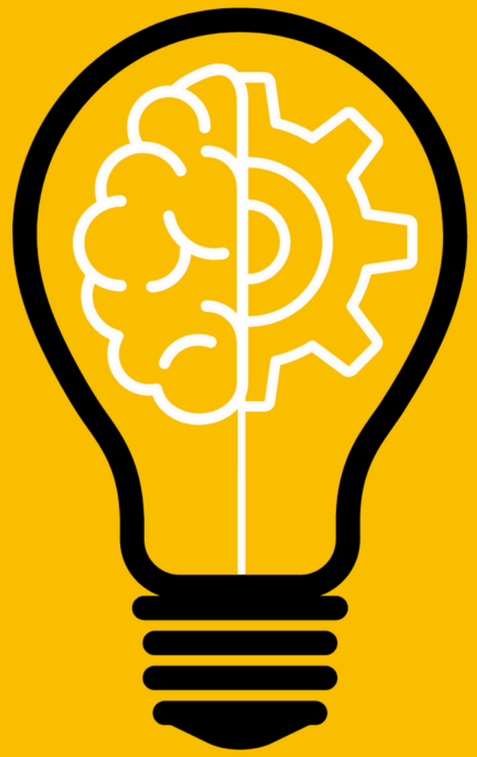


WEEK 5 - LECTURE

Learning & Motivation

Cognitive and Psychological Foundations for Product Design 2024/2025

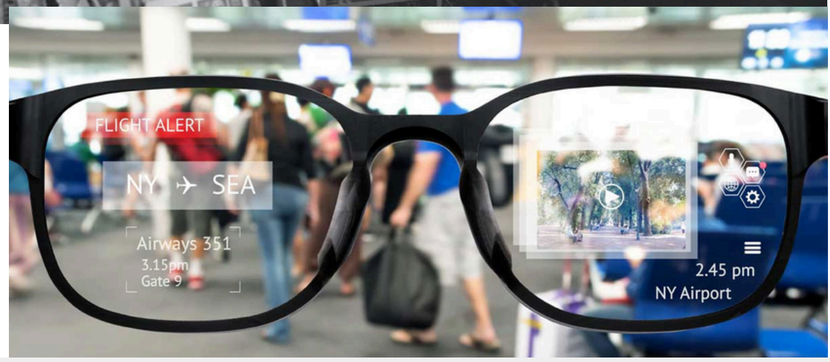
This week

Nov 13	Lecture Week 1: Information Processing & Senses
Nov 20	Lecture Week 2: Attention
Nov 27	Lecture Week 3: Memory
Dec 4	SYNERGY / AIR WEEK
Dec 11	Lecture Week 5: Learning & Motivation
Dec 18	Lecture Week 6: Problem-Solving, Decision-Making & Reasoning
Jan 8	Lecture Week 7: Human-Computer & Human-AI Interaction
Jan 15	Lecture Week 8: Embodied Cognition
Jan 22	Lecture Week 9: Recap & Discussion
Jan 29	Exam

1

LEARNING

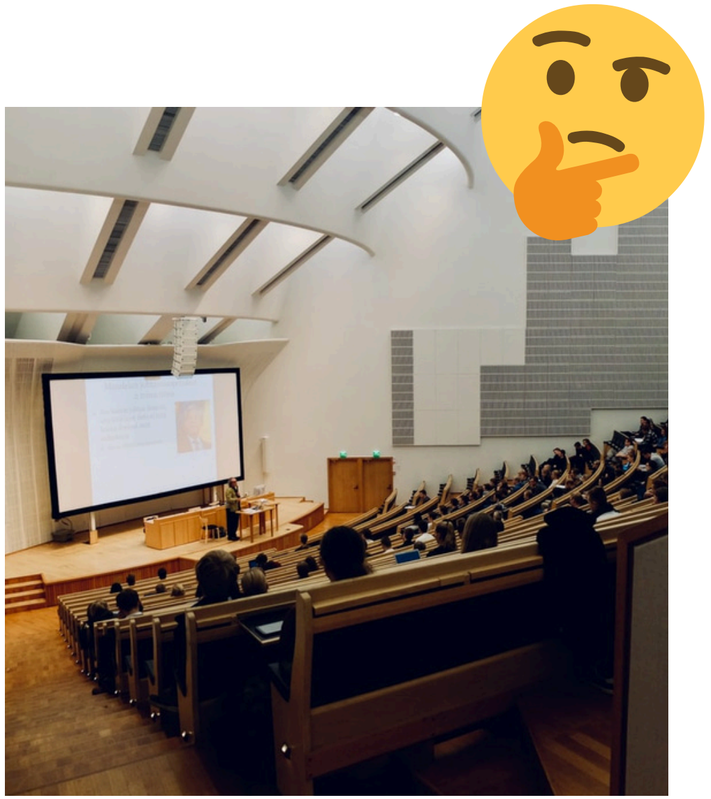
Relevance of Learning for Interactive System Design

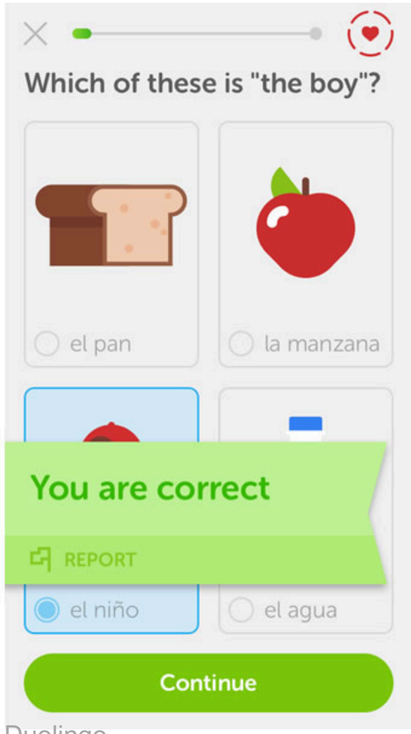


- Learning the interaction with a system
- systems that demands consideration of learning/memory due to the situation it is used in
- system that is specifically designed to help you learn or remember

1.1 Fundamentals

What people think Learning is

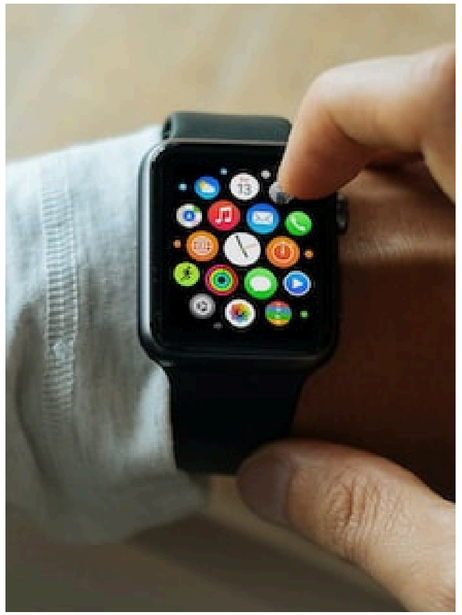




Duolingo

What Learning actually is




Definition

"the **acquisition of knowledge or skills** through study, experience, or being taught."

APA Dictionary

Types of Learning

Automatic vs. Deliberate

Unonsciously vs. Consciously

Passive learning:

- Non-associative learning, e.g., Habituation
- Learning through instructions

Active learning:

- Learner needs to recognize what they know/can do and what not
- Associative learning (learning association between two stimuli, e.g. conditioning)
- Observational learning (social, e.g. from parents, siblings, friends)

https://academicsupport.jhu.edu/resources/study-aids/active-versus-passive-learning/

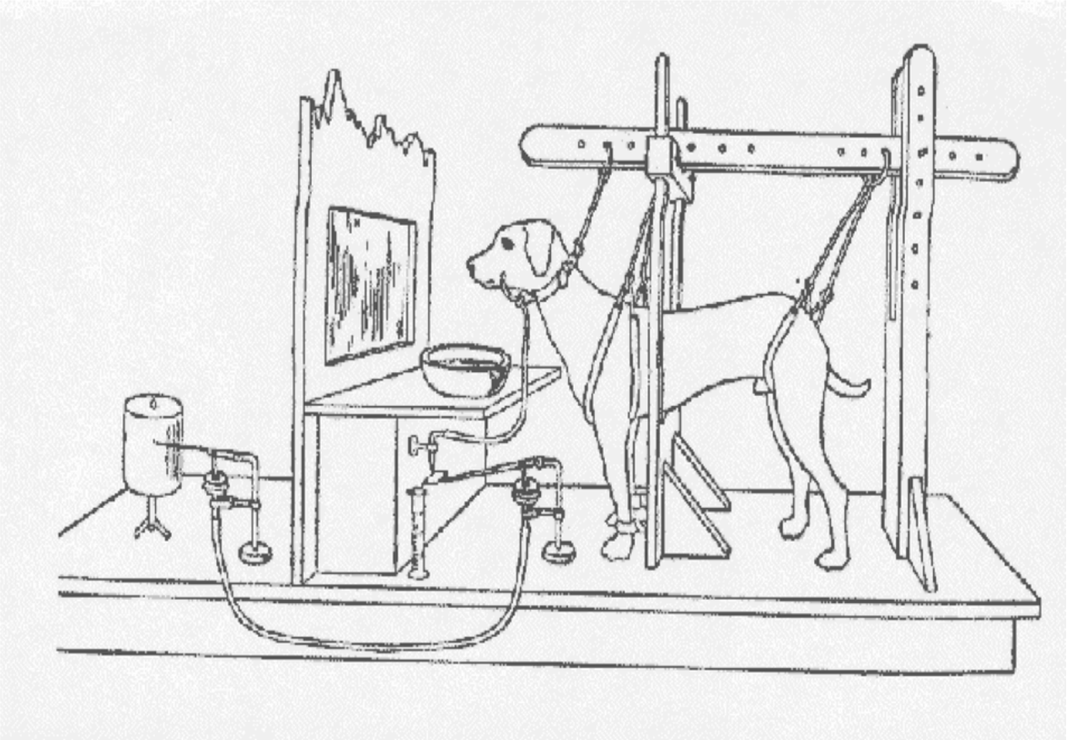
1.2 Behaviorism & Conditioning

Behaviorism – Classical Conditioning

by I. P. Pavlov (1897)

