Heuristics

They'll kill you. Or maybe the opposite.

A hasty talk for all occasions.

By Derek DeBruin

What’s something you knew to be true that turned out to be wrong?

What is a heuristic?

What is a heuristic?

- Rule of thumb

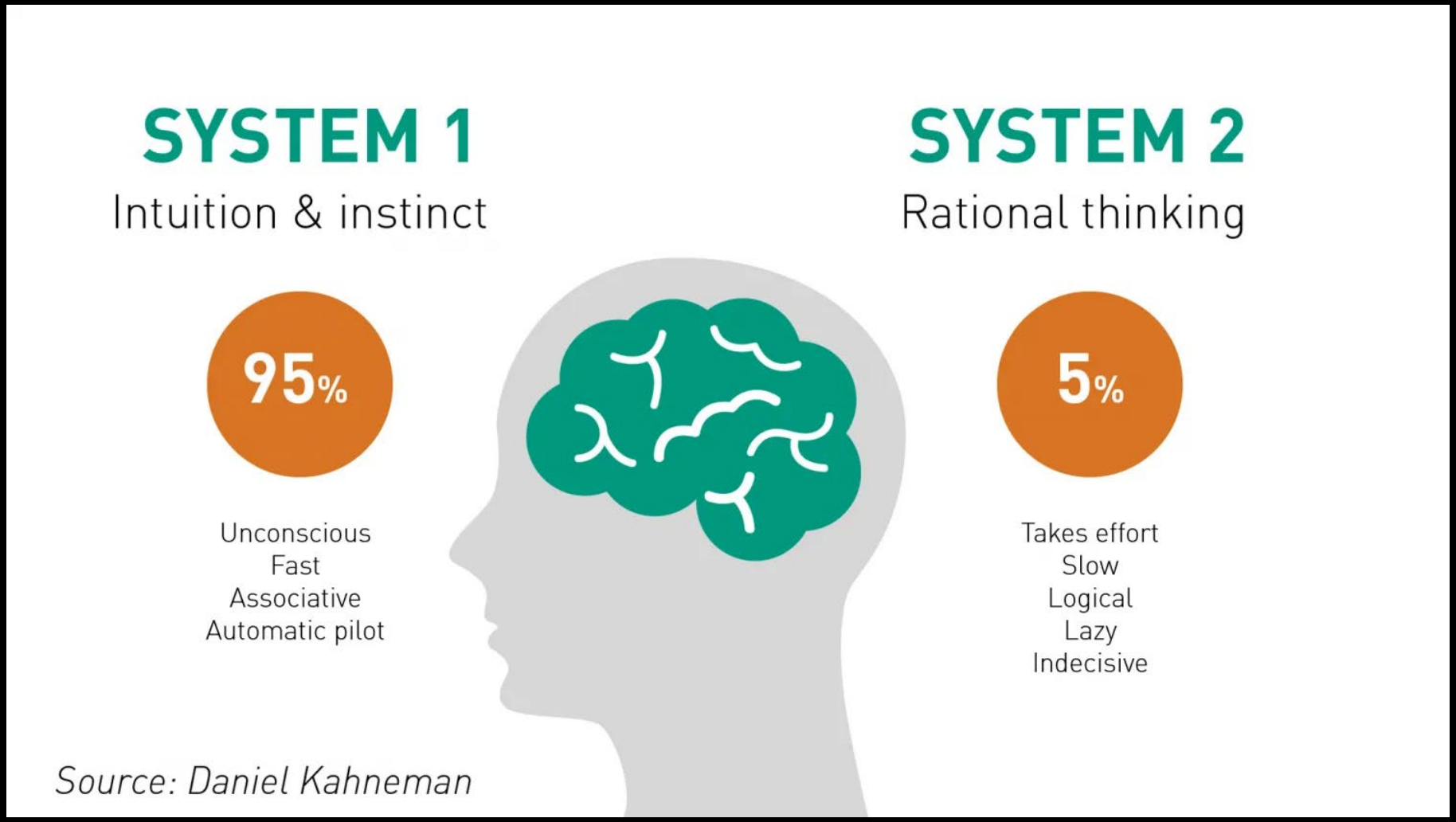
The operator is the problem

Why do people die in avalanches?

"FACETS"

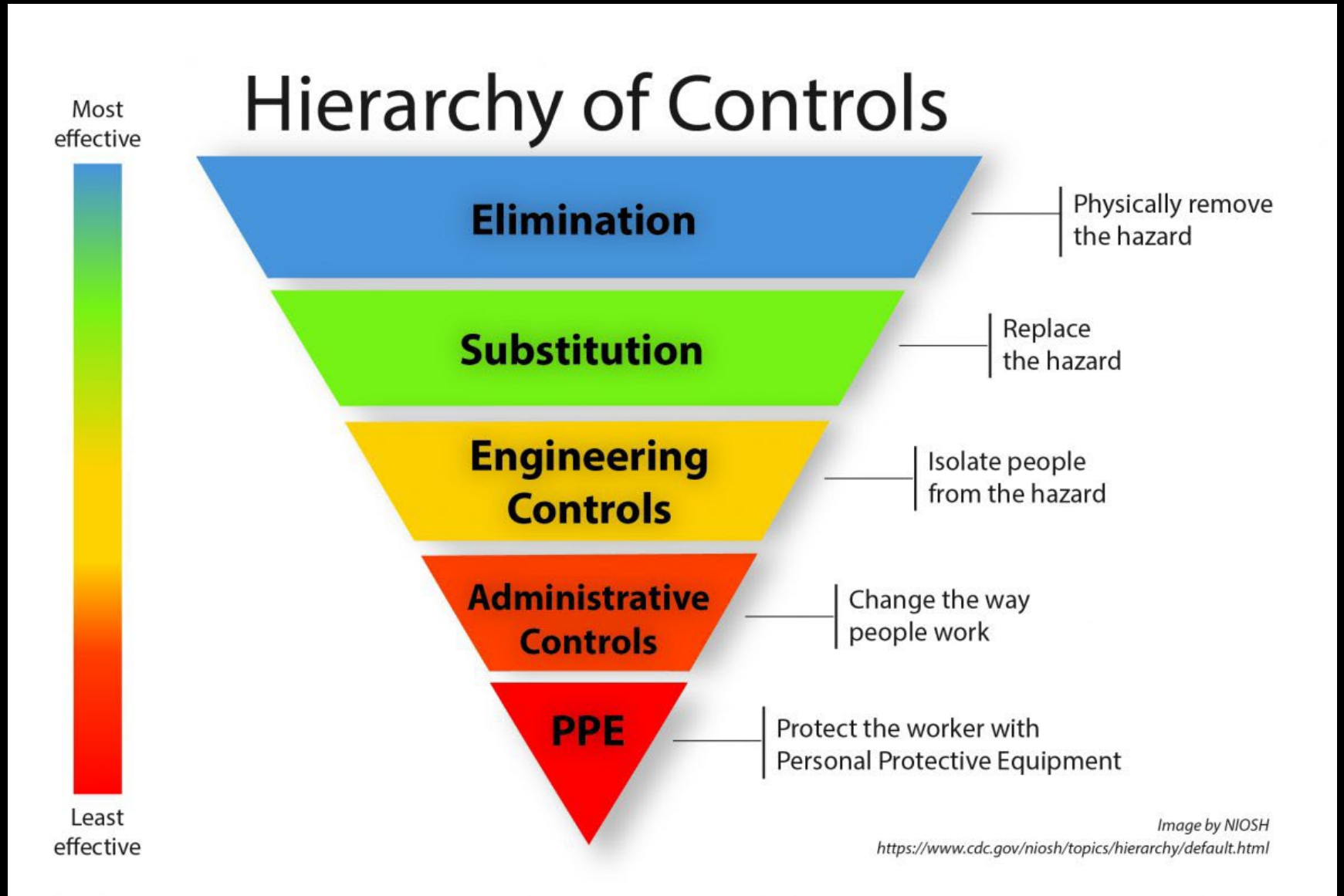
- Familiarity
- Acceptance
- Commitment
- Expert halo
- Tracks/scarcity
- Social proof/social facilitation

Why heuristics?



