Editorial: Are we outsourcing memory?

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As I age, I keep lists. Not the pen and paper or back of the envelope variety; my lists are entirely within my online personal learning environment. All accessible by mobile, tablet, laptop and desktop: I am a compulsive note-taker. I used to produce a form of scribbled graffiti within a physical diary, now it is all online – sorted, retrievable at a click or two. My record includes photos: of slides, of documents, of people and places. So however many dozens of meetings, seminars, conferences and just thoughts there are in the average week, I have a record of them. By referring back to my notes (not always written in recognisable English) I can recreate the event, the conversation and the thought of the moment. I add to them through reflection, connect thoughts, bring together resources which appeared separately. This is my way of living, by which I mean learning, since life without learning seems rather senseless.

There is an argument in psychology which proposes that, as cognitive function declines with age, it could be particularly helpful to outsource information to external devices, allowing forgetting and freeing up unnecessary interruptions of normal cognitive process or making space to think (e.g. see Wimber, Alink, Charest, Kriegeskorte, & Anderson, 2015). There are also strong cases for external environmental supports for sensory and cognitive degeneration with age (Ross & Schryer, 2015). We are told that we need to encode information to move it from working memory to long-term memory to be easily recalled. van Niekerk and Webb (2016) suggest that one of the basic principles of brain-compatible learning (blending neuroscience and educational psychology) is that there is no long-term retention without rehearsal. This principle offers much opportunity to facilitators and designers of learning experiences, to set up practice and application of ideas with relevant feedback loops to support learners. Presumably any such practice or rehearsal will involve some kind of action by learners as they recognise and construct patterns to develop their learning. I think that this is what I am doing when I take notes. The action involves the processing of information into shapes and structures, categorising what I hear and what I say into forms which enable me to retrieve not just the words written but also the thoughts and sensory experiences lodged in memory systems at that time. Of course, since this is an active behaviour, I may also by engaging in kinaesthetic preferences simply by moving my fingers to help me listen effectively. When I blog or write reports or take actions based on these notes, I reactivate that information and push it further along into semantic and perhaps also episodic memory, creating new neural connections in the brain in relation to what was already there. So the whole process involves my attention and action, my active notetaking which supports encoding of information into memory and its storage, not just in an external device such as a mobile, but also in my own memory systems, giving me potential to reactivate and recall.

So when I take a class of students, and they resist mutely the encouragement to take a note, to bring in a device to class, even to voice record the discussion for later playback, I start to worry. Is it just that at my advanced age I need to make notes and they, with younger

brains, do not? Well, age probably does have something to do with it. However, we do rely increasingly on external devices to do the work of memory for us. Students seem more and more reluctant to write anything in class, unless they are specifically engaged in a task. We could simply see this as a shifted opportunity for more active learning in that classroom. This sounds good; as teachers we must thus move further away from lectures and towards flipped learning, engaging learners fully in tasks, problems, discussions, projects within the classroom and online. Many of the papers in this issue discuss ways in which learners may be more effectively engaged through a richer learning environment in learning tasks rather than sitting passively and being expected to absorb knowledge. JuanFernando Martin-SanJose, M.-Carmen Juan, Ramón Mollá and Roberto Vivó discuss educational games which involve movement in learning, fitting neatly with brain-compatible education principles of whole body and mind interaction. Similarly Yanghee Kim and Diantha Smith explore the opportunities when children are engaged with robots through mobile learning. Ana I. Moro-Egido and Luis E. Pedauga discuss the combination of Unicode and spreadsheet programmes to encourage the use of simulations in teaching economic modelling.

There is a potential downside, however, as teachers and learners rely more heavily on external software and hardware, there could be a greater propensity to jettison note-taking, or indeed any form of recording, even through the many electronic vehicles available, and to adopt a purely passive route to finding information. If my learning environment offers me tailored resources, why should I learn to find suitable ones by myself? Since the answer is always likely to be online, why would I need to learn it? No amount of repeated Google searching for a concept is necessarily going to encode and store the information in our memory. We have all had the experience of looking up a word or phrase, and then finding we have to do it again because we read the definition but did not retain it. Perhaps this kind of outsourcing of memory, keeping it stored outside ourselves rather than in our own home-grown neural networks, could produce the kind of time-limited surface learning from which we hoped to distance ourselves in better learning design.

Marc Lafuente in this issue discusses the disturbing adaptive responses of Web 2.0 to provide compliant arguments and content which keep the user in their comfort zone. We have been discussing the laying down of long-term memory and such confirming bias in our use of technology could constrain the basis of critique and argumentation which we associate with higher learning. Other adaptive responses are discussed in two articles on ubiquitous learning environments for teachers in training and for students by Min Chen, Feng Kuang Chiang, Ya Na Jiang and Sheng Quan Yu.

Another principle of brain-compatible learning, originally proposed by Vygotsky, is that learning is essentially collaborative and influenced by interactions with others. In this issue, Elba GutiérrezSantiuste and María-Jesús Gallego-Arrufat discuss the role of social presence in the Community of Inquiry framework, exploring how online communication may be supported through this social interaction. Rosemary Luckin, Wilma Clark, Katerina Avramides, Jade Hunter and Martin Oliver offer an intriguing insight from the literature into Teacher Inquiry and Learning Analytics and their potential for formative assessment and improved learning design. This potential of learning analytics is further explored in an article

by Marine Delaval, Nicolas Michinov, Olivier Le Bohec and Benjamin Le Hénaff in terms of social comparisons and temporal comparisons of learning progress. I-Fan Liu and Shelley S.-C. Young refer to gender differences in motivation exhibited in an online community reading contest.

As we begin to revise and extend our understanding of neuroscience and what this means for our memory systems and learning behaviours, we may be moving away from Plato's aviary metaphor, trying to snatch the flying birds within our memory. Instead the evidence is helping us to demonstrate the active behaviours associated with learning: movement, rehearsal, social interaction and construction. Perhaps rather than trying outsourcing, we need to bring the memory building process back in-house.

References

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