Visual lectures for dyslexic students

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Chapter 5: Visual Lectures
By David Roberts

Abstract
Lecturing in Higher Education is dominated by PowerPoint presentations characterised by text and bullet points. But research tells us this is harmful because it overloads our minds’ ability to process text whilst simultaneously under-exploiting our ability to comprehend through imagery. It’s bad enough for neurostandard students, but for dyslexic students it can often be far worse. This chapter presents an alternative way of using PowerPoint that inverts how we use it so it takes advantage of visual processing abilities and presents text in cognitively-digestible ways. The method privileges very large, high-quality images not as supplements but as the means to convey substance and meaning. The chapter presents a range of evidence that reveals especially how dyslexic students benefit from using images effectively, but the message applies to many student cohorts in various disciplines because it’s cognitive, not disciplinary. The chapter concludes with demonstrations and advice on finding copyright-appropriate images.

Key words
Lectures; dyslexia; images; multimedia learning; visual learning; PowerPoint
Introduction:
It is a truism that ‘a picture’s worth a thousand words’; but Higher Education appears to have forgotten this. In the most visual era of human evolution, when students coming to university have been exposed to multimedia learning and teaching for most of their lives, universities persist for the most part with lecture slides overloaded with text. It’s often called ‘Death by PowerPoint’, and it refers to the tendency for presenters to fill slides with text and bullet points and then read them out or say something very similar. They’re not all like this; but most are, and that’s because of how PowerPoint itself formats slides. PowerPoint has become an easy target, to the extent that its now ‘parodied, disparaged and blamed for failures to communicate clearly’.¹

It’s bad enough for neurostandard students. Recent research argues convincingly that text-filled slides are both counter-pedagogical and harmful for learning. This is because
we can only process a limited amount of information at a given time, and because privileging text overloads our ability to process words and at the same time neglects our ability to process images.\textsuperscript{2} But for dyslexic students, this can be a nightmare.

The point of this chapter is to present an alternative way of using PowerPoint that inverts how we use it so it takes advantage of visual processing abilities and presents text in cognitively-digestible ways. Image-based lectures that stimulate engagement and prompt active learning can be ‘created with approximately the same level of technical expertise that it takes to master PowerPoint or Blackboard’.\textsuperscript{3} This does not mean we stop giving students text; we can still do that, but it can be relocated to the ‘notes view’ area of PowerPoint, so it doesn’t obscure valuable images. The method privileges very large, high-quality images not as supplements but as the means to convey substance and meaning along respected pedagogic lines. Text can still be an important part of the teaching content. It is just rebalanced with imagery to reflect how our brains work.

The approach comes from Multimedia Learning research and has been tested with neurostandard and dyslexic students. Students in both groups reported enhanced engagement, active learning processes, anticipation and enjoyment, as well as better
recall and attention. Before we proceed, it’s important to note the wider context all this is happening in.

**A digital visual world**

Today’s Higher Education (HE) students are the most visual of any university cohort, not because HE students now are any more special than their forbears, but because there is a ‘pictorial turn’ in human evolution, according to Peter Felten and others. We learn through imagery as infants long before we learn through text, and images inform our development alongside words as we grow up. But globalization and digitization challenge the hegemony of text. 300 million images per day are uploaded to Facebook, and by 2015, Facebook hosted roughly a quarter of a trillion images. Infographics, once the rare preserve of a few specialist outlets, are commonplace in TV, newspapers and magazines all over the world. Exhibitions of all kinds are now accessible online. Popular TV series from ‘Lost’ to ‘The Walking Dead’, sport and peer-to-peer digitally-distributed films are accessible at the click of a mouse. Louis Tietje and Steven Cresap propose in accordance with these developments that visuals are now ‘the main means of communication and expression in postmodern culture’.

![Digital Visual World Image](image-url)
Yet university teaching is out of sync with the evolving visual contexts from which their student clients come. If they use them at all, academics mostly use images as supplements and peripherals rather than as the medium through which a message may be conveyed. Instead, we load PowerPoint slides with text, and the speaker normally stays close to what’s on the slide, except in some disciplines like Art that have an inherent tendency towards the visual. Most social sciences, anthropology, psychology, history, language, business studies, along with maths and other science-based subjects, remain text-centric. This chapter is about changing how we deliver lecture content to bring it in line with the visual world that influences all our students, and with the parallel needs of dyslexic students. Global context merges with pedagogic research in the shape of Multimedia Learning.

