The Next G Web

Discernment and meaning-making and the implications for education

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Abstract

The Next Generation of the Web – 'Web 3.0'as it is generally known these days – will be here in a few years' time. But what will it mean for education, and especially for education as an intellectual and philosophical endeavour where we seek to critique the world and understand our place in it? This paper I argue that current notions of the Next G Web have the potential to profoundly disrupt the educational enterprise (both as practice and intellectual endeavour) if those notions are sustained, and I suggest that we must start reflecting more closely on what it means to *teach* and to *think*, and on how those things relate to each other. I present a brief history and description of the Next G Web, before providing an analysis of the two dominant scenarios in the Next G Web educational literature: the 'Adminstrative Scenario,' and the 'Pedagogical Scenario.' My main point is that the role of the teacher must remain (or more obviously become) one of discernment – on the part of both teacher *and* student – for it is discernment that underlies the uniquely human ability to create meaning and thus make sense of the world. Finally, I present an alternative scenario, the 'Education Scenario,' before asserting the need for education to take a political stance on the issues raised earlier in the paper.

Introduction

For those of us still trying to get our heads around the idea that Web 2.0 is a concept, and not a software package, it might seem a little premature to be talking about 'Web 3.0' and its likely impacts on education. But seemingly premature or not, what the 'tech-heads' have been discussing since the late 1990s (see, for example, Berners-Lee, 1998) is starting to infiltrate the worlds of business, finance, medicine, health, and even libraries. Education, as always, is a little slow in catching up. It is clear that Web 2.0 as a collaboration, participation, 'sharing' Web has had (and continues to have) the potential for an enormous impact on education, especially if we think of education as a social endeavour: it allows students and teachers to enter into co-operative *and* competitive relationships, all to the benefit of learning. But what about education as an intellectual and philosophical endeavour, where we seek to critique the world and understand our place in it? To some extent, the social affordability of Web 2.0 technologies can help us do this, but so much of Web Two's socialness is about engaging with events and 'contacts' (Freire, 2005 [1974], p. 3), and not necessarily with concepts, ideas and the life of the mind. Web 2.0 is quite often more about being *in* the world, rather than *with* the world, as Freire would say.

We normally think of things as getting better the more developed they become, and so it's natural to hope that the Web of the future will prove to be more enabling than Web 2.0 is, particularly in the intellectual context of promoting or developing the higher-order thinking and metaphysical reflection that characterises the educated person. Where, then, will the Next Generation Web lead us? Will it be a channel for critical thinking, reason and consciousness-raising? What will it mean for teachers? Will it help us do our jobs more effectively, or will it make us redundant – fading anachronisms on a new educational landscape?

This paper argues that present visions of the 'Next G Web' (as I refer to it) are already calling into question both the role of the teacher, and what we value in education as an intellectual, philosophical, uniquely human endeavour. I posit that current notions of the Next G Web have the potential to profoundly disrupt the educational enterprise (both as practice and intellectual endeavour) if those notions are sustained, and I suggest that we must start reflecting more closely on what it means to *teach* and to *think*, and on how those things relate to each other. I begin with a brief history of the concept of the Next G Web (often referred to as the 'Semantic Web' or 'Web 3.0' – I use 'Next G Web' to cover both terms), before moving on to a description of how some writers imagine that the Next G Web will be used in the educational context. Following this, I present an analysis that identifies two dominant scenarios that are being put forward in the educational Next G Web literature: the 'Adminstrative Scenario,' and the 'Pedagogical Scenario.' I demonstrate that there are real problems with the Pedagogical Scenario on its own, as it has the potential to outsource the what is arguably one of the most crucial role of the teacher, that is, *discernment*. Indeed, one of my main points is that it is only humans who can truly make sense of the world for themselves, and that the role of the teacher must remain (or more obviously become) one of discernment – on the part of both teacher *and* student – for it is discernment that underlies the uniquely human ability to create meaning and thus come to apprehend the world. I finally present an alternative scenario, the 'Education Scenario,' in which it is the role of the teacher, as properly understood, that underpins what we should value in education, philosophically and intellectually speaking; that is, an ability to make sense of the world, as well as that higher order thinking that includes an understanding of how to validate, analyse, interpret, synthesise, justify, evaluate, judge, critique, imagine. I also, at this point, assert the need for education to take a political stance on the issues raised, and, in particular, to exploit the opportunity we may shortly be presented with to demand better educational technologies than the ones we are currently lumped with, and to stake a claim for the importance of the teacher in decision-making about the future of education. I conclude that the Next G Web is not going to be of much use to us as educators if it leads to the franchising out of the role of the teacher – of the real, live human being, with all their creativity and experience and consideration and discernment – and to the devaluing of higher-order intellectual skills such as argument, reasoning and critique.

