29 THE TEN DEADLY SINS IN EDUCATION

QUOTE *"This isn't right. This isn't even wrong".*[1]

This book is about a particular tradition, a tradition which focuses on how to cultivate the best conditions which foster learning. By "learning" we mean a change in long-term memory (Kirschner, Sweller, & Clarke, 2006). Any attempt to do this which ignores the cognitive architecture of the brain is unlikely to be successful and may even hinder long-term learning. For many teachers on the frontline, the advice they have been given has been based on folk wisdom, vague abstract theory and approaches that conform to Wolfgang Pauli's famous quip: "This isn't right. This isn't even wrong". One aim of this book is to empower teachers to be able to not only evaluate what they are advised to do but to provide a strong evidence base from which they can refine and reflect on their own practice and create the best conditions under which their students can flourish.

The Christian teaching, attributed to the Desert Fathers, speaks of seven cardinal or deadly sins that we need to overcome to live a virtuous life: pride, greed, lust, envy, gluttony, wrath, and sloth. In this final chapter we very briefly describe what we feel are the ten deadly sins of education. Giving in to those sins is often tempting, but if you do you'll be guilty of implementing evidence-uninformed education and flying in the face of evidence.

1. The learning pyramid

The learning pyramid (see Figure 29.1) is a seemingly useful model that reflects the effectiveness of different forms of teaching. According to the pyramid, pupils only remember 5% of a classroom lesson (what the teacher says), 10% of what they read, 20% of an audio-visual

1 WOLFGANG PAULI WAS AN AUSTRIAN BORN PHYSICIST. HE IS REPORTED TO HAVE SAID THIS AFTER READING A COLLEAGUE'S PAPER. IT IS QUOTED IN *THE SUCCESSFUL TOASTMASTER: A TREASURE CHEST OF INTRODUCTIONS, EPIGRAMS, HUMOR, AND QUOTATIONS* (1966, P. 350) BY PROCHNOW AND IN *MATHEMATICAL APOCRYPHA REDUX: MORE STORIES AND ANECDOTES OF MATHEMATICIANS AND THE MATHEMATICAL* (2005, P. 194) BY KRANTZ.

presentation, 30% of a demonstration, 50% of a discussion, 75% of what they do themselves and 80–90% of what they explain to others. The percentages vary in different sources, but that's not important. What is important is that it's nonsense that you shouldn't fall for.

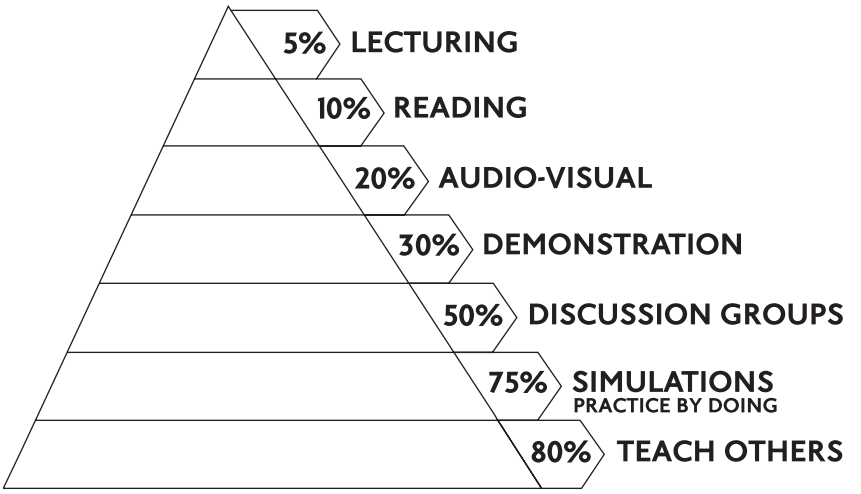

FIGURE 29.1
THE LEARNING PYRAMID

First, there is no basis for such percentages. Even the institution that everyone quotes (National Training Laboratories in Bethel, Maine, USA) says they don't have data to support them. Furthermore, the pyramid is simply a corruption of Edgar Dale's cone of experience (1954), in which he indicated how different media differ along a continuum from abstract (language, letters) to concrete (direct experience). Finally, even if the percentages were correct, you can't do anything with it. A teacher standing in front of the class and teaching about electricity (5%) can write the main points and principles on the whiteboard or show them in a PowerPoint® presentation (+10%), show a video clip about circuits (+20%), give a small demonstration of a battery or lamps in series and in parallel (+30%) and then discuss the results of the demonstration with the students (+50%), etc. No lesson is purely one or the other and just adding these percentages up teaches us that you could learn more than 100%!

