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A gorilla in their midst: rethinking educational technology

Chris Bigum & Leonie Rowan

Humans, unlike some species, have a blind spot that derives from an absence of photoreceptor cells in the retina. We usually don’t notice our blind spot because the other eye helps the brain fill in the missing information. Reality, as Leonard Mlodinow (2012, pp. 30-51) suggests, is a little less straightforward than we might imagine. He puts it this way: “senses plus mind equals reality”.

Recently, Cathy Davidson (2011) has written about a related phenomenon associated with human vision, that of attention blindness. She recounts her experience of an experiment in which subjects (including herself) were asked to watch a video tape of two groups of basket ballers, three dressed in black shirts and three in white. The task was to count the number of tosses the white team made. About thirty seconds into the tape a person in a gorilla suit appeared, stared at the camera, thumped their chest and wandered off camera. In Davidson’s case, she was the only one in her group to see the gorilla. The others in her group were ‘on task’ and dutifully did the counting, rendering the gorilla invisible. Davidson wasn’t paying attention to the counting task and she noticed the gorilla in the room. Davidson’s story is consistent with a much wider body of literature that explores the gap between what we “see” and what we notice. Timothy Wilson (2002, p. 24), for example, argues that the mind can take in about eleven million pieces of information at any moment but suggests that, even with the most generous estimate, we can be consciously aware of only about forty of these.

So what factors come together to determine what we notice? Davidson appears to argue that most of the participants were focused on their official task and, thus, what they were noticing were the things that officially matter: they were the things they were expected to notice. Everything else was rendered invisible.

Reflecting on the gorilla in Davidson’s story serves as a useful challenge for us as researchers. Many of the claims made about educational research are based upon the belief that a particular study or project or paper will look at a field/issue/topic, notice the things that are most important, and then communicate that message to others with a similar interest so that they, too, may learn to notice the really important things. In this process we not only send messages about what we see as important, we also contribute to a tradition of noticing (or not noticing) and influence where others in the same field may also be inclined to look.

The gorilla in our midst reminds us that there is a difference between an ability to notice what we are told (or trained or encouraged) to notice, and what there actually is to notice.

Of course, social neuroscience is not the only field that helps us make this point. It can be argued that over time, a kind of orthodoxy emerges in any well established field, something that Law (2004) describes as a hinterland, in which there are reality possibilities and impossibilities: things that can and cannot be said or thought about. Somewhat counter-intuitively, the more established a field becomes the less likely it is that new issues or new ideas will be noticed. To continue the metaphor introduced above, even if the number of
gorillas keep on multiplying, the rules of the hinterland do not actually allow them to exist and thus, they are impossible to notice.

In this paper we use the motif provided by Davidson and Law to frame a reflection on literature associated with educational technologies. In the pages that follow we ask questions about what we are trained, expected, encouraged to notice within much of the educational technorati (ET)\(^1\) literature and what, by extension, we risk overlooking.

In writing this chapter, we struggled with the usual process of writing chess, that is passing drafts back and forth, rewriting each others rewrites. We found ourselves having question and answer conversations. We have used this style for much of the remainder of the chapter.

**Noticing what is noticed**

So, let’s begin with the obvious question. What does get noticed in most ET literature: what ball catching are we encouraged to count?

It’s worth going back to the early days when ball catch counting began. The field might be said to have taken off in the early 1980’s. Prior to then there had been a number attempts to improve student learning by making use of a variety of computing systems.\(^2\) It was the logic or aim of this work, to somehow support, maybe even automate some of the teaching of things that students had to learn. With the advent of the micro or desktop computer, the interest in using computers to support student learning grew significantly. Computers became more common in the home and the interest in using these devices to support teaching and learning continued to increase. As more and more people became interested in using computers for educational purposes, the original interest or concern remained in tact. That is, for the past thirty or so years the concern or interest has largely been in positioning computers as *improvers of things*, of student learning, of access to information, of employability. Within this logic the key questions began with *how*: “how do we use a computer to help a student learn about geometry?”; “how do we organise computers in classrooms to improve student access?” The ball catch counting that began in the 80’s has continued to this day. The only thing to change, if I can extend the motif just a tad, is the colour, size, number and shape of the balls, that is, the hardware, software and computing infrastructure.

If activity today is anything to go by there must have been a great variety of things being tried in the classroom back then.

There were but this was prior to the Internet and not a lot of documentation from that time has survived. The dominant interest, then and now, has been in how to improve student learning. What mattered most was counting the ball catches. Regardless of how many gorillas appeared, the only thing that mattered was counting the catches of the ball.

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\(^1\) We borrow the term technorati from the Web and coin the label to gesture to those who contribute formally and informally to knowledge production in the field of educational technology.

