

# Psychology of Exceptional Learning

## Cognitive style

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**Cognitive style and learning style** Two main reasons for reference to learning style and cognitive style over last 10 years;

- disengagement and alienation from formal education.
- concern re assessing what and how people know, about managing learning and change in a range of contexts.

**Definition and distinctions** Definitions are confused. Cognitive style; notion of individuals display habitual mode of thinking, perceiving and remembering and problem-solving. They have been used as synonymous, as mutually exclusive, with cognitive style as an aspect of learning style. Cognitive / learning style measures traditionally occupy middle ground between aptitude measures and personality measures. Behaviours measured by sets of tasks included

- cognitive
- physiological, affective
- motivational.

Learning style comprises these components or 'traits that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment' (Karrer, 1988, p. 4).

Curry's Onion Model; cognitive and learning style measures can be grouped into 3 main types like layers of an onion;

- (1) inner layer is the controlling central personality dimension; the cognitive personality style.
- (2) the middle information processing dimension; intellectual approach to assimilating information, more stable than instructional preference but is modifiable by learning strategies.
- (3) the outer and most observable preference - the instructional preference - the individual's choice of environment in which to learn, is least stable and influenced level of measurement.

This model has doubtful validity. It does not refer to thinking and learning.

**Learning styles :** Consist of up to five 'dimensions' (Dunn, 1988):

- (1) preferred ways of thinking about the ideas when learning; whether they get overall impression of the ideas first or put them together bit by bit, whether they need to put ideas into words or pictures in their minds.
- (2) perceptual preferences when learning; learning by seeing, listening or by acting or doing.
- (3) affective and emotional characteristics when learning; whether learning is influenced by learner's level of interest, motivation and persistence, responsibility, organized by someone else, easily distracted.
- (4) characteristics of the physical environment; influence of noise, light, temperature, postural possibilities, time of the day and
- (5) sociological preferences; prefer to learn by themselves, co-operatively in small groups, with an adult or in the large group.

Lack of rigour and difficulties with this naive approach to behavioural analysis. .

**Cognitive styles** Ways of thinking or reasoning, interacting with the world, solving problems. Assumes learners display consistent patterns in how they operate cognitively, there is a 'general learning / thinking you and that this can be mapped into words.

**Approaches to analysing cognitive style** Two types have been used:

- analysing differences in how learners operate cognitively, in accuracy and time taken.
- differences in what learners believe about their general approach to learning and thinking.

**Types of cognitive style** Over 30 labels have been used, these may be grouped into two principal styles and a number of learning strategies (Riding & Cheema, 1991). The styles are represented as bipolar dimensions

- an information processing or manipulating dimension and
- an information coding or representing dimension

**The processing or manipulating dimension** Those more frequently noted include

|           |                  |              |            |            |           |            |
|-----------|------------------|--------------|------------|------------|-----------|------------|
| analytic  | independence     | reflectivity | convergent | sharpeners | serial    | sequential |
| wholistic | field dependence | impulsivity  | divergent  | leveller   | wholistic | random     |

Some of these distinctions have not been well-intercorrelated. The characteristics of each:

- (a) the field dependence versus independence measures the ability to see a shape as separate from its surrounding field, that is, to be disembedded in perceptual, cognitive and affective contexts (sense of self, self-concept) and is referred to as 'global-articulated dimension or differentiation' (Witkin & Goodenough, 1981). Field independent learners in cognitive restructuring are more able to
- (1) break up an organized field into its basic elements,
  - (2) provide a structure for an ambiguous stimulus complex and
  - (3) provide a different organisation to a field than that suggested by the inherent structure of the stimulus complex.

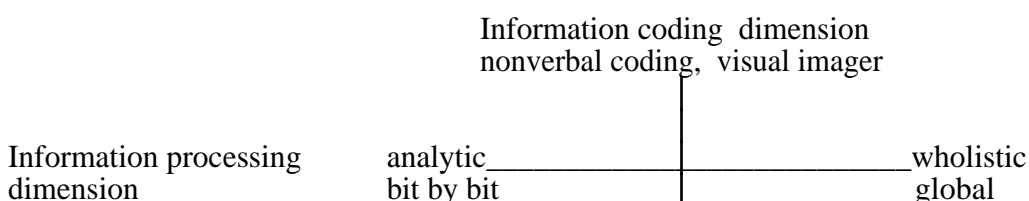
Teachers who score high field-dependence prefer frequent interactions with students, encourage active involvement of students in the management of learning, create positive attitudes towards learning. Teachers who score high field-independence prefer more formal approaches to teaching, emphasising their own standards and seeing their role as transmitting known factual information.

