

TOWARDS THE ELABORATION OF A META-MODEL UNIFYING LEARNING STYLES

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ABSTRACT

Numerous researches have formed the basis for the development of a number of personalised learning theories and models, based on cognitive, psychological, sociological, and cultural aspects of the learner. Each theory proposes a learning style from a particular point of view into a defined context.

These theories have been put into practice through several models consisting, typically, of a bipolar scale with a single characteristic at each end.

The problem is that many of the theories overlap and intersect in confusing ways. This confusion is, basically, about terminology, where different terms are used with similar meanings, and vice versa - the same term is used with different meanings.

This paper provides an overview of the learning style field and merges its different terms in order to define a meta model that unifies the different characteristics.

Key words: learning theories, learning styles, learning models, pedagogy, adaptive learning.

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TOWARDS A META-MODEL UNIFYING LEARNING STYLES MODELS

1 Introduction

The challenge regarding the application of learning styles in e-learning environment is taking in account, not only the cognitive, affective and social aspects of each learner, but also, the dynamic variation of these aspects for the same learner during a learning activity.

Numerous researches have formed the basis for the development of a number of personalized learning theories and models, based on cognitive, psychological, sociological, and cultural aspects of the learner. Each theory proposes a learning style from a particular point of view and into a particular context. It goes for the term “learning style” as well, which has no one definition.

This paper overviews different learning styles models, Then gives some examples of overlapping terms aiming to unify them into a generic model.

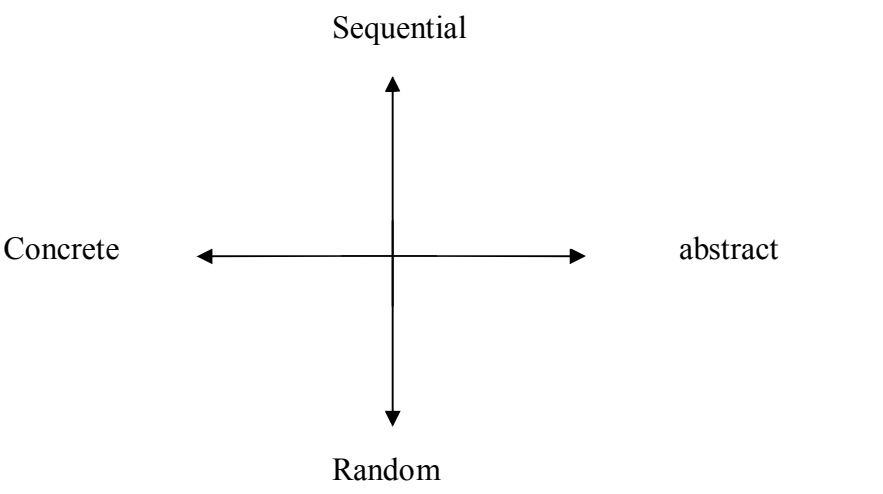
2 Learning styles

A learning style can be defined according to Keefe as the characteristic cognitive, affective, and psychological behaviours that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment [Mil 07].

Learning Styles and their effects on learning have been examined most carefully in [Cof 04] where a review of the literature on leaning styles and thirteen of the most influential models were examined in details. The report concludes that it matters fundamentally

which instrument is chosen. The following is a set of alphabetically ordered learning styles:

Personality types – learning/cognitive styles	
<p><i>Allinson and Hayes</i> Cognitive Style Index 1996; 2000</p>	<ul style="list-style-type: none"> • Intuition: immediate judgement, adoption of global perspective • Analysis: mental reasoning, focus on details
<p><i>Dunn and Dunn</i> Learning styles questionnaire/Inventory 1979; 1993</p>	<p>Based on 5 different categories:</p> <ul style="list-style-type: none"> • Environmental factors (sound/noise level, light level, design setting, temperature) • Sociological factors (self/pair/team/authority orientation) • Emotional factors (motivation, persistence, responsibility, structure) • Physiological factors • Psychological factors
<p><i>Entwistle</i> Approaches and study skills inventory for students ASSIST:1981; 1997</p>	<p>Learning is classified into:</p> <ul style="list-style-type: none"> • Deep learning: study with the ultimate intention of understanding the subject and integrate the new material with their prior knowledge • Surface learning: seek to reproduce the course material • Strategic learning: combines the two <p>Styles are connected to cerebral dominance (holist or serialist) combined with personality and divides students into four types:</p> <ul style="list-style-type: none"> • non-committers: anxious, cautious • Hustlers: competitive, dynamic, insensitive