\(^2\) PLATO was one example.
OK. It seems logical. Formal education institutions prime interest in helping students learn so is it a problem that this focus has remained in tact over this period of time?

Yes and no. Let me continue with this very brief overview. Faced with many accounts of ball catch counting, the ET have tried, over the past thirty years, to group or cluster these observations to identify patterns or produce lists of factors and categories that can be identified as important in the *successful* use of computers in classrooms. The aim has been to build models with some measure of predictive capability or with some capability to guide policy.

Loveless (2011) in a recent review, maps something of the history of model development in relation to pedagogy and computing technologies. Better known examples of pattern making include Sieman’s notion of connectivism (2005) and Koehler and Mishra’s (2009) TPCK model. Building models and their related classification schemes has been a common way to make sense of observations across a broad number of fields, as Bowker and Star (1999) put it, “to classify is human”.

So would someone like Rogers and his neat little categories be another example of this?

It’s a good observation, the neatness of categories. Rogers’ categories (Everett M. Rogers, 1962, 1983; 1995; 2003) were developed to tidy a large number of studies and projects that were concerned with the spread of an innovation. The model (DOI)\(^3\) has been influential across many fields, including education and educational technology. Terms like early adopter and change agent are familiar categories. The terms from the model have a common sense feel about them. They evoke the logic of the model. But, let’s step back for a moment and consider categories that have a less familiar logic. In the Preface of Foucault’s *The Order of Things* (1973), he writes:

> This passage quotes a ‘certain Chinese encyclopedia’ in which it is written that ‘animals are divided into: (a) belonging to the Emperor, (b) embalmed, (c) tame, (d) sucking pigs, (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camelhair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off look like flies’. (p. xv)

The quote, if seen for the first time, can be a little jarring. Foucault continues,

> In the wonderment of this taxonomy, the thing we apprehend in one great leap, the thing that, by means of the fable, is demonstrated as the exotic charm of another system of thought, is the limitation of our own, the stark impossibility of thinking that.

Foucault makes a different point to the one I am trying to make here, that is, that taxonomies, category systems of any kind, bring to the fore the attributes and properties of things that are to be grouped. This is what all category systems aim to do, to tidy, to make messy things neat. Rogers’ categories are no exception. There are no stray

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\(^3\) Diffusion of innovation.
adopters in his schema.

I’m not sure I am following you. Is tidiness a problem?

It is important to think about how things get tidied and the work associated with keeping things tidy. Some things get tidied out of sight. If they don’t fit any of the categories of a model they are simply made to disappear. So, yes, tidiness can be a problem.

Such as?

Most studies reported by the ET either make decisions in advance about what they will pay attention to, or are so wedded to ball catch counting that they are unaware of what is being left out or taken for granted. For example, experiments that ‘fail’ tend not to be reported. They are tidied away. Dropped into a category that implies they are of no interest. In recent studies of computer use in classrooms, the computers, hardware, software and associated bits and pieces are often grouped under the generic term technology. The detail disappears.

So this is Rogers categories at work?

It often can be, or some other category system that purports to capture what is most important about the use of computers in classrooms. I have some issue with Rogers’ categories as one way of describing what is going on in a particular study of change. In many respects you could invent any number of alternate categorisations, perhaps a modified version of Foucault’s Chinese encyclopedia to do the same work. As I want to argue, categories not only describe, they also perform or enact. They have effects.

So you want to talk about performativity?

Yes but before that, there are other problems with Rogers model I want to briefly point to. The purpose of these models or category systems is to offer explanations of why particular projects do or do not work or perhaps predict which projects will or will not work. The success or failure of an innovation is explained in terms of influences whose characteristics are judged retrospectively.

How else could you do it?

We will get to that, I promise. :) But it is important to note that the characteristics of a project that has failed or succeeded are only evident when the project is succeeding or failing. You can’t know what will happen in advance, which is what the model suggests. We may as well call Rogers’ laggards “that from a long way off look like flies”.

OK. I think I get it. So, for example, if was able to know in advance the characteristics of my students and how they would react to my pedagogy I would know if my class was going to be successful, or attract good feedback. But
actually, I can’t and so, in a sense I play it by ear, adjusting and adapting as I go.

Precisely. All approaches to the study of educational technologies, even the ones we develop in this chapter have a problem if it is used to predict or inform policy or practice. I think there is so much more to be learned in the study of any innovation. Whether or not a particular innovation was judged to be successful or not can be the least important consideration. The devil, I want to argue, is in the detail.

I did see a lot of determining the important factors when I was reading from the sample of papers we drew from the educational technology literature. I was also amazed at how many journals there are!

Me too.

In the sample we read, the persisting interest in how to best integrate computers into classrooms was remarkable.