- (b) the impulsivity versus reflectivity distinction (Kagan, 1965) refers to differences in the speed of individuals to make decisions in situations of uncertainty.
- (c) convergent versus divergent distinction (Hudson, 1966) refers to differences in the ability solve problems requiring a single solution as opposed to more open-ended solutions.
- (d) leveller versus sharpeners distinction (Holzman & Klein, 1954) refers to the differences in which individuals perceive a visual task.
- (e) the wholistic versus serial distinction (Pask, 1972).
- (f) the random versus sequential processing distinction (Gregorc, 1979).

**The coding or representing dimension** is usually described in terms of two options, verbal and nonverbal imagery dimensions, that is, in terms of everyday contexts or as decontextualised abstract ideas. Names include

- (a) the verbaliser versus imager or visualiser distinction (Riding & Cheema, 1991),
- (b) abstract versus concrete (Gregorc, 1982), where concrete refers to representations of everyday items and abstract refers to concepts more removed from reality and
- (c) active experimentation (doing) versus reflective observation (McCarthy, 1981).

The two aspects are often drawn diagrammatically in a two-dimensional way



|  
verbal coding verbaliser

**How are cognitive styles assessed ?** : Two approaches:

- differences in how learners operate cognitively, in performance accuracy and time taken
- differences in what learners believe about their general approach to learning and thinking.

**Processing cognitive tasks : Riding's CSA** The first approach involves providing a cognitive task and recording response and the time taken. It assumes that cognitive style can be described on two dimensions

- a wholist-analytic dimension that describes how learners process information, whether in parts or as a whole and
- a imagery-verbal dimension that describes how learners code information, whether by visualising it or by coding it in a verbal-linguistic form.

The types of styles proposed by Riding on the two dimensions are as follows

- for the wholist-analytic style, wholists tend to form an overall perspective of a situation while analytics tend to see the situation as a collection of parts and focus on some of these at a time.
- for the imagery-verbal style, imagers code information by visualising it while verbalisers represent the information in a verbal-linguistic form.

Differences have implications for preferred learning conditions:

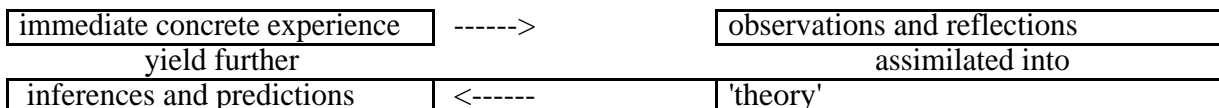
- wholists tend not to see the parts in a situation and may have difficulty identifying the components of an idea.
- analytics focus on parts at a time and may have difficulty seeing these in the context of the whole.
- imagers find concrete and readily visualised information easier than semantically organised information while the reverse applies to verbalisers.

The second approach (Gregorc, 1982; Kolb, 1984) assumes learners have constructed an awareness of 'the general learning / thinking you. Many of the tasks measure the beliefs individuals have about metacognitive processes (plan, monitor how they learn, evaluate and reflect on how they learn). Investigators use a pencil and paper self-reporting format in which learners either select or sequence statements that describe alternative ways of learning or to complete written statements.

**Myers-Briggs Type Indicator;** four bipolar dimensions;

- a perceiving dimension, examining how we initially process information,
- a judging dimension which characterises decision-making,
- an attentional dimension, examining preference for external-internal control and

**Kolb's Learning Skills Inventory** measures beliefs on two dimensions; the concrete versus abstract dimension and the active versus reflective dimension. It is based on a theory of experiential learning that consists of a four -stage cycle



To learn effectively, learners engage four 'learning modes'; to

- engage in new experiences (concrete experiences, CE),
- reflect on these from different perspectives (reflective organisation (RO)),
- create concepts that integrate the experiences into logical theory (abstract conceptualisation (AC))
- transfer this knowledge to new situations to make decisions and solve problems (active experimentation (AE)).

Learning styles differ in the extent to which each mode is activated. Issues re this model of learning:

- it is possible that individual differences in learning arise for each mode and these may be a more useful way of looking at cognitive style, for example, learners may engage in and code concrete experiences in different ways.
- as one's knowledge in a content area changes and perhaps becomes more automatic, the ways in which one engages in concrete experiences, for example, may change. In other words, learners' use of learning modes may be related to the status of their knowledge in particular areas, for example, whether they have novice or expert knowledge.
- learners' purposes and goals for engaging in learning may influence the learning modes that learners engage.
- the influence of one's past cultural and social interactions on the various learning modes. Earlier interactions and evaluative feedback may influence the modes implemented and the extent to which they are used subsequently. This could include the influence of formal educational, parental and peer valuing and perceived valuing in the media of the different aspects of learning.
- developmental trends in the various modes.
- whether learners can change how they operate in each of the modes, that is, whether they can learn to engage any mode more successfully.