US - Unconditioned Stimulus (Food)
CS - Conditioned Stimulus (Bell)
UR - Unconditioned Reaction (Salivation)
CR - Conditioned Reaction (Salivation)

Initially: US leads to UR
Training: combining US and CS leads to UR
Eventually: CS will lead to UR, now CR



McLeod, S. A. (2018, August 21). Classical conditioning. Simply Psychology. www.simplypsychology.org/classical-conditioning.html

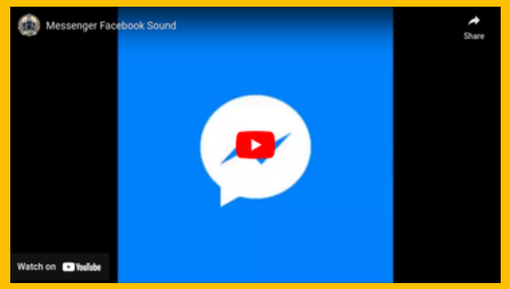
EXERCISE

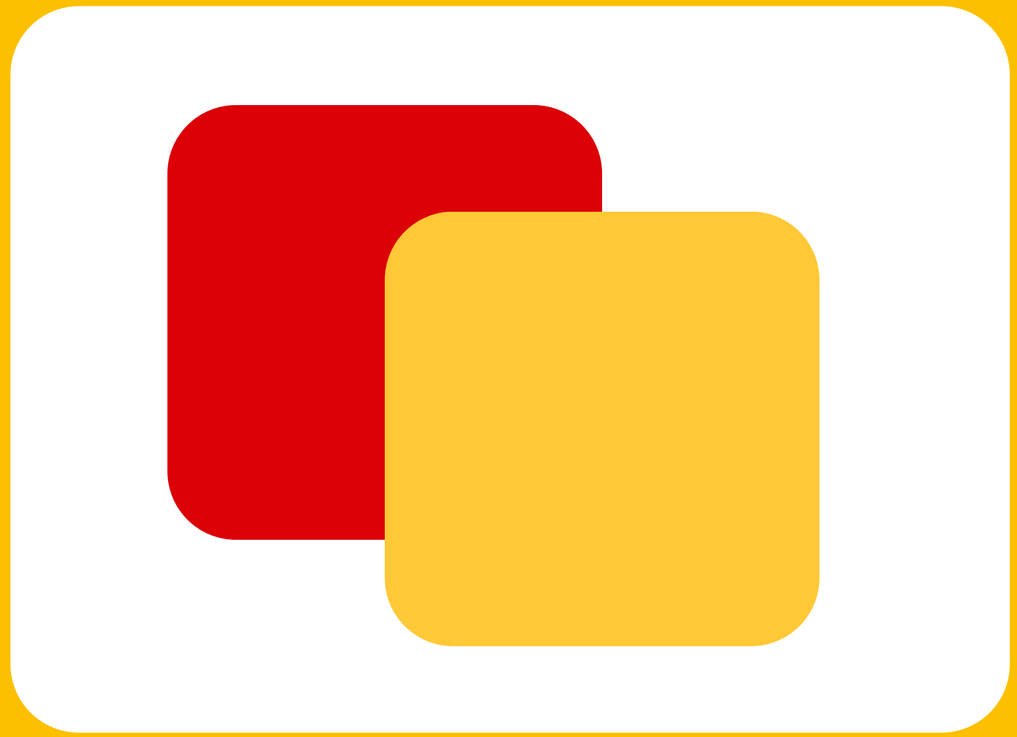
Conditioning in Interaction Design – Creating Experiences

Can you think of examples where classical conditioning is applied in product or system design?

EXERCISE

Conditioning in Interaction Design – Creating Experiences



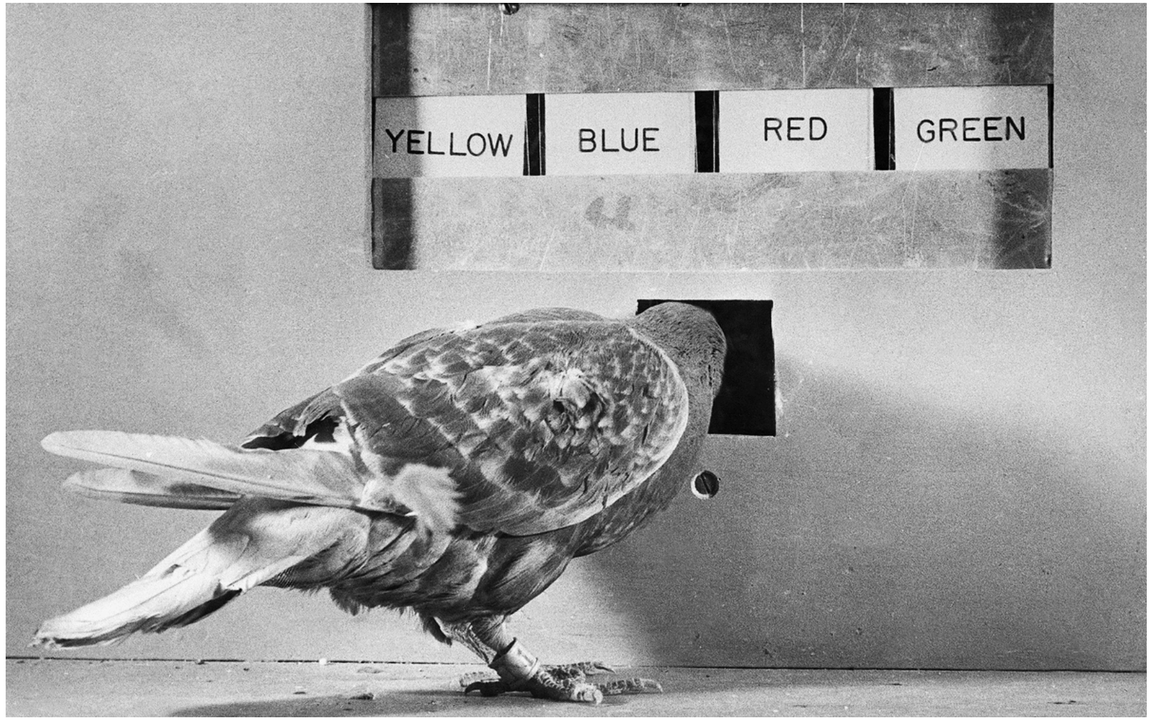


Behaviorism – Operant Conditioning

by B.F. Skinner

It is a learning method that works through reward and punishment of behavior.
Through operant conditioning, an individual associates a particular behavior with a consequence.

Purpose in Product Design:
To encourage desirable user behaviors through positive reinforcement (rewards), negative reinforcement (removal of negative stimuli), and punishment (penalties).



https://hackeducation.com/2018/06/15/pigeons
Skinner, B. F. (1965). Science and human behavior (No. 92904). Simon and Schuster.

Behaviorism – Operant Conditioning

by B.F. Skinner

Let's Rephrase

Positive Reinforcement = do good, get good (something you like)

Negative Reinforcement = do good, and the bad will go away / will be avoided

Positive Punishment (Punishment) = do bad, get bad (something you do not like)

Negative Punishment (Response Cost) = do bad, get something taken away (something you would like to have)

	Increase Occurance of Behavior	Decrease Occurance of Behavior
Stimulus is added	**R+** **Positive Reinforcement**	**P+** **Positive Punishment**
Stimulus is removed	**R-** **Negative Reinforcement**	**P-** **Negative Punishment**

https://hackeducation.com/2018/06/15/pigeons

Gamification

Operant conditioning is foundational to **Gamification**, which uses game-like elements to encourage certain behaviors.