Before we start though, a quick note on the exploratory nature of the current work. The paper is largely speculative by virtue of its subject matter, and I don't want to appear to have set up a straw man argument, but I believe it's never too early to start thinking about these things, especially when they provide the opportunity and have the potential to interrogate the foundations of what we should value in higher education. To this end, I hope to raise issues germane both to education and to the intellectual virtues of argument, reason, critique and rationality. Speculation is only really useful it it leads to critique of the present, and what the present essay hopefully confirms is something that many of us know, anyhow: that is, that education is undervalued as an intellectual and philosophical endeavour, and that teachers are, for the most part, undervalued as experts in how to think.

A short history and description of the Next G Web

Although the Next G Web is not yet a reality, it already has a history, and a pretty messy one at that. It's messy because of vagaries of interpretation and ascription and the simple fact that the Web now has numbers – which it certainly did not in the early days. The idea of a 'Semantic Web' has been around in some form or other for quite some time, at least since 1998. Tim Berners-Lee was probably the first to give the concept some coherence when he wrote a piece for W3C in which he outlined 'What the Semantic Web can represent.' Berners-Lee's early writing on the subject pointed to a "machine's abilty to solve a well-defined problem by performing well-defined operations on existing well-defined data. Instead of asking machines to understand people's language, it involves asking people to make extra effort" (1998, online). The language in which this would be made possible would be "capable of expressing paradox and tautology" (Bernsers-Lee, 1998, online).

Thanks to the historical accident of appelation that forged the designation 'Web 2.0,' this 'Semantic Web' identified by Tim Berners-Lee (and, later, others) also soon came to be thought of as Web 3.0, and, well, here we are. So, in many ways, the idea of the Semantic Web has cajoled its way into the idea of Web 3.0 (or is it vice versa?), and now the two are used pretty much interchangeably. And although many claims have been made for what Web 3.0 *is* – the Semantic Web, 3D Web, media-centric Web, pervasive Web (Metz, 2007), or a Web characterised by ubiquitous connectivity, network computing, open technologies, open identity, distributed databases and intelligent applications (Helmer, 2007) – it is probably safe to say that, although it probably covers all of these things, the Next G Web is now best understood in terms of a baseline of metadata, ontologies,[1] and 'semantic meaning-creation.' We can safely say, then, that the *technical artefacts* of the Next G Web, will be all about structure, architecture, interoperability, data, standards, and a Web that can supposedly 'create meaning' for itself (more on that, later). We can also say that what we will be able to do with that 'meaning' will constitute the *cultural phenomena* of the Next G Web. The cultural will be dealt with presently, and in detail; for the moment, though, let's just look at the technical.

[1] In computer science, 'ontology' refers to the foundations of computation.

Metadata and ontologies will be the keys to the Next G Web as a technical artefact. The Next G Web will be built on standardised depictions of resources, e.g., title, description, author, keywords, language, date, etc. (Breslin, 2005), that machines will read, make inferences from, and *create a meaning of* in a human-readable form. John Breslin presents a fine example of how such metadata and ontologies will be used:

> For example, if there is metadata about a soccer team, an underlying ontology will say that a soccer team always has a goalkeeper and always has a manager, so each metadata entry for a soccer team should have that information. (Breslin, 2005, slide 10)

So, why do we need ontologies? Breslin points to the confusion that can be caused by 'labelling' ("If I say 'car' and you say 'automobile', how do we know we mean the same thing?") and 'semantics' ("If I say 'vehicle', how do you kow if this includes buses, powered motorcycles?" (Breslin, 2005, slide 25). Ontologies will sort out this confusion, and, already, the Resource Description Framework (RDF) and the Web Ontology Language (OWL) are apparently making it big in the metadata and ontology world.

But it won't all be about re-vamping Web formats from the bottom up: the other side of the coin involves building better 'software agents' that can visit and interpret pages more readily than can current search engines, and that can provide links and related information more accurately from the top down (Metz, 2007). These autonomous agents will happily trawl the Web for us, identifying sources and evaluating them for appropriateness and fit for purpose. Agents are not programs because, unlike programs, they exhibit 'behaviour'; according to Franklin and Graesser an agent, therefore, is a "system situated within and a part of an environment that senses that environment and acts on it, over time, in pursuit of its own agenda and so as to effect what it senses in the future" (1996, online, emphasis removed).

