching are bruited abroad). One consequence of the traditional grammar of schooling, then, is that pedagogy has come to be widely regarded as a neutral means of transmitting the knowledge designated as of most importance, and as having little if any independent contribution to make. New forms of pedagogy may be

[27] See Susan de Castells and Jennifer Jensen (2004) Paying attention to attention: new economies for learning, *Educational Theory*, 54 (4), pp. 381-397.

[28] See David Tyack, David and Henry Tobin (1994) The 'Grammar of Schooling': Why has it been so hard to change? *American Educational Research Journal* 31 (3), 453-79

introduced, but they tend to be variations on the existing themes, different ways of doing the same thing, rather than doing different things. It is here that we see the main obstacles to the development of the potential of ICT in schools, for the implementation of ICT has tended very much to follow the former route, doing the same things differently rather than doing different things. There are two reasons at least for this, one relatively theoretical, the other relatively practical. The theoretical reason is that the place of pedagogy in the grammar of schooling has led to its potential being deeply underestimated. There is little examination, or theorization as to *how* precisely ICT can contribute to education, or even, more narrowly, to students' educational achievement.

The practical reason is the serious underestimation of what would be involved in preparing teachers to carry out and introduce deeper and further reaching changes in pedagogy through the use of ICT. The forms of professional development currently found, such as technical acquaintance courses, or short courses in the use of particular soft-wares, appear to assume, and reinforce, precisely the use of ICT as an 'add-on' to existing teaching that we have just been discussing. If the capabilities of ICT are to be realized something far more extensive will be needed. A further aspect of this point is that ICT is constantly changing—which in itself creates major financial obstacles for schools—but this also means constant obsolescence, especially in comparison to what is available to students on the Internet.

Classrooms as Particular Kinds of Digitally-Mediated Social Formations

In this final section we explore, briefly, the way the capabilities of ICT in the classroom—that is the combination of (i) ICT as an instrument; (ii) the children's ICT mediated knowledge and experiences within and outside schools; (iii) the teacher's ICT/subject and pedagogical mediated knowledges and experiences; (iv) official policies on learning, and learning with ICT, change the logic or grammar of the classroom as a particular kind of digital formation. Not only does it interrupt the existing grammar of schooling but that this combination of capabilities transforms the organisation, interaction and spatialisation of social relations in the classroom, thus tipping the logic in a new direction.[29] By *organisation* we mean the ordering of practices (for example, via rules and roles), content (data and images) and relations among actors (individual, collective and machine); by *interaction* we mean the flow of exchange and transmission among actors; and by *spatialisation* we refer to the electronic 'staging' of the content and social relations at play in a classroom-based digital formation. Here the idea of staging implies the coordination of views, visualizations and narrations that unfold in time –such as the possibility of multiple screens of one form or another on the desktop, or the organisation of actions and practices within digital formations with implications who can access, what information, on what basis and so on. In combination, spatialisation practices shape the possibilities for interaction and *inter alia* social relations.

In Andy's classrooms, both when using ICTs as part of the lesson or when students use ICTs to complete their work, there are an array of new roles that are now possible and new rules to be followed in the creation of knowledge. For instance, there is an expansion of the literacy horizon well beyond text-based literacy underpinning non-ICT-based knowledge creation. New kinds of expertise and competence are also possible, as we see with areas like music, mathematical problem-solving, and so on, so that the

[29] See Latham and Sassen (ibid: 10)

previous balance of power between expert-non-expert which was almost always tipped in the direction of the teacher is now recalibrated to include, if not favour, the student as expert. Furthermore, students are able to access many more resources from the available knowledge pools, however, this also requires rather different competencies in assessing truth claims, the inter-textual nature of knowledge, its genealogy and so on.

The spatialisation of classroom life is profoundly disrupted by the fact that ICTs offer more open and multiple stagings. However, in ICT-based lessons, the teacher is less able to control these performances not only because of how computer-based work-stations tend to be organized in contemporary learning settings, but there is the real possibility for the student to connect to sites globally. Here in ICT mediated classrooms we see a new logic at work; the teacher-directed classroom is replaced by a set of multivalent performances that are, in turn, enabled through this now leaky space. The challenge for Andy as a teacher is how best to understand this very different grammar in ways he can manage and incorporate into his pedagogy to enhance pupil learning. Finally, student's ICT mediated experiences are shaped by the spatialised politics of access, experience, quality and support – where new learning divides emerge and old ones reinforced. As a result, not all students in Andy's class will participate in these various stagings. Andy is increasingly aware of this, and the need to take these diverse experiences into account.

'Assemblages': A Metaphor for Seeing Classrooms as Dynamic Social Formations

What has become evident to us in working on this project is the tendency to view schools as an island, loosely connected to society. This kind of metaphor represents the school as an institution for teaching and learning, sitting outside of, rather than constituting, society. Several things follow from this metaphor. First, schools are viewed as being unique holders of a particular mandate; to develop the abilities of the learner.[30] As a result, what pupils learn in other places and spaces has little currency in the classroom, unless of course it is officially sanctioned as 'homework'; that is, essentially school-assigned learning in the home. When that knowledge is taken into account, as with students ICT mediated learning as a result of connectivity, they are likely to be constructed as 'aliens' in the classroom, rather than differently knowledgeable. Second, schools are also represented as enduring features of the landscape; immune to change. The typical example used to make this point is the architecture of schools – where, aside from some re-engineering from decade to decade, it is argued schools 'look' are the same. Changes in school infrastructures, like the addition of ICT hardware, are just as likely to be constituted as additions—as aliens too. Maybe schools look the same, but this is to miss the point about schools location in societies and this is the nub of our argument.

Schools and classrooms are particular moments in wider social relations. They are also particular configurations of social relations. As we have argued, students come to school and learn a wide range of things, however when they go home and return, they bring with them new learning from different locations—the playground, the home, their on-line communities, and so on. Schools, as official sites for learning, are also connected to a wide range of other activities—some of which shape what it is that schools, teachers and students do in direct ways; others more indirectly. This ensemble of linkages and social

[30] Though we would point out that this is not the only thing that schools do. Schools also socialize students into the workplace, produce compliant citizens, and so on.

relations is given coherence through particular logics, what it is that these various actors should do, how they are governed in pursuit of this, and so on. We might call this an assemblage – a particular set of linkages that form, like a constellation around a classroom, but which extend outward to a range of locations and with a range of effects on the learner, the teacher, the classroom, the school and so on. Viewing classrooms as an assemblage, on the one hand keeps the system more open and on the other hand also opens to the possibility of seeing it as far more dynamic and open to changes, both small and big. ICTs have the potential to generate *big* rather than incremental change, and they have, in our view, the potential to profoundly alter the social relations of classroom life. We see signs of this already, and as some of the chapters in this book reveal, some teachers are well advanced in managing the implementation and consequences of the learning that is made possible.

Conclusion

In this chapter we have used a specific classroom case based upon Andy, a secondary history teacher, to explore a number of issues surrounding the use of new technologies in conventional classrooms. We showed how ICTs, both in the ways that students bring their ICT mediated knowledge and experience into the classroom and in the incorporation of ICTs into the history curriculum, alter the dynamics of classroom life. Knowledge creation, the distribution of expertise, forms of interaction, organisation and the re-spatialisation of classroom life, tip the logic of the old assemblage into a new one. There are now new actors, practices and linkages which make up this new assemblage and ecology of knowledge production. Rather than seeing aliens in the classroom, by connecting classroom life more closely to wider social relations, Andy might now be able to ask questions that reveal to him different kinds of possibilities for working with and improving learning.