

Physics: Experts vs. Novices

Basic Skills in Physics

Possession of certain skills (i.e., basic math) needed

Performed in a **routine manner** with **minimal attention**

- Allows you to focus on problem-solving (goal) of the problem

Conceptual Understanding in Physics

Rote memorization of formulas does not work in Physics, Math, Calculus, Statistics exams since this strategy is void of conceptual understanding.

- Knowledge of which formulas and tools to use and when to use them
- Experts' understand fundamental knowledge principles.
- Knowledge not confused with more superficial information.
- Experts understand shared underlying principles.
- Novices' tend to rely heavily on rote memory
- Novices look at diagrams together superficially (they don't try to understand underlying concepts).
- Experts and novices memory structure in physics differ in three ways: (1) Content (2) Organization and organizing force (Novices especially challenged) (3) Form of knowledge organization

Strategies

Experts:

- Every step contributes to the information needed for the solution process:
- Use the working forward strategy (use givens--givens used to generate more information)
- They know the path that leads to the solution and follow it
- Recognize problem schemas for familiar problems

Novices:

- Use the working backwards strategy (identify goal--find formulas that lead to goal)
- Work backwards through a series of subgoals to try to solve this formula)
- This strategy seems to work well for novices because it reduces search to information related to goal