



Principle	Classroom	Pitfalls
<b>1. How do students understand new ideas?</b>		
1a. Connect new knowledge (K) to prior K (PK)	1a. Need a <b>well-sequenced K-rich curriculum</b> : ensure students (S) have <b>necessary PK</b> , <b>activate</b> through <b>retrieval (R)</b> , use analogies to map new K to PK ( <b>deal</b> with any resulting <b>misconceptions</b> ), <b>direct Ss attention</b> to <b>connections</b> , help them to <b>integrate new</b> with PK.	1a. Never assume they have the PK – check via retrieval, fill gaps
1b. Limited working memory (WM)	1b. Carefully paced <b>explanation</b> (not just teacher talk) = make content <b>explicit</b> without overwhelming WM, use <b>dual coding</b> (speech + images at the same time) + other modalities. <b>Cognitive load (CL) reduced</b> by: defining key words/ ideas first/using worked examples (WE)/ make thinking visible = explain steps/ explicitly make links to underlying concepts.	1b. Avoid: extraneous CL (fun stuff) / split attention (reading separately from image)/ procedural copying of WE
1c. Cog dev not linear/age dep	1c. Understanding (U) happens in fits and starts so don't select/define content by age – ask "have the prerequisites been mastered" and "are they ready?"	1c. Don't assume 'once is enough', needs periodic R
<b>2. How do students learn and retain new information?</b>		
2a. Learning = transfer WM → long-term memory (LTM)	2a. <b>Processing</b> in WM produces <b>transfer</b> usefully to LTM when Ss make <b>meaning</b> enabled by: explaining, meaningfully organizing = <b>connecting to PK</b> , using many/ varied concrete examples that Ss practice (P) in varied ways, using <b>structures</b> like mnemonics = <b>organizational anchor</b> , allow Ss to engage with more difficult concepts	2a. Do NOT expect Ss to apply concepts without relevant PK, structures like mnemonics not replacement for meaning
2b. Practice is essential (but not all practice is equivalent)	2b. <b>Effective practice</b> ( <i>effort</i> strengthens memory)= <b>spaced</b> (initial hours/days, later weeks/months)/effortful + overt challenging but doable R)/ <b>blocked</b> (newer material) / <b>interleaved</b> (later material, order mixed up/ cumulative i.e. adds to previously learned material/ <b>varied</b> (types of problems → fluency, strengthens retention), <b>LOW STAKES</b>	2b. Don't: only call on a few S, (need all), focus on recall of definitions, just do a test, make it high-stakes
2c. Effective feedback (FB) essential	2c. <b>Good FB</b> is: specific/clear/focused on task not student/focused on improvement/ has info re. strategies/addresses emotions/varies with type of task (practice – immediate, when proficient delayed FB beneficial)	2c. Avoid FB that triggers ego-threat (e.g. X isn't your strength)
<b>3. How do students solve problems and transfer learning to new contexts?</b>		
3a. K in LTM aids problem solving (PS)	3a. Teach different facts at different grade levels: <b>facts/skills free WM</b> + aids ability to interact with context in which they can solve problems. <b>Skills are built on K</b> prioritize systematic K building within each domain → deeper learning.	3a. General skills can't be taught without domain K
3b. Transfer needs domain K + K of structure	3b. Ss need sufficient K to appreciate the problem AND K of underlying structure/ organization of concepts (see 1b.), Support by making common underlying structures explicit.	3b. Never assume ability to transfer to new domain, needs to be explicit
3c. Need e.g.s, but need to see structure	3d. Have Ss <b>compare different problems</b> with <b>different</b> surface features but <b>same</b> underlying structure, <b>teach problem identification</b> (start concrete, fade out → abstract), get Ss to analyse/explain steps (incl. wrong WE later), start with structured WE → indep. P.	3c. Don't allow Ss to skip steps of problem identification