With the confluence of metadata, ontologies and agents, the Next G Web will be ready to do its thing: that is, create (apparently) meaningful and relevant answers, ostensibly as if by a human. At the moment, we humans have to make our own meaning of things from disparate sources. For example, a Google search will bring up any number of irrelevant, useless, and just plain 'wrong' resources. As Jeff Bates, co-founder of Slashdot, told *PC Magazine*, "Right now, search engines can't tell the difference bwtween Paris Hilton and the Hilton in Paris"

(Metz, 2005, online). This semantic failure on behalf of the current Web forces *us* to evaluate the search return and to decide upon the resource that best fits what was in our minds to begin with. With the Semantic Web, however, this will no longer be such a problem, as the Semantic Web will get better and better the more data we put into it – it will begin to learn for itself, creating inferences and inductions and accounting for "paradoxes and tautologies" (Berners-Lee, 1998, online) so that what is presented to us via search will better match our original intentions or needs.

This all sounds terrific, to my mind: as an academic, I want better, more accurate and relevant search returns, increased efficiency in research, less time spent following up on poor leads, and fewer distractions from all the cool stuff that a Google search throws up that I pursue, even though I know in my heart that it's only procrastination … . But can we really capture the capriciousness of human thinking in such a form? And is that something we want to, or should, aspire to, do anyhow – that is, to outsource our whimsical associations with the content that we generate and/or filter? What might this technology as a cultural phenomenon mean for education? What could be the potential impacts on higher-order thinking skills such as analysis, synthesis, critique, evaluation, interpretation, imagination? Furthermore, how desirable is it that we might have 'pedagogical agents' searching out, deciding upon and delivering course content to university (and other) students? What will be the role of the teacher? Some of these questions can wait for the time being. Right now, though, I want to examine some of the ways in which writers and researchers have started to envisage that Next G Web technologies might be used in education.

The Next G Web in Education: a brief literature review

It is exceedingly difficult to identify any detailed recent academic commentary on the Next G Web and its non-technical potential for education (perhaps I need a software agent to search it out for me?), although blog posts and non-peer-reviewed magazine articles are starting to appear.[2]

A small amount of interest was apparently stirred in the topic around 2004, when a number of articles were published that explored the educational potential of the 'Semantic Web' (at that

[2] A quick Google search will pull up a stack of blog posts from 2007 and 2008, and if you augment your search with magazine titles such as *Technology Review*, *PC Magazine*, *Wired*, *New Scientist*, etc., etc., you'll start hitting some more recently written pieces, too.

stage it was too early for it to have been called 'Web 3.0'), but they are still few and far between and often these occur in special issue collections. These articles, although often technical in nature (that is, they focus oftentimes on descriptions of code and ontologies and the like), provide, perhaps, our best window into what Next G Web might look like for teachers and students. From this scant body of work, we can, at least, glean two dominant scenarios for the Next G Web in education: one, as a way of improving efficiency in teaching, and, two, as a way for learners to get 'personalised learning services' delivered to their desktops. First, efficiency gains.

Anderson and Whitelock, in their synoptic essay for a special issue of the *Journal of Interactive Media in Education*, suggest that software agents will carry out many of the prosaic administrative tasks currently undertaken by teachers themselves. This might include things such as record-keeping, marking,[3] scheduling, documenting student progress, and suggesting learning resources such as tutorials (Anderson and Whitelock, 2004, p. 5). In a lucid article for the same special issue of *JIME*, Rob Koper also demonstrates how better processing of Web information will make life easier for educators, whether it be via improved workflow, the sharing and re-use of courses, the automatic instantiation of e-learning courses, or the creation of more complex but consistent learning designs (Koper, 2004, p. 8). Software agents will work in the background to deliver more relevant content to teachers and metadata and ontologies will be help in the planning and control of courses. As Koper concludes, "[t]he core ambition of the semantic web is to allow software agents to interpret the meaning of web content, in order to support users [teachers, learners, administrators] in performing their tasks" (Koper, 2004, p. 16). This is all fairly basic, admin-type stuff, and we can easily see how the Next G Web can save us a lot of time on our more clerical duties, and in the sifting of curriculum materials. However, this is quite different from the notion of the Next G Web as designer and deliverer of 'educational content', ostensibly without the intervention of the teacher, as we can see in a second set of possiblities for the Next G Web in education.

