

## Thirteen Thinking Tools of Creative People

*In their book, **Sparks of Genius: The Thirteen Thinking Tools of the World's Most Creative People**, Robert and Michele Root-Bernstein explore the following "thinking tools" essential to all learning:*

1. **Observing:** All knowledge begins in observation. Observation goes beyond the visual; it involves all the senses. The mind must be trained to observe, and the skill of observation must be practiced.
2. **Imaging:** Through visualization we create mental images that can be translated into other mediums - words, music, movements, models, paintings, diagrams, films, sculptures or mathematical treatises.
3. **Abstracting:** The process of revealing the critical essence of something, be it an object, a person, a gesture, a sound, etc. It begins with what is, and - using some kind of tool - pares away the excess to reveal its essence.
4. **Recognizing Patterns:** Requires observation and analysis. Patterns can be perceived in different ways. This is an imaginative skill. Watch cloud formations, invent your own puzzles. Find patterns among patterns.
5. **Forming Patterns:** The principle that complexity results from combinations of simple elements characterizes pattern forming universally. The striking thing about pattern forming is the cleverness and unexpectedness with which the combinations are made. It is the key to innovation in every discipline.
6. **Analogizing:** Finding an association between things that are otherwise unlike. It is the bridge between the known thing and the unknown one that needs to be understood. We teach and learn by analogy and metaphor.
7. **Body Thinking:** The body has an "intelligence" all its own; it is an instrument of thought. Re-enact a story, think "out loud" with your body, listen to your gut, "monkey around," and you may find yourself solving problems only your body knows how to answer.
8. **Empathizing:** See the world through other people's eyes. Play-act. Familiarize yourself with your subject. Understanding is most complete when you are not you, but the thing you wish to understand.
9. **Dimensional Thinking:** Involves moving from 2-D to 3-D or visa versa, mapping, altering the proportions of an object, or thinking beyond space and time as we know them. Make a paper airplane, draw a map with directions to your house, or play with a 3-D puzzle. Dimensional thinking pervades our lives.
10. **Modeling:** Models can only be made after a real system or situation has been observed, simplified, re-scaled and given a form whether it is physical, verbal, mathematical or artistic.
11. **Playing:** Strengthens mental skills whether it is practice, symbolic or game play. It provides a fun and risk-free means of seeing from a fresh perspective, learning without constraint, exploring without fear. Play transforms knowledge and builds understanding as new worlds, personas, games, rules, toys, and puzzles are created - and through them new sciences and arts.
12. **Transforming:** Involves transforming ideas from one language of communication into another. Creative work in the real world requires the ability to define a problem using one set of tools, to investigate it using others, and to express the solution using yet a third set. Mnemonic devices are a type of transformational thinking; so is taking a script and turning it into a play with costumes, sets and lighting.
13. **Synthesizing:** Sensory impressions, feeling, knowledge and memories come together in a multimodal, unified way that allows us to see the "whole" - to make sense of the world. The ability to synthesize is not an ideal or a dream it is a necessity.

*Root-Bernstein, Robert and Michele. **Sparks of Genius: The Thirteen Thinking Tools of the World's Most Creative People**. New York: Houghton Mifflin Company, 1999. ISBN: 0-395-90771-3*