	<ul style="list-style-type: none"> • Plungers: emotional, impulsive, original • Reasonable: combine curiosity and exploration with reflection and evaluation
<p>Felder-Silverman Index of learning styles 1988; 2002</p>	<p>Students are classified as:</p> <ul style="list-style-type: none"> • Active (learn by experimentation; working with others) / reflective (think on their own) • Sensing(concrete, practical, oriented toward facts and procedures) / intuitive(conceptual, innovative, oriented toward theories and meanings) • Visual (pictures; graphs; charts) / verbal (written or spoken explanation) • Sequential (incremental steps) / global (accumulate all the facts)
<p>Gregorc Gregorc's Style Delineator 1985</p>	<p>The two dimensional model is</p> <div style="text-align: center;">  </div> <p>Which leads to</p> <ul style="list-style-type: none"> • Concrete-sequential: ordered, perfection-oriented, practical, thorough, step by step • Abstract-sequential: logical, analytic, rational, evaluative, preference for verbal instruction

	<ul style="list-style-type: none"> • Abstract-random: sensitive, colourful, emotional, spontaneous, visual, unstructured learning, featuring a preference for holistic • Concrete-random: intuitive, independent, impulsive& original, featuring trial and error
<p>Herrmann Brain Dominance instrument 1986</p>	<p>This method classifies students in terms of their relative preferences for thinking in four different modes based on the task-specialized functioning of the physical brain. The four modes or quadrants in this classification scheme are:</p> <ul style="list-style-type: none"> • Quadrant A (left brain, cerebral): analytical, logical, factual, critical and quantitative • Quadrant B (left brain, limbic): sequential, structured, organized, planned, conservative and detailed • Quadrant C (right brain, limbic): interpersonal, emotional, sensory, kinaesthetic, symbolic and spiritual • Quadrant D (right brain, cerebral): visual, holistic, innovative, conceptual, imaginative, artistic
<p>Honey and Mumford Learning styles questionnaire LSQ:1982</p>	<p>Four main learning styles preferences are identified:</p> <ul style="list-style-type: none"> • Activists: accommodators: Open minded, like to be involved in new experiences • Reflectors: divergers: like to collect data and think about it carefully before coming to any conclusions • Theorists: assimilators: adapt and integrate observations into complex and logically sound theories, think step by step • Pragmatists: convergers: keen to try things out, want concepts

	linked to their job
<p><i>Jackson</i></p> <p>Learning styles profiler</p> <p>LSP:2002</p>	<ul style="list-style-type: none"> • Initiator: extrovert, sensation seeking, impulsive, speaks before thinking things out, leaps before he looks • Reasoner: intellectual and objective • Analyst: introverted, cautious,, methodical, responsible planner • Implementer: realistic and practical
<p><i>Kogan</i></p> <p>Matching Familiar Figures Test</p> <p>1971</p>	<ul style="list-style-type: none"> • Cognitive impulsives: make quick responses after briefly scanning the alternatives • Cognitive reflectives: scrutinise each alternative before making a final decision

<p>Kolb Learning styles inventory 1970s</p>	<p style="text-align: center;">Kolb's learning style model</p> <p>Kolb defined a 2-dimentional scale to represent learning styles, which leads to 4 extreme cases:</p> <ul style="list-style-type: none"> • Pragmatist(or Converger): abstract/active • Reflector(or Diverger): concrete/reflective • Theorist(or Assimilator): abstract/reflective • Activist(or Accommodator): concrete/active
<p>Myers-Briggs Myers-Briggs Type Indicator MBTI:1962-1985-1998</p>	<p>Students are categorised according to their position on scales based on Jung's theory [For] of psychological types. The types being:</p> <ul style="list-style-type: none"> • Perceiving (work spontaneously) / judging (prefer rigid structure and planning) • Sensing (prefer details) / intuition (prefer abstract concepts) • Thinking (strict logic, impartial) / feeling (decisions are based on social consideration) • Extraversion (thrive in group setting) / introversion (spend time