Devedzic (2004) nicely embodies this second vision in describing in detail how 'pedagogical agents' will access educational content[4] from dedicated educational servers and will "provide the necessary infrastructure for knowledge and information flow between the clients and

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[3] Although how much marking is 'admin,' how much is 'pedagogy,' and how much is 'teaching' is up for grabs.
[4] According to Devedzic, 'educational content' "is any educational material pedagogically organized and structured in such a way that interested learners can use to get introduced to a knowledge domain, deepen their understanding of that domain, and practice the related problem-solving skills" (Devedzic, 2004, p. 31).

educational servers" (Devedzic, 2004, p. 31). The servers/agents will be able to customise 'learning sessions' through ongoing interaction with the learner, and through building up a profile of the learner over time, so that eventually the server/agent will be able to 'pre-fetch' (Devedzic, 2004, p. 32). and structure material for individuals based on what the machine sees as being the student's learning needs. The server-agent will be responsible for 'realising' the learner's goals and needs, either through observation of the learner's online behaviour, or through being told overtly by the learner what their goals are (Devedzic, 2004, p. 34). The server/agent will then deliver and structure content according to those goals and needs. Henze (2005) describes a comparable picture to that proposed by Devedzic, albeit not in as much detail. Henze's idea is based on 'Personalisation Services' that interact with a 'Personal Reader Framework) to provide customised learning resources, information, links to further resources, quizzes, examples, and so on (Henze, 2005, p. 1) to learners. Stojanovic, Staab and Studer (2001) also envisage a learning environment that is adaptive and customised, that allows users, according to their preferences, to "find and combine useful learning material very easily" (Stojanovic, Staab & Studer 2001, p. 4), and Moreale and Vargas-Vera (2004) state that sematic portals would allow students to "construct their own courses, based on their own preferences, needs and prior knowledge" (Moreale & Vargas-Vera, 2004, p. 114) . Students, for Moreale and Vargas-Vega would be in charge of the learning agenda. A 'Personalised Learning Assistant' is how Simon *et al.* forsee this whole thing working: a PLA would support learners in "searching for, selecting, contracting with, and evaluting learning resources. It might also assess the learner's pre-existing knowledge to better identify knowledge gaps and learning needs" (Simon, *et al*., 2004: 3). This is all part of a larger Educational Semantic Web, that boasts 'learning services' including content, assessment, evaluation – and even reputation! – brokerage services (Simon, *et al*., 2004: 4). Basically, then, educators in the field seem to be saying that it will work like this: ontologies and metadata will enable pedagogical agents to identify, semantically annotate, structure, and deliver relevant and meaningful learning materials to learners, based on user profiles. User profiles are built up either via an individual's ongoing interaction with a pedagogy agent, or through the individual's explicit identification of what they want to learn. And sitting behind all of this is the Next G Web's ability to learn from its interaction with the learner and to deliver and adapt content, as needed – getting better and better as it goes through Tao *et al.*'s 'knowledge life cycle' of acquisition, modelling, annotation and re-use (Tao *et al.*, 2006, p. 3).

So, we have two chief scenarios as to how the Next G Web might play out in education: 1) as an effectiveness and efficiency tool for teachers, characterised by 'administrative agents'[5] – let's call this the 'Administrative Scenario' – and, 2) as a tool for the design and delivery of educational content to learners, as well as assessment, characterised by 'pedagogical agents' – let's call this the 'Pedagogical Scenario.' It must be remembered, though, that these scenarios are not restricted to purely Web-based education; even in face-to-face classes, teachers use computers to carry out daily admin as much as they use the Web to supply course materials. With this established, we are now in a position to analyse the potential effects of each of these scenarios on the future of education, and to interrogate what it means to teach, what it means to create meaning, and the issues and consequences involved.

Administration and Pedagogy Next G Web Education

So, let us start breaking things down more clearly in terms of the technical artefacts (products) and cultural phenomena (actions) produced by each scenario. Once we've done this, we can start critiquing those products and actions in terms of their potential educational outcomes. Table 1 provides an analysis of how each scenario might play out in the Next G Web future.

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[5] My term. Anderson and Whitelock (2004, p. 5) dub them 'teacher agents', but the problem with this, as we shall see shortly, is that teacher do more than just take the roll each morning.