It is. Interest in integration goes back a long way, to the very early days. The terms used to talk about the idea differ a little over time but the interest has consistently been in how best to get computers used to good effect in classrooms.

The how question again?

Exactly.

So here, I think, it would be useful to briefly outline the sub set of papers we eventually chose. Two of the papers report studies aimed at getting at the key factors for integrating computers into classroom. Zhao et al. (2002) report the outcomes of an evaluation study in which they collected data from 118 funded innovation grants. The purpose of the work was to develop the characteristics of instances of successful integration of computing and related technologies in classrooms. Debele and Plevyak (2012) draw in part on the work of Zhao et al. and examine reported accounts of successful integration of computers in social studies classrooms. The third paper is an editorial (Maddux & Johnson, 2012). They argue that the overall problem of integration is to do with not achieving what they call external validity,

By external validity, we mean the extent to which results of a study or a given program development project can be assumed to apply to other people in other places and at other times. (p. 250)

OK. So what did you make of each of them? What did they actually do to arrive at their categories or characteristics?

Zhao et al. outline the process they went through to identify the eleven “salient
factors” which they cluster under three headings: the innovator, the innovation and the context. They argue that each cluster interacts with the other two and identify the implications of their findings for the professional development of teachers, the way in which this work should be understood, evolutionary not revolutionary, and support.

Teachers need access to a healthy human infrastructure and a functional and convenient technical infrastructure. (p. 512)

The observation that the factors interact poses problems for the ET who are keen to attach numbers to these observations (see, for example, Jamieson-Proctor, Watson, Finger, Grimbeek, & Burnett, 2007), but the point about interacting factors gestures to what we will explore later in the chapter.

The second paper is similar to the first. Debele and Plevyak draw on the work of Zhao et al. to establish factors and conditions for the successful integration of computers in social studies classrooms. They canvassed 45 empirical studies from which they selected 33 based upon whether or not the instructional goals for each project were met. They also draw on Mishra and Koehler’s (2006) work on Technological Pedagogical Content Knowledge (TPCK). Their analyses broadly mesh with the findings of Zhao et al. They found that:

The most visible commonalities among the successful technology projects were clarity/focus of the targeted learning outcomes, pedagogy–technology alignment, and the role of the researcher in the project development and implementation. (p. 289)

TPCK is vogue among many of the ET at present. It does expand the things to be considered in thinking about computer use in classrooms but, like all category-based approaches, decides in advance what matters, which ball catchers to watch.

I’m wondering what they are missing that is so important but before we get onto that, there is the third paper. The editorial by Maddux and Johnson captures some of the key themes in the other two papers and frames these findings with the question, why computing technology has “not lived up to its considerable potential in education” (p. 249). They see the solution to the problem as inattention to what they term external validity, or the reproducibility of results of an innovation across time and space.

The Maddux and Johnson editorial is interesting. They are concerned that studies of computer use in classrooms are done under good or almost ideal conditions, “master teachers in classrooms and schools where personnel are strongly committed to the success of these programs and methods” (p. 250). Their interest, as is the case for those who develop category systems, is in generalizability. But, they argue that to produce more useful categories, studies ought to be done under less than ideal conditions. The argument is not dissimilar to what has happened with Rogers’ DOI model; they tend to proliferate categories, that is to add more categories when the original model appears to be less useful than it was initially imagined to be.
I get the picture: this kind of “labeling” approach certainly makes you look for certain things. Surely other people have drawn attention to the narrow and restrictive nature of this category-based analysis? What about critical sociologists?

There have been a number of scholars from the critical sociology tradition that have been making this point for quite some time. Michael Apple, Hank Bromley (1998) and Larry Cuban’s work (1986, 2001) come to mind. The term critical appears to have been something of a flag to the ET as something that misses the much more important task of figuring out how to do it. Critical approaches tend to focus on “why” and “what” questions.

So does this mean that critical sociology is also a form of category-based analysis?

In a word, yes. Critical sociologists use categories, but they tend to be of a different order than those of the ET. What characterises the scholarship of critical sociologists are terms that point to generic influences or forces. As Bruno Latour (2005, p. 249), writing about critical sociology, rather unkindly puts it:

> When faced with new situations and new objects, it risks simply repeating that they are woven out of the same tiny repertoire of already recognized forces: power, domination, exploitation, legitimization, fetishization, reification

Well (indignantly), that is a glib account of a large and important body of scholarly work that has been hugely influential over a long period of time in education. Nevertheless, I remain curious about putting criticality into the same camp as the ET. Are you saying that they are both category makers and users.

Yes. As we will be also at the end of this chapter but the categorisation we do will have a different basis than the typical ET analysis or the usual critical take on things digital.

So does this mean that even if we add in criticality to our thinking about computers and classrooms, there are still, at least potentially, gorillas in our midst?

