Ultralearning

- **Core of strategy**
  - intensity
  - a willingness to prioritize effectiveness
- **Principle 1:Metalearning（Learn about learning）**
  - What
    - Concepts
    - Facts
    - Procedures
    - Draw your map(find bottlenecks)
  - Why（Talk to experts to find out if this helps to reach your goal）
  - How
    - Benchmarking
      - find common ways
      - design a default strategy(ex:curriculum)
    - Emphasize/Exclude(Focus on your goals)
    - Use 5-10 percent of learning time to plan
    - Continue to do research, keep reassessing
- **Principle 2:Focus**
  - How to start
    - recognize you are procrastinating(whether you really want to do something else)
    - unpleasantness about tasks will dissolve in a few minutes, tell yourself to just endure five minutes
    - When you can start for five minutes, go for Pomodoro Technique(25min work,5min break)
    - Break down the goal, give yourself a break when a much easier goal is achieved
  - How to sustain
    - Don't worry too much about not being in a work flow
    - Switch between topics, or even switch between different aspects of a certain task.
    - Length:50min-1hour(most importantly find what fits best for you)
    - Three distraction source
      - Environment(ex: test how your environment affect you, whether listening to music is better?)
      - Task: choose the material that is easier to focus on(can't supersede other considerations)
      - Ex: write notes while reading (more intense strategies to ensure fewer distractions to creep in)
      - Mind: be aware your negative feelings and try to let it pass(believe that the feeling with diminish and try to use Meditation)
  - Create the right kind of focus
    - High Arousal
      - suitable for simple tasks or tasks that require intense concentration for a small target
      - noisy environment increases arousal and sometimes may benefit performance
    - Low Arousal
      - suitable for more complex tasks
      - when you are stuck under intense concentration, take a break
  - Tips — recognize where you are , and start small
- **Principle 3:Directness**
  - Meaning: the idea of learning being tied closely to the situation or context you want to use it in
  - What is learning directly
    - spend a lot of time doing the thing you want to become good at(to pass the exam: have access to the problem sets)
    - practice and study under similar context of your goal
  - The problem of transfer
    - fact — transfer of knowledge is hard to achieve
    - ways to solve it
      - learn with a direct connection
      - directness help with transfer to new situations (shared subtle details can be learned)
      - avoid transfer
        - learn by directly doing
        - create artificial environment to test your skills
        - when not learning a practical skill: remember what you want! Still learn accordingly to your goal!
  - How to learn directly
    - Project-Based Learning (Realize your end goal and try to produce something at the end)
    - Immersive Learning (require larger amounts of practice and exposer yourself to a fuller range of situations)
      - Language: be in the speaking environment
      - Programming: join the communities or open-source projects
    - The Flight Simulator Method (Stimulate the cognitive features)
    - The Overkill Method — increase the challenge, aim for something that will be above the skill level you require
    - Learn Straight from the Source — ask yourself where and how the knowledge will manifest itself
- **Principle 4:Drill**
  - Direct-Then-Drill Approach
    - Identify the rate-determining step in your learning reation
    - 1. Practice directly
    - 2. Analyze the direct skill and try to isolate the difficult components(Practice separately)
    - 3. Go back to practice directly and Intergrate
    - Cycle between Direct and Drill. When you become better and approach toward mastery, you may spend more time on drills
  - Tactics for Designing Drills
    - 1. Time Slicing — Isolate a slice in time
    - 2. Cognitive Components — Try to drill only one component without considering other aspects
    - 3. The Copycat — Copy the parts you don't want to drill
    - 4. The Magnifying Glass Method — spend more time on one component
    - 5. Prerequisite Chaining — No need to learn all the prerequisite knowledge to start, learn them ONLY when you need them.
- **Principle 5:Retrieval**
  - Self-testing perform the best — Pushing difficulty higher and opting for testing oneself well before you are "ready" is more efficient
  - What should be retrieved?
    - Direct practice force you to retrieve what is important
    - Sometimes a certain amount of passive exposure can benefit retrieval practice
  - How to practice Retrival
    - 1. Flash Cards — work well when there's a pairing between a specific use and a particular response
    - 2. Free Recall — recall the main points and arguments
    - 3. The Question-Book Method — Ask one question per section on your notebook with a reference to where the answer is
    - 4. Self-generated Challenges — Use techniques in practice
    - 5. Closed-Book Learning — Cut off the ability to search for hints can be used in any learning activity.
- **Principle 6:Feedback**
  - Three things to be careful about
    - 1. Identify the types of feedbacks. Don't overreact to feedbacks that won't lead to improvements.
    - 2. Don't let overly positive or negative feedbacks to lower your motivation.
    - 2. Don't be afraid to get feedbacks. Learn to dive into the harshest environment.
  - Three types of feedbacks
    - 1. Outcome feedback--Are you doing it wrong? — This gives you an overall assessment. It can provide you with a motivational benchmark to give you updates on your progress. Also, it can show you the relative merits of different methods you are trying.
    - 2. Informational feedback--What are you doing wrong? — This shows you where you can improve but doesn't provide with guidance. It pairs well with Directness because you can get real-time access to a feedback source.
    - 3. The corrective feedbacks--How can you do it right? — The most useful kind of feedback. It usually comes from mentors but you can get it from assignments' answers or flashcards method or active recall by yourself.
    - Be careful, don't easily level up feedbacks. Otherwise, it might cause misinformation.
  - How to improve your feedbacks?
    - 1. Noise cancellation
      - Don't make judgements based on a single, random feedback.
      - Try to measure the credence of feedbacks and modify as well as select sources of feedbacks.
      - Find consistency in feedbacks. If something is brought up multiple times, you know you are getting something.