2. Learning styles

People are all different and just as they may prefer different foods, they also may prefer different ways of learning. One prefers pictures while the other prefers words. While it sounds and even feels logical that there are children who are visual learners (learn best when information is presented as pictures, diagrams, and charts), while others are auditory (learn best in a lecture or group discussion) readers/writers (learn best through reading and writing) or kinesthetic (hands-on learners who

learn best through physical experience), there's no evidence whatsoever for this. And this is just one of the 72 different learning styles (the so-called VARK) that Coffield and colleagues (2004) found when they went through the literature.

Unfortunately, all that glitters is not gold. This way of looking at how children learn, and therefore how the teacher should teach, has at least three problems, as we have already described in Chapter 26, Did you hear the one about the kinaesthetic learner … ?. First, in most studies learning styles are determined based on what people say they prefer. It's therefore about learning *preferences* and not learning *styles*. Second, there's a big difference between these and what leads to better learning. I think we all can agree that if we ask people what they prefer to eat, many if not most will say fatty things and/or salty things and/or sugary things. I think that we can also all agree that these preferences are not the constituents of a healthy diet. That you prefer it doesn't make it good for you, both in food and learning. Finally, most so-called learning styles are based on specific types: people are classified into different groups. However, there's no evidence for the existence of these groups. And this discounts the fact that even if they all did exist, if the 72 types of learning styles were simply dichotomous (e.g. concrete versus abstract thinkers), which they aren't as we saw with VARK, there would be 2^{72} different combinations of learning styles, or 4,722,366,482,869,669,245,213,696 different combinations – more than the number of people who have ever lived on earth – so good luck tailoring your teaching to them!

But possibly the most important problem is that if we put learners in different boxes and teach accordingly (i.e. pigeonhole them), we create situations that instead of promoting learning, hinder it (see Chapter 27, When teaching kills learning).

3. Children are digital natives and think differently from previous generations

We have to radically change education! We're teaching a new type of learner with specific competencies that enable them to use ICT effectively and efficiently. This new learner is the *digital native*. Marc Prensky introduced this term in 2001: the idea of a generation that has never lived without digital technologies and therefore has exceptional and unique characteristics that distinguish it from all previous generations with respect to thinking and learning (Prensky, 2001). He concluded that we must design and introduce new forms of education that focus on the special gifts of these digital natives. Unfortunately, he based all of this on simple personal observations of young people and not on any research.

Wim Veen and Ben Vrakking (2006) followed suit, introducing the term *homo zappiëns* to describe a new generation of students who learned significantly differently from their predecessors. They claim that *homos zappiëns* independently and without instruction develop the metacognitive skills needed for discovery learning, networked learning, experimentation, collaborative learning, active learning, self-directed learning, and problem-based learning. Based on these claims (again acquired through personal observation and not research) a growing group of people, including politicians and administrators, believe that education should respond to this. We hear things like "Let's Googlify education", "Knowledge acquisition isn't necessary", and "We need to harness the cognitive and metacognitive skills of this technology-savvy generation!"

Don't! There's no evidence that young people today have any special skills (other than very fast-moving thumbs) that would allow them to learn differently. The proponents of these ideas based this purely on their own experiences and anecdotal evidence.

4. Children can multitask

One of the competencies that people attribute to the non-existent digital native is that of multitasking. There's much confusion about this concept. Multitasking is the ability to simultaneously perform two or more tasks that require thinking (or information processing) without a loss of speed or accuracy. To really multitask you need two or more separate processing units (think of a multicore computer with two, four, eight, or even more CPUs). The problem is that people only have one CPU, namely their brains. When it comes to automated tasks that don't require thinking, we can easily do two or more things at the same time.