Table 1. Administrative and Pedagogical Scenarios for the Next G Web in education

Administrative Scenario	**Pedagogical Scenario**
Technical artefacts (products): The Next G Web in education will be characterised by • Admininstrative agents • Ontologies • Metadata • Interoperability • Standards • Intelligent applications • Self-organisation	Technical artefacts (products): The Next G Web in education will be characterised by • Pedagogical agents • Ontologies • Metadata • Interoperability • Standards • Intelligent applications • Self-organisation
Cultural phenomena (actions): The Next G Web takes over class management tasks • Tracks student progress • Keeps class attendance lists • Does some marking • Schedules classes • Schedules learning activities • Instantiates e-learning courses • Stores and retrieves student information • Stores and retrieves class information • Collects and collates student results	Cultural phenomena (actions): The Next G Web takes over teacher tasks • Decides upon curriculum (in conjunction with learner, or independently) • Seeks out educational content • Determines the reputation of learning services • Analyses and synthesises course content • Plans courses • Develops course content • Structures and organises courses • Identifies learning resources • Filters resources • Delivers learning resources • Identifies learning goals of the learner • Personalises learning materials • Provides exercises • Tracks learner interest • Adapts to learner needs • Selects assessment tasks • Assesses student work • Identifies knowledge gaps • Provides feedback • Analyses learning patterns • Acts as an 'intelligent tutor' (Devedzic, 2004, p. 32) for online learners • Provides instruction
Outcomes: for teachers • Improved workflow • Decreased workload • More time for quality teaching • More time for quality support (Koper, 2004, p. 7) • More time for innovation (Koper, 2004, p. 7)	Outcomes: for learners • No need for a teacher

Admittedly, such a break-down simplifies things, but it is entirely necessary if we are to have a clear-sighted discussion about the potential issues involved, and to identify those things we may have to attend to in the future, as the Next G Web becomes a reality. Of course, such an obvious division between 'Administrative' and 'Pedagogical' outcomes will never occur in practice – or at least, *hopefully* will never occur, as I argue presently. In fact, my main reason for presenting this table is to help us interrogate two main questions: 1) What is the role of the teacher in all of this? and, 2) What do we value in education as an intellectual, philosophical, singularly *human* endeavour? I will get to each question shortly, but, firstly, a quick review of Table 1.

It's probably fairly safe to say that the technical artefacts produced by each scenario are much the same, with the exception of having to specify exactly what type of software agent plays its part in the scenario. As we move through, then, to the matter of cultural phenomena, it seems transparent to me that the Administrative Scenario is relatively value-free and uncontroversial in terms of attendant outcomes: if I can safely farm out some of the more mundane tasks involved in teaching, such as keeping class lists or collating student results, then I'm a happy teacher, not least of all because it frees me up to focus on the 'main game,' that is, the teaching itself – developing curriculum, coming up with more innovative and directed assessment tasks, providing better support for students, improving learning materials, and the like. In fact, these outcomes are satisfyingly pedagogical in nature, and have evident knock-on effects for students – and I doubt there are many who would argue that that is not a good thing in and of itself.

The trouble begins when we move into the second column, and start interrogating the cultural phenomena and outcomes of the Pedagogical Scenario. Pedagogical agents and educational servers, on this view, will be able to carry out all of the current educational tasks undertaken by teachers: from curriculum design and development, to deciding on learning materials, to planning and delivering courses, to assessing student outcomes. As a learner, it means that I no longer need teachers[6] as we've come to know them – the Next G Web will be capable, in a

[6] This may seem a very crude interpretation of the role of the Next G Web in education, but I must assure readers that the literature I have come across that describes this pedagogical vision really does ignore the role of the teacher as a real-live human person, and does not, even by way of a footnote, point out the essential role that a teacher must play in this whole scenario (cf. Aroyo & Dicheva, 2004; Devedzic, 2004; Henze, 2005; Moreale & Varga-Vega, 2004; Nilsson *et al.* 2002; Simon *et al.*, 2006; Stojanovic *et al.*, 2001; Tao *et al.*, 2006).

very 'Rumsfeldian'[7] way, of putting together all for itself my known knowns, my known unknowns, my unknown unknowns, and of discovering more and more of my unknown unknowns in each learning session. But perhaps the spookiest thing in this whole scenario is Devedzic's claim that, the educational server should appear to the learner "to act as an intelligent tutor with both *domain* and *pedagogical* knowledge to conduct a learning session (Devedzic, 2004, p. 32, italics in original).

