53 Powerful Ideas All Teachers Should Know About

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There is such a thing as too much information

The human brain is extraordinarily powerful and flexible but not infinitely so - there are limits to how much information it can handle at once, and how many things it can do at once. Exceed the limits and things can go wrong. The brain can be conceived of as having a central processing unit, like a computer, with a fixed total capacity. This processor may be called upon to carry out many tasks simultaneously. The demands of one task may compete with the demands of another for the limited information processing capacity which is available. When that happens, sometimes one or more of the competing demands are essentially put on hold so that a higher priority demand can be seen to first.

For example when a student is sitting in a lecture they have a number of things to do at once. The sounds that make up the lecturer's voice have to be recognised as speech and the words and sentences have to be recognised. The meaning of these words, phrases and sentences has to be worked out, drawing on what is already known and stored in memory. This may prompt new thoughts and reflections. Meanwhile there may be visual images on the screen of whiteboard to interpret, at the same time, in parallel. Decisions have to be made about what is worth writing down in notes and then the notes have to actually be written. One of several difficulties here is that while the notes are being written the next bit of the lecturer's speech is already going on and needing to be recognised and made sense of, and new visual images may already be presented, all these demands competing for finite processing capacity at the same time.

What often happens is that one or two of these demands takes up all the available capacity and the others have to wait their turn in a queue. This queue does not last very long: from a few seconds to tens of seconds depending on what kind of processing is involved. After that the brain dumps what is in the queue so that there is some space available for the next thing coming in.

The effect of this is that, for example, if a student is listening hard to what is being said it may not be possible to write anything down at the same time. What needs to be written down might be very quickly forgotten if new listening demands come rushing in. If a student is thinking and writing things down they may become temporarily deaf, in effect, as there is no short term memory space or processing capacity to hold these sounds and make sense of them, and by the time the notes have been written, short term memory has been wiped, ready for the next thing. A student might experience looking up from their notes and realising they have just missed

something but have no idea what. Students have to make choices about which processing demands to prioritise, and these choices are not all under conscious control.

How much information processing capacity is required to listen to and hear and understand speech depends on several things. If the speech is quiet or indistinct this will increase processing demands, as will a noisy background over speech. Familiar words and phrases are easier to recognise, in the sense that they require less information processing to be undertaken, than are unfamiliar ones. New course content in an unfamiliar discourse, or using unfamiliar terminology, places additional burdens on processing capacity. If the lecturer is speaking quickly while introducing new terms and phrases over a noisy background then a student might have their work cut out just recognising what is being said, let alone understanding what it means or making notes about it. If there is complex and rapidly presented parallel visual information to recognise and make sense of, and that is difficult to see because of the lighting, this can also effectively make a student deaf while they are looking at it.

For a lecturer it can be hard to judge what kinds of demands are being made on students. They can hear their own voice clearly, their own material is familiar to them, their PowerPoint slides are well illuminated right in front of them and are familiar to them, and so on. It is very easy to misjudge information processing demands and overburden students' ability to cope. A student listening in a second or third language, or a student with a hearing or visual disability, or a student without the necessary pre-requisite knowledge, is likely to struggle with even following what is being said or presented, let alone doing anything with it such as thinking or note taking. If you ask questions of students who are already overburdened they may have effectively blank minds.

In general, it helps to:

- Not expect that students should look at complex visual information at the same time as listening to rapid complex speech. If the auditory and visual demands are both likely to be high, make them in sequence rather than in parallel.
- Allow time for note-taking after each short section of presentation rather than at the same time.
- Pause before asking questions, and give students time after the question before expecting them to have the information processing capacity available to think about the question and answer immediately.
- Build up students' familiarity with new terms and language (for example with reading or handouts to be studied before a lecture), and pause and repeat if there are doubts about students' level of familiarity.
- Provide partial handouts that can reduce the demands of note taking - ideally where it only involves recording rather than thinking. If you can reduce

the low level demands (such as word recognition) then there is more capacity left over for the high level demands (such as reflection).

- Check out, in feedback questionnaires or in less formal ways, the extent to which students are coping with the level of information processing demands your lecturing practices normally make. For example if students' notes look incomplete, with frequent missed points, this is a fairly obvious clue that you are overburdening them.

This item is based on an item in the 'Powerful ideas in teaching' section of a book I wrote with Trevor Habeshaw, now out of print.

Gibbs, G, & Habeshaw, T. (1989) Preparing to Teach. Bristol: TES.

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