Yes. But the key point is, even if we shift to a different approach, one we will talk about shortly, you can never be sure there will not be gorillas in our midst.

Noticing representation

So, are we there yet?

Yes we are. Let me make a brief argument about the broad kind of knowledge making that is going on in the literature we have looked at. The research of the ET is concerned with representing the reality of what is going on in classrooms. Of course the ET are
not the only group who represent things. It is a mode of knowledge work that is common in much of Western thought. Representations have, as Karen Barad (2007) suggests, taken on a common-sense appeal (p. 48). It seems so obvious that it may appear odd to raise it, that is, there is a reality “out there” and we represent that reality in words, images, measurements and so on.

And then we build category systems to organise those representations.

Exactly. But the problem is, and it is a philosophical issue, the separation between the thing being represented and its representation. So bear with me a little. It is important in terms of learning to deal with gorillas. All ideas, particularly those that have hung about for a long time have histories, beginnings. As Karen Barad, drawing on Ian Hacking’s (1983) work points out, representationalism is no exception. It dates back to the Greek philosopher Democritus. Barad (2007) continues,

> According to Hacking’s anthropological philosophy, representations were unproblematic before Democritus: “The word ‘real’ first meant just unqualified likeness” (1983, 142). With Democritus’s atomic theory emerges the possibility of a gap between representations and represented. — “appearance” makes its first appearance. (p. 48)

Once you separate matter from the meaning given to it, the opportunity to further divide or categorise matter becomes straightforward. The material, as Richard Edwards (2011) argues can then be divided into, “the social, the natural, the technological, the cultural and the economic. These enacted distinctions or boundary markings are then assumed to be ‘natural’ and taken to be foundational” (p. 529).

So the social, the natural and the technological are not foundational? What then is?

What follows is less an answer about what is or might be foundational and more one of drawing attention to the systems of thought which rely on foundations in which there is a separation of matter and meaning.

Foundations matter a lot. It’s like saying that counting the catches of basketballs is foundational. Every system of thought has to make some assumptions about the nature of knowledge (epistemology) and the nature of reality (ontology). What is important is to be aware of the assumptions and their limitations.

So it is not a matter of one being better than another?

Rather than which foundation is better, I think it is more useful to ask what is being done when a particular epistemology is deployed. The thing is that each set of assumptions of a particular epistemology has effects. For example, if you take the view that people or things have essential attributes or properties then claims, for example, that a woman’s place is in the home or that particular technologies have affordances are controversial only at an epistemological level. What tends to be forgotten is that claims like this are dependent upon the assumptions that are made about reality, that
is, in this case that people and things have _essential_ attributes and properties.

**Poststructural feminism in its many guises has worked to destabilise essentialisms of various kinds to good effect over the years.**

Indeed it has and in this chapter we draw on the work of some of their number, Donna Haraway and Karen Barad. There are, as you point out, a large number of approaches that have rightly asked questions about essentialisms of one kind and another. In the literature of the ET these considerations become tangled up in the social/technical determinism debates and tend to go nowhere.

**That is an old debate.**

It is. The important point is that the basis of representation, i.e. the separation of matter and meaning is not an issue of interest in the literature of the ET. This is where we enter the world of the performative. A quote from Barad (2007, p. 49) captures it well,

> Performative approaches call into question representationalism's claim that there are representations, on the one hand, and ontologically separate entities awaiting representation, on the other, and focus enquiry on the practices or performances of representing, as well as the productive effects of those practices and the conditions for their efficacy.

What a performative approach draws attention to is _practices_, what is done, for example, to make categories, what is done to determine that ball catch counting is important.

**There are a lot of different approaches to the performative which, I think, can make the idea seem a bit confusing to the newcomer. It’s not something that leaps out at you as routine as representational approaches do.**

I agree. The idea is not easy. Whether we deploy this as the basis for how we make sense of what is “out there” is neither here nor there. But we can argue that _how_ we think about reality (or realities) matters and that the assumptions we make matter. These are choices that are neither natural nor innocent.

Moving to the performative turns things on their heads, so to speak. Rather than beginning with a fixed set of components, factors or predispositions that require representation, we have to think about the practices that make or do or enact, in the case of computers in classrooms, what we might call, integration-realities. For instance, the papers we cited earlier in this chapter, as well as this chapter, all do or enact realities. A key question then is, how realities get done in practice. How, for instance, are teachers, their students, the computers in the classroom enacted in integration-realities? Or, to put it another way, teachers, their students and the computers which are the focus of concerns about integration are _not_ entities to be represented, they are
all effects of practices.

That is a big leap to make. But let's see where it takes us with each of the three papers. And in passing, we still have not escaped the category problem have we?

