

5<sup>th</sup> World Conference on Educational Sciences - WCES 2013

## Approaches to learning, metacognition and personality; an exploratory and confirmatory factor analysis

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### Abstract

The “approaches to learning” framework is widely used in higher education. Unlike other learning styles models, a person’s approach to learning is seen as a function of the interaction between the learner, the discipline and the context (rather than as a function of personality traits). However the relationship between context-specific approach to learning, context-general metacognition and trait-based personality requires further elaboration. Using exploratory and confirmatory factor analysis of three different inventories (approach to learning, metacognition and personality), we identify that these constructs do not appear to be distinct from each other, and consequently that the approaches to learning model may misrepresent both the nature and the importance of strategic approaches to learning.

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Selection and/or peer-review under responsibility of Academic World Education and Research Center.

*Keywords:* Metacognition, approaches to learning, personality, factor analysis

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### 1. Introduction

The ‘deep/surface/ strategic approaches to learning’ framework is widely used and is one of the most cited in the literature on learning in higher education. The recent review of cross-citations in the academic development literature conducted by Amundsen and Wilson (2012) found that two of the authors most associated with the framework (P. Ramsden and J. Biggs) are among the most frequently cited authors in the field and have acquired the status of “classic theoretical works” (2012, p. 112). The approaches-to-learning framework has been treated as a kind of learning style or intellectual style theory (Coffield, Moseley, Hall & Ecclestone, 2004; Entwistle & McCune, 2009). However, it is also described as being different to other learning styles theories in that the approach to learning a person adopts is a function of the interaction between the learner’s prior knowledge and experience of the subject, and the ways in which the subject are represented by the teacher, rather than being a trait of the person.

According to the framework, a person takes a strategic approach to learning when they are motivated to achieve the best grade possible, and, as a result, they strategically choose learning strategies in order to meet the teacher’s expectations and assessment criteria. This approach to learning includes a focus on clarifying the learning and

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assessment goals, planning how to meet those goals optimally, and monitoring one's self progress towards them. Framed in this way, a strategic approach is related to the metacognition (Flavell 1981; Tarricone 2011). It also appears to be related to dispositional conscientiousness (Diseth, 2003); yet, despite these ostensibly evident connections each of these concepts are treated by researchers and practitioners as different. For instance, a strategic approach to learning is as much a function of the subject and its presentation-in-context as it is of the person (Coffield et al., 2004); metacognition is relatively independent of the subject or context (Schraw, Dunkle, Bendixen, & Rodell, 1995; Schraw, 1998); and conscientiousness, a trait, is relatively stable and enduring (Maltby, Day & Macaskill, 2007).

How, then, is the relationship between these three concepts, strategic approach to learning, metacognition and conscientiousness, to be understood? In this paper we report on an exploratory factor analysis conducted with three inventories: Entwistle's Approaches and Study Skills Inventory for Students (ASSIST; Tait, Entwistle & McCune, 1998), the Metacognitive Awareness Inventory (Schraw & Dennison, 1994); and, an International Personality Item Pool, Five-Factor Personality Inventory (IPIP; Goldberg, 1999; Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger & Gough, 2006). The goal of the analysis was to explore to what extent the three inventories can be understood as measuring substantively different factors. We supported our findings further by a confirmatory factor analysis. We discuss the implications of the analysis for the approaches to learning model.

## **2. Approaches to learning, metacognition and conscientiousness**

In this section we describe the concepts of approaches to learning, metacognitive awareness and conscientiousness, and identify why the issue of the relationship between these three concepts is relevant and important.

### *2.1. Approaches to learning*

The approaches-to-learning model is widely used by educators, as well as in literature on faculty development. The primary argument arising from this model is that the approach to learning a student adopts depends, in part, upon their perception of the subject they study, on the teacher's goals, and on their context (e.g., how much time they have). As such, changing a learner's perception of their subject, of their teacher's goals or of their context can change their approach to learning. According to Prosser and Trigwell (1999) the significance of approaches to learning research "cannot be overstated" and, "without exception the results show that deep approaches to learning are more likely to be associated with higher quality learning outcomes" (p. 4). This claim perhaps overstates the strength of the evidence (see Entwistle, Tait & McCune, 2000; Diseth, 2003; Duff, Boyle, Dunleavy & Ferguson, 2004; 2008).