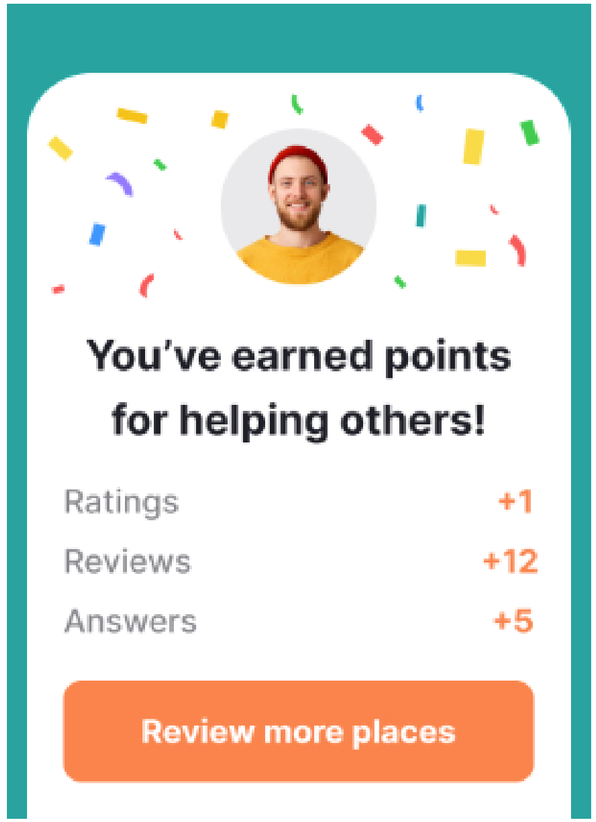
Gamification leverages the principles of operant conditioning by applying rewards, incentives, and sometimes penalties to influence user actions and sustain engagement.

https://www.interaction-design.org/literature/topics/gamification
https://app.uxcel.com/courses/gamification-in-design-context/behaviorism-in-gamification-171

Feedback Loops

- Types of Feedback Loops:
  - **Positive Feedback Loops:** Reward cycles that engage users (e.g., streaks, levels, points).
  - **Negative Feedback Loops:** Encourage users to take corrective actions (e.g., error notifications).

- Feedback timing (immediate, delayed) can impact motivation and user satisfaction



https://www.interaction-design.org/literature/topics/gamification
https://app.uxcel.com/courses/gamification-in-design-context/behaviorism-in-gamification-171

EXERCISE

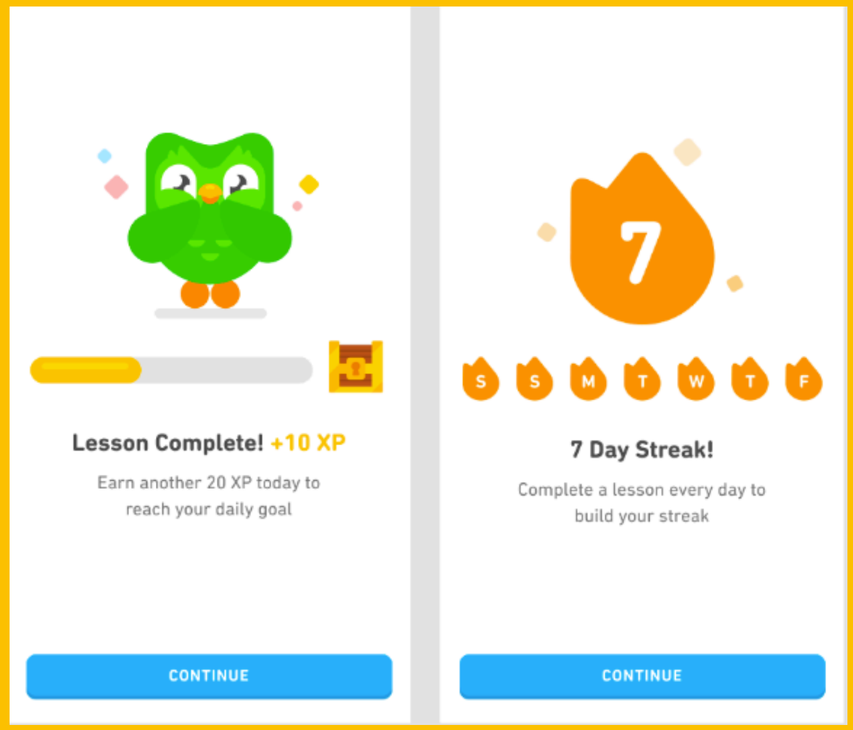
Operant Conditioning in Interaction Design

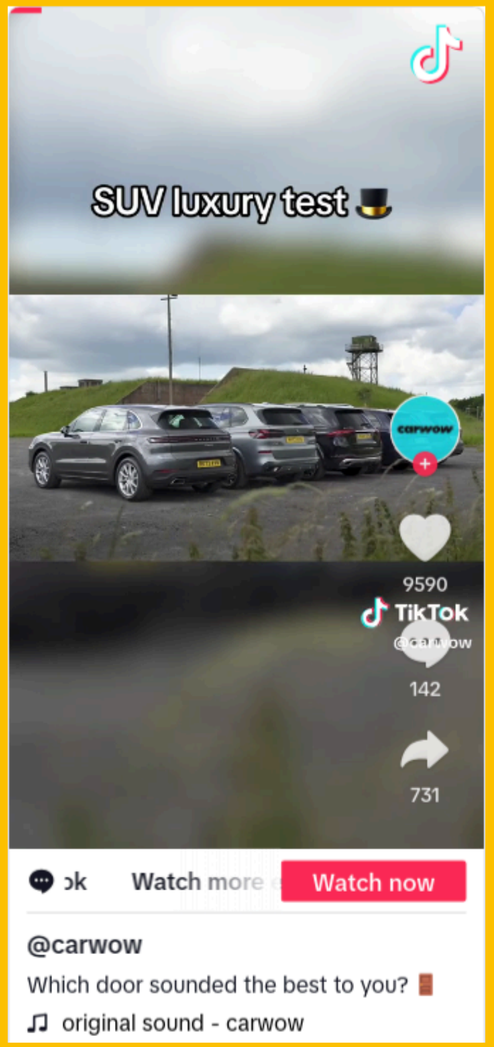
In interaction design, this theory is used to reinforce positive behaviors and discourage unwanted ones -- one way is through **Gamification**. Think of examples where conditioning in the form of gamification is applied to products, applications or systems.

EXERCISE

Operant Conditioning in Interaction Design

In interaction design, this theory is used to reinforce positive behaviors and discourage unwanted ones -- one way is through **Gamification**. Think of examples where conditioning in the form of gamification is applied to products, applications or systems.





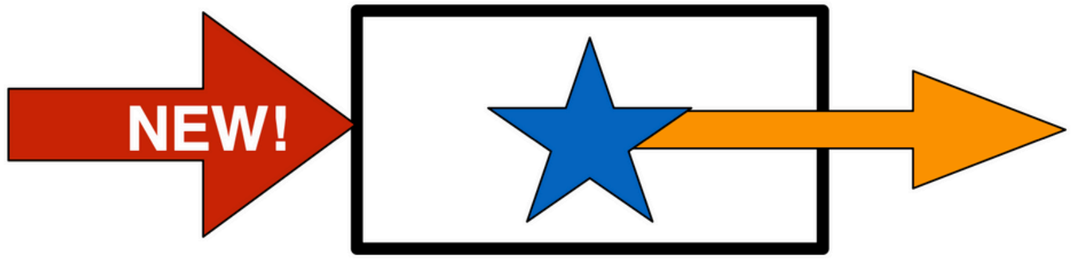
Constructivism

by J. Piaget

- Assumes subjective interpretation of sensory input by a human
- Learning happens through assimilation or accommodation (based on prior knowledge)

In Interaction Design:
Active construction of knowledge, e.g., through tutorials, sandbox environments, or onboarding procedures.

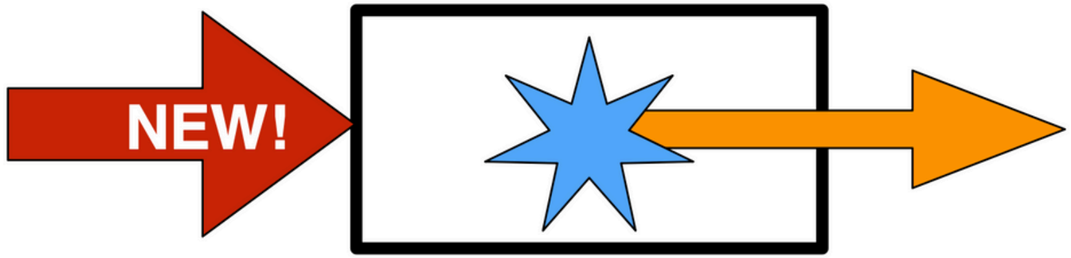
Assimilation (understanding):



Select schema, integrate

(Presented information must be familiar to some extent)

Accommodation (learning):



Modify schema

(Presented information must be different from existing knowledge)

How are memory and learning intertwined?

- Learning and memory are closely related concepts.
  - Learning is the acquisition of skill or knowledge
  - Memory is the expression of what you've acquired.