No we have not. Language and particularly its role in knowledge production has to be about categories of some kind. So deploying the category of practices in thinking about the realities in which we are interested, shifts focus away from things and how to put them into tidy boxes and towards how those boxes are built and how different things are put into different boxes.

Maybe it's best to illustrate the idea by looking again at the three papers. What can we say about the integration-realities that are described in these papers?

Now, unless you are familiar with, for example, the Zhao et al. paper then all you know about it is what we have put in this chapter. Our writing practices and your reading practices together assemble, for you, a putative reality of the Zhao et al. paper (Law, 2012). This is, as Law argues, the performativity of practice at work. Similarly, our reading practices and the writing practices of Zhao et al. produce various realities of teachers, of failed and successful projects, of technologies and pedagogical beliefs. Teachers, in the paper by Zhao et al. are enacted as knowledgeable (or not) about specific technologies, as having beliefs “compatible with the technology” or not, as being able to draw support from colleagues (or not).

So there is work being done here to divide, to make boundaries, to classify? I think I am beginning to join some of the dots but I don’t quite see why we focus on practices when we were not sitting alongside these folk when they did this research.’

No doubt. There are practices that went before the practices that produced these papers and our reading of them. It’s not the case that somehow practices stop once the people studying the classroom complete their observations and note taking. Practices, in this mode of thinking about reality, are everywhere. They make or do4 realities that are proximate or are remote and difficult to get at. Law writes about these enactments as doing collateral realities (Law, 2012).

But surely there are different kinds of practices and some are a little closer to the reality that is being studied?

The appeal of what we might call common sense realism is hard to shake. It is the default setting if you like for how “things” are understood: there is a reality “out there”

4 We use the verb ‘do’ to underline the point that in a performative idiom, we are not talking about a single reality “out there” that requires description. It is to emphasise that “realities (including objects and subjects) and representations of those realities are being enacted or performed simultaneously” (Law, 2008, p.635)
and our job is to represent it as best we can. Relying on this assumption, representations “closer” to “the reality” would, one imagine, be more detailed, richer accounts. However, all of this depends on maintaining the separation between a reality “out there”, and its representation. We are back to counting basketball catches.

**So we don’t allow the separation and we pay attention to what is being done, and I presume not done?**

Yes. But to get back to the point that Law makes about collateral realities, we can also pay attention to the things that get done incidentally, along the way as it were. He offers a useful set of steps (Law, 2012, p169) if we take the performative path.

First attend to practices. Look to see what is being done. In particular, attend empirically to how it is being done: how the relations are being assembled and ordered to produce objects, subjects and appropriate locations. Second, wash away the assumption that there is a reality out there beyond practice that is independent, definite, singular, coherent, and prior to that practice. Ask, instead, how it is that such a world is done in practice, and how it manages to hold steady. Third, ask how this process works to delete the way in which this sense of a definite exterior world is being done, to wash away the practices and turn representations into windows on the world. Four, remember that wherever you look whether this is a meeting hall, a talk, a laboratory, or a survey, there is no escape from practice. It is practices all the way down, contested or otherwise. Five, look for the gaps, the aporias and the tensions between the practices and their realities – for if you go looking for differences you will discover them.

So we need to pay attention to what else is being done in each of the three papers? To me, the **criteria for successful innovations** in Zhao et al.’s (2002) paper are being done or enacted.

OK. How are they being done, and, importantly, what is being done incidentally?

The paper maps the process the authors went through in some detail. I got a sense of a great deal of data being tidied or reduced down to something that was able to be managed, to fit into the accepted length of the discussion/methods section of a paper. This is what always happens in research. You can’t publish it all. The authors noticed a messiness in the practices on which they report. A set of accounts from surveys, interviews and observations is reduced to three clusters of attention: the teacher, the project and the context and how each of these “need” to relate in order for integration/implementation to occur.

It struck me that the clusters are held together conditionally, “successful implementation of classroom technology is more likely to occur if… (p. 492)”. There are nine statements that are structured this way in the text. Further, they are nested, almost like computer code, IF ... THEN ...IF... THEN... The else is always implicit. Success is enacted as a nested set of conditions. The successful world is realised through snippets of the cases that were studied. Interestingly, the artifacts, the hardware
and software that are the concern of the work are glossed into one word, *technology*. There are gestures to affordances, to upgrades, and to infrastructure. There is a brief list of some software and implied hardware in the table that maps the participants (pp. 486-7). What must have been a large and disparate set of artifacts is represented by *one* word. The reality of successful innovations is enacted as a tidy reality, one characterised by a set of check-box conditions and generic technology.

**So the various bits and pieces of hardware and software are being enacted as generic?**

There is more than that. The various bits of hardware and software are being enacted as *having affordances*, lending themselves for “fitting” with the pedagogical beliefs of teachers.