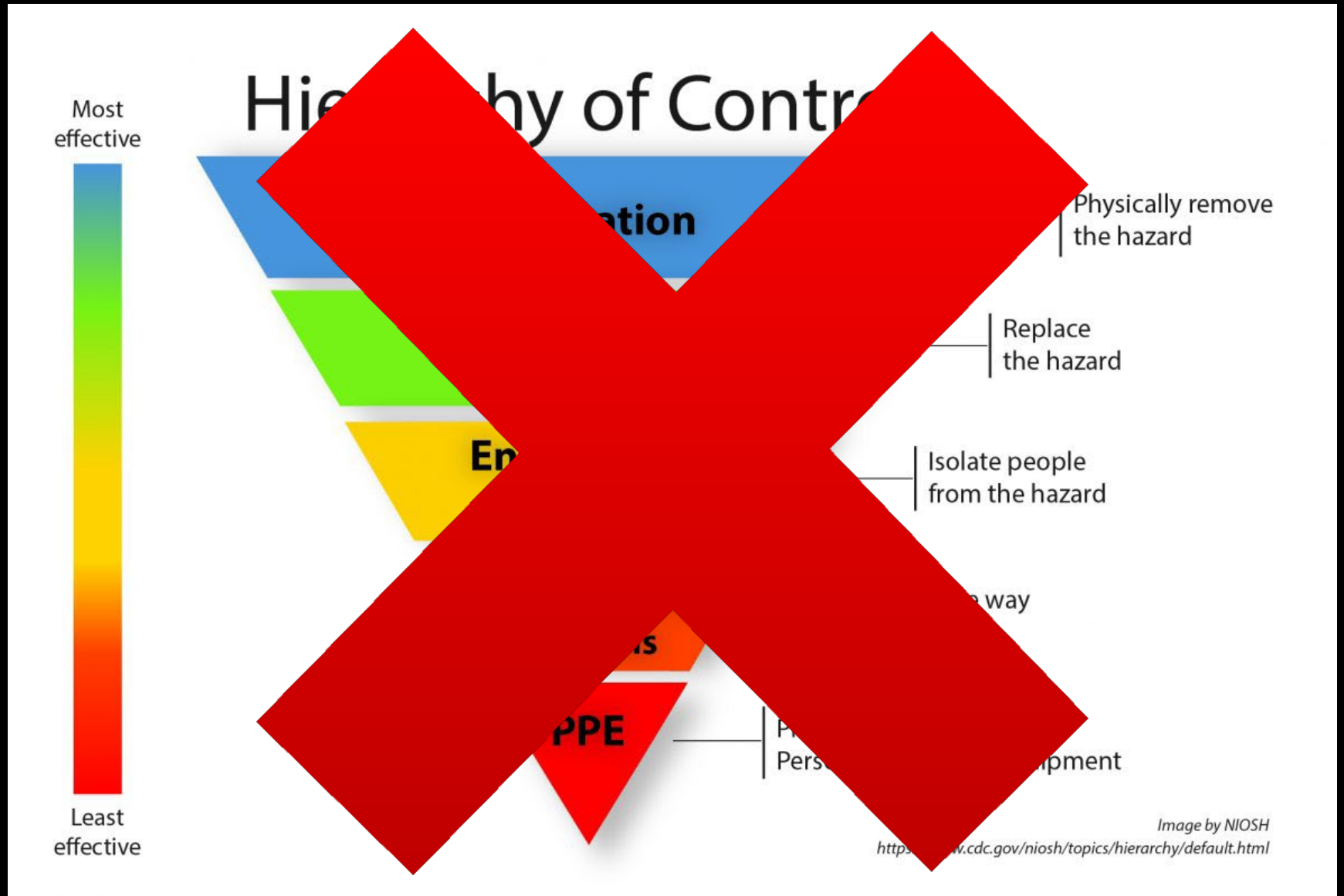
Kahneman and Tversky

Hierarchy of controls



OSHA & CDC

Hierarchy of controls



The operator is the problem…

- …and the solution?

Sydney Dekker *Field Guide to Understanding Human Error*

Operator competence drives outcomes in high risk environments.

Competence via “Deliberate Practice”

- High reps
- High fidelity
- High feedback

- Overtraining
  - “Learn it until you forget it.”
- Stress inoculation
  - Learn it, then stress it

Anders Ericsson; also Kahneman

Heuristics for good?

- “Fast” thinking…
  - Enables daily living
  - Enables intuition and judgment (based on expertise*)

*See previous slide for how to get there.

(formal) Rules of thumb that work…

(formal) Rules of thumb that work…

ALPTRUTh Situational Awareness		
Clue	**Description**	**Rating**
Avalanches	Avalanches in last 48 hours	
Loading	Loading from snow, wind, etc. in 48 hours	
Path	Known avalanche path by novice	
Terrain	Terrain Traps that increase consequences	
Rating	Avalanche rating >= Considerable	
Unstable	Unstable snow (cracking, whumpfing)	
Thawing	Increase (of 10-15° F in 24 hours)	

Give one point for each condition that exists.

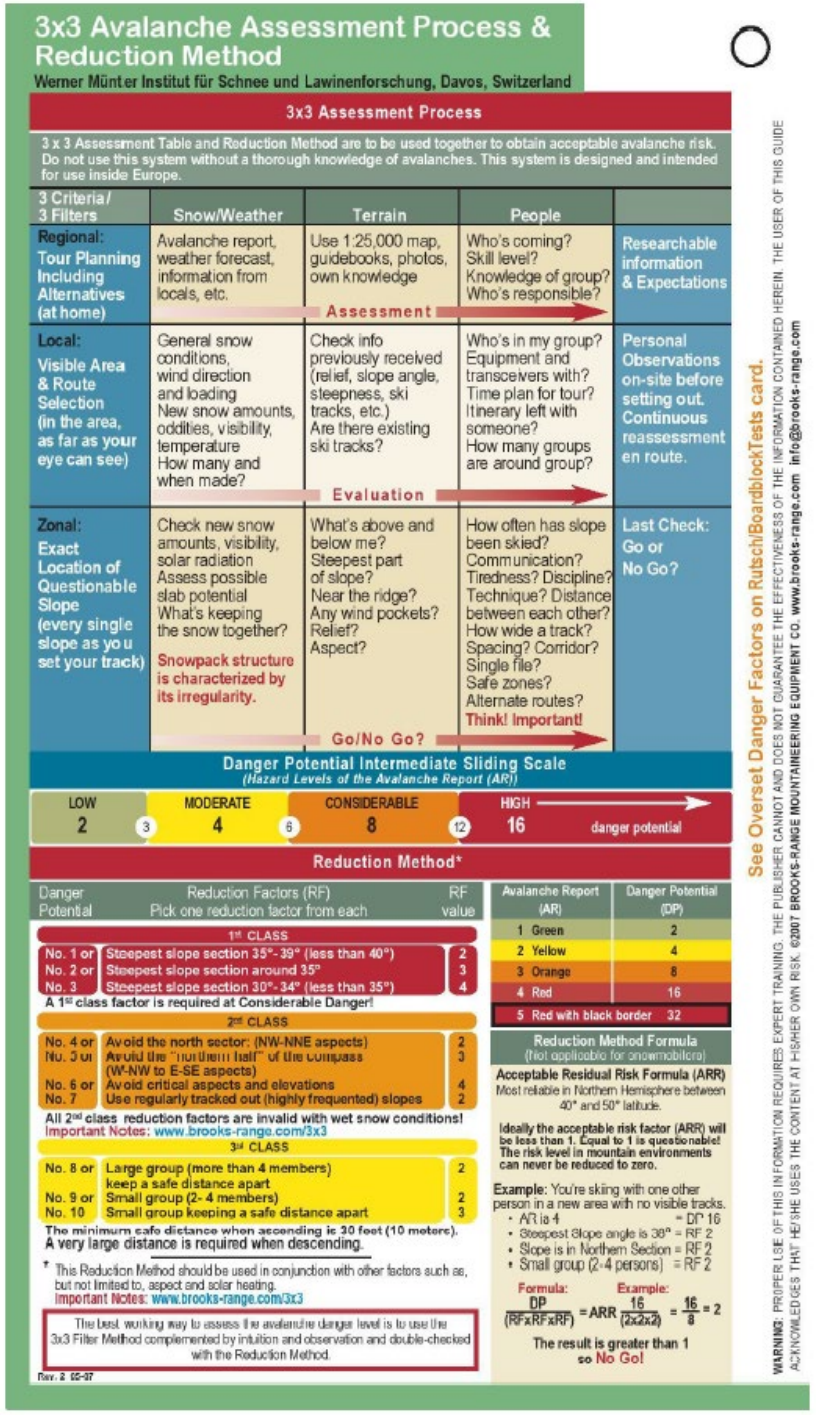
1-2 points: normal caution (2% of accidents)

3-4 points: extra caution (21% of accidents)

5-7 points: travel not recommended (77% of accidents)

Developed by Ian McCammon, SnowPit Technologies. Table by BeaconReviews.com.