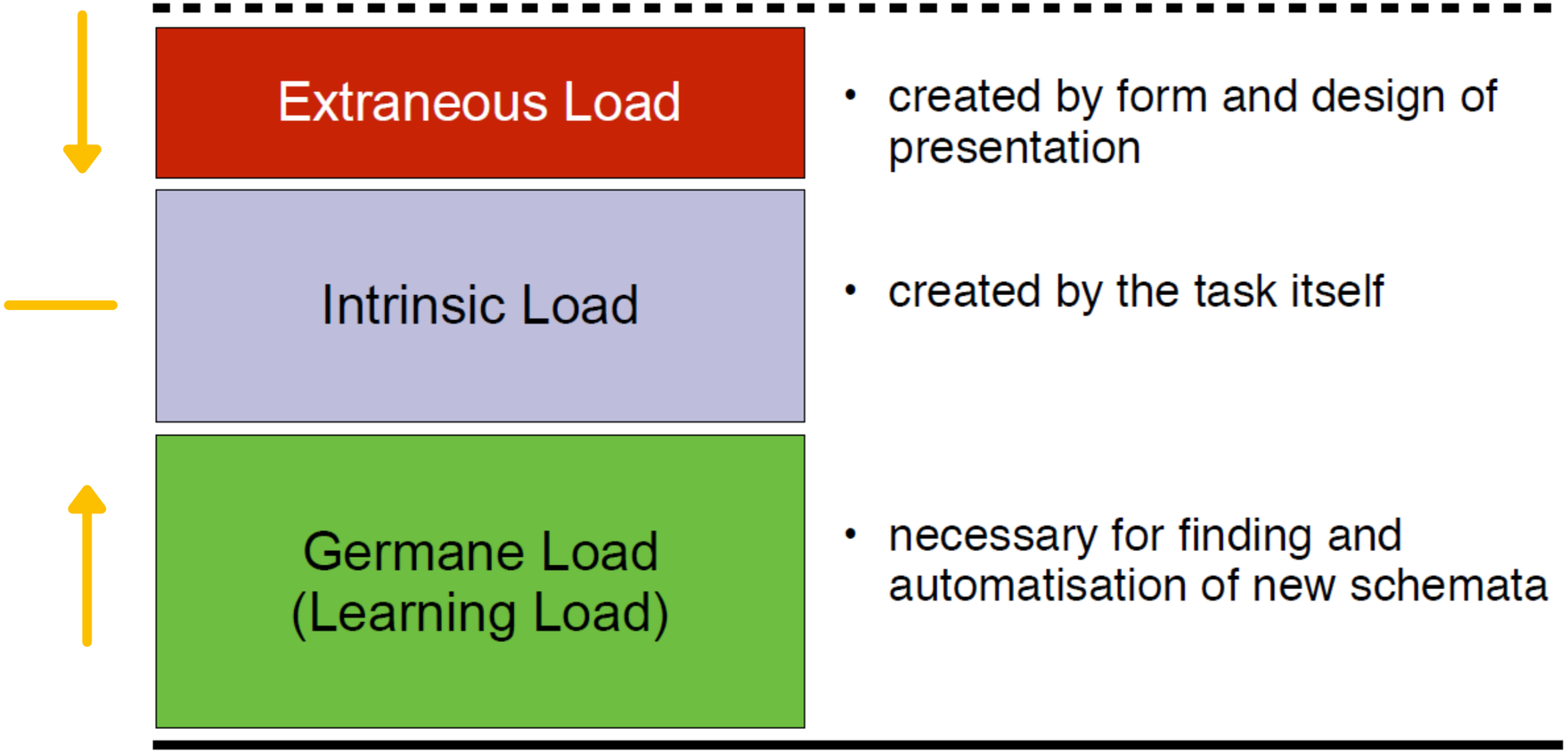
- Memory is essential to all learning because it lets you store and retrieve the information that you learn.

- Understanding creates stronger memories

https://www.apa.org/topics/learning-memory#:~:text=Learning%20and%20memory%20are%20closely,slowly%20and%20laboriously%2C%20that's%20learning

1.3 Enhancing Learning and Training

Cognitive Load Theory



Kirschner, P. A. (2002). Cognitive load theory: Implications of cognitive load theory on the design of learning. Learning and instruction, 12(1), 1-10.

10 Strategies

How to moderate intrinsic load, enhance focus on germane load and minimixe extraneous load:

1. Training support and error prevention
2. Task simplification
3. Part-time training
4. Active learning
5. Multi-media instructions
6. Feedback
7. Practive and overlearning
8. Distribution of practice
9. Expertise effect
10. Training-transfer dissociation

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Training support and error prevention

Guided training strategies help learners build skills effectively by reducing errors and cognitive load while balancing the need for error recognition and correction.

- **Reduce intrinsic load:** Use “training wheels” or “scaffolding”, which is gradually reduced when the learner improves.
- **Avoid “Bad” Extraneous Load:** Prevent errors that lead to frustration or wasted time (e.g., a child falling off a bike or deleting work unintentionally).
- **Cautions:** Learners need to experience some errors to develop skills in error recognition and correction.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Task simplification

Reduces intrinsic load by simplifying tasks initially, allowing learners to focus on essential learning.

- **Gradual Difficulty Increase:** Complexity gradually increases to match the final task's demands as learners progress.
- **Adaptive Training:** Adjusts task difficulty based on individual skill levels, requiring more effort but showing improved effectiveness.
- **Meta-Analysis Findings:** Simplifying tasks with increasing difficulty generally has no overall benefit or cost compared to fixed-difficulty training.
- **Effect of Adaptation:** Positive transfer occurs with adaptive difficulty increases, whereas fixed increases can lead to slight negative transfer.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Part-time training

Reduces intrinsic load by breaking down a complex task into smaller parts, trained individually before integration.

- **Fractionation vs. Segmentation:** Fractionation (training concurrent parts separately) can lead to negative transfer; segmentation (training sequential parts) shows no cost or benefit.
- **Negative Transfer in Fractionation:** This occurs due to a lack of time-sharing skills, which are essential when combining parts into the full task.
- **Variable Priority Training:** A modified fractionation technique where parts are practiced together with varying emphasis, improving transfer outcomes.
- **Application Example:** Learning a piano piece by practicing left and right-hand parts individually, then integrating both hands for full performance.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Active Learning

Encourages retention by engaging learners in active choices, improving germane load through the "generation effect."

- **Deep vs. Shallow Processing:** Active learning promotes deep processing (semantic rehearsal) over shallow processing (rote rehearsal), enhancing meaningful retention.
- **Benefits of Active Learning:** Examples include navigation practice by actively driving a route, knowledge retrieval through practice tests, and reciting material, all outperforming passive review.
- **Guidance in Active Learning:** Providing some guidance (rather than full autonomy) avoids distractions and extraneous load, keeping focus on relevant skills.
- **Effective Strategies:** Meta-analyses show modest transfer advantages with active learning, especially with targeted guidance, as learners avoid irrelevant content and optimize learning.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Multi-media Instructions

Reduces extraneous load and aids learning by presenting information through multiple channels (e.g., text, images, audio).

- **Dual Coding Principle:** Material is better retained when represented in both pictorial (spatial) and verbal forms, enhancing retrieval.
- **Effective Modality Combinations:** Combining images with spoken words (visual-auditory) is more effective than visual-visual combinations, reducing split-attention effects.
- **Temporal and Spatial Contiguity:** Align audio-visual elements in time and space to prevent cognitive overload from searching or waiting between elements.
- **Focus on Relevance:** Filter out unrelated material to avoid extraneous load, ensuring attention is directed toward critical information for learning.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Feedback

Feedback isn’t a training strategy itself but is essential in training environments, influencing either extraneous or germane load.

- **Timing of Feedback:** Can be concurrent (during task), temporally adjacent (immediately after task), or delayed (interval after task completion).
- **Memory Challenges with Delayed Feedback:** Delay increases the risk of memory failure, making it harder for learners to connect feedback to specific actions.
- **Concurrent Feedback Risks:** Often causes dual-task interference if feedback and task share the same sensory modality, adding extraneous load.
- **Optimal Feedback Timing:** Immediate (temporally adjacent) feedback is most effective, reducing memory issues and minimizing interference.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Practice and Overlearning

Extended practice beyond error-free performance leads to skill automation and reduced cognitive demand.

- **Continuous Improvement:** Skills improve over time, increasing speed and decreasing required cognitive resources, even after achieving error-free performance.
- **Role of Overlearning:** Overlearning enhances retention by reducing the rate of forgetting, making skills more resilient over time.
- **Automaticity:** Skills practiced to automaticity require less conscious attention, benefiting tasks that demand quick, efficient responses.
- **Application in Rarely Used Skills:** Overlearning is crucial for retaining infrequent, high-stakes skills (e.g., emergency procedures) that lack regular on-the-job practice.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Distribution of Practice

Spacing practice over multiple sessions enhances skill acquisition more effectively than massed (crammed) practice.

- **Retention Benefits:** Longer intervals between practice sessions improve long-term retention of skills.
- **Component Order in Complex Tasks:** The sequence of training task components impacts learning effectiveness for complex tasks.
- **Random vs. Blocked Schedules:** Random practice schedules slow initial learning but improve long-term retention compared to blocked schedules.
- **Blocked-Repeated Schedule:** A mixed approach (e.g., ABCABCABC) improves both skill acquisition and retention with extended practice.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Expertise Effect

Experienced learners benefit less, or even incur costs, from load-reducing training strategies compared to novices.