And this is where we hit a major snag in terms of the learner, for as I've been doing my reading and research around the topic, one thing keeps cropping up in my marginalia and other notes: "Where is the teacher?" By that, I don't mean the Next G Web as 'teacher,' but I mean where is the real-live human person, drawing on their own knowledge and experience, and acting subjectively to make decisions about what is right and good for learners? What is the role of the teacher in all of this? Of course, I'm assuming that learners do, in fact, need teachers who can act subjectively, and they don't simply need pedagogical agents that can plan and execute a whole individual learning program from scratch, but I am quite at ease in making that assumption. So, it is at this point that I want to distinguish between 'teaching' and 'training.' No doubt 'training' can be easily and probably successfully supported by the Next G Web on the Pedagogical Scenario, for 'training' is a fairly basic thing, not least of all because it is quite possible to train dogs and elephants both, not just humans. 'Training' to my mind involves the teacher pushing content at the student until certain patterns of behaviour or thought have been internalised and can be evaluated objectively, i.e., the trained subject either can or cannot perform the task required to the level required. This does not involve *thinking* on the part of the learner in any intellectual or philsophical sense. To put it in Freirean language, if we see the ultimate role of a teacher as being to raise the critical consciousness of students so that they become aware of their own subjectivity and are therefore in a position to intervene in and change the world (Freire, 1996 [1970]) … then we have to ask how a pedagogical agent can do this. Teaching also means encouraging intellectual *thought*, which in itself may involve analysis, interpretation, reflection, discovery, evaluation, imagination, curiosity, reasoning, critique – and leaps of logic, that the Next G Web would never be able to assume. How a pedagogical agent might measure the *quality* of a student's analysis of a topic, for example, is as yet unclear. It is similarly unclear how pedagogical agents would excite or

[7] In a 2002 press conference, US Defense Secretary Donald Rumsfeld famously stated, 'There are known knowns. There are things we know that we know. There are known unknowns, that is to say, there are things we now know we don't know. But there also unknown unknowns, there are things we do not know we don't know.'

inspire or motivate students, as human teachers do. Surely the evaluation of such thought can only be done by humans, no matter how sophisticated the Next G Web may be.[8]

This now forces us to address the problem of what it means to 'create meaning,' for how we address this problem will also inform what we value in education, both intellectually and philosophically. The idea that the Next G Web will be able to 'create meaning' for itself is a little misleading: we are not talking here about a Web that will exhibit the discernment required to *make sense of or critique or interrogate the world* as a human can. Rather, what is really connoted is that the Next G Web will get better and better at identifying *relationships* and *connections* between stuff. This does not mean that it will be making proper sense of things: it means simply that it will be sorting, filtering and delivering the best fit for the entered search. There can be no justification or reasoned argument presented by a pedagogical agent as to why it 'chose' these materials over those materials. In other words, a pedagogical agent cannot intellectually justify its 'choices' other than to say, 'I identified, filtered and presented these materials based upon the metadata and ontologies that inform my programming.' This is not choice, or evaluation, or discernment, or meaning-making: it is only *presentation*. Teachers, on the other hand, *can* choose and evaluate, simply through virtue of their humanness, and through virtue of the fact that making meaning out of something – that is, a *true human* meaning – quite often requires the intangibles of imagination and creativity, as well as leaps of reason that aren't necessarily deductive or inductive in nature and thus predicated upon a formal logic, as needs must be the case for pedagogical agents.

The bottom-line is that we cannot franchise out the 'sense-making' elements of teaching and learning; that must be done by teachers and learners either for themselves or with each other. Teachers cannot (must not!) simply take whatever materials a pedagogical agent presents to them and then deliver them, unchanged, to the student. (In fact, there *is* no teacher in that situation.) Rather, the teacher (or teachers or curriculum committee or whatever group of humans) must remain responsible for choosing what is right and good for students to learn, and what are appropriate materials to learn from – if the Next G Web can help teachers more readily identify materials to support student learning of those things, then so much the better. In other words, the crucial role of the teacher is again one of *discernment*. Students must not

[8] I'm leaving things open for a *Star Trek* future … maybe such things *will* be possible by then, but that is a whole different ball-game.

simply be provided with course materials unvetted by a human mind; students must also learn the art of discernment, for it is *crucial to and a precondition for* sense-making. Students, too, need to know how to analyse, synthesise, judge, imagine, interpret, evaluate, if their conclusions are to have any intellecutal validity.