(formal) Rules rk...



3x3 Avalanche Assessment Process & Reduction Method

Werner Münter Institut für Schnee und Lawinenforschung, Davos, Switzerland

3x3 Assessment Process

3 x 3 Assessment Table and Reduction Method are to be used together to obtain acceptable avalanche risk. Do not use this system without a thorough knowledge of avalanches. This system is designed and intended for use inside Europe.

3 Criteria / 3 Filters	Snow/Weather	Terrain	People	
Regional: Tour Planning Including Alternatives (at home)	Avalanche report, weather forecast, information from locals, etc.	Use 1:25,000 map, guidebooks, photos, own knowledge	Who's coming? Skill level? Knowledge of group? Who's responsible?	Researchable information & Expectations
		Assessment →		
Local: Visible Area & Route Selection (in the area, as far as your eye can see)	General snow conditions, wind direction and loading New snow amounts, oddities, visibility, temperature How many and when made?	Check info previously received (relief, slope angle, steepness, ski tracks, etc.) Are there existing ski tracks?	Who's in my group? Equipment and transceivers with? Time plan for tour? Itinerary left with someone? How many groups are around group?	Personal Observations on-site before setting out. Continuous reassessment en route.
		Evaluation →		
Zonal: Exact Location of Questionable Slope (every single slope as you set your track)	Check new snow amounts, visibility, solar radiation Assess possible slab potential What's keeping the snow together? **Snowpack structure is characterized by its irregularity.**	What's above and below me? Steepest part of slope? Near the ridge? Any wind pockets? Relief? Aspect?	How often has slope been skied? Communication? Tiredness? Discipline? Technique? Distance between each other? How wide a track? Spacing? Corridor? Single file? Safe zones? Alternate routes? **Think! Important!**	Last Check: Go or No Go?
		Go/No Go? →		

Danger Potential Intermediate Sliding Scale

(Hazard Levels of the Avalanche Report (AR))

LOW		MODERATE		CONSIDERABLE		HIGH	
2	3	4	6	8	12	16	danger potential

Reduction Method*

Danger Potential	Reduction Factors (RF) Pick one reduction factor from each	RF value
1st CLASS		
No. 1 or	Steepest slope section 35°-39° (less than 40°)	2
No. 2 or	Steepest slope section around 35°	3
No. 3	Steepest slope section 30°-34° (less than 35°)	4
A 1st class factor is required at Considerable Danger!		
2nd CLASS		
No. 4 or	Avoid the north sector: (NW-NNE aspects)	2
No. 5 or	Avoid the "northern half" of the compass (W-NW to E-SE aspects)	3
No. 6 or	Avoid critical aspects and elevations	4
No. 7	Use regularly tracked out (highly frequented) slopes	2
All 2nd class reduction factors are invalid with wet snow conditions! Important Notes: www.brooks-range.com/3x3		
3rd CLASS		
No. 8 or	Large group (more than 4 members) keep a safe distance apart	2
No. 9 or	Small group (2- 4 members)	2
No. 10	Small group keeping a safe distance apart	3
The minimum safe distance when ascending is 30 feet (10 meters). A very large distance is required when descending.		

* This Reduction Method should be used in conjunction with other factors such as, but not limited to, aspect and solar heating.
Important Notes: www.brooks-range.com/3x3

The best working way to assess the avalanche danger level is to use the 3x3 Filter Method complemented by intuition and observation and double-checked with the Reduction Method.

Rev. 2 05-07

Avalanche Report (AR)	Danger Potential (DP)
1 Green	2
2 Yellow	4
3 Orange	8
4 Red	16
5 Red with black border	32

Reduction Method Formula
(Not applicable for snowmobilers)

Acceptable Residual Risk Formula (ARR)
Most reliable in Northern Hemisphere between 40° and 50° latitude.

Ideally the acceptable risk factor (ARR) will be less than 1. Equal to 1 is questionable! The risk level in mountain environments can never be reduced to zero.

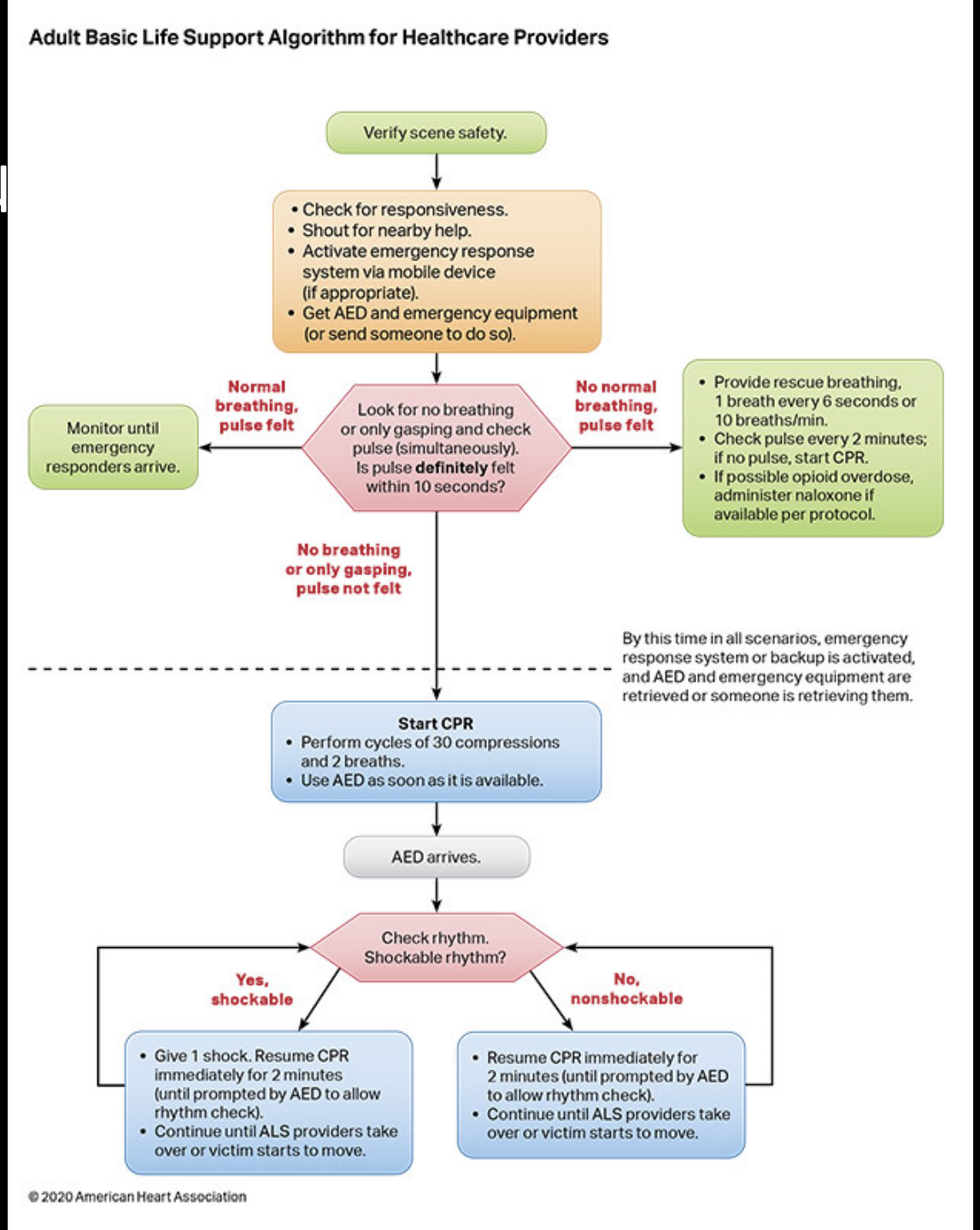
Example: You're skiing with one other person in a new area with no visible tracks.
- AR is 4 = DP 16
- Steepest Slope angle is 38° = RF 2
- Slope is in Northern Section = RF 2
- Small group (2-4 persons) = RF 2

Formula: $\frac{DP}{(RF \times RF \times RF)} = ARR$ Example: $\frac{16}{(2 \times 2 \times 2)} = \frac{16}{8} = 2$

The result is greater than 1 so No Go!