- **Intrinsic Load Differences:** For experts, tasks impose lower intrinsic load, freeing up more cognitive resources for germane load.
- **Effectiveness of Germane Load Strategies:** Experts gain more from germane load-increasing strategies (e.g., active learning) than from simplified or segmented instruction.
- **Training for Novices vs. Experts:** Simplifying techniques (like part-task training) are more beneficial for novices due to their higher intrinsic load.
- **Aptitude vs. Experience:** Training outcomes vary more by experience level than by innate cognitive ability differences (aptitude).

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

Training-transfer dissociation

Strategies that make training easier (e.g., massed practice) may not improve transfer and can even reduce it.

- **Ease vs. Effectiveness:** Learners often mistake easy training for effective learning, leading to overconfidence and inadequate study or practice.
- **Overconfidence Illusion:** Ease of learning doesn't equal retention; cognitive misers avoid effortful (germane) learning, which is essential for strong transfer.
- **Implications for Training Perceptions:** Learners may favor enjoyable or easy strategies, which boosts positive attitudes but doesn't ensure effective transfer.
- **Proof of Effectiveness:** True training effectiveness should be judged by transfer success rather than ease or enjoyment during training.

Designing for People: An introduction to human factors engineering. (Lee, J., Wickens, C., Liu, Y. & Boyle, L. (2017))

EXERCISE

Task

Imagine you are teaching a friend how to ride a bicycle. Your friend is nervous and has never ridden a bike before. You want to ensure they learn effectively and retain the skill.

How could you apply:

- Task simplification
- Feedback


coffee
break
for
10 min

1.4 Learnability in UX & UI

What is Learnability of UI?

- Is one of the five quality components of usability (the others being efficiency, memorability, errors, and satisfaction)
- Testing learnability is especially valuable for complex applications and systems that users access frequently, though knowing how quickly users can acclimate to your interface is valuable for even objectively simple systems.

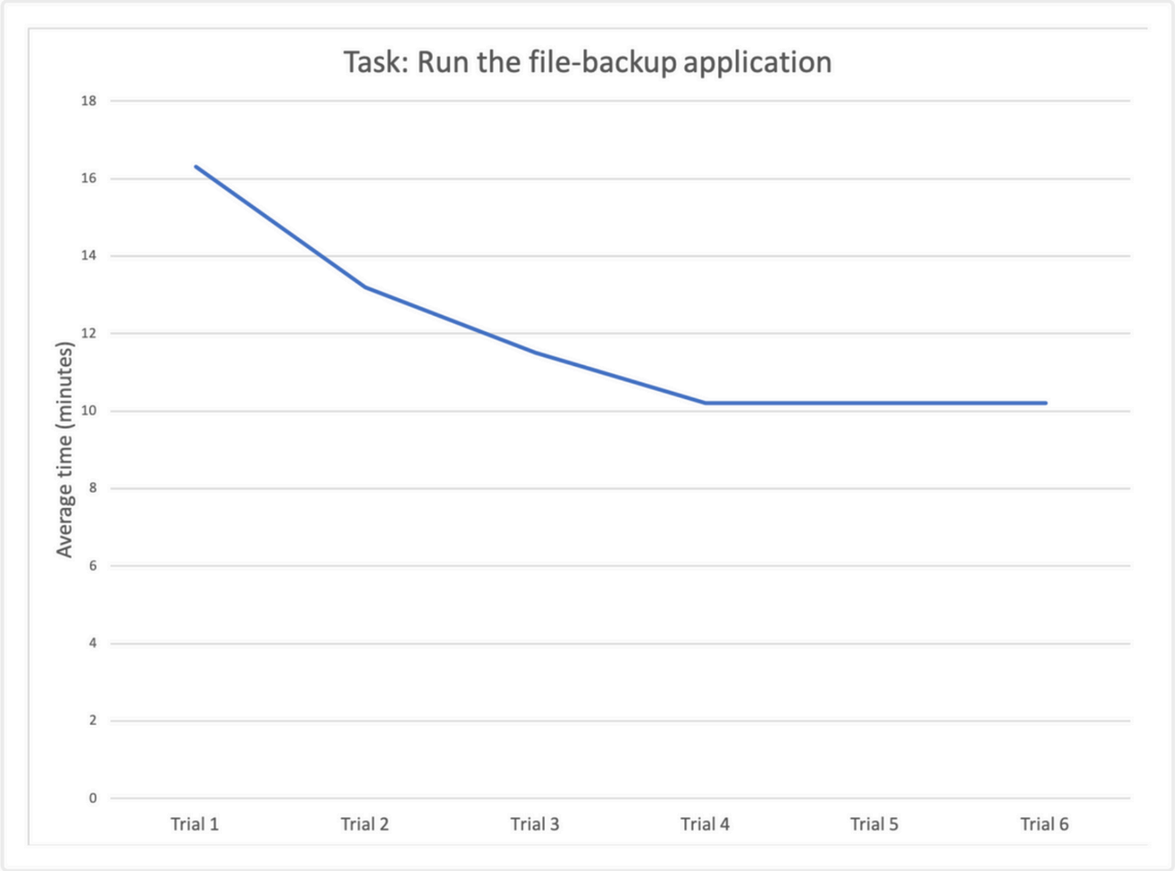
> *Learnability considers how easy it is for users to accomplish a task the first time they encounter the interface and how many repetitions it takes for them to become efficient at that task.*

https://www.nngroup.com/articles/measure-learnability/

Testing Learnability

Learning Curve:

The hypothetical completion time for a backup as a function of the number of task repetitions.



https://www.nngroup.com/articles/measure-learnability/

3 Aspects of Learnability

1. First-use learnability (--> e.g., first-use testing)
2. Steepness of the learning curve (--> e.g., longitudinal usability study)
3. Efficiency of the ultimate plateau (--> e.g., productivity benchmarking)

https://holland-explorer.com/wp-content/uploads/2020/06/ns-how-to-buy-train-ticket-the-netherlands.jpg

https://www.apple.com/newsroom/images/product/os/macos/standard/apple_macos-bigsur-availability_redesign_11122020_big.jpg.large.jpg

https://www.nngroup.com/articles/measure-learnability/

EXERCISE

Task

You are testing the usability of a task-management application designed for different types of users. Match the test with the feature and user group!

LEARNABILITY TEST

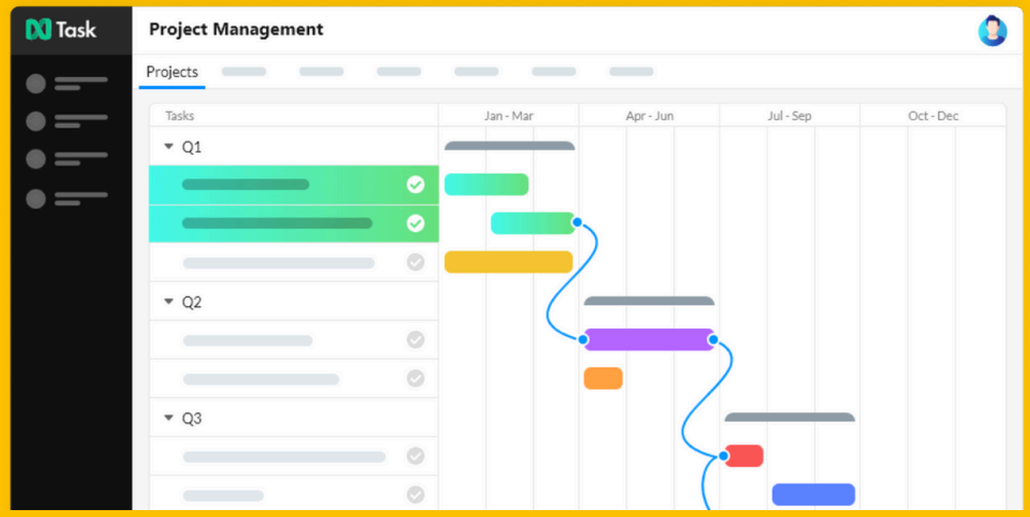
- steepness of learning curve
- first-use learnability
- efficiency of the ultimate plateau

