

# Instructional Illusions by Paul Kirschner, Carl Hendrick, Jim Heal

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Content		Do This/Remember This
<p><b>Introduction:</b>                      Illusions work because humans are cognitively predisposed to being deceived. Education is susceptible - we can't see what's going on when people learn, AND what we see can be opposite to what is happening.  <b>Instructional illusions</b> are seen as real while effective strategies are overlooked/ undervalued. Teaching is multifaceted/ complex. People think they know what works in as they have all been taught → false confidence.  <b>Misconceptions about teaching:</b> Anyone can teach. Teaching is: a job/ not a profession/a calling/not work/easy/means short days + long summers/good when it's fun/teachers just need to know their subject/be one step ahead of students/to impart knowledge and teaching hasn't changed much.  <b>Misconceptions about learning:</b> It's memorization/which is drill and kill/ faster is better/ends after graduation/ academic performance is sole indicator of learning/just because you learn some things without explicit instruction (speaking) doesn't mean you can learn other things without it (reading).                      Illusions= outward appearance masks deeper truth about what works and why (are not edu-myths)</p>		<ul style="list-style-type: none"> <li>• We can't see what's actually going on during learning</li> <li>• Surface phenomena don't tell the whole story</li> <li>• Be aware of overconfidence through attending school</li> <li>• Teachers are not deliberately engaged in deception</li> <li>• Very many misconceptions about both teaching and learning</li> <li>• Look out for simplification in political/policy debates</li> </ul>
The illusion	Unmasking the illusion	Do This/Remember This
<p><b>1 The engagement illusion</b>                      "If a child is engaged (busy), they are learning."  <b>Appearance of engagement</b> is poor proxy for actual learning. <b>Performance</b> manifests as: Activity without progress/ emotional engagement/ Familiarity trap = doing what they already know/ Performance illusion: short term performance = learning.  <b>Research:</b> Soderstrom + Bjork (desirable difficulties), Nuthall (Hidden Lives of Learners)</p>	<p><b>Reconceptualise engagement</b> as internal cognitive process which is NOT observable.</p> <ul style="list-style-type: none"> <li>• Effortful thinking=difficult in a good way + THEY have to attribute meaning/connect</li> <li>• Distinguish behavioural/emotional/ cognitive engagement</li> <li>• Focus on desirable difficulties</li> <li>• Design tasks that direct attention to underlying features</li> <li>• Use formative assessment</li> <li>• Explain process to students</li> <li>• Prior knowledge is the biggest determinant of learning</li> </ul>	<ul style="list-style-type: none"> <li>• Don't be fooled by busyness</li> <li>• I have taught it ≠ they learnt it</li> <li>• Performance ≠ learning</li> <li>• Don't succumb to the feedback from visible engagement</li> <li>• True engagement is in the mind</li> <li>• Don't think lesson a success because of visible engagement</li> <li>• Students most engaged with what they already know (Nutall)</li> </ul>
<p><b>2 The expertise illusion:</b>                      "Expertise is always a good thing."  <b>Double edged sword: Knowing too little</b> = think subjective reality is objective reality (naïve realism) + over-estimate what we know + assume we know what we need  <b>Knowing too much</b> = curse of knowledge, novice and experts organize knowledge differently, experts can do more with what they have BUT assume novices think similarly, forget what it's like not to know.  <b>Research:</b> Dunning + Kruger (their effect)</p>	<p><b>Use lesson internalization</b> to move novice-expert gap- ask:</p> <ul style="list-style-type: none"> <li>• What do students know (background knowledge)?</li> <li>• What am I asking them to do (cognitive task analysis)?</li> <li>• What do they need so they can do the task (often underestimated because of curse)?</li> <li>• What is this learning building towards?</li> <li>• How might they struggle (in ways you don't)?</li> <li>• How might they succeed (what gains)?</li> <li>• Use examples/non-examples* to help ameliorate conversational implicature – lack of precision in language of novices-</li> </ul>	<ul style="list-style-type: none"> <li>• Always try to remember what it's like to be a novice</li> <li>• Beware naïve realism</li> <li>• Beware the curse of knowledge</li> <li>• Experts see underlying mechanisms / novices focus on surface features</li> <li>• Plan to bridge the gap – can't just skim a lesson plan</li> <li>• E/NE* + provide boundaries, help novices structure knowledge like experts</li> </ul>