What we actually do is switch between tasks (i.e. task switching). But when we switch between tasks, we lose time and we make mistakes. If we switch tasks, we (unconsciously) make a "decision" to shift our attention from one task to another. Our brain then activates a rule to end the processing of one task whereby you leave the cognitive schema that you were using, and initiates another rule to enable the processing of the other task with its concomitant schema. Switching between tasks takes time and distributing attention between these two tasks requires space in our working memory. The two tasks therefore interfere with each other. In short, we simply can't multitask. If we try to do two or more things at the same time that require thought, we do things worse and it takes more time in total than if we had done them one after the other (i.e. serially monotask).

5. With Google, knowledge is no longer important

We hear that just about all the "knowledge" we need can be found on the internet via Google or other search engines and, thus, that we no longer need to know as much as we used to, as long as we can look it up. But there are problems here, First, there's no knowledge on the internet; only information, of which a great deal is non-information or outright nonsense from questionable sources. Without a solid knowledge base we can do little with what we find on the internet. In an interview with a Dutch quality newspaper, two women who run a nutrition website propagating a healthy lifestyle stated in 2016 that eggs are the menstruation of chickens and are, therefore, bad for you. The two are registered dietitians and therefore you might conclude that this is true.[2] But mammals menstruate and chickens aren't mammals! In other words, nonsense. But how could you know that without basic knowledge of biology?

So what we read, see, and understand is determined by what we already know and not the other way around (see Chapter 6; What you know determines what you learn). Our prior knowledge and experiences determine how we see, understand, and interpret the world around us. It also determines how well we can look up, find, select, and process (or evaluate) the information available on the internet. Unfortunately, in the best case, students only have minimal prior knowledge of a subject (after all, they are students; if they already had the knowledge, they would be experts).

Related to this is the myth that knowledge has a limited expiration date (as perishable as fresh fish is sometimes said). This is nonsense too. The vast majority of what we have learned is still correct. There is a huge increase in information. But as said, without knowledge we can do little with it.

6. You learn to solve problems by solving problems

Problem-based learning is quite popular. One of its premises is that the best way to learn to solve problems is to solve them. Unfortunately this isn't the case (see Chapter 2; Take a load off me). To solve problems, we must first have knowledge of and skills in the domain in which we must solve that problem. We can't solve a chess problem without being able to play chess (knowing how the pieces move, what the rules are, what the common strategies and tactics are, etc.), just as we cannot solve a math problem without math knowledge. In other words, skills are domain specific.

Also, it helps enormously if we have a set of possible solution strategies plus knowledge of when we can best use each one. This is

2 THE DUTCH NUTRITION CENTRE WARNS THAT FOLLOWING THE ADVICE OF THESE TWO WOMEN CAN LEAD TO A WEAKENED IMMUNE SYSTEM, BONE LOSS, AND WEAKENED MUSCLES.

called procedural knowledge (knowing what the steps are) and is very similar to the so-called twenty-first century computational thinking skill, which means that you can analyse a problem in smaller steps so that you can solve it. But again, without knowledge you can't carry out the procedure and so you cannot acquire this domain-general twenty-first century skill.

Finally, without domain-specific and procedural knowledge, problem-solving becomes an exercise in trial and error. This is neither effective nor efficient, especially since we're constantly hitting walls because we're doing it wrong (which can be quite frustrating). And then, should we happen to solve the problem, we usually don't know why we've succeeded and it's therefore difficult to repeat and apply in other situations. And finally there's a good chance that we'll teach ourselves a wrong approach that we'll have to unlearn in the future.

7. Discovery learning is the best way to learn

Jerome Bruner introduced discovery learning as a research-based instructional form in 1967 (Bruner, 1967). He assumed that it would be better for students to discover facts and the connections between them than to provide them as a teacher. But if we use such an approach with starting students, we do not take into account the limitations of their working memory (see Chapter 1, A novice is not a little expert). During discovery learning, we must always look for links between things and the principles that apply in the domain. Beginners, however, hardly have any domain knowledge and also have no systematic approach to finding it. This therefore requires a great deal of their working memory, all the more because inexperienced students are capable of connecting any and all elements in the domain through ignorance. They're faced with an explosion of combinations without knowledge to keep them under control. Moreover, this load on working memory doesn't result in more knowledge in long-term memory as it was used to discover and not to learn.

In addition, this approach is based on the idea that a child is a kind of miniature scientist. But children not only have less knowledge than a scientist (who can use discovery as a way to move forward; it's their epistemology), they also see and interpret the world differently (much more naively), think differently (concretely and not abstract) and therefore experience the world differently. That is why we shouldn't use the working method of the scientist as an educational approach for the inexperienced student!

8. Motivation leads to learning

A frequently heard statement from parents, teachers, politicians, and even scientists is that the problem with contemporary education is that pupils find it boring and unattractive and therefore don't learn well. People often use concepts such as motivation and engagement as keys to better education and as proxies for learning; as if being hyped about or engaged with something means that you've also learned something. The idea is that the more we motivate learners, the better they'll learn. Unfortunately this isn't the case. Don't get us wrong. Of course motivation is great and motivated students will start on something sooner than if they aren't motivated, but this is no guarantee for learning. In fact, if a student starts out motivated but doesn't succeed, that motivation fades away very quickly and we're worse off than if the learner was only lukewarm to begin with.

What we know from research is this: there's neither a causal relationship (motivation does not lead to better learning and performance) nor a reciprocal relationship (in the sense that motivation leads to learning and learning leads to motivation) between motivation and learning. It's learning that leads to motivation. When we experience success, no matter how small that success is, it feeds our motivation to continue (as we saw in Chapter 8, Beliefs about intelligence can affect intelligence). For example, good maths performance has a significant positive effect on the intrinsic motivation of students for maths, but motivation for maths doesn't lead to better math performance (Garon-Carrier et al., 2016; McConney et al., 2014). And that applies to both boys and girls.

9. Non-existent grit

It's weird. On the one hand, we hear that learning is boring and hard and should be fun, but on the other hand, everyone is talking about grit. Grit is putting your shoulders to the wheel and noses to the grindstone. According to the creator of the term, Angela Lee Duckworth, grit is the passion and perseverance to achieve long-term goals combined with interest, practice, purpose, and hope. For her, grit is being so driven to reach your goal that you never ever give up – even in the face of adversity – and do everything you can to achieve it. In short, perseverance, dedication, efficacy, and resilience.

Marcus Credé and his colleagues (2016) have shown that grit is just old wine in new bottles and is actually nothing more than perseverance. In addition, they looked at, among other things, the relationship between grit and both learning performance and remembering what was learned, and that was also disappointing. Researchers found poor correlations

between grit and learning performance and grit and remembering, while there are strong correlations between, for example, learning and cognitive ability (IQ), study habits, and skills. Even perseverance alone, without all the extra trimmings from Duckworth, was more strongly correlated with learning than grit!

10. School kills creativity

Ever heard of a straw man? According to Wikipedia, a straw man is a type of fallacy – reasoning that is wrong, but seems plausible – whereby the actual position of an opponent isn't refuted, but a caricature thereof. The man who claimed that schools kill creativity – Sir Ken Robinson – was guilty of this. He presented the school as a place where teachers do nothing but preach from the pulpit and where students do nothing but listen obediently and do their homework. We don't know of any such teachers or schools; do you?

Strange here is that Sir Ken defines creativity as "the process of having/coming up with original ideas that have value – usually the result of the interaction of different disciplinary ways of seeing things".[3] In other words, based on domain-specific knowledge! Without knowledge and skills which we acquire at school it's impossible – except in the case of luck – to come up with something of value. The most creative painters, even surrealists, first learned how to paint. Therefore, we suggest that you quote Keith Sawyer rather than Ken Robinson. Sawyer (Sawyer, 2012) says that "creativity is largely domain specific – that the ability to be creative in any given domain, whether physics, painting, or musical performance, is based on long years of study and mastery of a domain-specific set of cognitive structures" (pp. 11–12).