**Multimedia Learning (MML) research.**

Multimedia Learning is defined as the process of ‘building mental representations from words and pictures’.\(^8\) This literature claims that we learn better with images and text than with text alone.\(^9\) It identifies two channels through which the brain processes auditory and textual information, and visual information. This is referred to as ‘dual processing’. In presentations and lectures characterised primarily by text, the first channel is over-loaded and the second is under-used. MML posits that if we divide information delivery more equitably between the two channels and take advantage of our visual processing abilities, we would be better able to engage with and understand the material we are presented with.
Adherence to text-centricity is bad for students’ learning experiences, then, for two reasons. First, slides full of text overload short-term memory processing. Second, that reliance on text wastes the potential all sighted students have to explore, interpret and engage the world through their eyes – what they do every day of their lives beyond the lecture theatre. MML theory is perhaps especially interesting for dyslexic learners because using images and limited text exploits under-utilised visual capacity whilst reducing stress on short-term memory. Because many dyslexic people find text-saturated slides hard to process and are often adept at visual processing, the method potentially offers exponential benefits to dyslexic people. The process is really about words for the ears and pictures for the eyes. Whilst it may be unfamiliar in the teaching world, it’s commonplace beyond the academy. We attend museums and galleries that provide audio support for
We read newspapers that use images to complement text. This disconnect, between the wider world and the academy, and my own disdain at my own lectures, and those of others I saw at conferences, stimulated a search for alternatives. Engaging with MML literature and watching the world beyond the academy embrace imagery led me to instigate a visual method in my own lectures. The next section discusses how this worked at Loughborough University across a wide range of disciplines in ways that benefitted both neurostandard and neurodiverse students.

Using images in lectures
The visual method for large group lectures derived from MML scholarship was developed, introduced and evaluated over a three-year period. This section looks at how it works in practice, how to find images and how to integrate them. It’s followed by the results of testing conducted specifically with dyslexic students on the effectiveness of the method in terms of their engagement with subject matter.

The first consideration is the type of image. This method deployed three categories: literal, figurative and paradox. Literal images are the simplest. They manifest a visual representation of a subject. For example, if discussing the EU, we may use an image of the EU flag, here.
But more valuably, when subject matter is alien to student’s direct experiences, we may use literal images to describe what students may never have seen. Images may bring otherwise abstract or unfamiliar places and practices to life in ways that even the most eloquent text alone cannot. Equally importantly, they displace excessive slide text that overloads students processing capacities and short-term memory, according to a plethora of MML and other research. Even basic, illustrative, figurative images have a triple role. First, they provide description of the unfamiliar. Second, they remove the causes of memory overload so injurious to many students, dyslexic or otherwise. Third, they allow students to more effectively split their attention between the speaker and the screen, instead of a situation where one contests the other for mental space.

Figurative images as a second category may also be referred to as metaphorical images. A visual metaphor is an ‘image... used in place of another to suggest an analogy between the two images’. Metaphor images were very popular with neurostandard and dyslexic students alike. Eppler argues that visual metaphors ‘support learners in connecting what they already know (the properties of the metaphor domain) with new material (the domain unto which the metaphor is being applied)’. This mirrors the idea of active
learning in which students build on existing knowledge and criticize what they already believe to be truth. The learning potential is especially valuable ‘when the power of a metaphor is combined with the appeal and directness of visualization’. Visual metaphors may be used to convey complex messages as opposed to serving a more illustrative purpose. If we think back to the EU flag example, if the stars on the flag were linked with barbed wire,

![EU Flag with Barbed Wire](image)

develop a subjective meaning the lecturer may discuss. S/he may propose that for some, the EU is seen less as an objective and neutral community for progressive, peaceful change and more as a barrier to migration for some people beyond its borders. The image becomes a discussion point that isn’t duplicating the spoken word, that students may focus on and absorb the component parts of, interpreting their meaning and bringing their existing knowledge to the fore as a foundation upon which the lecturer’s commentary may build. Importantly, a visual metaphor helps render the unfamiliar more familiar by suggesting a parallel phenomenon. Visual metaphors or figurative images ‘support learners in connecting what they already know (the properties of the metaphor domain) with new material (the domain unto which the metaphor is being applied)’. The following are some examples of metaphorical images.
This image supports a conversation about biological evolution, presenting most of the process in one image, and allowing dissection and discussion of its component parts in ways that better exploit audio-visual processing. Reproduced with permission of the artist Christophe Kiciak, http://www.kiciak.fr/p77750736#h288fa048