      - Look for proxy signals, find objective evidence to support the feedbacks.
    - 2. Try to find the difficulty sweetpoint. — Try to find the point where it's difficult for you to predict the outcome of the feedback. This makes sure the task is not too hard nor easy.
    - 3. High intensity, Rapid feedbacks — Throw yourself in such a environment and force yourself to learn more aggressively.
    - 4. Find the right time to get your feedbacks. — The sooner you get feedbacks, the quicker you can adjust your method. However, when encountering difficult problems, getting to answers too fast may change the process to passive reading, so it's the best to set a timer and give yourself enough time to think.
    - 5. Metafeedback — Notice your Learning Rate. Use it to decide whether one method is still good and compare between two methods.
- **Principle 7:Retention**
  - Why we forget?
    - Decay: Forgetting with Time
    - Interference: Overwriting Old Memories with New Ones
    - Forgotten Cues: A Locked Box with No Key — suggests that relearning is much faster
  - How to prevent from forgetting?
    - 1. Spacing
      - Find the best interval point: Too short, lose Efficiency; Too long, forget most of it.
      - Use spaced- repetition system
      - For more integrated tasks, do refresher projects: Relearn for time to time
    - 2. Proceduralization — Emphasize a core set of information much more frequently
    - 3. Overlearning
      - 1. Practice the core elements of a skill
      - 2. Advanced Practice. Higher level of skills ensure the lower level skills are overlearned.
    - 4. Mnemonics
      - 1. Designed to remember very specific information
      - 2. Involve translating abstract or arbitrary information into vivid pictures or maps — keyword method: relate and associate
    - General Rule: Easy to stick to
- **Principle 8:Intuition**
  - How to form intuition?
    - 1. Don't give up on hard problems easily — Give yourself a struggle timer
    - 2. Prove things to understand them — Illusion of explanatory depth: You may not understand a concept as you think
    - 3. Always start with a concrete example — The levels-of-processing effect: How deep you think matters more, while the motivation doesn't matter so much
    - 4. Don't fool yourself!
      - 1. Ask a lot of questions
      - 2. The Feynman Technique
        - (1) Write down the concept of problem
        - (2) Explain how to convey the idea or how to solve the problem
        - (3) When get stuck, go back to find answers
      - 3. When to use the Feynman Technique
        - (1) When you don't know the concept: try to sketch out the broad strokes
        - (2) When you can't solve a problem: Go through explanation you find step by step
        - (3) To expand your intuition: Focus on generating illustrative examples, analogies to explain to others
- **Principle 9:Experimentation**
  - Three types of experimentation
    - 1. Learning Resources(Materials,Methods) How to learn
    - 2. Techniques(Different aspects of skills) What to learn next
    - 3. Style No right or wrong. Make sure to be aware of all the different styles exist.
    - when you choose to try out something, do it intensely for a set amount of time and evaluate
  - How to Experiment
    - 1. Copy and Create Method
      - gives you a starting point
      - need to deconstruct the method to understand why it works
    - 2. Introduce new constraints — push yourself out of routine to try new methods
    - 3. Find superpower in Hybrid of unrelated skills — Mix it up to become integrated
    - 4. Explore the extremes — Search the space of possibilities more effectively and have a broader range of experience
    - 5. Compare Methods Side-by-Side — split the task to compare the efficiency
  - Experimentation ties all the other principles together
- **First Ultralearning Project**
  - Do your Research
    - 1. Identify the topic and its Approximate Scope: ELABORATE your goal!
    - 2. Find the primary resources to use
    - 3. Learn from others' successful attempt: Use the Expert Interview Method
    - 4. Direct practice activities: Directly practice as early as possible
    - 5. Backup materials and drills
  - Schedule your Time
    - Plan ahead!
    - 1. Decide how much time to commit
    - 2. Decide when to learn: Experiment!
    - 3. The length of time for your project: Short better, you may cut a big goal apart
    - Put your plan into the calendar!
    - Do a pilot week to test your plan
  - Execute your Plan
    - Ask yourself whether you have followed the principles all the time
    - 1. Metalearning: — Have you used enough time to prepare?
    - 2. Focus:
      - Are you procrastinating?
      - How long have you sustained the focus?
      - Should you be more concentrated for intensity or more diffuse for creativity?
    - 3. Directness
      - What mental processes are missing from the practice compared to real environment?
      - How to transfer knowledge to life?
    - 4. Drill
      - Are you paying attention to your weakest point and the rate-limiting step?
      - Have you split apart a complex skill?
    - 5. Retrival
      - Are you spending most of your time solving problems and recalling without looking?
      - Are you constantly testing yourself?
    - 6. Feedback
      - Are you getting all honest feedbacks?
      - Do you get a general idea of yourself?
      - Are you overreacting to noisy data?
    - 7. Retention
      - Do you have plan for remembering?
      - Are you turning knowledge to procedures?
      - Are you overlearning the most critical parts?
    - 8. Intuition
      - Have you deeply understand the things?
      - Do you understand why and can you teach it someone else?
    - 9. Experimentation
      - Are you stuck right now?
      - Have you tried to branch out and try new approaches?
  - Evaluate your Result — Learn from both your failures and successes
  - Choose what to do afterwards
    - 1. Maintenance
      - Overlearning to sustain
      - Try to integrate the skill to life!
    - 2. Relearning
      - Suited for hardly used skills
      - Just remember what kind of problems they can solve is enough
    - 3. Mastery — Can be continued with lighter pace or another ultralearning project
  - Alternatives for Ultralearning
    - Low-Intensity habits — Work best when the act of learning is mostly a process of accumulation
    - Formal, structured education — Integrate it with ultralearning