In the 1970s and 1980s, when the approaches-to-learning model was developed, theorists posited two distinct approaches to learning. The first was a deep approach, based on a motivation to understand the material and a tendency to use learning strategies aimed at understanding how the material related to other ideas. The second was a surface approach, based upon a motivation to reproduce the material as presented and a tendency to focus on rote learning or memorization strategies (see Entwistle & McCune, 2004; Entwistle, 2009, p. 33-39). Empirical data on the model, however, led to the emergence of a third factor, the 'strategic' approach to learning. A strategic approach, motivated by a desire to achieve the best grade possible, involved a tendency to choose learning strategies best designed to meet the teacher's expectations and assessment criteria (Entwistle & McCune, 2004). Mixed responses to this third factor occurred within the field. While Entwistle continued to develop inventories that incorporated aspects like planning and monitoring of learning, Biggs redeveloped his study process questionnaire, removing the strategic dimension. The latter argued that the "deep and surface approaches... are the indicators which are most pertinent to its intended use by teachers in their classrooms" (Biggs, Kember & Leung, 2001, p. 145). Nonetheless, for Entwistle too, a strategic approach to learning has not been afforded the same theoretical centrality as the deep and surface approaches (Entwistle, 2009).

Currently, there are numerous inventories for identifying a person's approach to learning in a given context, including various iterations of the Entwistle questionnaire, one developed and redeveloped by Biggs (1987; Biggs et al., 2001), and another developed by Vermunt (1994). An analysis by Coffield et al. (2004) of 13 major learning styles inventories identified that the reliability and validity of Entwistle's framework and inventory had been confirmed both by Entwistle and by independent analysts. Entwistle's inventory has been developed and redeveloped over time. Like other inventories, it gives a score for a deep approach and a score for a surface approach to learning. One version of it, the ASSIST, also gives a score for a strategic approach to learning.

## 2.2. *Metacognition*

Metacognition is "knowledge about the nature of people as cognizers, about the nature of different cognitive tasks, and about possible strategies that can be applied to the solution of different tasks...includes executive skills for monitoring and regulating one's cognitive activities" (Flavell 1999, p. 21). Interest in the value of metacognition in supporting learning has been considerable over the last fifteen years (Bransford, Brown and Cocking 2000; Hattie, 2009). Alexander and Murphy (1998), for example, concluded that the available evidence suggested that, "those who reflect on their own thinking and learning performance and use that self-knowledge to alter their processing are more likely to show significant academic growth than those who do not" (p. 31). Where students are taught to make explicit, monitor and regulate their own learning through approaches like assessment for learning (Black and William, 1998), self-verbalisation and self-questioning (Janssen, 2002), concept-mapping (McAleese, 1998) and reciprocal reading (Rosenshine and Meister 1994), this has been found to have strong positive impacts upon pupils' learning.

While approaches to learning are context specific, some debate suggests that metacognitive skills are general. Alexander and Murphy argue that training in metacognitive skills has been found to be of limited value unless it adequately addressed transfer of these skills to new situations (1998, p. 32). Schraw has argued that at least some aspects of metacognitive awareness are transferable from context to context, and so it should be regarded as a domain-general attribute (Schraw et al., 1995; Schraw, 1998). Research in metacognition has drawn from a variety of traditions and methods (Tarricone, 2011). One approach has been the use of inventories to assess the extent to which learners report themselves using various metacognitive strategies of planning, monitoring, debugging, and reviewing learning (Schraw & Dennison, 1994). Schraw and Dennison refer to this self-awareness of using metacognitive strategies as 'metacognitive awareness'.

There are clear linkages between the concept of strategic approaches to learning (with its focus on strategies such as clarifying learning goals, planning on how to meet them, and self-monitoring of progress) and the concept of metacognition. However, within the 'approaches to learning' field the strategic-approaches-to-learning model has been an uncomfortable construct, not a primary theory. Within the cognition and learning literature, metacognition has been a central concept. While the approaches to learning literature has been criticized for failing to pay sufficient attention to the agency of the learner (Haggis, 2003, p. 98; Boshier & Huang, 2008, p. 654), metacognition has been regarded as central to accounts of agency and self-regulation in learning (Kluwe 1982, cited in Hacker, Dunlosky & Graesser, 2009).

## 2.3. *Conscientiousness*

Personality is "relatively stable, enduring and important aspects of the self" (Maltby et al., 2007, p. 9). Personality attributes are stable in that the same person is likely to have similar attributes over time, and they are enduring in that the same person will have similar attributes in different social contexts. As such, personality attributes are more or less domain-general, although they can change over time and context: they are important in understanding people's actions. While there are a range of different models for personality, there is some degree of consensus that a five-factor model "may adequately describe the structure of personality" (Maltby et al., 2007, p. 170); however, this view may be regarded as most accurate in countries where northern European languages are

spoken (Saucier, Hampson, & Goldberg, 2000). One of these five traits is conscientiousness, which includes features like competence, organization, self-discipline, thoroughness and reliability (Costa & McCrae, 1985; Goldberg, 1993). These five factors are assessable via personality inventories (Costa & McCrae, 1985; Goldberg et al., 2006).