See Overset Danger Factors on Rutsch/BoardblockTests card.

(formal) Ru .


Adult Basic Life Support Algorithm for Healthcare Providers
Verify scene safety.
• Check for responsiveness.
• Shout for nearby help.
• Activate emergency response system via mobile device (if appropriate).
• Get AED and emergency equipment (or send someone to do so).
Look for no breathing or only gasping and check pulse (simultaneously). Is pulse definitely felt within 10 seconds?
Normal breathing, pulse felt
Monitor until emergency responders arrive.
No normal breathing, pulse felt
• Provide rescue breathing, 1 breath every 6 seconds or 10 breaths/min.
• Check pulse every 2 minutes; if no pulse, start CPR.
• If possible opioid overdose, administer naloxone if available per protocol.
No breathing or only gasping, pulse not felt
By this time in all scenarios, emergency response system or backup is activated, and AED and emergency equipment are retrieved or someone is retrieving them.
Start CPR
• Perform cycles of 30 compressions and 2 breaths.
• Use AED as soon as it is available.
AED arrives.
Check rhythm. Shockable rhythm?
Yes, shockable
• Give 1 shock. Resume CPR immediately for 2 minutes (until prompted by AED to allow rhythm check).
• Continue until ALS providers take over or victim starts to move.
No, nonshockable
• Resume CPR immediately for 2 minutes (until prompted by AED to allow rhythm check).
• Continue until ALS providers take over or victim starts to move.
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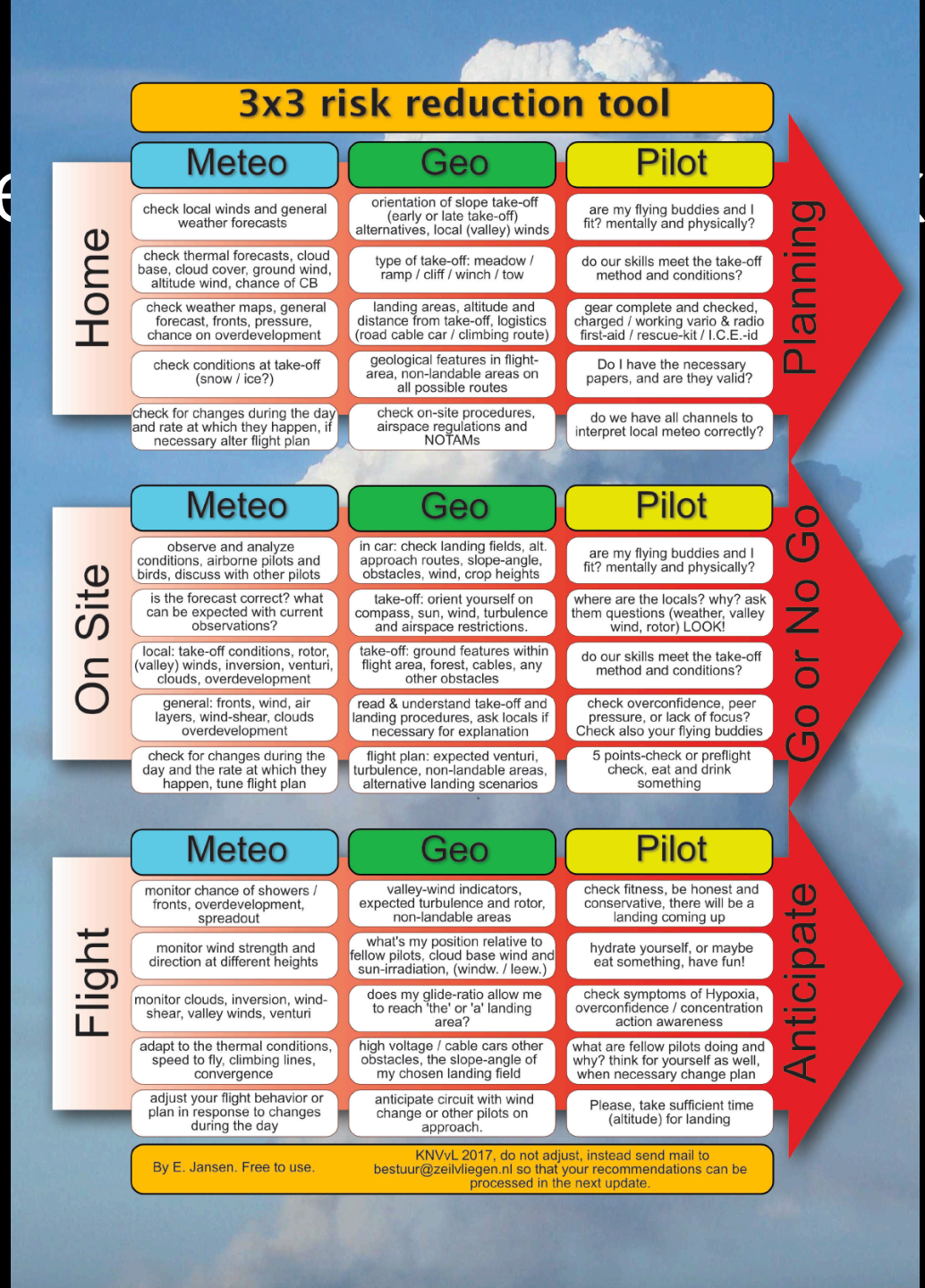
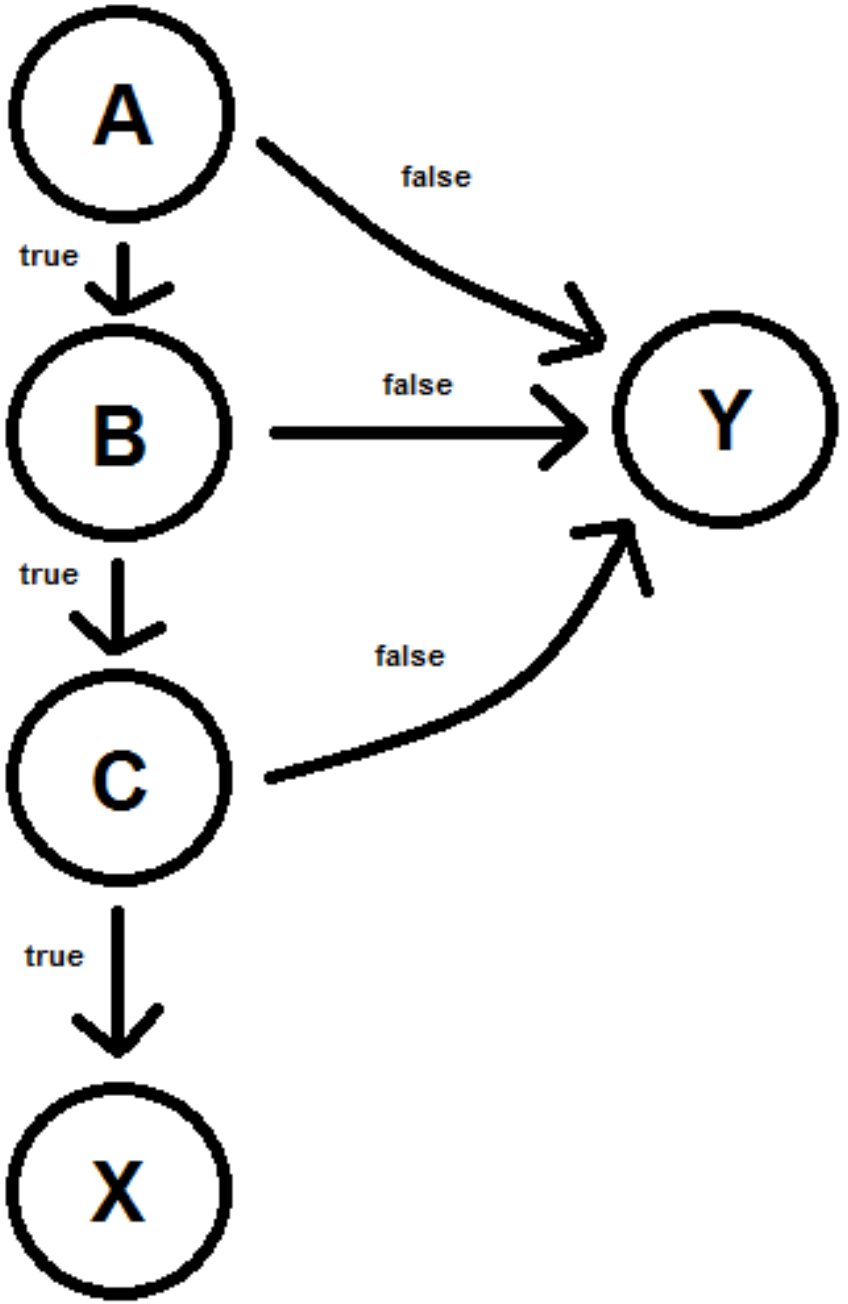
(formal) Rule …