This idea that everything has to be "relevant" to children is a debased view of the profession. The notion that children can only learn things through the prism of their own interests and that to ask them to consider things outside of that is somehow beating a love of learning out of them is demeaning, not just to teachers but to students themselves. Possibly the greatest thing a teacher can do is to introduce students to wondrous worlds beyond the limited borders of their own experience, to allow them to see the previously unseen and to make new and enriching connections that were hitherto unavailable to them.

Takeaway

- If you want to teach well, avoid these ten deadly sins!

3 WWW.TED.COM/TALKS/KEN_ROBINSON_SAYS_SCHOOLS_KILL_CREATIVITY/TRANSCRIPT?LANGUAGE=EN

References

BRUNER, J. S. (1967). *ON KNOWING: ESSAYS FOR THE LEFT HAND*. NEW YORK: ATHENEUM.

COFFIELD, F., MOSELEY, D., HALL, E., & ECCLESTONE, K. (2004). *LEARNING STYLES AND PEDAGOGY IN POST-16 LEARNING. A SYSTEMATIC AND CRITICAL REVIEW*. LONDON: LEARNING AND SKILLS RESEARCH CENTRE. AVAILABLE FROM WWW.RESEARCHGATE.NET/PUBLICATION/232929341_LEARNING_STYLES_AND_PEDAGOGY_IN_POST_16_EDUCATION_A_CRITICAL_AND_SYSTEMATIC_REVIEW.

CREDÉ, M., TYNAN, M. C., & HARMS, P. D. (2016). MUCH ADO ABOUT GRIT: A META-ANALYTIC SYNTHESIS OF THE GRIT LITERATURE. *JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY*. AVAILABLE FROM WWW.ACADEMIA.EDU/25397556/MUCH_ADO_ABOUT_GRIT_A_META-ANALYTIC_SYNTHESIS_OF_THE_GRIT_LITERATURE

DALE, E. (1954). *AUDIO-VISUAL METHODS IN TEACHING* (2ND ED. ORIGINALLY PUBLISHED 1946). NEW YORK: THE DRYDEN PRESS.

GARON-CARRIER, G., BOIVIN, M., GUAY, F., KOVAS, Y., DIONNE, G., LEMELIN, J.-P., SÉGUIN, J., VITARO, F., & TREMBLAY, R. (2016). INTRINSIC MOTIVATION AND ACHIEVEMENT IN MATHEMATICS IN ELEMENTARY SCHOOL: A LONGITUDINAL INVESTIGATION OF THEIR ASSOCIATION. *CHILD DEVELOPMENT*, *87* (1), 165–175. AVAILABLE FROM WWW.RESEARCHGATE.NET/PUBLICATION/282135309_INTRINSIC_MOTIVATION_AND_ACHIEVEMENT_IN_MATHEMATICS_IN_ELEMENTARY_SCHOOL_A_LONGITUDINAL_INVESTIGATION_OF_THEIR_ASSOCIATION

KIRSCHNER, P. A., SWELLER, J., & CLARK, R. E. (2006). WHY MINIMAL GUIDANCE DURING INSTRUCTION DOES NOT WORK: AN ANALYSIS OF THE FAILURE OF CONSTRUCTIVIST, DISCOVERY, PROBLEM-BASED, EXPERIENTIAL, AND INQUIRY-BASED TEACHING. *EDUCATIONAL PSYCHOLOGIST*, *46* (2), 75–86. DOI:10.1207/S15326985EP4102_1.

MCCONNEY, A., OLIVER, M. C., WOODS-MCCONNEY, A., SCHIBECI, R., & MAOR, D. (2014). INQUIRY, ENGAGEMENT, AND LITERACY IN SCIENCE: A RETROSPECTIVE, CROSS-NATIONAL ANALYSIS USING PISA 2006. *SCIENCE EDUCATION*, *98*, 963–980. AVAILABLE FROM HTTP://EPRINTS.NOTTINGHAM.AC.UK/27768/1/INQUIRYENGAGEMENT%26LITERACYINSCIENCE-REVISEDMAR2014.PDF.