The inventory contain 12 items , each asking learners to rate themselves on the four learning modes by completing statements similar to

I learn best by    **p** using my                    **p**    watching                    **p** thinking about                    **p** doing  
    feelings    and listening    the ideas    things

For each, learners rank the four alternatives from 4 to 1. The inventory yields scores on the four primary 'learning modes' ; concrete experience (CE), reflective organisation (RO), abstract conceptualisation (AC) and active experimentation (AE). Each is interpreted as follows:

| a high score on            | suggests  |
|----------------------------|---|
| concrete experience        | a receptive, experiential approach to learning with learners preferring to learn through personal activity and intuitive, feeling-based experiences in real-life contexts         |
| reflective organisation    | 'tentative, impartial and reflective approach to learning' with learners preferring to use objective empirical evidence in making judgments and being programmed                  |
| abstract conceptualisation | analytical approach to learning that draws on logical thinking and objective aspects of ideas and the world, prefer to learn through systematic objective analysis and theorising |
| active experimentation     | an active, hands-on approach to learning, with learners preferring to do things for themselves to learn, rather than to be programmed   |

From combinations on these, four learning styles are identified (Kolb, 1976, 1984)

|                                 |   |
|---------------------------------|---|
| convergers; high on AC and AE;  | high level of abstract conceptual knowledge, apply it to solve specific problems in an objective, detached way, for example, in engineering and the physical sciences.                      |
| divergers; high on CE and RO    | high level of imaginative ability and to look at real life situations from different perspectives with an emotional loading, for example, in liberal arts fields,                           |
| assimilators; high on AC and RO | ability to generate theoretical models through inductive reasoning and by integrating disparate observations in an objective consistent way, for example, in pure research contexts.        |
| accomodators, high on CE and AE | ability to learn by doing in real-life contexts through social interaction rather than by representing ideas in an abstract way, for example in technical, practical and business contexts. |

The Kolb model has been used to develop other learning style inventories and to develop instructional materials, for example, the '4MAT System' by McCarthy (1978; 1990). The 4MAT System attempts to integrate learning styles and hemispheric processing.

**Gregorc Style Delineator (Gregorc, 1982).** Gregorc's model of cognitive style also has the two-dimensional structure; a concrete-abstract information type dimension and a sequential-random information processing dimension. This leads to the identity of four types of learning style;

|                            |   |
|----------------------------|---|
| concrete sequential style, | structured, practical and analytic real-life learning |
|----------------------------|---|

|                           |   |
|---------------------------|---|
| abstract sequential style | logical and analytic learning of abstract ideas                       |
| abstract random style     | imaginative, creative and less predictable learning of abstract ideas |
| concrete random style     | intuitive, original and investigative learning of real-life learning  |

***Conceptual/theoretical evidence supporting alternative ways of representing information***

- models of short term working memory have proposed the representation and retention of an idea in terms of a variety of codes; visual-spatial verbal and symbolic codes
- learning to read words discernible preferences in learning to recognize words have been reported for 4 to 6 year olds by Stuart and Coldheart (198\*).
- differences in how we go about 'coding' information.: Paivio's Dual Coding Theory.
- multiple ways of knowing : Howard Gardner's (1985) multiple intelligence model

***Analysis of the statistical reliability and validity of the inventories***

- Evaluating the underlying dimensions of the scales: construct validity
- Evidence Supporting the Predictive Power of Cognitive Style

***The extent to which cognitive style is correlated with success in learning.*** The effectiveness of the learning /cognitive style inventories

- abstract-sequential style are more successful in tertiary level learning than dominance in other styles. These studies have not taken account of differences in teaching style.
- field independent dominant learners learnt more effectively when exposed to simulation-type presentations while field dependant students learnt more effectively when exposed to more structured tutorials type presentations (Rowland, 1988).

***Matching learner cognitive style with teaching.***

- teaching mathematics by matching cognitive style worked for early primary level students and for tertiary level students.
- teaching by distance education is more influenced by cognitive style than teaching students in a normal classroom setting
- similarity between the teaching methods used by educators and their cognitive style.
- matching cognitive learning styles of students with and teaching styles has been disputed by some investigators

***Gender differences***

- females tend to be more field dependent than males
- females tend to be more dominant in the abstract-random dimension of the Gregorc Style Delineator while males tended to be dominant in the concrete-random and abstract-sequential scales.
- gender interactions in teacher and student styles

***Age differences*** With increase in age, a trend from field dependency to independency has been suggested

***At risk students*** Improving teacher knowledge of learning and cognitive style theories was associated with improvements in learning for at risk junior high students.

***Racial differences*** African students more field dependant than independent

***Neuropsychological processing*** field independent learners use left hemisphere more .