Is the digital learning revolution a waste of money?

By Manfred Spitzer

This is a longer version of the article published in *New Scientist* No. 3043, 17 October 2015

Where there are effects, there are often side effects – and not just in medicine. The car was a boon to mobility, but can lead to obesity, injuries, deaths and pollution. Burning fossil fuels may keep economies going, but wrecks the climate in the long run.

In a similar way, there are side effects to information technology in education settings – from childcare to the classroom to the lecture hall and beyond. The IT industry and educational policy-makers repeatedly state that computers are good for learning, and therefore worthy of public investment. But numerous studies have showed no positive impact, or even negative effects.

The latest is a report by the Organisation for Economic Co-operation and Development. It highlights that education systems investing most in these technologies saw “no appreciable improvement” in results for exams used in a scheme to compare attainment internationally – the Programme for International Student Assessment (PISA).

What’s more, an earlier study that drew on PISA results and contained data from 250,000 students aged 15 showed that they performed worse at school if they had a computer in their bedroom. In Israel, researchers found performance declined in elementary and middle schools with computers, and in Romania it has been reported that poorer children whose families received money to buy a computer performed worse in school than those without computers.

IT problems

Why is this so? Given what we know from experimental psychology and neuroscience, negative effects from IT on learning are not surprising: the deeper that content is processed mentally, the better the learning. This is the main finding in the “levels-of-processing” model of memory. IT use when learning tends to cause shallow processing of information in the brain, preventing memory encoding. Accordingly, a study in Science found that information online is less likely to be encoded in memory than that in books or journals.

Moreover, studies have shown that the presence of laptops in classrooms is linked to decreased performance in tests and assignments, and fails to close achievement gaps between socio-economic groups – the digital divide. A comparison between electronic and paper textbooks in Science showed that embedded videos and hyperlinks in the former are a distraction and impede learning. In California, students prefer reading from paper rather than an e-book by a wide margin.

In addition, US researchers who presented data from experiments on student learning in classrooms that looked at typing versus handwriting concluded that “the pen is mightier than the keyboard”. Longhand note-taking means that the student has to listen, think and prioritise important material, whereas keyboard users favour verbatim notes.

Finally, according to one survey of a representative sample of US students, in lectures most are engaged in various distracting activities made possible by mobile computing and the wireless internet.

Digital media pose serious risks and side effects in educational settings, causing marked levels of internet addiction, insomnia and inattention, especially when used for non-course-related activities. They also take time away from more valuable learning processes.

In the light of such large and converging evidence, it is time to rethink the spending of public money on ever more IT in classrooms.