If we really come to believe that it is possible for the Web to create 'meaning' for itself, then our understanding of what meaning *is* will have shifted to simply denote the identification of connections and relationships. In which case, it will have ceased to have been 'meaning' as we presently think of it and instead will actually represent a completely different phenomenon.

There are some other problems, though, with the cultural phenomena we've identified in the Pedagogical Scenario: firstly, this scenario ignores the fact that *all* content – not just that residing on dedicated educational servers – is potentially 'educational content.' What makes content educational is not the fact that its metadata and ontology identify it as such, but rather the use to which a teacher puts that content. I very much doubt that the creed of a neo-Nazi gang, published on an underground Website, would contain metadata identifying it as 'educational,' but in the hands of a clever and imaginative teacher it could surely be treated as such. This is the problem inherent with all so-called 'learning objects': someone, an expert, perhaps, has created course or curriculum content with a specifically educational outcome in mind. This is all well and good, but it does rather assume that the 'learning object' – and, by implication, all material on 'educational servers' – is pedagogically sound and useful. We may mark content up with resource type, title, description, date, keywords, whatever, but it is the special *creativity* of the teacher that makes for a good learning experience, not the technical specifications of a given Web item.

There are, however, two instances in which I can see the Pedagogical Scenario working. The first is in the case of the youngest of students, who need to learn basic curriculum, and who don't know what they don't know (Rumsfeld, again …). In this case, educational servers may very well be able to 'pre-fetch' (Devedzic, 2004, p. 32), plan, structure and deliver materials that relate to learning times-tables, or money, or spelling, or fractions. Assessment and student feedback would be fairly simple, too: either two times two equals four, or it doesn't. The second instance in which I can see the Pedagogical Scenario working is with adult learners, who have some idea of knowing what they don't know, and who would build their own, personalised curriculum with the help of pedagogical agents. For example, I might want to learn more about astronomy – let's say, the Sun. I would know enough, in this instance (because I am an adult learner, and I am working from something of a knowledge base, no matter how limited) to know that I want to learn more about solar flares, sunspots and what keeps the Sun going. In both cases, I build my knowledge, learn basic facts – in many ways, these are basic training scenarios. With such a strong focus on the learner, though, we must be careful, as Koper argues, "that the shifting of control does not lead to an overburdening or abandonment of learners" (Koper, 2004, p.12). This is a vital point, for even when education is admirably 'learner-focused,' the teacher, seen or unseen, is still an equal partner in the endeavour. We are going to have to be very careful to distinguish between 'teachers' – those real-live humans – and 'training programs,' which can be safely delivered by pedagogical agents and educational servers. But, still, a problem remains: in actual fact, a software agent can only strictly decide what is good for itself – it has no true understanding of human needs and wants; it, in and of itself, is not capable of making informed decisions as to what is good for the learner. In other words, and as I have said previously, pedagogical agents will not be making decisions: they will be simply filtering and sorting materials and presenting the best fit for the requested search.

The Next G Education Scenario

So, on the argument that the ultimate role of the teacher, ideally speaking, is to help students apprehend the world so that they can make philosophical and intellectual sense of it and thus reach a level of consciousness where they are aware of their own subjectivity and can therefore intervene in and change the world, we are now ready to ask, What *should* education look like under the Next G Web? Here is my proposal for a 'Next G Education Scenario.' It's fairly simple and common sense. Firstly, let's keep the Administrative Scenario more or less intact, for as I've already pointed out, it is relatively uncontroversial and will provide great benefits for teachers in terms of freeing them up to do what matters, which is to educate. But let's move the Administrative Scenario down a level and change it to an 'element' of the larger Next G Education Scenario. And let's complement the Adminstrative Element of the Next G Education Scenario with a 'Teaching and Learning Element' that also lives under the Next G Education Scenario, and alongside the Admin Elements, but which replaces the Pedagogical Scenario. A Teaching and Learning Element within this Next G Education Scenario as a whole provides *choice* and recognises the special role that the teacher plays in helping students to come to know the world both intellectually and philosophically. It allows teachers and learners both to make best use of the Next G Web in its *assistive* capacity: it will *help* teachers (and learners, depending on the context), it will not *replace* teachers, for teachers will still be responsible for making informed choices about what is right and good for students to learn, as well as how they should learn it.