Another supports a discussion of tensions between Liberal and critical feminisms over pole dancing. The image’s component parts associate pole dancing not simply with autonomous sexuality and free choice but also with privileging masculine preferences, suggesting an illusion of progress for women.
A third example, of the relationship between energy production and environmental harm, illustrates further the type of metaphor image easily integrated into lectures. This one was created to suggest a relationship between consumption, or capitalism, or Liberalism, or markets and the impact of early third millennial technologies and beliefs on the natural environment and planetary existence.
This metaphor image of a pill and dollars has been used to underpin discussion of the cost of medicine generally or to raise questions about the market as a valid means of deciding who gets what and how much healthcare. It has been particularly helpful in discussing antiretroviral research, breast cancer treatment and global child mortality. It may of course also present as a paradox for those that believe healthcare should be free, supporting discussions of socialist ideology and political morality.

A third type of image is the paradox image. A paradox is a statement that may appear to be self-contradictory but which may simultaneously communicate a truth. Paradox images may present as puzzles, creating temporary confusion generating internal attempts at reconciling meaning. A well-known example is the eternal triangle. The diamond with blood
presents a problem: love is not immediately associated with violence until we examine concepts like hypermasculinity, domestic violence, honour killing, dowry murder and so on. This image was used to support a discussion of capitalism and conflict (‘blood/conflict
diamonds'). If we return to the matter of evolution, a paradox seems to present - ape and human in one entity – supporting a discussion of evolutionary relationships between humans and hominoids.

The first consideration when choosing images has been the type of image, outlined above. A second consideration is its scale and its visible relationship to the usual accompanying text. We are often used to images as a secondary element to a slide, sometimes occupying a relatively minor portion of slide space. MML approaches privilege the image, which here means their occupation of the entire slide. Images can be inserted or better still embedded in a few simple steps involving changing the background of the slide just as we might if we wanted to change its colour (you could insert the image but that doesn’t re-scale it to proportionally fit the slide). For many, this brings up immediately the question of text. An emerging consensus proposes that if we are to use images, it would be counterproductive to then cover them with text. Various design ‘gurus’ like Nancy Duarte and Guy Kawasaki propose very limited text, normally never more than one line which, for the lecturer can act as a prompt and for students can act as a reminder. This approach can produce some anxiety for academics and students alike because we may still need to impart large amounts of text for many good reasons. Fortunately, PowerPoint’s ‘notes view’ can accommodate as much text as could have been put on a slide. This can quickly and easily be accessed from the ‘view’ tab and saved as part of the usual slides.
What do dyslexia students think about the use of images in lectures?

Dyslexic students have to date mostly been very interested in and supportive of visual learning. Self-identifying students have informally volunteered positive opinions, but formal testing reveals substantial benefits. Quantitative testing over 3 years across 9 academic disciplines revealed that 90% of those dyslexic students exposed to the method preferred slides with large images and limited text, to slides full of text. Of those, 65% preferred metaphor and paradox images to illustrative images, but both were valued more highly than text alone. Qualitative, focus group research showed there are a number of reasons for these preferences.

The first is that eliminating large swathes of text per slide makes students feel less overwhelmed. According to MML research, this probably has much to do with excessive text overloading human processing capacity, wasting visual processing ability and filling up short-term memory so thought tasks are harder to complete. A second reason for preferring imagery and text to text alone is that students claim to feel a connection to an image but not to words alone. To illustrate this point, one said she ‘felt she was there in the image’ when they were shown. This brought students into contact with the subject of the lectures in ways text alone can’t achieve. Dyslexic students declared that this led to a third reason for their preference: they felt engaged and included, rather than disconnected and bored. One student said ‘the slides were almost a breath of fresh air as the images allowed me to concentrate on what the lecturer was saying and I was able to take more in’. Another considered that by comparison, image-based lectures were more worth attending than their text-centric counterparts. A very small minority (3%) said they preferred text to images; that text can be relocated to the notes view for such students. A fourth reason became clear – they were better able to recall what had been said in the lecture, because the words were ‘hooked’ to the images. One student commented that normal revision from text was a struggle because it didn’t stay in her memory very long. With images, she said she could remember what the concepts and issues had been surrounding the image. A variety of students have remarked that they can recall lecture content a year later.