**So the pedagogical beliefs of teachers are also a kind of affordance or attribute?**

I think that it is simpler to allocate affordances to objects that don’t have language than those that do. So we have the pedagogical beliefs of teachers being done here. For instance, one of the teachers, Kathy (p. 492) makes a connection between the way hypertext can be used to connect chunks of text and the way humans think.

**How is that a pedagogical belief?**

That’s not the point: one of Kathy’s pedagogical beliefs is being *done* this way. The account washes away all else about Kathy’s pedagogy. It enacts her pedagogical beliefs as an association between computer algorithms and how humans think. This is the ball catch counting that matters. Her project is deemed to be successful and a project like Willa’s (pp. 493-4), unsuccessful. The complexity of what a teacher values, how they think about particular challenges, students and working with various materials is collapsed into a category, pedagogical beliefs.

**Of the three broad categories that Zhao et al. settle upon, they argue that the innovator, i.e. the teacher working on a project to make use of computer technologies in the classroom, is the most important. The judgment is qualified throughout the paper with the observation that all three factors interact.**

A similar argument is made by Debele and Plevyak.

**Yes, like Zhao et al., Debele and Plevyak’s paper (2012) also enacts the criteria for successful integration, this time in social studies classrooms in terms of the alignment of pedagogy and technology.**

This study is somewhat different to that of Zhao at al.

**Yes, the authors took 45 empirical studies which they reduced to 33 by deleting**
those that did not meet their instructional goals.

So the stuff that “failed” is left out?

Yes. They made the model of Zhao et al. a little more elaborate. To the three clusters of factors identified by Zhao et al., they added four more: the role of the researcher(s), the objectives of the project, the type of technology, and the “types of targeted learning outcomes” (p. 288). Here, technology has been split into the many forms that one might anticipate are in use in classrooms. Software is named. Hardware is implicit. There are brief synopses of the papers’ accounts of the success of projects. Success is being done. It is being done, like Zhao et al. in terms of the ordering or coincidence of a series of factors, like the IF... THEN idea you just mentioned.

What was interesting to me was that the practices in which these factors do not align are culled from the final set of documents with which they worked. It is like the Rogers model, a predictive model being done retrospectively. A key idea they write about is alignment.

So alignment is also being done?

Yes it is. It is not so tricky once you get the hang of it. You pay attention to practices, in this case those of the written account. In the paper, alignment is being done as strong or weak, well-aligned and not well-aligned. Alignment is being done as a kind of fit between the use of particular artifacts and the development of particular learning outcomes. Successful teachers, in this model, are being done as aligners of things. As they put it:

Educators should ensure that pre-service and in-service teachers are not only introduced to the “what” and “how” of a certain innovation, but also to the kinds of learning outcomes (e.g., historical thinking, media literacy, etc.) that can best be achieved using those innovations. (p. 296)

OK. So successful teachers are being enacted as knowers of the practices that support or encourage particular behaviours of students and knowers of the capacities, affordances, or attributes of particular computing artifacts. That’s a good thing to argue isn’t it?

It may be if we could examine the practices that enact each of these attributes. But we would end up pursuing a long chain of practices which produce representations of knowers, students, computing artifacts and so on.

Including alignment?

Including alignment. It’s the separation that is the problem, as Barad (2007, p.28) puts it:
representationalism—the idea that representations and the objects (subjects, events, or states of affairs) they purport to represent are independent of one another. It is an ontological distinction that is made between representations and the things, human and non-human, that the representations purport to represent.

So debates about the importance of “social” versus “technological” that are commonplace in ET literature is a contest between which representation, and hence explanation is better? The technology did it or the teacher did it.

Well, yes. Once you have representations, that is all you pay attention to: keep counting those catches. You can see that in the third paper we consider (Maddux & Johnson, 2012). It is the editorial for the issue in which the Debele and Plevyak paper appears. The authors pose a variation on the now long-standing question among the ET, why have we not seen the kinds of changes in schools that are evident in so many other social practices? Their question is:

Why has technology failed to bring about a widespread shift from passive methods such as the lecture to more active kinds of instruction including inquiry-based learning? (p. 249)

What is different in this paper, is that failure rather than success is being enacted. Failure is being done as an absence, a lack of demonstrating “good external validity” (p. 249), or as the authors put it (p. 250),

... the extent to which results of a study or a given program development project can be assumed to apply to other people in other places and at other times.

Maddux and Johnson point to the practices in which “ideal” circumstances are put in place in order to carry out a project. We might assume that these ideal conditions are those mapped in the other two papers. So there is a tension here. Maddux and Johnson are supportive of the development of ideals but they want findings from sites that are not ideal.