PRENSKY, M. (2001). DIGITAL NATIVES, DIGITAL IMMIGRANTS. ON THE HORIZON. *NCB UNIVERSITY PRESS*, *9*, 1–6. AVAILABLE FROM WWW.MARCPRENSKY.COM/WRITING/PRENSKY%20-%20DIGITAL%20NATIVES,%20DIGITAL%20IMMIGRANTS%20-%20PART1.PDF.

SAWYER, R. K. (2012). A CALL TO ACTION: THE CHALLENGES OF CREATIVE TEACHING AND LEARNING. *TEACHERS COLLEGE RECORD*, *117* (10), 1–34. AVAILABLE FROM HTTP://KEITHSAWYER.COM/PDFS/SAWYER%202015%20TCR.PDF.

VEEN, W., & VRAKKING, B. (2006). *HOMO ZAPPIENS: GROWING UP IN A DIGITAL AGE*. LONDON: NETWORK CONTINUUM EDUCATION. THE ACCOMPANYING POWERPOINT IS AVAILABLE FROM WWW.SCRIBD.COM/DOC/2578647/WIM-VEEN – NO LONGER AVAILABLE ONLINE.

Further reading and links

BLOG GRIT: TO GRIT OR NOT TO GRIT: THAT'S THE QUESTION.

AVAILABLE FROM HTTPS://3STARLEARNINGEXPERIENCES.WORDPRESS.COM/2016/07/05/TO-GRIT-OR-NOT-TO-GRIT-THATS-THE-QUESTION/.

BLOG MOTIVATION: CLOSE THE STABLE DOORS: EFFECTS OF MOTIVATION AND ENGAGEMENT ON LEARNER ACHIEVEMENT?

AVAILABLE FROM HTTPS://3STARLEARNINGEXPERIENCES.WORDPRESS.COM/2016/05/17/CLOSE-THE-STABLE-DOORS-EFFECTS-OF-MOTIVATION-ANENGAGEMENT-ON-LEARNER-ACHIEVEMENT/.

BLOG DIGITAL NATIVES: THE DISTURBING FACTS ABOUT DIGITAL NATIVES.

AVAILABLE FROM HTTPS://3STARLEARNINGEXPERIENCES.WORDPRESS.COM/2015/10/20/THE-DISTURBING-FACTS-ABOUT-DIGITAL-NATIVES/.

LEARNING STYLES: IS WHAT LEARNERS SAY THAT THEY PREFER GOOD FOR THEM? [BLOG]

AVAILABLE FROM HTTPS://3STARLEARNINGEXPERIENCES.WORDPRESS.COM/PAGE/11/?S=LEARNING+STYLES.

LEARNING PYRAMID: AN UPDATE TO THE LEARNING PYRAMID [BLOG].

AVAILABLE FROM HTTPS://THEECONOMYOFMEANING.COM/2016/07/08/AN-UPDATE-TO-THE-LEARNING-PYRAMID/.

LEARNING PYRAMID: A NEW STUDY ON THE DIFFUSION OF THAT *%*§§§ LEARNING PYRAMID [BLOG].

AVAILABLE FROM HTTPS://THEECONOMYOFMEANING.COM/2015/10/19/A-NEW-STUDY-ON-THE-DIFFUSION-OF-THAT-%C2%A7%C2%A7%C2%A7-LEARNING-PYRAMID/.

SOME EXCELLENT PIECES ON WHY SIR KEN ROBINSON'S ARGUMENTS ARE PROBLEMATIC ARE

AVAILABLE FROM CRISPIN WESTON: HTTPS://EDTECHNOW.NET/GUEST-POSTS/KEN-ROBINSON-REBUTTAL.

JOE KIRBY: HTTPS://PRAGMATICREFORM.WORDPRESS.COM/2013/10/12/WHAT-SIR-KEN-GOT-WRONG

CARL HENDRICK: WWW.TES.COM/NEWS/KEN-ROBINSON-TEACHER-BASHER-SCHOOLS-MUST-STOP-LISTENING-HIS-PANGLOSSIAN-IDEAS