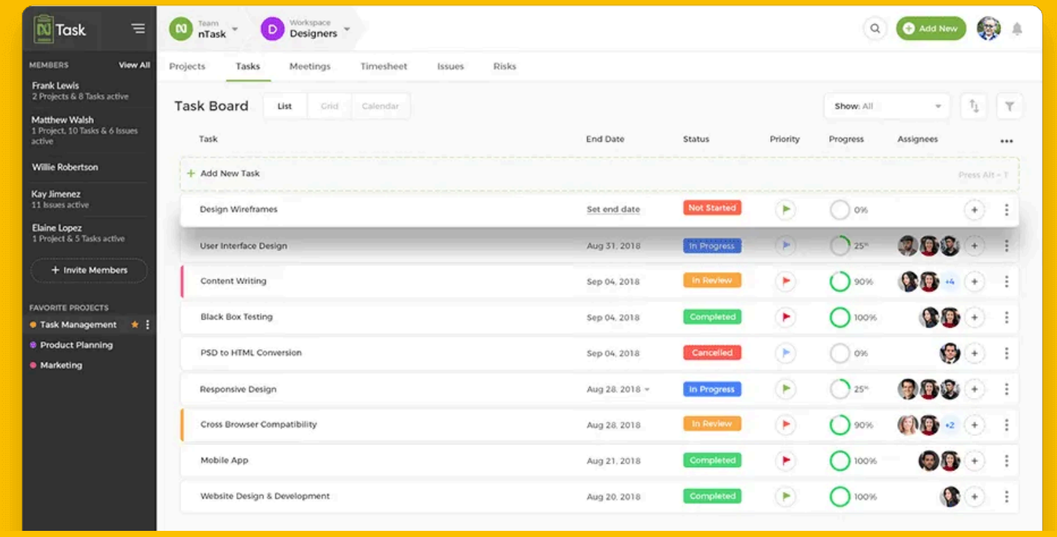
FEATURE

- customizable calendar
- data analytics tool
- onboarding wizard

USER GROUP

- freelance writer
- project manager
- project analyst

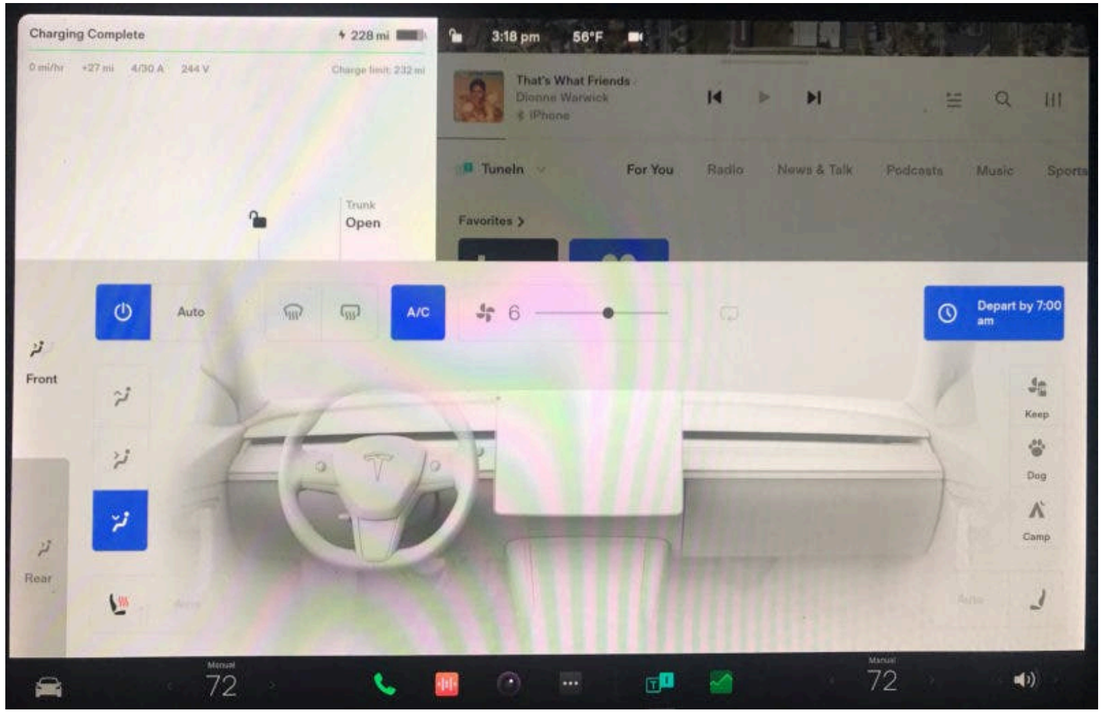




https://hive.com/blog/task-management-software/
https://www.ntaskmanager.com/wp-content/uploads/2022/09/Project-Planning-1-2.png

Learnability: Standardization vs. Adaptation

https://cdn.pocket-lint.com/r/s/1201x/assets/images/144304-cars-review-tesla-model-x-interior-screen-image2-5yawmahe6s.jpg



https://cleantechnica.com/files/2022/03/Tesla-Model-3-UI-tips-2-1536x993.jpeg

https://cleantechnica.com/2022/03/14/tesla-user-interface-reorganization-love-it-hate-it/

Learnability: Standardization vs. Adaptation

https://time.com/6083975/inside-spacex-crew-dragon-spacecraft/

1.5 Learning in Groups

Cooperative & Collaborative Learning

What is the difference?

Collaborative learning: “Collaboration involves the mutual engagement of participants in a coordinated effort to solve the problem”

Cooperative learning: “is accomplished by the division of labor among the participants where each student is responsible for a part of the information required to solve the problem”

In other words:
in collaboration, partners work together ⟷ in cooperation, they split the work

Roschelle, J., & Teasley, S. D. (1995). The construction of shared knowledge in collaborative problem solving. In Computer supported collaborative learning (pp. 69-97). Springer Berlin Heidelberg

Collaboration Load

Mental Load that occurs through group work

- The cost of verbalization
- The cost of grounding
- The cost of modelling

Dillenbourg, P., & Betrancourt, M. (2006). Collaboration load. Handling complexity in learning environments: Theory and research, 141-165.

EXERCISE

Task - Collaboration Load

Imagine you and a colleague collaborating on a shared document editor (e.g., Google Slides) to create a project pitch deck.

You are working remotely and cannot communicate verbally.

What specific features do you know (or could you think of) that can support **verbalization, grounding, and/or modeling**?

Group Cognition

(by Gerry Stahl)

> *The collective knowledge reached by a group that individuals alone could not achieve.*

Group cognition involves knowledge-building processes that emerge from group discourse, not attributable to individuals. --> More than the sum of individual knowledge

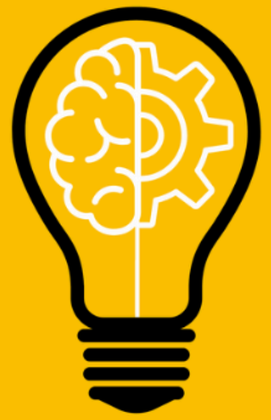
Shared Knowledge: Equality of knowledge among individuals; is achieved through communication.

Group Knowledge: Knowledge acquired interactively in discourse.

Knowledge Building: Construction of knowledge artifacts requires high cognitive activity and involves relatively short interactions.

Stahl, G. (2005). Group cognition in computer-assisted collaborative learning. Journal of Computer Assisted Learning, 21, 79-90
Stahl, G. (2006a). Group cognition: Computer support for building collaborative knowledge. Cambridge, MA: MIT Press
Stahl, G. (2010). Group cognition as a foundation for the new science of learning. In M. S. Khine & I. M. Saleh (Eds.), New science of learning: Cognition, computers and collaboration in education (pp. 23-44). New York, NY: Springer

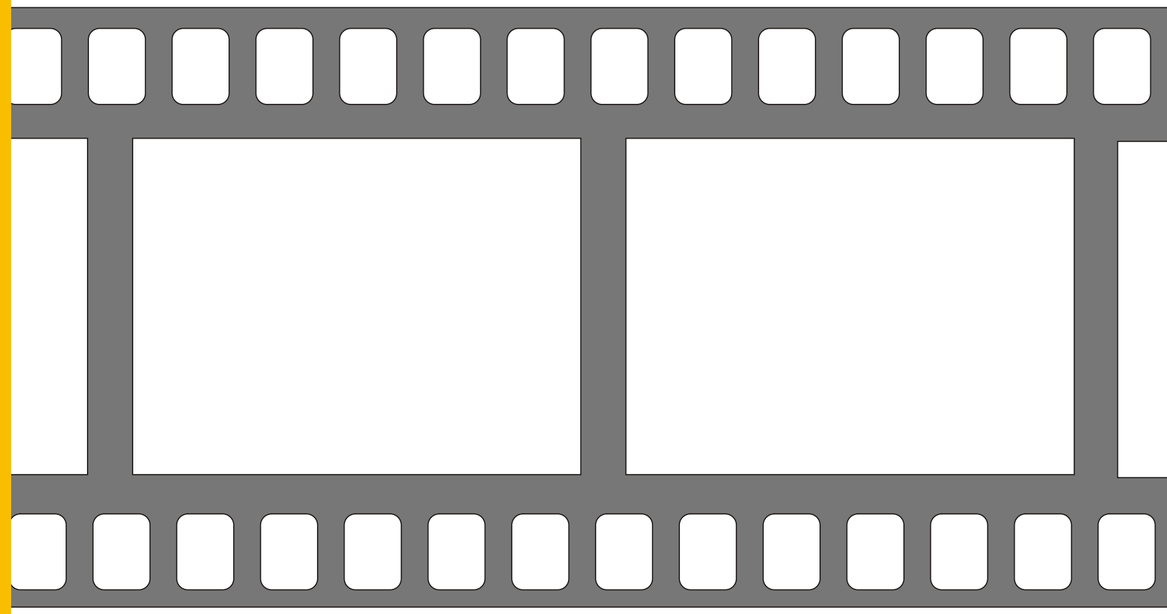
VIDEO



GROUP LEARNING

EFFECTIVE COLLABORATIVE LEARNING

Cognitive and Psychological Foundations for Product Design 2024/2025



Check out our specialization topic video on group learning!

