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The onion model: Myth or reality in the field of individual differences psychology?

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ABSTRACT

To bring order in concepts related to individual learner differences, Curry (1983) designed the three-layered onion model. As this model provides an interesting way to distinguish related concepts – such as cognitive styles and approaches to studying – on the basis of their stability in learning situations, ample studies build further on this model. Given that only few studies have been conducted to empirically test the model, we conducted two studies to address this research gap. In the first study ($N = 113$), analyses do not show a clear causal path from three concepts belonging to different layers in relation to learning outcomes. In the second, longitudinal study ($N = 162$), no support is found for differences in stability between cognitive styles and approaches to studying. Our research does not provide solid evidence for the onion model, which warns to be cautious with applying the assumptions of theoretical models in educational practice without empirical support.

1. Introduction

Scholars in the education field as well as educational practitioners are increasingly convinced that a 'one-size-fits-all' paradigm is no longer an effective model for today's students, as learners approach learning in different ways (Evans, Cools, & Charlesworth, 2010). This implies that educators nowadays have to use diverse learning methods, didactics, and educational interventions to create a constructive learning climate for all learners. To reach this objective, it is necessary to develop a good understanding of the impact of individual differences on learning outcomes. Ample research has already been conducted regarding the role of cognitive and learning styles and approaches to studying in education (e.g., Armstrong, 2000; Backhaus & Liff, 2007; Riding & Rayner, 1998; Sadler-Smith, 1999a, 1999b; Sadler-Smith, Allinson, & Hayes, 2000). However, we still have no definite answer as to how and when cognitive styles and approaches to studying predict learning outcomes beyond other individual characteristics (Cools et al., submitted for publication; Gully & Chen, 2010). One of the reasons for this lack of understanding might be related to the fact that literature in the field of individual style differences is diffuse (Zhang & Sternberg, 2009). Different authors use concepts such as cognitive styles, learning styles, and learning preferences randomly and interchangeably, and there seems to be no consensus on how these concepts are interrelated (Sadler-Smith, 1999a, 2001a, 2001b).

In an attempt to bring order in the multitude of concepts, Curry (1983, 2000) designed the onion model, which situates existing style theories in an integrated model that distinguishes three levels, organised as the layers of an onion: an inner 'cognitive personality style' layer, a middle 'information-processing style' layer, and an outer 'instructional preference' layer. The onion model assumes that the more a concept is situated on the outside layers, the more it is influenced by external stimuli and hence the least stable. The outermost layer is most observable and is labelled 'instructional preferences,' referring to "the individual's choice of environment in which to learn" (Curry, 1983, p. 8). Because this layer interacts most with the external features of the learning environment (e.g., learner expectations, teacher expectations, learning environment), Curry (1983) expected that this is the least stable and most influenced layer. The second layer is labelled 'information-processing style' and refers to the individual's approach – in the classical information-processing perspective – to assimilate information (i.e., orientation, sensory loading, short-term memory, enhanced association, coding system, long-term storage). According to Curry (1983), information processing is not directly involved in the environment. It is therefore expected that this layer is more stable than the outer layer, but still subject to the influence of learning strategies. The innermost layer of the onion is labelled 'cognitive personality style' and refers to the individual's approach of assimilating and adapting information. The adaptation of information does not directly interact with the environment, but is a function of the deep, more permanent personality. In summary, according to Curry (1983, p. 117), "learning behaviour is fundamentally controlled by the central personality dimensions, translated through middle stratum information-processing dimensions, and given a final twist by interaction with environmental factors in the outer strata".

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The onion model is one of the most widely cited integrated models within the style field (Coffield, Moseley, Hall, & Ecclestone, 2004) and ample studies build further on the model's assumptions (e.g., Hsieh, Jang, Hwang, & Chen, 2011; Richardson, 2011), as it provides an interesting way to distinguish related concepts theoretically. Nevertheless, only few studies have been conducted to empirically test the assumptions of the model (Cools, 2008, 2009). Zhang and Sternberg (2005) therefore argue that efforts should be made to provide empirical evidence for the validity of the model. To address this research gap, we conducted two empirical studies: the first one being a cross-sectional study focusing on the relation between diverse individual learner differences and learning outcomes, and the second one looking at the stability versus malleability of these concepts in a longitudinal design. Before we elaborate on the methodology and results of these studies, we describe the different concepts and hypotheses that have been investigated in more detail. We subsequently define cognitive styles (inner layer), approaches to studying (middle layer), and didactical preferences (outer layer).

1.1. Cognitive styles

Messick (1996) conceptualised cognitive styles as stable attitudes, preferences, or habitual approaches determining a person's typical mode of perceiving, remembering, thinking, and problem solving. Cognitive styles have more recently been defined as "individual differences in processing that are integrally linked to a person's cognitive system… they are a person's preferred way of processing… they are partly fixed, relatively stable and possibly innate preferences" (Peterson, Rayner, & Armstrong, 2009a, p. 11). Studies investigating the cognitive style concept conclude that students' cognitive styles are likely to be stable characteristics (Ausburn & Ausburn, 1978; Peterson, Rayner, & Armstrong, 2009b; Riding & Pearson, 1994; Riding & Sadler-Smith, 1997), which implies that they can be generalised across different contexts and that they are not likely to change based on a specific learning context. Further confirmation of the stability of cognitive styles can be found in the test-retest reliability scores of several cognitive styles measurements. For example, a test-retest reliability ranging from .78 to .90 has been found for the Cognitive Style Index (CSI; Armstrong, Allinson, & Hayes, 2002) and from .82 to .88 for the Kirton Adaption-Innovation Inventory (KAI; Buttner & Gryskiewicz, 1993). The Rational-Experiential Inventory (REI) showed a test-retest reliability ranging between .95 and .98 (Marks, Hine, Blote, & Phillips, 2008). Therefore, we consider cognitive style as a concept belonging to the inner 'cognitive personality style' layer of the onion model.