Working from the notion of an ideal can, for the study of some things, prove useful. It is a notion sometimes found in science. Students of chemistry may recall the notion of an ideal gas, one that behaves perfectly according to established laws, unlike real gases, and is amenable to prediction and analysis. Real gases are then able to be studied in terms of their deviations from ideality. Gases, we submit, may be lot easier to measure and observe than the use of computers in classrooms in which teachers, computers, kids, blackboards, books, desks, dust, attendance rolls, noise, interruptions, chalk, doors, disruptions, power supplies, pencils, Internet connections, cables, modems, posters and so on may or may not participate in the way integration is being done or enacted.

I can see that when confronted with the messiness of a classroom it is easy to

5 In saying this, we don’t wish to ignore the various pieces of equipment, meters, containers and the other commonplaces of a laboratory in which this may occur. There is mess here also.
be attracted to the counting of basketball catches. There are just too many gorillas. It is so much easier to ignore them and give all your attention to counting catches.

If we can swap back from our analogy to the problems of representation, it is possible to see that the attraction of seeing the task as one of representing and not attending to the practices of representation comes at a cost. Yes, we can represent what we see going on in classrooms or in papers that are written about what is going on in classrooms.\(^6\) We can generate idealities, abstractions, frameworks and schemas but they are not longer connected to the practices that produced them. The separation makes their reproducibility or their external validity in Maddux and Johnson’s terms, impossible. We can’t be certain that what was left out as the criteria for success or failure were progressively purified was not an important part of the enactment of integration.

**So we need messier accounts of computers in classrooms?**

Yes and no. Yes to obtain some sense of what a non-representational account looks like and no because we will still have gorillas. Accounts that are cast in the performative idiom offer a contrast to those of the representational idiom. Here it is useful to briefly draw attention to two accounts, two PhD theses, one has been turned into a book (Sørensen, 2009), the other (Nicholls, 2009) is available online. Both works report studies of practices associated with computer use in educational settings. Sørensen reports an ethnography conducted in a school in Denmark. Her interest was in (p.3),

> how newly implemented technologies participate in school practice with the way in which established technologies do so

some of which are,

> The established technologies we encounter in this study include a blackboard, chalk, a chalk-holder, a one-meter ruler, songs, bodies, notebooks, a bed-loft, sheets of paper, chairs, and a bell. The new technologies include an online 3D2 virtual environment, a weblog3 (more commonly know as a “blog”), and a conference system.

Nicholls (2009) also conducted an ethnography in Ramingining - an indigenous town in Arnhem Land, Australia. Like Sørensen, Nicholls was interested in the materials that had a role in enacting the practices she studied. In both accounts there is no initial assignation of attributes or affordances of people or things. For example, knowledge, as was the case for all the other labeled practices and things, was something that was done or performed. Both accounts explore the materiality of the practices which produce the multiple realities of the two ethnographies (Law, 2008).

Sørensen’s rich account of the introduction of a virtual environment into a school arose

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\(^6\) Or in papers that are written about papers that are written about what goes on in classrooms.
from her noticing the already in place ways of knowing and doing in the classroom, the other technologies. As she puts it,

My point of departure was to study a 3D virtual environment, but the nature of the empirical field led me to ask questions about materials I thought I knew all to well: a blackboard, notebooks, pencils, chalk, even walls and doors. I was surprised to find how crucial and unexpected were the formations these materials contributed to performing (p. 189).

Like Sørensen, Nicholls has a collection of rich accounts of computers, learning and mess in her performance of the social life of the computer at Ramingining. One such story, about Bulany and the donation of a computer to him by the school in the local community is, I think, illustrative of our argument (Nicholls, 2009, p.181):

Today, the 9 November 2006, the school is donating a computer to Bulany, in recognition of the work he has put into learning about computers. It is an iMac and sports a sticker which reads, To Bulany, Council Chairman, from Ramingining School…

He has cleaned his office earlier today, to use the Tablet PC for internet banking. It seems a fitting welcome for the colorful iMac. The lead only just makes it from the desk to the PowerPoint and Bulany seems reluctant to move the desk closer, so the computer accommodates by sitting at an angle…. Power surges into the iMac and it bursts into life, bright faced. Good, it has Microsoft Word amongst its programs .. that will mean some continuity for Bulany who has been working with PCs. All the same he takes to the new Apple environment quickly and a little later responds to a suggestion to write the school a thank you note. He starts straight away. The screen already says, Hi there, where he has been practicing how to select text and change its size, and he goes to start the letter, Hi there Corrie … but then he hesitates, saying aloud, Hi Corrie. The computer is prepared for such changes and together they take the “there” out….