2

MOTIVATION

Learning is about more than just memory

> *Motivation is generally defined as that which explains the direction and magnitude of behavior, or in other words, it explains what goals people choose to pursue and how actively or intensely they pursue them. (J.M. Keller)*

- Frameworks for motivation
- Role of intrinsic & extrinsic motivation
- Personalization

Keller, J. M. (2009). Motivational design for learning and performance: The ARCS model approach. Springer Science & Business Media.

2.1 Self-determination Theory

Self-determination Theory

by Ryan & Deci

Autonomy -- The need to feel in control of one’s own behavior and goals.

Competence - The need to gain mastery and be effective in one's activities.

Relatedness - The need to feel connected to others.

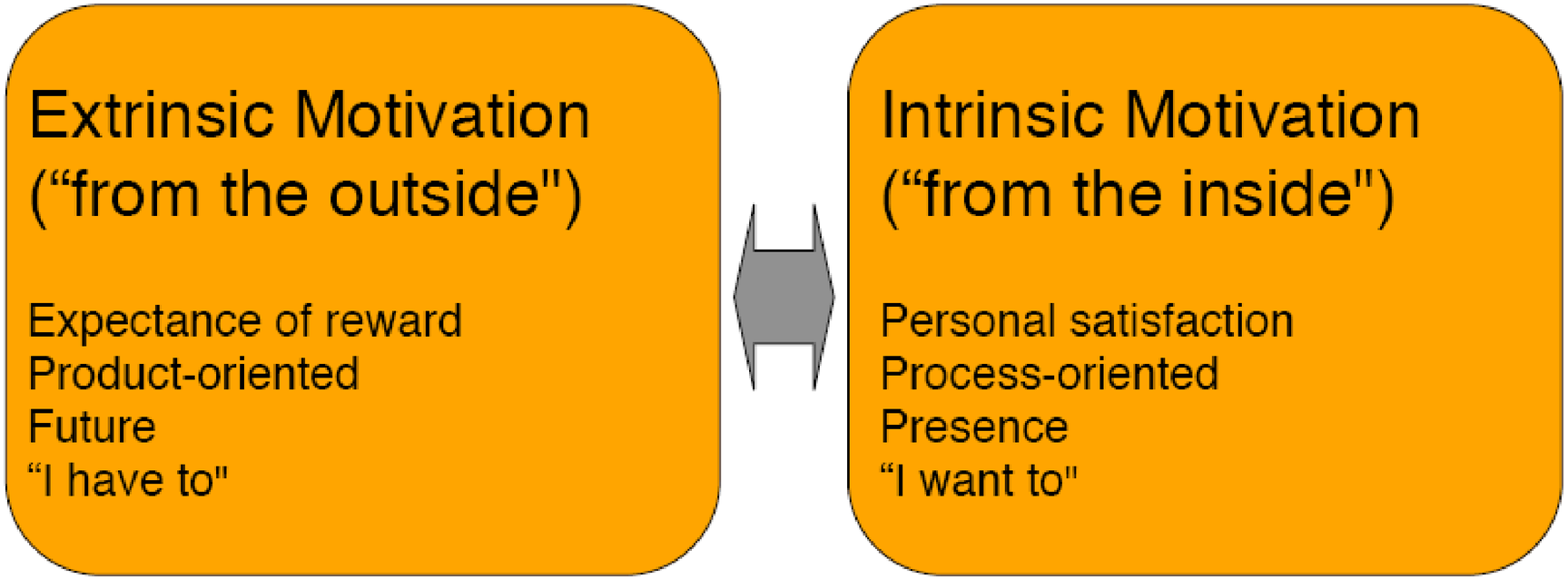
Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American psychologist, 55(1), 68.
https://selfdeterminationtheory.org/wp-content/uploads/2023/01/2022_RyanDeci_SDT_Encyclopedia.pdf

EXERCISE

Self-Determination Theory in Product Design

How can we foster Autonomy, Competence, and Relatedness in product or system interaction?

Extrinsic vs. Intrinsic Motivation



Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American psychologist, 55(1), 68. https://selfdeterminationtheory.org/wp-content/uploads/2023/01/2022_RyanDeci_SDT_Encyclopedia.pdf

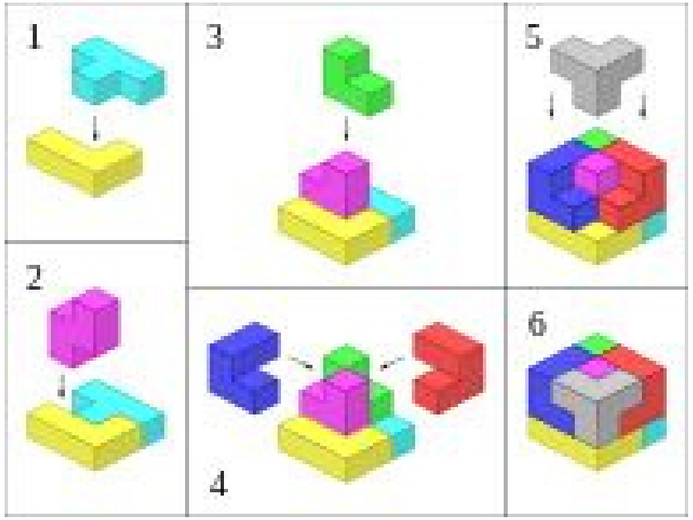
Extrinsic vs. Intrinsic Motivation

- Studied by Edward Deci, Carnegie Mellon University (1969)

- Let students solve given puzzle tasks and measured intrinsic motivation by observing them during "breaks", where they are free to do other tasks

- Two groups:
  – Group 1: Extrinsic motivation (one dollar per solved puzzle)
  – Group 2: No rewards

- Students who were rewarded were far less likely to continue with the puzzle ("just for fun") in their free-choice period!



Extrinsic motivation and the autonomy continuum

Extrinsic Behavior Regulation

- **External Regulation:**
  - Regulated by external constraints that are not under the control of the individual
  - Examples: To obtain reward, to avoid punishment

- Internalized:
  - **Introjected Regulation**:
    - Behavior follows an internal sense of obligation or guilt
    - Example: Losing weight because being fat is unfashionable

  - **Identified Regulation**:
    - Behavior caused by self-ascribed importance
    - Example: Learning to get an important degree

- **Integrated Regulation**:
  - Behavior according to consistency with other individual goals and values
  - Example: Self-perception as a “good athlete,” “good student,” etc.

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. Journal of Organizational behavior, 26(4), 331-362. https://onlinelibrary.wiley.com/doi/pdf/10.1002/job.322?casa_token=XS4CEzIDFJUAAAAA%3AIfldFj-yDKvUeW6UnhdEBXZeO24R__eD6Kkq0_f-CSaM0_IT1-6h4bxFE98NRY15v6cC4wJXNAEJhEut

2.2 ARCS

ARCS Model

by John M. Keller (1983)
Practically applicable rule system for motivation-enhancing design

Attention

- Capturing the interest of learners
- Stimulating the curiosity to learn

Relevance

- Meeting the personal needs/goals of the learner
- Effect a positive attitude

Confidence

- Helping the learners believe/feel that they will succeed
- Control learners' success

Satisfaction

- Reinforcing accomplishment with rewards
- (internal and external)

Keller, J. M. (1987). Development and use of the ARCS model of instructional design. Journal of instructional development, 10(3), 2-10. https://link.springer.com/content/pdf/10.1007/BF02905780.pdf