3x3 risk reduction tool
Meteo
Geo
Pilot
Home
check local winds and general weather forecasts
orientation of slope take-off (early or late take-off) alternatives, local (valley) winds
are my flying buddies and I fit? mentally and physically?
check thermal forecasts, cloud base, cloud cover, ground wind, altitude wind, chance of CB
type of take-off: meadow / ramp / cliff / winch / tow
do our skills meet the take-off method and conditions?
check weather maps, general forecast, fronts, pressure, chance on overdevelopment
landing areas, altitude and distance from take-off, logistics (road cable car / climbing route)
gear complete and checked, charged / working vario & radio first-aid / rescue-kit / I.C.E.-id
check conditions at take-off (snow / ice?)
geological features in flight-area, non-landable areas on all possible routes
Do I have the necessary papers, and are they valid?
check for changes during the day and rate at which they happen, if necessary alter flight plan
check on-site procedures, airspace regulations and NOTAMs
do we have all channels to interpret local meteo correctly?
Planning
Meteo
Geo
Pilot
On Site
observe and analyze conditions, airborne pilots and birds, discuss with other pilots
in car: check landing fields, alt. approach routes, slope-angle, obstacles, wind, crop heights
are my flying buddies and I fit? mentally and physically?
is the forecast correct? what can be expected with current observations?
take-off: orient yourself on compass, sun, wind, turbulence and airspace restrictions.
where are the locals? why? ask them questions (weather, valley wind, rotor) LOOK!
local: take-off conditions, rotor, (valley) winds, inversion, venturi, clouds, overdevelopment
take-off: ground features within flight area, forest, cables, any other obstacles
do our skills meet the take-off method and conditions?
general: fronts, wind, air layers, wind-shear, clouds overdevelopment
read & understand take-off and landing procedures, ask locals if necessary for explanation
check overconfidence, peer pressure, or lack of focus? Check also your flying buddies
check for changes during the day and the rate at which they happen, tune flight plan
flight plan: expected venturi, turbulence, non-landable areas, alternative landing scenarios
5 points-check or preflight check, eat and drink something
Go or No Go
Meteo
Geo
Pilot
Flight
monitor chance of showers / fronts, overdevelopment, spreadout
valley-wind indicators, expected turbulence and rotor, non-landable areas
check fitness, be honest and conservative, there will be a landing coming up
monitor wind strength and direction at different heights
what's my position relative to fellow pilots, cloud base wind and sun-irradiation, (windw. / leew.)
hydrate yourself, or maybe eat something, have fun!
monitor clouds, inversion, wind-shear, valley winds, venturi
does my glide-ratio allow me to reach 'the' or 'a' landing area?
check symptoms of Hypoxia, overconfidence / concentration action awareness
adapt to the thermal conditions, speed to fly, climbing lines, convergence
high voltage / cable cars other obstacles, the slope-angle of my chosen landing field
what are fellow pilots doing and why? think for yourself as well, when necessary change plan
adjust your flight behavior or plan in response to changes during the day
anticipate circuit with wind change or other pilots on approach.
Please, take sufficient time (altitude) for landing
Anticipate
By E. Jansen. Free to use.
KNVvL 2017, do not adjust, instead send mail to bestuur@zeilvliegen.nl so that your recommendations can be processed in the next update.