<p><b>3. The student-centred illusion:</b>                      "Students know what's best for them." Can be philosophical/political. Need schema theory – which means: what they learn depends on what they know AND what they know can be inaccurate and they still use it. To learn new material students must activate and link to prior knowledge (PK). <b>Pitfall 1:</b> PK is irrelevant or wrong (missing by a mile). <b>Pitfall 2:</b> PK is marginal, not strong enough (just enough to be dangerous). <b>Pitfall 3:</b> Accurate, relevant PK isn't activated (hiding in plain sight)  <b>Research:</b> Brophy + Good (Teacher behavior &amp; student achievement)</p>	<p><b>Take students' prior knowledge and schemas into account</b> so</p> <ul style="list-style-type: none"> <li>• Students are at the center of learning AND require an intentional teacher-led process</li> <li>• Make schemas explicit</li> <li>• Make connections with prior knowledge visible</li> <li>• Avoid activities that do not help to build schemas (e.g. list as many as possible)</li> <li>• Use activities that build schemas (sort/categorize/justify inclusion/exclusion) that link to PK)</li> <li>• Building schemas means meaningful encoding</li> <li>• Can do both teacher-led + student-centred if teachers:                             <ul style="list-style-type: none"> <li>○ realize students learn new material by referencing PK</li> <li>○ activate PK that in ways that helps build schemas</li> <li>○ invite students to make organization explicit when activating PK</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Watch out for activities/ lessons that make students choose what to learn</li> <li>• Schemas are networks of interconnected ideas</li> <li>• Students should be the beneficiaries not responsible</li> <li>• Just because you teach it doesn't mean they learn it</li> <li>• Make sure ALL students can connect the accurate, relevant PK (equity issue)</li> <li>• Research says students learn more when teacher-led IF students do something with it</li> </ul>
<p><b>4 The transfer illusion:</b>                      "Optimizing performance is the goal."                      (Transfer = apply knowledge/understanding to near or far novel situation). True understanding = seeing superficial +deep structure.  <b>Research:</b> Thorndike – contextual imprisonment (knowledge easily bound to</p>	<p>Conditions that optimize performance now differ from those needed for long-term far-reaching transfer so</p> <ul style="list-style-type: none"> <li>• Vary the context during the initial learning process</li> <li>• Present problems with calculated superficial differences but same underlying principles – develops 'boundary crossing competencies'/metacognitive skills</li> <li>• Use interleaving (not blocking) e.g. mixing problem types</li> </ul>	<ul style="list-style-type: none"> <li>• Learning is contextual</li> <li>• ... and can remain 'imprisoned'!</li> <li>• Therefore exposure to a range of contexts from the start is needed</li> <li>• Contextual variation aligns with Bjork and Bjork's desirable difficulties</li> </ul>

<p>original learning context), Roediger – remember more when <b>tested</b> where you learned it, Salomon – <b>low-road</b> (automatic) vs. <b>high-road</b> (mindful abstraction) transfer. Lave and Wenger’s <b>situated learning theory</b> (learning embedded socially/culturally) = challenge, need to orchestrate contexts</p>	<ul style="list-style-type: none"> <li>Likewise use <b>spacing</b> – dividing study over time</li> <li><b>Initially slower</b> as having to shift attention between strategies but makes for <b>more robust and flexible knowledge</b></li> <li>Aiming for <b>orchestration of variation</b> to avoid hyper-contextualization (only know that context), or decontextualization (inert knowledge)</li> </ul>	<ul style="list-style-type: none"> <li><i>Decide</i> the contexts for maximum benefit i.e. developing ‘structural perception’</li> <li><i>Decide</i> the progression through the contexts = transfer-rich learning environments because you know eventual applications.</li> </ul>
<p><b>5 The easy wins illusion</b>  “Learning should be made easy.”  Students/teachers want <b>easy</b> (perverse incentives = course evaluations, happy students, test scores.) <b>No pain no gain</b> BUT can’t be too hard. A ‘calculating student’ expends min effort for max benefit. Need to <b>coax/stimulate</b> them to expend more effort.  <b>Research:</b> Bjork &amp; Bjork – difference between ‘<b>storage strength</b>’ (how stored) vs ‘<b>retrieval strength</b>’ (how easily recalled), developed ‘desirable difficulties’ to produce ‘<b>better conditions</b>’ to improving storage.</p>	<p><b>Teachers</b> can:</p> <ul style="list-style-type: none"> <li>Select and use <b>desirable difficulties</b>: Interleaving/variable practice (different contexts), contextual interference (e.g. different rooms!), spaced practice (different times), reduced feedback, retrieval practice/practice testing.</li> </ul> <p><b>School leaders/inspectors</b> can:</p> <ul style="list-style-type: none"> <li>Stop using test scores/student evaluations/self-reports of lesson judgements,</li> <li>Develop <b>assessments of real long-term learning</b></li> </ul> <p><b>Students</b> can:</p> <ul style="list-style-type: none"> <li>Learn (with our help!) the <b>benefits of delayed gratification</b>/embracing the effort for long-term gain</li> </ul>	<ul style="list-style-type: none"> <li>Mental effort builds cognitive architecture</li> <li>Productive failure/discovery learning are <i>not</i> desirable difficulties</li> <li>Performance ≠ learning</li> <li>Know/tell students not to interpret retrieval strength as learning</li> <li>Explicitly teach about desirable difficulties</li> <li>Provide low/no stakes experiences to show they work</li> <li>‘It’s investing more effort not time’</li> </ul>
<p><b>6 The motivation illusion:</b>  “Motivation leads to success.” Motivation may prompt <b>initial engagement</b>, but <b>success is needed for sustained effort</b> + we don’t really know what motivation is.  <b>Research:</b> Nuthall (see Engagement Illusion), Murayama: motivation as linguistic construct, difficulties in definition otherwise.</p>	<p>Give <b>experiences of success</b> by:</p> <ul style="list-style-type: none"> <li>Rosenshine: <b>breaking down</b> the material into manageable steps then ensuring a <b>high (80%+) success rate</b> in guided practice</li> <li><b>Monitor/adjust tasks</b> based on student performance</li> <li>Give thoughtful, timely and actionable <b>feedback</b> that <b>builds foundational knowledge</b> that they can then transfer (and see even more success)</li> </ul>	<ul style="list-style-type: none"> <li>Success is compelling, builds confidence, produces motivation</li> <li>Links to self-concept, self-efficacy</li> <li>Success → competence → confidence → higher self-concept</li> <li>Attempts to ‘improve motivation’ in the abstract don’t work</li> </ul>
<p><b>7 The discovery illusion:</b>  “Children learn best when they discover things for themselves”.  No because <b>effort fallacy</b>, discovery not ‘natural’, <b>confirmation bias</b>, <b>category error</b> – how experts <b>create knowledge</b> ≠ how novices <b>acquire it</b>.  <b>Research:</b> Hodson – epistemology ≠ pedagogy, novices have different cognitive architecture, need to help them build it.</p>	<p>Educational <b>realism</b> (not romanticism) =</p> <ul style="list-style-type: none"> <li>Give <b>novice learners structured instructional techniques</b></li> <li><b>Transition</b> from worked examples to guided practice to independent practice with expertise development</li> <li>Aim for <b>80% success</b> to <b>sustain motivation</b>/reduce frustration</li> <li><b>Structure to avoid working memory overload</b> (that can happen with discovery)</li> </ul>	<ul style="list-style-type: none"> <li>Discovery persists because it looks like it works (engagement etc.)</li> <li>True intellectual independence requires extensive guided prep</li> <li>Discovery approaches perpetuate inequalities- those with PK succeed</li> <li>Those without left with trial &amp; error</li> </ul>