	alone)
Riding Cognitive style analysis CSA:1991-1998	<ul style="list-style-type: none"> • holist-analytic: organize information into wholes or parts • Verbaliser-imager: represent information during thinking verbally or in mental pictures
Sternberg Thinking styles	<ul style="list-style-type: none"> • Thirteen thinking styles divided into three functions, four forms, two levels, two scopes and two leanings
Vermunt Inventory of Learning Styles 1994	<p>Learning concerns:</p> <ul style="list-style-type: none"> • Cognitive processing: how students process content • Learning orientation (motivation): why they do it • Affective processes: how they feel about learning • Mental model of learning: how they see learning • Regulation of learning: how they plan and monitor learning <p>Learning styles are divided into</p> <ul style="list-style-type: none"> • Meaning-directed learner: looks for relationship between ideas, builds on past knowledge, intrinsically motivated • Application-directed learner: interested in practical details and concrete examples • Reproduction-directed learner: want to rote learn in order to get good marks in exams • Undirected learner: finds study difficult and lacks confidence and wants input and guidance from the teacher
Witkin Embedded Figures Test (EFT) 1978	<ul style="list-style-type: none"> • Field dependent: global picture, ignore the details, and approach a task more holistically. • Field independent: discern figures, focus on details, serialistic

Adapted from [How 96; Lai 01; Chen 02; Cri 02; Mck 03; Cof 04; Kar 04; Had 06; Lay 06]

3 Examples of overlapping polarities

A number of studies have noted that:

- The distinction between field dependent and field independent individuals is similar to that differentiating holist and serialist [Bru 82; Ash 86; Chen 02; Mag 03; Rum 03]. That is to say Field dependent typically see the global picture, ignore the details, and approach a task more holistically. Field independent individuals tend to discern figures as being discrete from their background, to focus on details, and to be more serialistic in their approach to learning.
- Vermunt's categories cut cross and overlap with Entwistle's [Had 06]: the non-committers clearly resemble the undirected, the meaning-directed learner resembles Entwistle's reasonable adventure or deep learner, and the reproduction-directed learner resembles the surface learner.
- Herman's model has some similarities to Kolb model such as the converger could map approximately over the quadrant A(analytical, logical, factual, critical and quantitative) [Cri 02]
- The format of Gregorc's style delineator is similar to that of Kolb's learning styles inventory [De Bel 90]
- Messer indicates a significant overlap between impulsives/reflectives and field dependent/field independent [Mes 76]
- Looking closer to the table summarizing learning styles, similarities between Felder-Silverman and Kolb LSI as well as MBTI can be pointed out. Besides, Honey&Mumbord LSQ supports Kolb LSI

4 Towards unifying learning styles' models

With the aim of developing a single instrument capable of assessing learning styles across the range of already established characteristics the following dimensions are to be taken into consideration:

➤ *The wholist-analytic dimension:* It represents the manner in which individuals tend to process information, either as a whole or broken down into components (analytic). This is supported by major models with different labelling:

Model	Label
Allinson and Hayes	Intuition-analysis
Entwistle	Holist-serialist
Felder-silvermann	Global-sequential
Herrmann	Right brain-left brain
Honey and mumford	-theorist
Kogan	Impulsive-reflective
Myers-Briggs	Intuition-sensing
Riding	Holist-analytic
Witkin	Field dependent-field-independent

Besides, Rayner and Riding argue the wholist-analytic dimension of cognitive style is present within Gregorc's model ,[Ray 97].

➤ *Perceptual response to visual and auditory stimuli:* Verbaliser-imager dimension describes the degree to which individuals tend to represent information as words (verbaliser) or as images (imager).

This is independent from the wholist-analytic dimension.ie an imager may be positioned at either end of the wholist-analytic dimension.

➤ *Study and instructional preferences*, including emotional factors (motivation,..) and environmental preferences

5. Conclusion

As we have seen, there are many areas of overlap among the models, and a multidimensional model seem to offer a more thorough approach. We are looking forward to define a model unifying the majority of terms.

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