(formal) Rule



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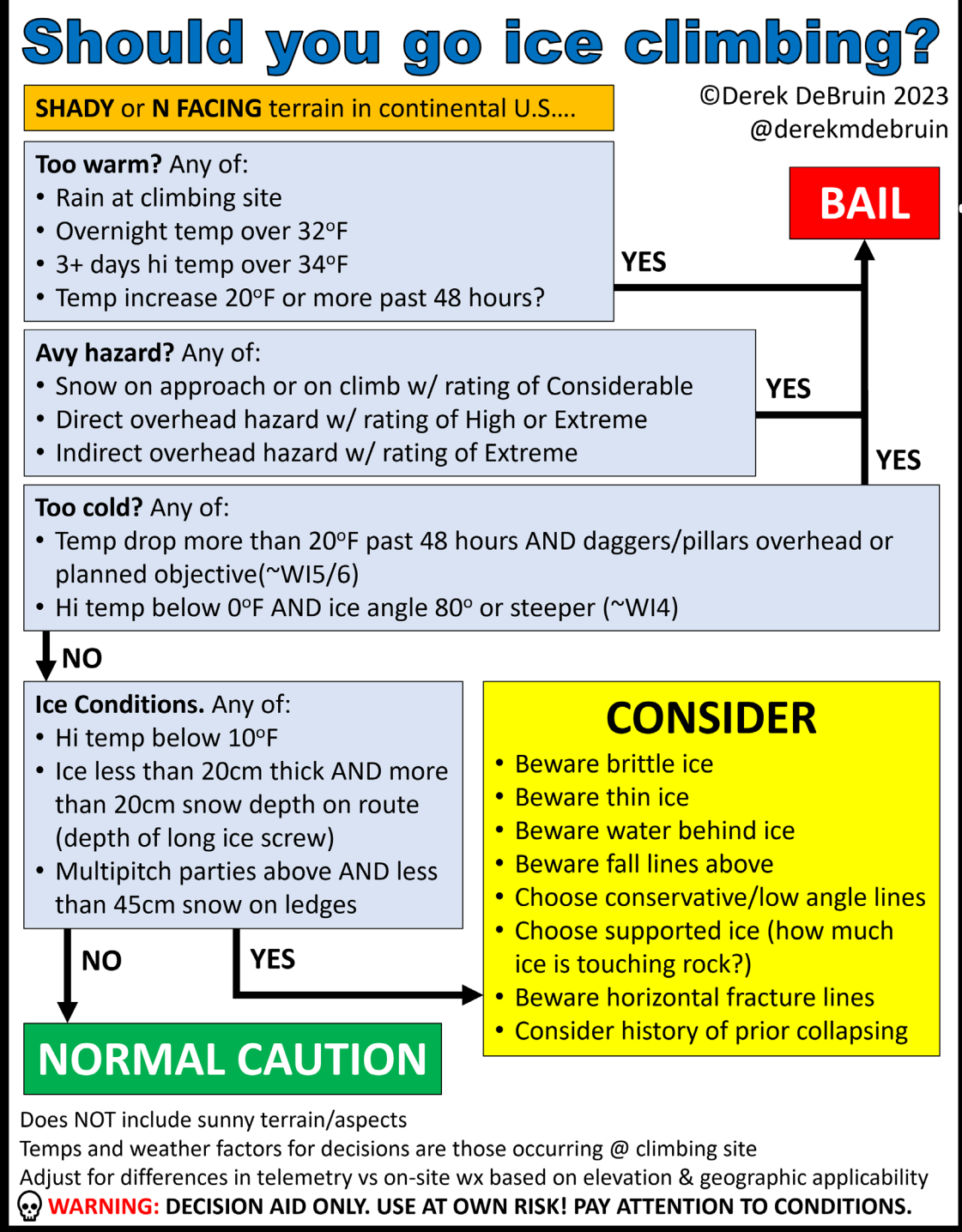
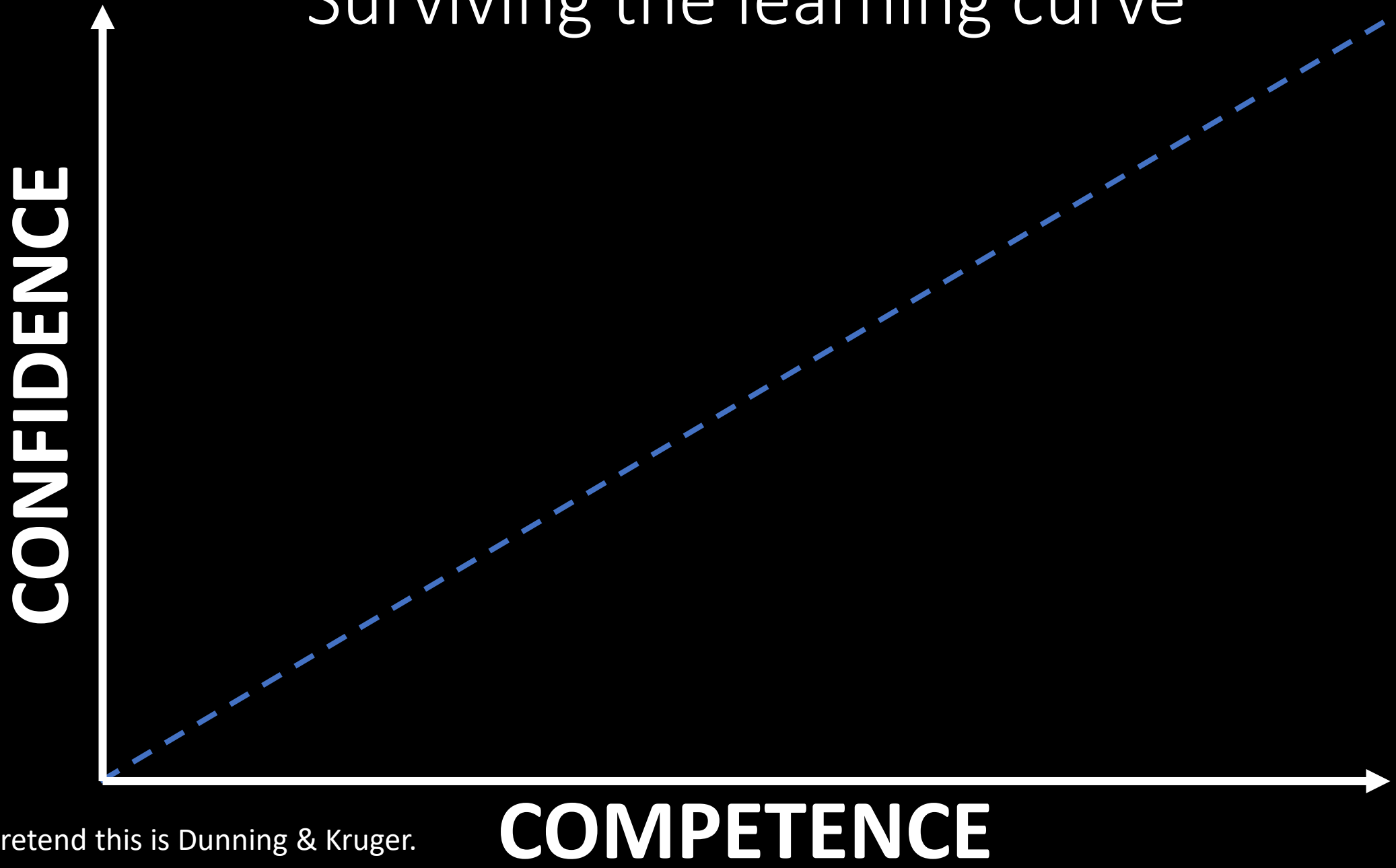

Should you go ice climbing?
©Derek DeBruin 2023
@derekmdebruin
SHADY or N FACING terrain in continental U.S....
Too warm? Any of:
• Rain at climbing site
• Overnight temp over 32°F
• 3+ days hi temp over 34°F
• Temp increase 20°F or more past 48 hours?
YES
BAIL
Avy hazard? Any of:
• Snow on approach or on climb w/ rating of Considerable
• Direct overhead hazard w/ rating of High or Extreme
• Indirect overhead hazard w/ rating of Extreme
YES
YES
Too cold? Any of:
• Temp drop more than 20°F past 48 hours AND daggers/pillars overhead or planned objective(~WI5/6)
• Hi temp below 0°F AND ice angle 80° or steeper (~WI4)
NO
Ice Conditions. Any of:
• Hi temp below 10°F
• Ice less than 20cm thick AND more than 20cm snow depth on route (depth of long ice screw)
• Multipitch parties above AND less than 45cm snow on ledges
NO
YES
CONSIDER
• Beware brittle ice
• Beware thin ice
• Beware water behind ice
• Beware fall lines above
• Choose conservative/low angle lines
• Choose supported ice (how much ice is touching rock?)
• Beware horizontal fracture lines
• Consider history of prior collapsing
NORMAL CAUTION
Does NOT include sunny terrain/aspects
Temps and weather factors for decisions are those occurring @ climbing site
Adjust for differences in telemetry vs on-site wx based on elevation & geographic applicability
WARNING: DECISION AID ONLY. USE AT OWN RISK! PAY ATTENTION TO CONDITIONS.

