

# Guilford's Structure of the Intellect

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J. P. Guilford was a psychologist involved during the World War II in developing tests to select candidates for training as pilots. As he expanded his interests into testing various other specific thinking skills, he developed a model to guide his research and to organize his thinking about all the various skills he was testing.

Guilford is generally credited with getting the field of psychology to start looking at creativity. In his 1950 Presidential Address to the American Psychological Association (Guilford, 1987), he pointed out the very important nature of creativity as a research topic and the scarcity of published research related to creativity. He felt that people were assuming that creativity was a natural result of intelligence as measured by IQ, and as a result had not begun to look at creativity. Guilford gave his perspective on the field and announced his intention to use a factor analytic technique to begin isolating the various factors of thinking, to separate out creativity and other skills from the factors measured by IQ.

His "Structure of Intellect" model organized these various abilities along three dimensions: **content**, **product**, and **process**. He sought to develop tests for each combination of the possibilities on these three dimensions, expecting that a person could be high on some of these abilities while being low on others. In *The nature of human intelligence* (1967) and *Way beyond the IQ* (1977), he lays out the results of his efforts and the modified model which evolved from his research.

By **content** he meant that different people seemed to pay more attention to and think more effectively about different kinds of information, such as:

- **Visual** information directly from the senses or from imaging
- **Auditory** information directly from the senses or from images
- **Symbolic** items such as words and symbols which generally convey some meaning

- **Semantic** meanings often, but not always, associated with words
- **Behavioral** information about the mental states and behavior of observed individuals. This type of content was added to the model based on abilities that emerged from his testing. Daniel Goleman (1995) has popularized this as "social intelligence".

An artist might excel at processing visual information, but be poor at processing words, numbers and other symbolic content. A researcher who excels at processing symbolic content such as words and numbers and semantic meaning, might be very poor at processing behavioral data and thus relate poorly with people.

The **products** dimension relates to the kinds of information we process from the content types:

- **Units** refers to the ability to perceive units in a content area. This might be symbolic units such as words, visual units such as shapes, or behavioral units such as facial expressions.
- **Classes** refers to the ability to organize units into meaningful groups and to sort units into the right groups.
- **Relations** pertains to the ability to sense the relationships between pairs of units.
- **Systems** consist of the relationships among more than two units.
- **Transformations** is the ability to understand changes in information, such as rotation of visual figures, or jokes and puns in the semantic area.
- **Implications** refers to expectation. Given a certain set of information, one might expect certain other information to be true.

With the two dimensions of **content** and **product** we can sort out all the kinds of information people can think about. People can talk about the implications of a symbolic series, the relationship of two sounds, or behavioral transformations such as changes in emotions.

The **operations** dimension describes what the brain does with and to these types of information:

- **Cognition** has to do with the ability to perceive the various items. For example, the cognition of semantic units has to do with one's ability to recognize words, i.e. one's vocabulary. Cognition of Behavioral Transformations would be the ability to perceive changes in the expressions of an individual.
- **Memory** has to do with the ability to store and retrieve various kinds of information. People differ in their abilities to remember not only from other people, but also among various kinds of information. Some people who are poor at remembering faces (behavioral units) may be excellent at remembering puns (semantic transformations).
- **Divergent production** has to do with the ability to access memory. It refers to the ability to find large numbers of things which fit certain simple criteria. For example, the ability to divergently produce visual units includes the ability to list a great many images which include a circle. Divergence in behavioral transformations would include the ability to revise stories about people. Divergence in Symbolic Implications would include the ability to list various equations which can be deduced from given equations.
- **Convergent Production** is the search of memory for the single answer to a question or situation. This area includes most areas of logic type problem solving. It differs from divergence in the constraint of one right answer. It seems likely that performance on convergent tasks is actually the result of divergent production and evaluation, but it is an often tested for skill, and the one most often associated with IQ..
- **Evaluation** is the ability to make judgments about the various kinds of information, judgments such as which items are identical in some way, which items are better, and what qualities are shared by various items.

These three factors combine to identify 150 different skill areas. It is important to remember that this model was developed as a guide for a research project to explore the relations among the various categories and the ability to fit the results of tests into this model. It does not explicitly show the relationship among the various cells in the matrix. In Guilford's language, it could be said that they

simply concentrated on the cognition of a class of behavioral contents.

One implication of this matrix is that most IQ tests are severely limited in the areas of ability they assess, often assuming that those who test well on some of the areas can be expected to do well on all of them. Gardner (1983) has made the same case in simpler terms in *Frames of Mind: The Theory of Multiple Intelligences* in which he describes seven types of intelligence: linguistic, musical, logical-mathematical, spatial, bodily-kinaesthetic, intrapersonal, and interpersonal.

It is useful to consider how these different skills contribute to problem solving and to look at how these categories fit the activities within organizations. In one of the last articles he published Guilford (1983) suggested that although much of the work on increasing creativity had focused on the various divergent production skills there seems to be a strong argument in favor of focusing upon the various skills related to transformations, which would support the idea of focusing some attention upon shifts in insight, on AHA's. Interviews with people creative in various complex technical and artistic disciplines confirm that such skills are a vital part of their work and source of their creativity.

## References

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Guilford's Structure of Intellect has few supporters today, but Joy Paul Guilford is considered as one of the founders of the Psychology of Creativity. He emphasized the distinction between convergent and divergent thinking. In 1976 he introduced the developed model of Divergent Thinking as the main ingredient of creativity. Guilford appointed the following characteristics for creativity : Fluency : the ability to produce great number of ideas or problem solutions. Flexibility : the ability to simultaneously propose a variety of approaches to a specific problem. Originality : the ability to pro In Guilford's Structure of Intellect (SI) theory, intelligence is viewed as comprising operations, contents, and products. There are 6 kinds of operations (cognition, memory recording, memory retention, divergent production, convergent production, evaluation), 6 kinds of products (units, classes, relations, systems, transformations, and implications), and 5 kinds of contents (visual, auditory, symbolic, semantic, behavioral). These tests provide an operational definition of the many abilities proposed by the theory. Furthermore, factor analysis was used to determine which tests appeared to measure the same or different abilities. Parenthetically, it is interesting to note that a major impetus for Guilford's theory was his interest in creativity (Guilford, 1950). Developing the views of L. L. Thurstone, J. P. Guilford rejected Charles Spearman's view that intelligence could be characterised in a single numerical parameter and proposed that three dimensions were necessary for accurate description: Content. Operations. Productions. He made the important distinction between convergent and divergent production. Guilford provided a three-dimensional cubical model to explain his theory of the Structure of the Intellect. According to this theory, an individual's