Table 2. Next G Education Scenario

Administrative Element	**Teaching and Learning Element**
Technical artefacts (products): Administrative elements of The Next G Web in education will be characterised by • Administrative agents • Ontologies • Metadata • Interoperability • Standards • Intelligent applications • Self-organisation	Technical artefacts (products): Teaching and learning elements of The Next G Web in education will be characterised by • Teaching and learning agents • Ontologies • Metadata • Interoperability • Standards • Intelligent applications • Self-organisation
Cultural phenomena (actions): Administrative elements in the Next G Web take over class management tasks (with some teacher oversight) • track student progress • keep class attendance lists • do some marking • schedule classes • schedule learning activities • instantiate e-learning courses • store and retrieve student information • store and retrieve class information • collect and collate student results	Cultural phenomena (actions): Teaching and learning elements in the Next G Web *help* teacher tasks • *Help to* decide upon curriculum • *Help to* seek out educational content • *Help to* determine the reputation of learning services • *Help to* analyse and synthesise course content • *Help to* plan courses • *Help to* develop course content • *Help to* structure and organises courses • *Help to* identify learning resources • *Help to* filter resources • *Help to* deliver learning resources • *Help to* identify learning goals of the learner • *Help to* personalise learning materials • *Help to* provide exercises • *Help to* track learner interest • *Help to* adapt to learner needs • *Help to* select assessment tasks • *Help to* assess student work • *Help to* identify knowledge gaps • *Help to* provide feedback • *Help to* analyse learning patterns • *Help to* act as an ‘intelligent tutor’ (Devedzic 32) for online learners • *Help to* provide instruction
Outcomes: for teachers • Improved workflow • Decreased workload • More time for quality teaching • More time for quality support (Koper, 2004, p. 7) • More time for innovation (Koper, 2004, p. 7)	Outcomes: for students and teachers • Teachers’ special abilities as human beings combine with better information storage and retrieval to help students learn more deeply. • Students and teachers come to apprehend the world intellectually and philosophically: thinking and meaning-creation are centre-stage.

There is one final point I wish to make, and that is that education, as well as being an inherently intellectual and philosophical endeavour, is also a political one. By this I don't just have in mind the politics of our decisions as to what is or is not taught (that is for another essay) but I mean the politics of how we *get what we want* as teachers in a fast-moving edtech world. Currently, we are obliged to work with dreadfully inflexible, inefficient, cumbersome, monolithic 'learning management systems' such as BlackBoard, WebCT and MyClasses that are actually *counter* to good teaching and learning, not least of all because they actively add to the workload of teachers due to their poor systems design, and they make it infernally difficult for teachers to set up intellectually motivating, inspiring, real-world-or-mind-world learning activities. Whether by intention or design, such platforms force us into one way of teaching, regardless of individual style, and, as such, they humiliate the role of the teacher by sub-ordinating the teacher to an inferior system. We must take this opportunity, before the Next G Web becomes an unstoppable classroom reality, to demand what we want, and to take part in the bottom-up development of technical systems. That means having a clear sense of the role of the teacher, and a clear sense of what we value in education, as argued above, but it also means using education's huge numbers to claim our market share and start insisting upon free, nimble, software platforms and agents that address education-specific concerns such as privacy, security, pedagogy and control.[9] In other words, we, as educators, need to get smarter in our politicking around who makes business decisions for us.

Conclusion

In a Next G Web where technologies may very well become smart enough to deliver educational content to students, it will be essential that we have an unambiguous understanding of the purpose of education and the role of teachers in it. We must recognise the Next G Web for what it will be: a technical artefact, a tool, that is also a human-mediated cultural phenomenon. The educational uses to which we put the Next G Web will be up to us, but our considerations must recognise the special, human role that the teacher has in meaning-making and discernment, and we must recognise the intellectual and philosophical nature of education that brings people to an awareness of the world and their ability to intervene in it. Education, then, is not just, or even largely, about teaching people *stuff*; rather, it is about

[9] For a more comprehensive polemic around this issue, see my blog post at <http://www.meganpoore.com/?p=81>.

teaching people to *think*. It is an intellectual enterprise in that it must encourage quality and rigour in thought, and it is a philosophical one in that it forces us to interrogate what it means to be human. Teachers play an essential and irreplaceable role in the development of critical consciousness and critical faculties in other people – choosing what 'objects' people should engage with in order to reach this end should not be left to computers, even ones that are very clever at drawing together related materials.

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