Tacet vs explicit knowledge

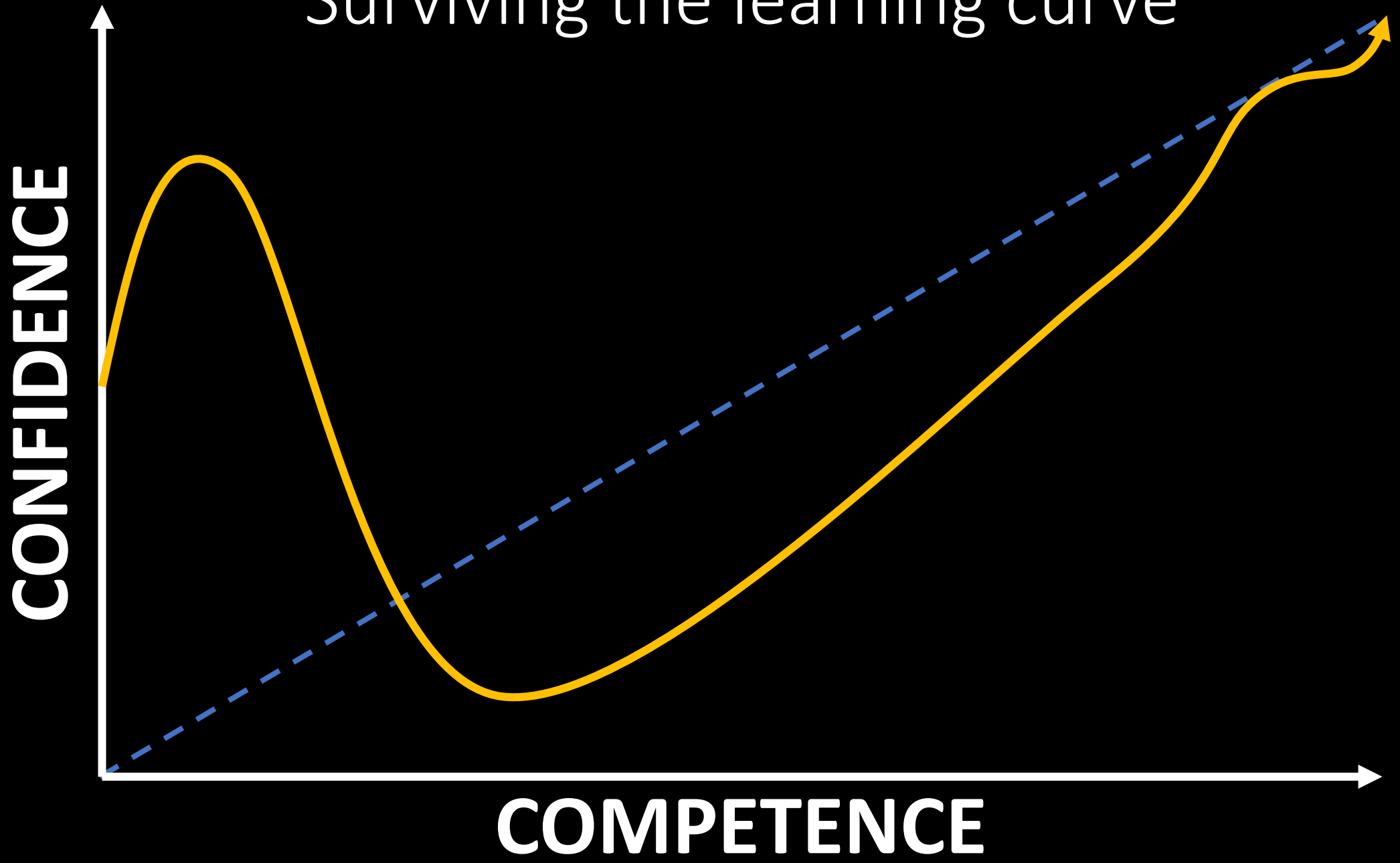
- How to turn a rookie into a silverback…

Surviving the learning curve

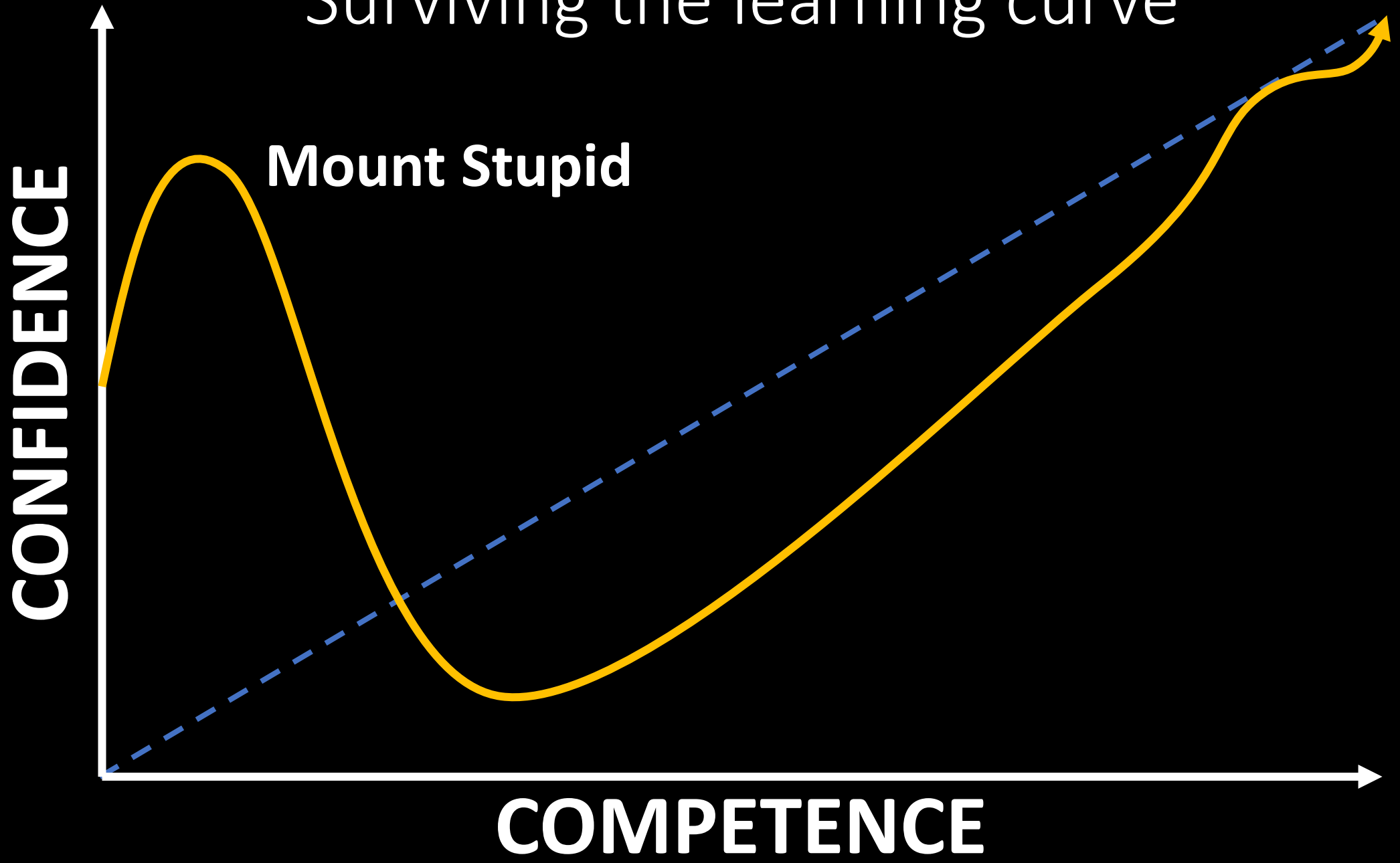


Let’s pretend this is Dunning & Kruger.