Despite the wide diversity of available cognitive style models (Kozhevnikov, 2007), many researchers have focused on the distinction between analytic and intuitive thinking, assuming that cognitive styles can be positioned on an axis (Allinson & Hayes, 1996; Nickerson, Perkins, & Smith, 1985), distinguishing an analytic, structured, detail-oriented cognitive style on one side of the axis, and an intuitive, divergent, global cognitive style on the other side. Following recent evolutions in the style field, however, we preferred a multidimensional rather than a unidimensional perspective in this research (Hodgkinson & Sadler-Smith, 2003; Kozhevnikov, 2007; Sadler-Smith, 2009). Cools and Van den Broeck (2007, 2008a, 2008b) recently developed and validated a multidimensional cognitive style model based on three cognitive styles: knowing, planning, and creating. Consistent with a non-unitary conceptualisation of style (Hodgkinson & Sadler-Smith, 2003), people can score high or low on the three styles, thereby offering a flexible approach to style assessment (Miron, Erez, & Naveh, 2004). Individuals with a *knowing style* prefer a logical, rational, and impersonal way of information processing; make informed decisions on the basis of a thorough analysis of facts and figures and rational arguments. Individuals who score high on *planning* are attracted by structure; search for certainty; prefer well-organised environments; make decisions in a structured way and are concerned with efficiency in decision making. Individuals with a *creating style* search for renewal; have a strong imagination; like to work in a flexible way; prefer creative and unconventional ways of decision making, and make decisions based on intuition ('gut-feel'). As previous studies in diverse Western and non-Western samples (e.g., students, managers, employees, entrepreneurs) found strong support for the construct validity and predictive validity of this new three-dimensional model (Cools, De Pauw, & Vanderheyden, 2011; Cools & Van den Broeck, 2007, 2008a, 2008b; Cools, Van den Broeck, & Bouckenooghe, 2009), we chose to use this framework in current research.

1.2. Approaches to studying

An approach to studying is generally defined as "the manner in which studying is grasped" (Ashworth & Greasley, 2009, p. 561), pointing to students' mental orientation to studying. Entwistle and Peterson (2004a, p. 537) defined an approach to studying as "a context- and content-specific way of carrying out academic tasks." Although students prefer to use a certain approach to studying across different learning contexts (Ashworth & Greasley, 2009), this does not imply that an approach to studying can be considered to be a stable psychological trait, as students have the flexibility to change their approach to studying according to their perception of the specific context (Entwistle, 1991; Entwistle & Peterson, 2004b; Segers, Nijhuis, & Gijselaers, 2006; Struyven, Dochy, Janssens, & Gielen, 2006; Vanthournout, Donche, Gijbels, & Van Petegem, 2009, 2011). Consequently, students' approaches to studying are defined by features of the learning and teaching environment as well as students' characteristics and experiences, and as such depend on both the 'context' and 'the learner.' Therefore, approaches to studying are considered to be a concept belonging to the middle layer of the onion model.

Most authors investigating students' approaches to studying built further on the work of Marton and Saljö (1997), distinguishing between a deep and a surface approach (Furnham, Christopher, Garwood, & Martin, 2008). A *deep approach* to studying entails looking for meaning in the matter being studied and relating it to other experiences and ideas with a critical approach. Students adopting a deep approach aim to understand the subject and are intrinsically interested in, and derive enjoyment from, studying. Deep learners attempt to build a global picture of all the knowledge gathered. A *surface approach* is adopted when learners view the task as a demand to be met to reach a goal. Surface learners perceive the task of learning as an external imposition and they are externally motivated, thereby depending largely on rote learning and memorisation. They typically treat parts of the subject as separate entities and fail to integrate topics into a coherent whole. Some researchers (e.g., Entwistle & Ramsden, 1983; Marton & Saljö, 1997) mentioned the need to add a third approach, namely a *strategic approach*. Learners who adopt this approach are characterised by the intention to achieve the highest grade possible through effective time management and organised study methods and an alertness of the assessment process. A strategic approach entails well-organised and conscientious study methods linked to achievement motivation, and the determination to do really well in the courses taken. We used this three-dimensional conceptualisation within our research, following more recent theorising on approaches to studying (Vanthournout et al., 2009, 2011).

1.3. Didactical preferences

Didactical preferences are defined as an "individual's propensity to choose or express a liking for a particular instructional technique or combination of techniques" (Sadler-Smith, 1997, p. 52). Following this definition, students' didactical preferences depend heavily on the context in which learning takes place, as they will judge the appropriateness of a particular method in relation to the specific subject