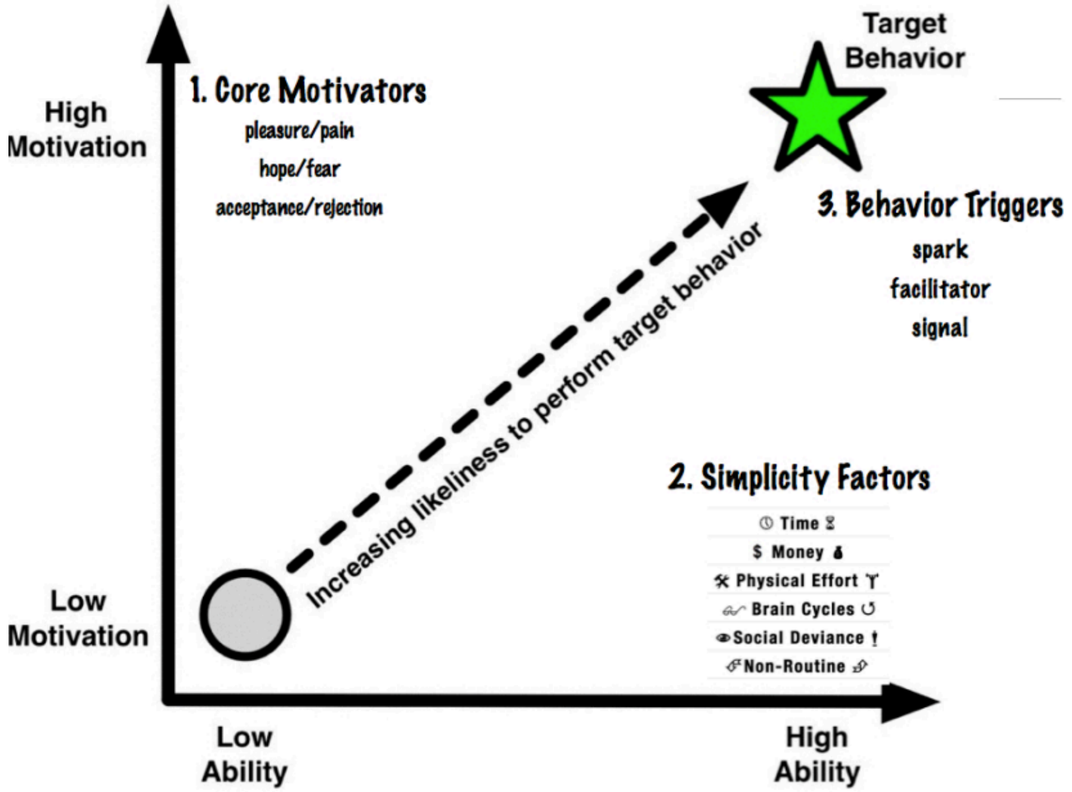
2.3 Persuasion

Behavior Model for Persuasive Design

by BJ Fogg

Small design choices can shape user habits

- **Motivation:** Can drive people to perform certain actions, but it must be combined with sufficient ability and a trigger to result in behavior.
- **Ability:** Making a behavior simpler increases the likelihood of action, which is why simplifying tasks in design can significantly enhance user engagement.
- **Triggers** prompt users to perform a behavior. They are effective only if the user has sufficient motivation and ability at that moment.



Fogg, B. J. (2009, April). A behavior model for persuasive design. In Proceedings of the 4th international Conference on Persuasive Technology (pp. 1-7). https://dl.acm.org/doi/pdf/10.1145/1541948.1541999

EXERCISE

Task

Imagine you are designing an e-learning platform to encourage students to complete their daily lessons. Using Fogg's Behavior Model, create a persuasive strategy that ensures users log in at least once a day.

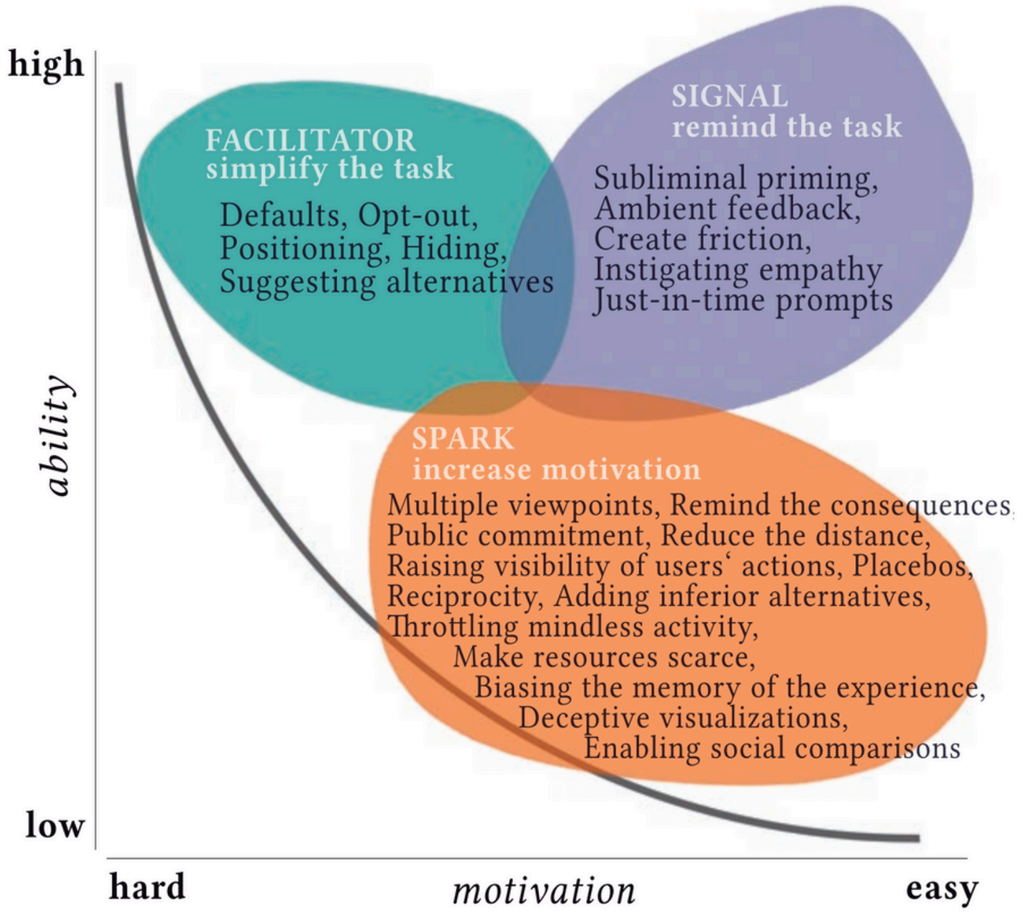
How can you support/implement:

- Motivation
- Ability
- Trigger

Nudging

- Concept of Nudging originated by Thaler & Sunstein
  - alters behavior via subtle changes in 'choice architecture'
- Widely used in health, sustainability, and privacy applications
- Research Gap: Limited understanding of designing effective technology-mediated nudges

- **23 Nudging Mechanisms**:
  - Identified and grouped into 6 categories:
  - Facilitate, Confront, Deceive, Social Influence, Fear, Reinforce
- 15 cognitive biases leveraged, including status quo, herd instinct, availability heuristic



Caraban, A., Karapanos, E., Gonçalves, D., & Campos, P. (2019, May). 23 ways to nudge: A review of technology-mediated nudging in human-computer interaction. In Proceedings of the 2019 CHI conference on human factors in computing systems (pp. 1-15). https://dl.acm.org/doi/abs/10.1145/3290605.3300733

Nudging Design Considerations

Success Factors:

- Context-specific implementation
- Balance between automatic and reflective nudging
- Transparency and user autonomy

Challenges:

- Sustainability of effects over time
- Ethical concerns related to user manipulation
- Potential for backfiring or user reactance

Mechanism	*Design considerations*
Suggesting alternatives	How many alternatives should the system suggest? When should they be presented (e.g., during, before or after a selection has been made)? What type of suggestions should be made? *Hint:* It is important to determine the number of choice alternatives and attributes users can process without suffering the negative effects of overload.
Default options	What constitutes an appropriate default choice or value, and why? Should the default be personalized or adapt over time (e.g., gradually reducing the size of a plate in a restaurant)? Who bears the ethical responsibility when an inappropriate default is presented and unwanted consequences arise, for instance, in the case of algorithmic decisions.
Reminding of the consequences	What are the main undesirable consequences of the behavior to be altered? Are they severe enough to dissuade the behavior when presented by the system? How can you alter users' perception of the likelihood of their occurrence? How can the system make the consequences, in terms of losses, more personal?
Placebo	What is the primary function of the placebo (e.g., to increase self-efficacy?). How this can be achieved? How can the system make the user feel in control? Can you ensure that the information presented is noticeable, yet trustable?
Make resources scarce	How can the system render the desirable alternative as a scarce resource and invoke feelings of missing out if not pursued? Is the use of text, images or visualizations more appropriate? Hint: Using language, which implies that the audience already has achieved the outcome or selected the alternative, can trigger feelings of ownership and in turn, increase users' motivation to avoid a loss.

Caraban, A., Karapanos, E., Gonçalves, D., & Campos, P. (2019, May). 23 ways to nudge: A review of technology-mediated nudging in human-computer interaction. In Proceedings of the 2019 CHI conference on human factors in computing systems (pp. 1-15). https://dl.acm.org/doi/abs/10.1145/3290605.3300733

2.4 Emotional Design & Motivation

Emotional Design and Motivation

> Everything has a personality: everything sends an emotional signal. Even where this was not the intention of the designer, the people who view the website infer personalities and experience emotions. (Don Norman)

- **Three Levels of Emotional Design (by Norman):**
  - Visceral: Immediate, sensory appeal that draws users in.
  - Behavioral: Ease of use and reliability that encourage continued interaction.
  - Reflective: Deeper emotional connection and meaning that promote long-term loyalty.

- Affective Triggers and Mood-Influenced Interaction:
  - Mood can influence user interaction and motivation
  - Interfaces can adapt to this, such as relaxing color schemes in meditation apps or motivating music in fitness apps.

https://www.interaction-design.org/literature/topics/emotional-design

CLOSING

Reflection

Think about today's session with your neighbor and each answer one of the following questions:

It can be answering any of the following questions:

- What is your main take away from today?
- What was most surprising from this session?
- What did you find most interesting?
- What made an impact on you?