<p><b>8 The uniqueness illusion:</b>  “Students learn differently because they are all different.”  All humans have <b>same cognitive architecture</b>: sensory memory → working memory → encoding → long-term memory = <b>use same principles</b> + <b>tailor to needs of students</b>.  <b>Research:</b> Rosenshine, Sweller (cognitive load theory), Mayer (16 multimedia principles) but NOT rigid checklists</p>	<p><b>Tailor proven general principles</b> (e.g. Rosenshine) to students:</p> <ol style="list-style-type: none"> <li>Start with <b>short review</b>: younger = game, older = quiz,</li> <li>new material in <b>chunks</b>: stories vs graphic organizers,</li> <li><b>questions</b>: open vs epistemic (how/why),</li> <li><b>models</b>: physical vs abstract,</li> <li><b>guided practice</b>: immediate feedback vs delay,</li> <li><b>check for understanding</b>: show &amp; tell vs written response,</li> <li><b>high success rate</b>: achievable vs varying tasks,</li> <li><b>scaffolding</b>: hands on tools vs templates/outlines,</li> <li><b>independent practice</b>: short vs long,</li> <li><b>weekly/monthly review</b>: drawings vs quizzes</li> </ol>	<ul style="list-style-type: none"> <li>We all learn the same way, but one technique does not fit all in teaching</li> <li>Think track coach: same exercises tailored to individual needs/goals</li> <li>Use proven principles and</li> <li>Adapt to age, goals, prior knowledge, aptitudes, challenges etc. bearing in mind task complexity and cognitive load.</li> </ul>
<p><b>9 The performance illusion:</b>  “<b>If a student performs well, they’ve learned it.</b>” <b>Performance</b> = short-term change to knowledge (fragile, fragmentary shallow processing). <b>Learning</b> = long-term change (durable, cumulative, deep processing).  <b>Research:</b> Soderstrom &amp; Bjork – can ‘see’ performance not learning, Fiorella &amp; Mayer – generative learning</p>	<p>Hone a set of <b>observational/diagnostic techniques</b> to assess learning e.g.</p> <ul style="list-style-type: none"> <li><b>Desirable difficulties</b> (see 5. Easy wins)</li> <li><b>Generative learning strategies</b> = actively constructing their understanding of new knowledge: summarizing, mapping, drawing, self-explanation, teaching others, generating questions, imagining, enacting</li> <li><b>Teach students benefits</b> of learning over performance</li> </ul>	<ul style="list-style-type: none"> <li>Strategies that are beneficial for performance may impede learning</li> <li>Performance easily ‘measured’</li> <li>Students prefer performance – less cognitive effort</li> <li>Goal: what you’ve taught is remembered, can be retrieved, used in the long term.</li> </ul>
<p><b>10 The innovation illusion:</b>  “<b>Newer methods are better than old ones.</b>”  <b>Seductive</b> as: innovation = progress, forward thinking. Pressure on schools/admin/SLT. <b>History</b> is important – <b>reveals cycle</b>. Notable ‘innovations that failed’: open classrooms, whole language approach, multiple intelligences.  Often <b>failure</b> due to implementation ‘gap’, difference between lab and classroom, + not all ideas transplant.</p>	<p><b>Things to remember</b> when faced with innovation:</p> <ul style="list-style-type: none"> <li><b>Watch for cycle</b>: new approach/catchy name, research findings often simplified, spreads via social media, schools invest money/time, teachers required to implement/replace, limited success/results, replaced by next new idea.</li> <li><b>Whole replacement rarely works</b>, thoughtful refinement better</li> <li>We should ‘<b>define problem</b>, look at current situation: what’s going well, what needs changing.’</li> <li>Effective practices have <b>more commonalities than differences</b>.</li> </ul>	<ul style="list-style-type: none"> <li>‘Evidence-informed practice’ is a meta-level innovation.</li> <li>Aim for ‘disciplined innovation’: employ rigorous scrutiny</li> <li>Willingham’s ‘strip it &amp; flip it’ Beware</li> <li>Solutions in search of a problem</li> <li>‘Revolutionary’ practices often repackage old principles</li> </ul>