The next day Anthea has to go into Darwin for a month, on the trail of a caravan. When she returns the iMac has a sad look to its desktop face, with only a few icons scattered there. She searches in vain for the Word program, the phonics and the games. They have all gone. The only program remaining is a SimpleText word processor. An e-savy friend delves further but he too finds no trace of these affordances. The iMac has been stripped of its capacity to take anyone on these encounters. It retains one more powerful agency: its Trash Can. It can still devour its own records and its own programs. This is what has happened. Kids have been here. They have had fun moving icons around on the screen. Little did they know that if they got too near the Trash Can it could swallow their games and fun, as well as Bulany’s ally in his pursuit of computer skills. Not only the programs have been wiped; further attempts to reinstall original disks also fail.

So if Nicholls had gone to Ramingining with a predetermined set of things to notice we would have read a very different account to the one that now sits in a digital repository at Charles Darwin University?

Exactly. Enactments such as this and Sørensen’s clearly meet the Maddux and Johnson
criterion of less than ideal conditions. They would be unlikely to be included in studies such as those conducted by Zhao et al. or Debele and Plevyak. For us, these enactments resonate with memories of working with computers and their users over many years: stories of teachers having to put modems into refrigerators in the North of Australia to cool them sufficiently so that they would work and connect to a distant site; stories of gently pressing the chips on a computer’s motherboard firmly into their sockets to bring the dead computer back to life; stories of workarounds, kludges and bricolage, all accounts of the myriad entanglements of humans and nonhumans in the long history of using computing technologies in educational settings.

**Learning to laugh at certainty**

So where to from here? Is it a case of representational bad, performative good?

No it isn’t. As Law (2007) reminds us, we are in the realm of what Mol (2001) calls ontological politics, or ontics, that is not deciding in advance what ontology is right or wrong, as he (Law, 2007, p.127) explains, ontics is a politics that “is explicit about the goods and bads of different metaphysics”.

This is all very well but for teachers and the ET there is the ongoing challenge of what do we do on Monday? Are we, for instance, suggesting that we stop worrying about counting ball catches or that we pay more attention to the practices of counting ball catches or what?

Let’s go back to Law’s advice and pay attention to the practices of Monday. In a school for example, a myriad of practices are entangled and come together to produce an affect we call school. The amazing thing is that this entanglement occurs at so many different sites and in so many different communities. School gets done in much the same way in many parts of the world. In any particular school, doing school is multiple, not plural, that is school is done differently by the various humans and non-humans.

So for a teacher, thinking along these lines means paying attention to practices and perhaps being a little less concerned with their representation?

Which, when you think about it, is not far from what teachers do. It’s just that representing, naming and labeling can come to occupy most of their time, i.e. I am teaching, she is learning, this is an assessment and so on. Being set a little free of various ways of thinking about the big foci of schooling, can, as Ball (2006, p. 64) argues, be liberating:

Theory can serve to conjure up its own anterior norms and lay its dead hand upon the creativity of the mind. Too often in educational studies, theory becomes no more than a mantric reaffirmation of belief rather than a tool for exploration and for thinking otherwise.

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7 There was a time when you could easily get at the motherboard of a computer.
8 An illustrative account is offered by Cornford and Pollock (2003) in their account of universities “going online”.
What about the ET?

I think it may be a little trickier for the ET more because, for some, their investment in various systems for representing the various realities with which they work is not inconsiderable. It’s not a matter of tossing out things like TPCK but of adding a consideration of practices to their repertoire. It allows them to ask how is TPCK being done for instance, or how is integration of computers into classrooms being done.

You seem to be suggesting that it is possible to have a foot in both camps.

I am. I don’t think you can avoid representationalism but attending to practices and avoiding the easy representation of them offers a more demanding and, I would argue, useful approach to thinking about the phenomenon of computing and formal education.

To illustrate the point we draw upon Helen Verran’s (1999), study of the teaching of mathematics and science in Nigerian (Yoruba) classrooms. Verran comes to a setting in which bilingual Yoruba children are able to work with the ontics of the two different, English and Yoruba knowledge systems. She suggests that opposing ontologies are not necessarily hostile to the other.

In subverting both English and Yoruba in working them together, blending accepted routines of collective acting in ways that both retain the certainty and reveal the origins of that certainty as located in routines, repetitions and rituals, Mr. Ojo’s⁹ lesson is a revelation. We experience the certainty at the same time as we experience something else: the amazing hoax of certainty. This laughter, the disconcertment, is vital for it is in that that we can know ourselves as participants who tell stories as part of our participation. Staying true to that laughter will give us better ways of telling true stories in responsible ways.

To return to the point at which we began. There may be as many problems is noticing gorillas as there are in not noticing them. Perhaps we have to learn how to count basketball catches and notice gorillas. Perhaps too, we can also learn to laugh when we stumble upon the amazing hoax of certainty.

References

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⁹ One of the teachers with whom she worked.