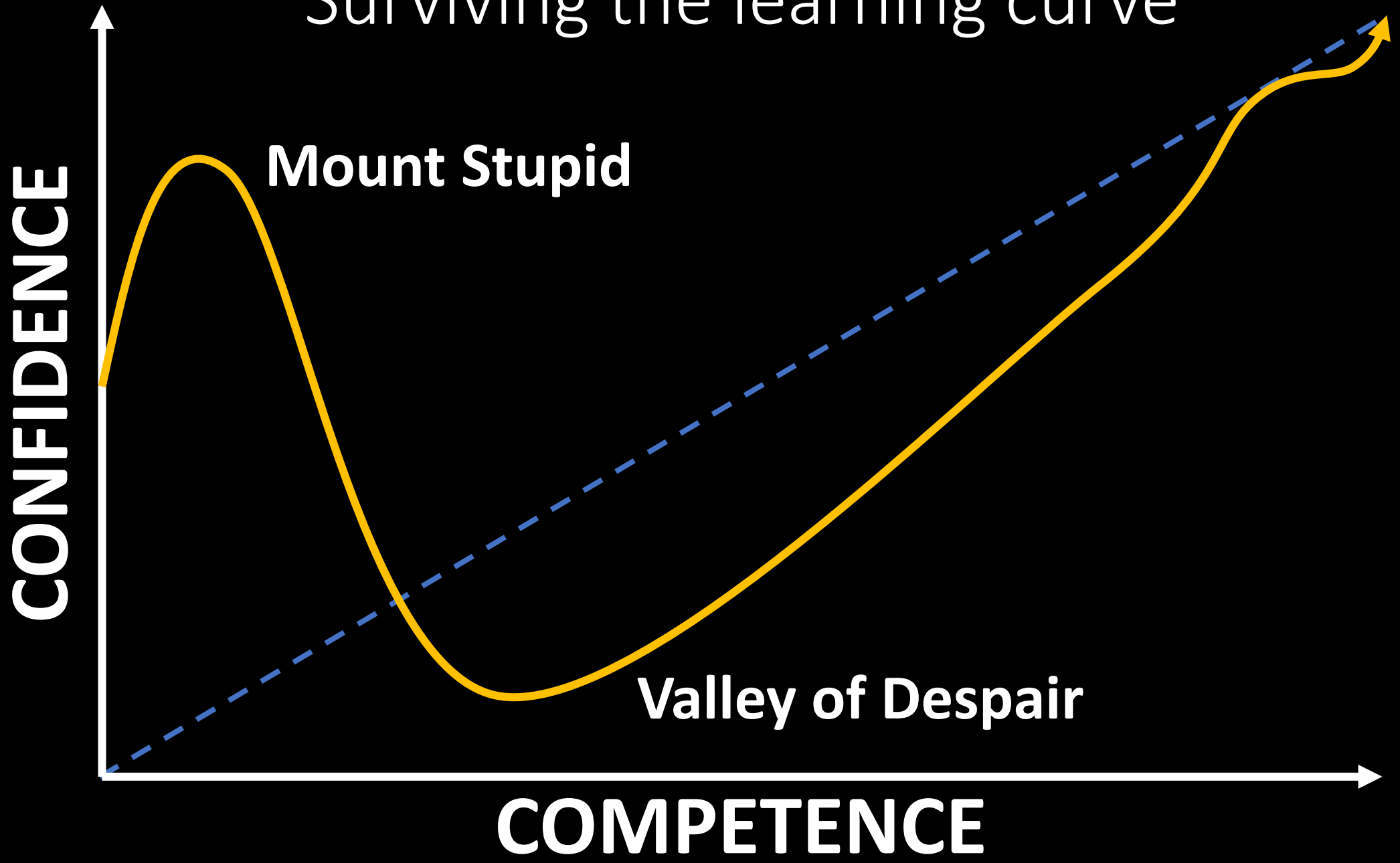
Surviving the learning curve



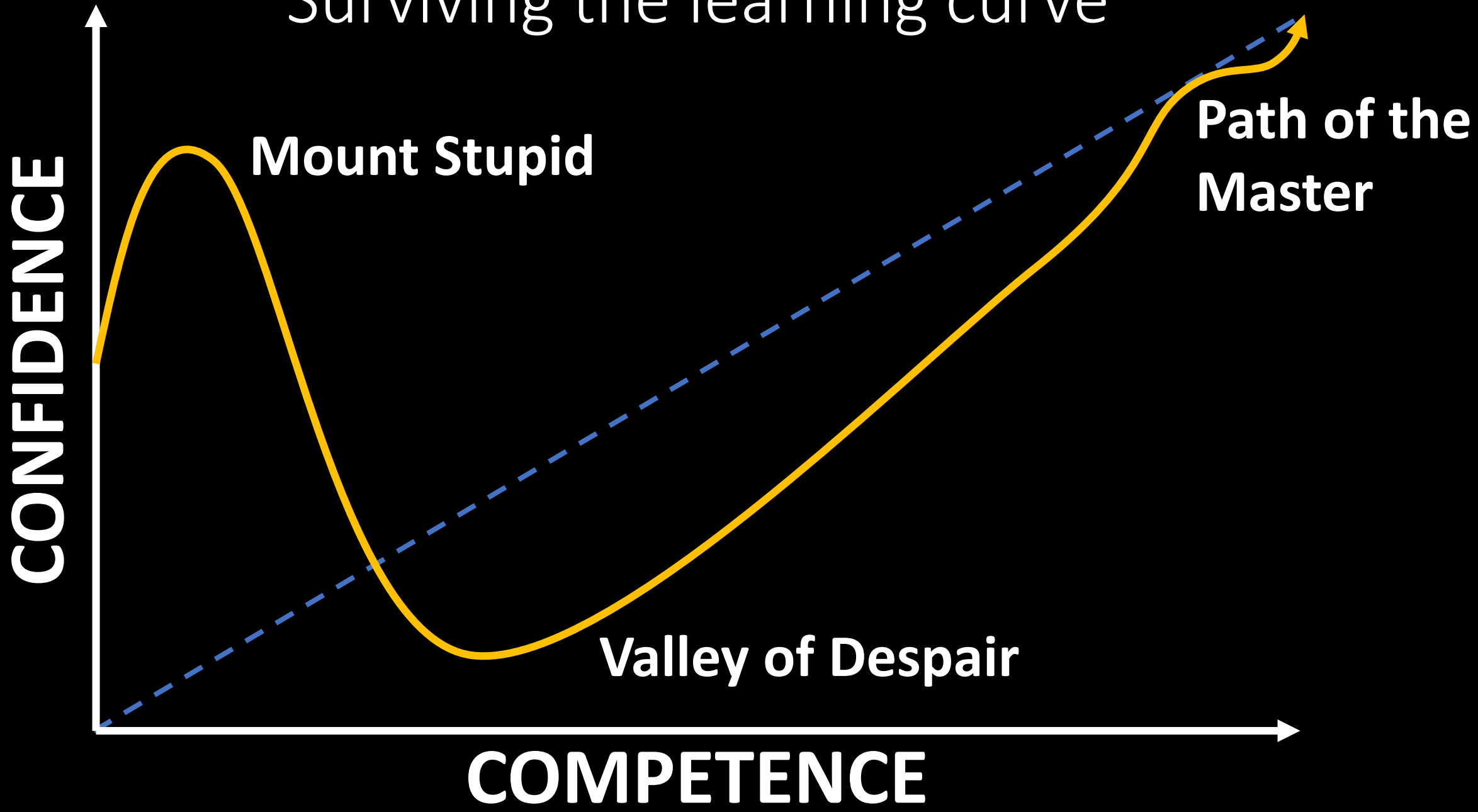
Surviving the learning curve



Surviving the learning curve



Surviving the learning curve



Experts work the problem one thing at a time.

Kahneman & Klein “A failure to disagree.”

A rule of thumb to share…

- One rope per person
- Keep it under 30 degrees
- Slow is smooth, smooth is fast
- 2 things between you and the deck
- Look good, feel good, safety third
- 3 bad things means bail
- Resuscitate, then intubate
- Think like the leader
- How do we die today?
- Believe your upset stomach
- Keep one foot in the black
- Time is tissue
- First guy is never wrong
- Keep the goal the goal
- Something else here…

- Something else here…

- Something else here…

So what?

- Train often
  - High reps
  - High fidelity
  - High feedback
- Find good heuristics
  - Use them
  - Communicate them

And…

- Sometimes you’re just off your game

Think of a call that didn’t go so great…

- Enough sleep?

Think of a call that didn’t go so great…

- Enough sleep?
- Feeling physically well?

Think of a call that didn’t go so great…

- Enough sleep?
- Feeling physically well?
- Work relationships?

Think of a call that didn’t go so great…

- Enough sleep?
- Feeling physically well?
- Work relationships?
- Organized/on schedule/good logistics?

Think of a call that didn’t go so great…

- Enough sleep?
- Feeling physically well?
- Work relationships?
- Organized/on schedule/good logistics?
- “Same old, same old”

Think of a call that didn’t go so great…

- Enough sleep?
- Feeling physically well?
- Work relationships?
- Organized/on schedule/good logistics?
- “Same old, same old”
- Conditions?

Think of a call that didn’t go so great…

- Enough sleep?
- Feeling physically well?
- Work relationships?
- Organized/on schedule/good logistics?
- “Same old, same old”
- Conditions?
- Personal life distractions?

Think of a call that didn’t go so great…

- Enough sleep?
- Feeling physically well?
- Work relationships?
- Organized/on schedule/good logistics?
- “Same old, same old”
- Conditions?
- Personal life distractions?
- Plan?

Think of a call that didn’t go so great…

- Enough sleep?
- Feeling physically well?
- Work relationships?
- Organized/on schedule/good logistics?
- “Same old, same old”
- Conditions?
- Personal life distractions?
- Plan?
- Communication?

FAA *Pilot’s Handbook of Aeronautical Knowledge*

So…

- Take care of yourself
- Know when you’re off your game

Making it more complicated by adding people

- Mental models
- Comms problems
- Coordination problems

See “Crew Resource Management”

Train hard
Use rules of thumb
Share them with others