Locating images

There are some useful images free for use here. I own the copyright, so please acknowledge me if you use them. There are various ways to find images that say what we might normally say with text, which explain a complex relationship, which illustrate a point we want to make and/or which render familiar the unfamiliar. I begin with what I want to convey and start searching using terms or words that describe that. If I wanted to talk
about evolution, an image search reveals a range of pictures that may or may not be to your liking. As I find images, I interrogate them for the meaning I want to communicate, and choose accordingly. A search for ‘evolution’ brings up timeline images, for example. In this, a primitive ape-type being crouches on the far left; and on the far right is an upright human. But additionally, the search brings up political, philosophical and religious images that can express a complex debate. One is a variant of Michelangelo’s ‘The Creation of Adam’. It involves a human arm reaching out, but instead of connecting with God’s hand, it connects with an ape’s arm. This might support a discussion of whether humans are a creation of God or whether we are explained in a more Darwinian sense, being descended from apes. I also teach about conflict. I wanted to convey what a nuclear war would be like; having grown up in the Cold War with the ever-present threat of such carnage, I wanted my students to understand important technical issues like the Circular Error of Probability; but I also wanted then to have a sense of its human consequence. I Googled the wrist-watch that survived the blast, stopping at 8.16am, the moment the bomb detonated, and used it to tell the story of what happened on that day. Students said they were ‘spell-bound’ as the story developed as they watched it. They wondered who wore it, how it got to the museum it’s in and so on. If I can’t find what I want this way, I turn to other sites like DeviantArt. If I find something I think is really useful, I write to the artist. One outcome was the image of evolution (above), by Christophe Kiciak, who was delighted to have his work used this way. I also seek ways to express meaning through visual metaphors. If the academic topic I want to convey has an associated metaphor, I search that. For example, if something isn’t what it appears to be and might be dangerous, a suitable metaphor might be ‘a wolf in sheep’s clothing’. Searching for the term may yield an apposite image that communicates what you mean but using the visual processing channel instead of overloading the text-auditory channel with text and speech. There are many ways and it may feel slow at first but we get quicker the more we do something and the benefits can be substantial, for neurostandard and dyslexic students alike.

Copyright
For the most part, Google Advanced Image Search and Flickr allow users to filter image searches by type of copyright licence. This means we can search for an image of an ape with human eyes (for example) and designate that the only images generated in the search are Creative Commons (CC) licenced images. In addition, sites like DeviantArt contain some of the most imaginative images, but they are almost all copyright-protected. However, because it is a community of artists, they are often supportive of direct requests to use work for educational purposes, especially as it’s another way their work may be disseminated. Furthermore, Departments may choose to fund innovative
teaching methods backed by first class scholarship; my own Department funds regular purchases of copyright-covered images from sites like depositphotos.com. Such images can constitute an investment (since they only need to be bought once but can be used for however long they are pertinent to the subject we are teaching. To complicate matters further, however, the rules about copyright vary from place to place. For example, in the US, most images are free to use for educational purposes. In the UK, copyright is much harsher, but claims are only likely where an image has been misappropriated for financial profit. Whatever we do, we must attribute the images to their creators or owners, and this can be done on the images themselves (perhaps in a semi-opaque font size that doesn’t detract from the effect the images are meant to have); or on an end slide. Universities normally provide guidance on copyright rules, and in addition often have subscriptions and licences to image repositories that allow us to use selected items appropriately.

Conclusion
MML research suggests images and text work better for learning and understanding that text alone, partly because university students now come from a distinctly more visual context than their forebears, but mainly because people are ‘dual processors’ whose brains are better suited to a combination of visual and text processing. This can be particularly useful for dyslexic students, many of whom are challenged by excessive slide text and many of whom may be adept at visual processing. When images are combined with limited text, it argues, our brains split the workload which then reduces pressure on working memory and mental processing. The great majority of dyslexic students tested expressed an unequivocal preference for slides with images and limited text over slides with text alone. Furthermore, testing has shown that key characteristics of active learning are present, considered by many to be more effective and sustainable than passive learning. The opportunity to exploit this understanding of imagery in learning has never been greater as the accessibility of images continues to increase exponentially. If we do only one thing, it should be to end ‘Death by PowerPoint’.