As with metacognition, there are clear conceptual links between a strategic approach to learning and conscientiousness. Indeed, Diseth's empirical work (2003) found a strong correlation between conscientiousness and a strategic/achieving approach ( $r = .55$  and  $r = .62$  in two different samples). There is also evidence to suggest that conscientiousness is associated with learning attainment in a way that is independent of deep and surface approaches to learning. For example, by combining the Biggs' approaches to learning inventory and the five-factor personality model, Chamorro-Premuzic and Furnham (2008) found a significant independent effect of conscientiousness on attainment, which was stronger than the effect of a deep approach to learning. In other words, conscientiousness was found to perform the function expected of a strategic approach to learning. A meta-analysis of studies of the relationship between attainment and the five-factor personality model identified that, of "the Big Five factors, Conscientiousness has been the most consistently linked to post-secondary academic success" (O'Connor & Paunonen, 2007, p. 974). They found a mean correlation between conscientiousness and academic attainment of  $r = .24$ .

#### 2.4. Research question

Three similar concepts, a strategic approach to learning, metacognition, and personality, are each measured using a similar approach, a self-report inventory; however, with different implications drawn in each case. Within the approaches to learning literature, a strategic approach to learning depends upon context and is a secondary concept, less central to understanding learning than deep and surface approaches. Within the cognition literature, metacognition is potentially generalizable across learning situations and central to understanding learning and to enabling learners take control of their learning. Within the personality literature, conscientiousness is generalizable across a wide range of different social contexts, not simply to learning contexts.

The similarities and differences between these three concepts suggest that it would be useful to know to what extent each inventory can measure distinctly, as different concepts or factors. The present paper addresses this question.

### 3. Method and findings

Participants included 460 first-year undergraduate students (68% women) whose ages ranged from 17 to 32 ( $M = 19.2$ ,  $SD = 2.5$ ). In week one, first year students of a pre-service teacher education degree program were invited to take part in the study. Volunteers were assessed during their weekly tutorials about "How Young People Learn" via the Meta-Cognitive Awareness Inventory (MAI, 16 items measuring meta-cognitive knowledge and 30 MAI items assessing meta-cognitive regulation / management), 20 items from the ASSIST (strategic approach), and a Big five personality inventory (IPIP, 10 items conscientiousness).

#### 3.1. Statistical procedure

We examined the distributions of the items and scales for a strategic approach to learning, the MAI, and conscientiousness for deviations from normality. We assessed the item structure via Principal Components Analysis (PCA). A Monte-Carlo Parallel Analysis confirmed the factor structure. We assessed internal consistency of the items via Cronbach's Alpha (1951), Cattell's Scree Test (1966). The  $F$ -test of the Interclass Correlation Coefficient was also used. This gives the same reliability as the Pearson test-retest statistic (Bartko, 1966). However, the  $F$ -test allows you to test the probability of the factor maintaining .70 in reliability over time. Finally, we assessed the primary model via Confirmatory Factor Analysis (CFA).

### 3.2. Exploratory factor analysis

We conducted a PCA to determine the number of factors derived from the eighty-four items. We used a cut-off on loadings less than 0.35 as the critical value, suggested by Stevens (1992). Results revealed a three-factor solution. A Monte Carlo Parallel Analysis corroborated the three-factor model. The three factors accounted for 24.50% of the variance. A direct oblimin rotation was then used to obtain a three-factor solution.

The primary factor, *self-regulated learning preparation*, explained 13.80% of the variance and included 23 items, nine from conscientiousness, 10 from strategic approach to learning, and four from the MAI (two from knowledge; *declarative & conditional*; two from regulation; *planning*). The highest loading item was, “I am always prepared” (IPIP; .75), the lowest loading item was, “It is important for me to feel that I am doing as well as I can on courses” (ASSIST; .40). Nine items were removed for loading below .35. Cronbach’s Alpha on the factor produced a reliability of .81. The interclass correlation alpha 95% confidence, lower bound was .76 and upper bound at .85. The *F*-test at a criterion value of .70 was significant,  $p < .001$  (Bartko, 1966; Shrout & Fleiss, 1979).

Factor 2, *metacognitive regulation strategies*, explained 6.70% of the variance, and incorporated 20 items from the MAI and two items from the Strategic Approach to Learning component of the ASSIST. The highest loading item in the factor (.65) was “I ask myself if I have learnt as much as I could have after finishing a task” (MAI-R), and the lowest loading item in the factor (.37), “I ask myself if there was an easier way to do things after I finish a task” (MAI-R). Seventeen Items were removed for loading below the .35 cut off. A Cronbach’s Alpha was conducted on the factor and produced a reliability of .84. The interclass correlation alpha at 95% confidence at lower bound was .81 and upper bound at .88. The *F*-test with a true value of .70 was significant  $p < .001$ .

Factor 3, *meta-cognitive information management strategies*, explained 4.0% of the variance and included nine items from both the knowledge (seven items; *declarative*) and regulation (two items; *evaluation and information management*) factors of the MAI. The highest loading item in the factor (.59) was “I am good at remembering information” (MAI-K), and the lowest loading item on the factor (.39) was “I consciously focus my attention on important information” (MAI-R). Four items were removed for loading below the .35 cut off. Cronbach’s Alpha of the items on this factor was .68. The interclass correlation alpha at 95% confidence at lower bound was .61 and upper bound at .75. The *F*-test with a value of .70 was not significant  $p > .001$ .

### 3.3. Confirmatory factor analysis

Evidence from a Confirmatory Factor Analysis suggests that a one factor model based on the primary factor derived from the results of the PCA is a good fitting model in comparison to a three factor model based on the ASSIST, IPIP and MAI.

## 4. Discussion

The results of the study confirmed the importance of the research question. The EFA and Cronbach’s alpha garnered strong evidence for a theoretical overlap between the three concepts of a strategic approach to learning, conscientiousness and metacognition. In fact, the primary factor, *self-regulated learning preparation* was comprised of items from conscientiousness, strategic approach to learning, and the MAI, whereas the second and third factors included items from the MAI and reflected its two-factor nature.

The primary factor, ‘self-regulated learning preparation’, reflected statements that related to planning, preparing and thinking about learning. Such results exemplify a “personality paradox”, posited by Mischel (1968). He stated that the incongruence between theories of stable personality theory and evidence of variability in individual behaviour across domains needed to be examined empirically. Mischel (2004) concluded that an “integrated science of the person” should be considered when thinking about personality and behaviour. Moreover, that such integration should take into account “cognitive, attention, and brain processes essential for adaptive self-regulation in the face of strong temptations and immediate “hot” situational triggers that elicit impulsive, automatic responses that threaten the individual’s pursuit of more important distal goals” (p. 17). In the current context, that self-



regulation could be thought of in terms of metacognition, strategic approaches and conscientiousness and the goal, learning.

Previous studies have sought to identify if there is an association between personality factors, like conscientiousness, and factors specific to the learning context, like a strategic approach to learning. However, correlation implies that there are different constructs that could explain such a relation (i.e., conscientiousness, metacognitive awareness, and strategic approach to learning). The present analysis suggests that it may not be entirely appropriate to view each of the three inventories as assessing discrete constructs. Rather, the data suggest that specific element of the three inventories offer aspects of a single construct.

If so, then our data suggest that the approaches to learning model could be re-considered. Two of the key ideas in the approaches to learning model are: 1) approaches to learning are contextual to the learning situation rather than domain-general characteristics or personality traits, and 2) strategic approaches to learning are less central to the model than deep and surface approaches. Both of these ideas are questionable in our data. In our data, no clear factorial differences emerge between the strategic approaches to learning items and personality or metacognitive awareness items. This suggests that, at least in the case of strategic approach to learning, the assumption that it is highly dependent upon learning context may not be supported (deep and surface approaches were not included in this analysis). Additionally, given that the strategic approach to learning is both empirically and conceptually intertwined with metacognition and conscientiousness, and that both are important predictors of attainment, it suggests that the strategic approach should be regarded as being of central concern to studies of learning, rather than something that is treated as an epiphenomenon. These suggestions have important implications. For instance, the approaches to learning literature focuses on changing teaching in order to change learning (Biggs, 2003; Entwistle, 2009; Prosser & Trigwell, 1999). If the strategic approach is both less context-dependent than assumed and relatively important for learning, then the focus of attention should be on helping to develop in learners in higher education their ability to self-regulate and self-monitor. In short it suggests that metacognitive awareness should have a more central role in the literature on learning in higher education and on faculty development.

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