3d. Need to be able to select	3d. Often more than one way to PS, need to <b>choose strategy</b> (and <b>know why</b> that's the better choice), teach to flexibility/ adaptability/having a repertoire based on deep U	3d. Don't allow Ss to default to favorite strategy
<b>4. What motivates students to learn?</b>		
4a. Motivation (M) linked to mastery+success	4a. <b>Motivate by</b> : involving in <b>decisions</b> /setting meaningful + challenging tasks/clear + high <b>expectations</b> (in context of support + care)/giving helpful + intentional FB/ using <b>growth-oriented language</b> + <b>course structure</b> + <b>policies</b> (low stakes practice + grade recovery)	4a. Don't compare Ss/penalize mistakes harshly/overly praise mediocre work
4b. Intrinsic motivation (IM) better long term	4b. IM <b>driven by autonomy/interest better</b> than rewards/punishment, supported by <b>agency</b> (appropriate choices, student FB), minimizing overly directive/ harsh punishment. <b>When IM lacking</b> : increase perceived usefulness/create situational interest/provide extrinsic rewards	4b. Don't overwhelm with choices (must be relevant), use extrinsic rewards with IM Ss
4c. M linked to belonging	4c. <b>Belonging enhanced by T</b> : learning about Ss/expressing <b>care</b> / enabling <b>supportive peer relationships</b> (via structured group work with meaningful engagement, all contribute, group size manageable)/ explaining <b>doubts are common</b> + diminish over time,	4c. Care with group work – can backfire, needs careful management
4d. Motivation ↔ learning	4d. <b>Motivation grows</b> when Ss <b>experience success</b> /can fade if they don't/bi-directional. <b>Build M</b> by chunking, modelling, sequencing for early success in learning.	4d. Don't assume M → learning needs practice with K
<b>5. How do students self-regulate their learning?</b>		
5a. Actively manage cycle of self-regulation	5a. Ts can <b>encourage self-regulation (SR)</b> (planning/monitoring/self-reflection in cycle) by not immediately helping/asking 'what else can you try'. <b>T = dual role</b> : teaching <b>content</b> and <b>how to learn</b> /take control of cycle.	5a. Don't assume they know what they don't know, misled by fluency/overconfidence
5b. Learning = effort, challenge themselves	5b. Reinforce that <b>learning</b> (building connections/mental model) <b>takes time</b> + <b>requires effort</b> Motivate to engage in ' <b>productive struggle</b> ', <b>mistakes = opportunity to learn</b> . Use RP /expl. to help them monitor learning. Make <b>challenge purposeful</b> /aligned to content/supportive.	5b. Don't just make work harder/penalize mistakes/say it should be easy
5c. Habits really help	5c. Support habits related to SR learning – can work even without M e.g. RP routines (effortful recall not recognition spaced, connected), elaboration. Model using effective strategies.	5c. Don't do routines for the sake of it

6. Common misconceptions	What the evidence tells us
6a. Humans use 10 % of their brains	6a. Learning: requires sustained cognitive work (not unlocking unused capacity)/integrates new info with PK, repetitions strengthens neural connections.
6b. Students have different learning styles/ people are right or left brained	6b. General strategies = useful for all e.g. dual coding. Students don't learn more if taught in their 'preference'.
6c. Novices and experts think in all the same ways	6c. Curse of knowledge – obvious to T is not obvious to S. What works best changes as S move from novice → expert. WE/blocked P/short spacing early on → PS/interleaved/longer later
6d. Memorization = rote regurgitation ≠ doesn't support learning/deep understanding	6d. 'Understanding is remembering in disguise'. 'Learning is change to LTM' = goal of instruction LTM frees WM for processing complex tasks, need K in LTM through repeated spaced P.
6e. Productivity = competence, performance = learning	6e Error-free completion ≠ (necessarily) long-lasting learning. Can increase short term performance by cramming/blocked P/open-book notes does NOT = meaningful learning

Notes: