Vlerick Leuven Gent Working Paper Series 2011/02

INDIVIDUAL DIFFERENCES IN MANAGEMENT EDUCATION: AN INTERNATIONAL INQUIRY ABOUT THEIR IMPACT ON LEARNING OUTCOMES

EVA COOLS

Eva.Cools@vlerick.com

JANA DEPREZ

Jana.Deprez@vlerick.com

KARLIEN VANDERHEYDEN

Karlien.Vanderheyden@vlerick.com

KIM BELLENS

Kim.Bellens@vlerick.com

KRISTIN BACKHAUS

DAVE BOUCKENOOGHE

D/2011/6482/02

INDIVIDUAL DIFFERENCES IN MANAGEMENT EDUCATION: AN INTERNATIONAL INQUIRY ABOUT THEIR IMPACT ON LEARNING OUTCOMES

EVA COOLS

Vlerick Leuven Gent Management School

JANA DEPREZ

Vlerick Leuven Gent Management School

KARLIEN VANDERHEYDEN

Vlerick Leuven Gent Management School

KIM BELLENS

Vlerick Leuven Gent Management School

KRISTIN BACKHAUS

DAVE BOUCKENOOGHE

Contact:

Jana Deprez

Vlerick Leuven Gent Management School

Phone: ++32 16 24 88 35

Fax: ++32 16 24 88 00

E-mail: Jana.Deprez@vlerick.com

ABSTRACT

The aim of the present study is to provide further insights about the impact of students' cognitive styles, learning styles, and motivation on learning outcomes in higher education. We studied management and MBA student three business schools in Belgium (n = 244), the US (n = 95), and Canada (n = 78). As hypothesised, the effect of cognitive styles on academic achievement was mediated through the intervening mechanisms of learning styles and motivation. This research contributes to the education and styles literature by investigating the combined impact of individual style differences and intervening mechanisms on student learning outcomes in an international way; and to educational practice in higher education by providing relevant insights to stimulate the design of constructive student-centred learning environments.

Keywords: cognitive styles, learning styles, motivation, learning outcomes, management education

INTRODUCTION

Recent evolutions in business (e.g., globalisation, technological changes,…) and education (e.g., e-learning, increased focus on developing skills, …) call for renewed attention on how we develop and educate higher education and management students (Armstrong & Fukami, 2009). The current trend towards student-centred and life-long learning also necessitates a better understanding of the impact of individual differences on learning outcomes (Evans & Cools, 2011). Moreover, as the diversity of students in management programmes and MBA classes increases (Boyatzis & Mainemelis, 2011), it is highly relevant to get a better view on how increasingly diverse students learn. To create an environment that enhances learning for all students, schools must increasingly use a wider variety of pedagogical methods (Vermunt, 2011; Vermunt & Endedijk, 2011).

Although there has been considerable research on individual differences that could be useful to avoid a 'one-size-fits-all' pedagogical approach, research often tends to study the impact of one individual difference at a time and in this sense lacks integrative theoretical models that focus upon how, why, and when combined individual differences are likely to promote learning (Gully & Chen, 2010). Indeed, many individual factors have been explored in isolation as a means of understanding student learning, including for instance cognitive and learning styles (Evans & Waring, 2009; Sadler-Smith, 2009). However, despite the ample research conducted on the roles of both cognitive and learning styles in the context of education (e.g., Armstrong, 2000; Backhaus & Liff, 2007; Riding & Rayner, 1998; Sadler-Smith, 1999a; 1999b; Sadler-Smith, Allinson, & Hayes, 2000), we still have no definitive answer as to how and when styles predict learning outcomes beyond other individual characteristics. Moreover, there is a lack of international research in the area of style differences, with researchers often using 'local' samples without cross-cultural validation of their findings in other countries (Cools, Armstrong, & Sadler-Smith, 2010). Another factor that has been studied frequently in the field of learning differences is motivation (Zimmerman, 2008). Again, this research leaves us with different, sometimes contradictory conclusions concerning the influence of motivation on the learning process and learning outcomes (Taht & Must, 2010; Tella, 2007).

Following these gaps in current research, we aim to provide further insights about the impact of a combination of individual learner differences on learning outcomes, using a conceptual framework based on Biggs (1978; 1987; 1999). Biggs' 3P-model distinguishes between three consecutive phases in the learning process, respectively Presage, Process, and Product, which will be explained in more detail below. Figure 1 gives an overview of the model, including the specific variables used in this study. In summary, this inquiry focuses upon the impact of cognitive styles, learning styles, and motivation on academic achievement of Belgian, US, and Canadian higher education students.

Insert Figure 1 About Here

Presage phase

The presage phase contains factors that exist before students enter the learning situation (Biggs, 1987; Jones, 2002), such as prior knowledge, intelligence, values, and personality characteristics (Biggs, 1985). It is presumed that factors of the presage phase have an indirect effect on performance through their effect on the motives and strategies adopted in the process phase (Jones, 2002).

Cognitive styles are measured as a concept of the presage phase in this study, as they are considered to be an influential stable characteristic of people belonging to what is called their 'cognitive personality' layer (Curry, 1983; Riding & Sadler-Smith, 1997). Cognitive styles have 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). 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. They give an indication of how people prefer to see, organise and interpret information from their environment, and how they use this to guide their actions (Hayes & Allinson, 1998). As such, their influence extends to almost all human activities that implicate cognition, including learning and social and interpersonal functioning (Hayes & Allinson, 1994; Sadler-Smith, 1998).

Despite the wide diversity of available cognitive style models (Kozhevnikov, 2007), many researchers have focused on the distinction between analytic and intuitive thinking (Hodgkinson & Sadler-Smith, 2003). Following recent evolutions in the style field, however, we preferred a multidimensional rather than a unidimensional perspective in this study (Kozhevnikov, 2007; Sadler-Smith, 2009). Cools and Van den Broeck (2007; 2008a; 2008b) recently developed and validated a multidimensional cognitive style model – measured with the Cognitive Style Indicator (CoSI) – based on three cognitive styles: knowing, planning, and creating. Consistent with a non-unitary conceptualisation of style (Hodgkinson & Sadler-Smith, 2003) individuals may score high or low on the three CoSI dimensions, thereby offering a flexible approach to style assessment (Miron, Erez, & Naveh, 2004). Individuals with a *knowing style*: have strong analytical skills; 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').

Process phase

The process phase exists of factors developed during the learning process, namely students' motives and strategies for learning (Biggs, 1987). As previously stated, the process factors are assumed to be influenced by the presage variables and in their turn, to have a direct effect on the product of the learning process. Two factors were involved in this study to get a better view on the learning process, this is: learning styles and motivation.

Learning styles represent "an individual's preferred way of responding to learning tasks which change depending on the environment or context…" (Peterson et al., 2009a, p. 11). Riding and Rayner (1998) point out that learning styles differ from cognitive styles, in that cognitive styles refer to the usual way in which a person assesses, perceives, and remembers in general, whereas learning styles are used to emphasise the effect of cognition within a specific learning context. Consequently, learning styles are considered to be malleable (Chiou, 2008; Peterson et al., 2009b; Price, 2004), depending on the specific learning context.

In line with the earlier mentioned multidimensional perspective in styles research, we used the five-dimensional learning styles model of Towler and Dipboye (2003) – assessed with the Learning Style Orientation Inventory (LSOI) – to measure students' learning styles. Although the most commonly used measurement of learning style is Kolb's Learning Style Inventory (KLSI; Kolb, 2007), a substantial amount of research indicates that this instrument lacks validity and internal consistency (Freedman & Stumpf, 1978; Furnham, 1992; Metallidou & Platsidou, 2008). Moreover, contrary to a flexible approach to styles, respondents are unable to score high or low on all Kolb's learning styles as they have to rank each of the four modes of learning of the model. The learning styles' model of Towler and Dipboye (2003) differentiates between five subscales, which people assess independently: discovery, experiential, group, observational, and structured learning. *Discovery learners* enjoy a broad range of learning situations and have an inclination for exploration during learning. They show a preference for subjective assessments, interactional activities, informational methods, and active-reflective activities. *Experiential learners* enjoy jumping straight into a task and putting newly acquired knowledge to immediate use. They have an impulsive orientation and desire hands-on approaches to instruction. *Group learning* is related to preferences for action and interactional learning. Group learners prefer to work with others while learning. *Observational learning* refers to a preference for informational methods and active-reflective methods. Observational learners tend to be passive learners who need external cues to help them learn and enjoy concrete experiences that have been organised by others. *Structured learning* is related to preferences for subjective assessments. Structured learners rely on their own information-processing strategies to enable effective learning to occur, and prefer to impose their own structure on learning.

Motivation, the second process variable in our model, is considered to be changeable over time and highly dependent on a concrete situation (Eggen & Kauchak, 2008; Jang, 2008; Kimmel & Volet, 2010) and as such a factor belonging to the process phase. It has been defined as the psychological processes that arouse and direct behaviour towards attaining some goal (Greenberg & Baron, 1997), and in this sense play a critical role in people's choice to pursue, initiate, and respond to learning opportunities (Beier & Kanfer, 2010; Rheinberg, Vollmeyer, & Rollett, 2002). Generally, people can be motivated to perform primarily for the pleasure derived from the activity itself (intrinsic motivation) or they can be motivated to learn because of something separate from the activity (extrinsic motivation) (Amabile, Hill, Hennessey, & Tighe, 1994). Students are likely to be intrinsically motivated if they attribute their educational

results to internal factors they can control, believe they can be effective agents in reaching desired goals, and are interested in mastering a topic rather than just rote-learning to achieve good grades. Extrinsic motivation usually comes from outside of the learner, such as getting good grades to compete with others, to earn more money, or because of coercion or threat of punishment. Following recent debates in the motivation field on the unipolar (i.e., they are opposites on one dimension) versus orthogonal (i.e., they are independent dimensions) nature of intrinsic and extrinsic motivation (Gagné et al., 2010), we chose for an instrument that was specifically designed to measure motivation in a multidimensional way (i.e., the Work Preference Inventory (WPI) of Amabile et al., 1994).

Product phase

The product of the learning process can both be cognitive (i.e., examination marks) and affective (i.e., the felt satisfaction about the learning process by the student) (Biggs, 2001). This study only focuses on cognitive learning outcomes as variables of the product phase, which refer to the academic achievement of students, conceptualised as their overall academic achievement.

HYPOTHESES

Concerning the relation between the presage and process factors (see Figure 1), previous research has found that cognitive styles influence people's behaviour in many different situations, including the strategies and motives developed during the learning process (Sadler-Smith, 1996; 1997; Sadler-Smith et al., 2000). A number of studies have been specifically conducted to investigate how cognitive styles affect students' learning processes (e.g., Pretz, Totz, & Kaufman, 2010; Ruttun, 2009). Sadler-Smith (1999b), for instance, found that analysts adopt a deeper way of learning (i.e., a learning approach characterised by an attempt to understand the material by relating it to a wider context, adopting a critical stance, and an acknowledgement that the material has an intrinsic value), while intuitives more than analysts prefer a collaborative approach (i.e., the propensity to search for support from and interaction with others and to engage in group-based activities). Riding and Rayner (1998)

found that analytical thinkers tend to prefer clearly organised information and to take a structured approach to learning, while intuitive thinkers tend to organise information in loosely clustered wholes and did not habitually use a structured approach. Building on these research results, we expect that cognitive styles will influence students' learning processes directly, and in this sense also indirectly impact on their learning outcomes, as quite some researchers in the cognitive style field assume that "people will learn and perform best in those situations where the information-processing requirements of the situation match their cognitive style or preferred approach to processing information" (Hayes & Allinson, 1998, p. 851). Hayes and Allinson (1993) concluded that in 12 of the 19 studies reviewed support was found for the idea that matching people's styles with the learning activity had positive effects on learning performance.

Regarding the link between the presage-process-product factors (see Figure 1), it is clear that many researchers attempted to predict students' academic achievement, investigating the influence of particular individual learner differences. Some researchers, for instance, studied the direct effect of cognitive styles on academic achievement, which yielded unequivocal results. Although Armstrong (2000), Au (1997), and Backhaus and Liff (2007) found higher academic grades for analytic students in their research, they attributed this to the assessment methods used to score the students, as it is generally assumed that cognitive styles and overall ability are independent (Cools, 2009; Riding & Rayner, 1998). Riding (1997) stated in this regard that the basic distinction between styles and overall ability is that performance on all tasks will improve as ability increases, whereas the effect of style on performance for an individual will either be positive or negative depending on the nature of the task. Others investigated the relation between learning styles and academic achievement (e.g., Chun-Shih & Gamon, 2002; Lu, Yu, & Liu, 2003), although no conclusive results can be drawn from this research. Whereas Thomas, Ratcliffe, Woodbury, and Jarman (2002) concluded that learning styles influenced students' performance (i.e., reflective as well as verbal learners had higher grades than active and visual learners respectively), Lu et al. (2003) did not find a link between both concepts. Furthermore, the impact of motivation on academic achievement has been studied frequently (e.g., Green, Nelson, Martin, & Marsh, 2006; Hidi & Harackiewicz, 2000; Pintrich, 2003). When studying the direct link between motivation and academic achievement, research generally concluded that intrinsically motivated learners tend to achieve higher levels of academic performance compared to extrinsically motivated learners (Deci & Ryan, 1985; Komarraju, Karau, & Schmeck, 2009). However, this link has not been

found in all studies (Taht & Must, 2010), which Cheng and Ickes (2009) and Ning and Downing (2010) attributed to the fact that most authors only investigate single-directional effects of motivation on academic achievement rather than its effect in an integrative model that tests the interrelatedness with other individual factors. Following the 3P model of Biggs and aforementioned existing research on the impact of individual learner characteristics on learning outcomes, we hypothesise that:

> Hypothesis 1: The effect of cognitive styles on academic achievement will be mediated through the intervening roles of learning styles and motivation.

METHOD

We collected data through a self-report questionnaire in the Spring term of 2010. It was clearly explained to the students that the survey was for research purposes only and that their participation was voluntary. In return, participants received an individualised feedback report with the general results of the study and their personal scores. To encourage participation, the aim of the study was briefly explained by one of the authors in each of the student groups in the different countries. Moreover, participation was taken into account in the research credit pools of each of the business schools.

Participants

We studied undergraduate, graduate, and MBA students of three business schools in Belgium, Canada, and the US. These three countries and institutes were chosen because they all represent an Anglo-Saxon educational setting and are characterised by an international student public with interactive teaching methods. We received 417 useful questionnaires. In total, 244 postgraduate and MBA students from a business school located in Belgium participated in this research (mean age = 26.70, ranging from 21 to 48 years; 70% men and 30% women; 67% national and 33% international students; 4% with a major in accounting and finance, 40% in management, 9% in marketing, and 47% in general business). In addition, 95 undergraduate and graduate students from an American business school (mean age = 23.18,

ranging from 20 to 35 years; 47% men and 53% women; 56% national and 44% international students; with a major spread of 16%, 17%, 33% and 34% respectively) and 78 students of a Canadian business school (mean age = 22.06, ranging from 20 to 44 years; 53% men and 47% women; 73% national and 27% international students; respective majors 27%, 39%, 24% and 10%) took part in the study.

Measures

To select the measures, we considered their usefulness and relevance in the context of our overall conceptual framework and also took into account cross-cultural validation evidence (e.g., Cools, Van den Broeck, & Bouckenooghe, 2009; Cools, De Pauw, & Vanderheyden, submitted; Moneta, 2004; Moneta & Christy, 2002) to make sure to have appropriate scales for international research. We created a composite score for each scale by averaging the responses across the items used for the measure. Higher scores on a measure reflect higher levels of the construct. The survey was pre-tested with academics and students to check whether the questions were clear and understandable.

Cognitive styles. The 18-item Cognitive Style Indicator (CoSI; Cools & Van den Broeck, 2007) distinguishes between three cognitive styles: a knowing style (4 items; α = .68, e.g. 'I like to analyse problems'), a planning style (7 items; α = .85, e.g. 'I prefer clear structures to do my job'), and a creating style (7 item; α = .82, e.g. 'I like to extend the boundaries'). The response format is a five-point likert scale from 1 (totally disagree) to 5 (totally agree).

Learning styles. We used the Learning Style Orientation Inventory (LSOI) of Towler and Dipboye (2003) to assess learning styles, which is a 54-item questionnaire, differentiating between five subscales: discovery learning (14 items; α = .83, e.g. 'I am a reflective person while learning'), group learning (7 items; α = .78, e.g. 'I like discussions in groups') experiential learning (13 items; α = .72, e.g. 'I like to dive in and practice'), structured learning (11 items, α = .77, e.g. 'I like to break a task into simpler terms'), and observational learning (9 items; α = .73, e.g. 'I learn best when pictures or diagrams are provided'). The response format is a five-point likert scale from 1 (totally disagree) to 5 (totally agree).

Motivation. We used the student version of the 30-item Work Preference Inventory (WPI), developed by Amabile et al. (1994), to assess motivation. This scale was developed to

measure longitudinal changes in motivation and sees intrinsic motivation (15 items; α = .72, e.g. 'I enjoy trying to solve complex problems') and extrinsic motivation (15 items; α = .74, e.g. 'I am strongly motivated by the grades I can earn') as two orthogonal rather than unipolar factors. The response format is a four-point likert scale from 1 (never or almost never true) to 4 (always or almost always true).

Academic achievement. As our data were collected in three different institutes (implying diverse educational systems), we used country-specific indicators of academic achievement to take into account the context-specificity of achievement scores. In the Belgian business school, a weighted aggregation of scores on diverse business-related courses was calculated for each of the respondents, whereas the US and Canadian respondents provided us with their grade point average and average term percentage respectively.

RESULTS

Table 1 shows the correlations, means, and standard deviations of the study variables.

Insert Table 1 About Here

To test hypothesis 1, we conducted path analysis. The results of this analysis indicated a good fit of the hypothesised model for the three samples (US, Canada, Belgium), providing support to the first hypothesis (i.e., the effect of cognitive styles on academic achievement will be mediated by learning styles and motivation). The chi-square/degrees of freedom ratio ($\chi 2/df$) ranged between 1.11 and 1.84 (Belgium: 1.84; Canada: 1.57; US: 1.11), which is well below the standard criterion of 5 (Schumacker & Lomax, 2004). The Comparative Fit Index (CFI; Belgium: .98; Canada: .96; US: .99) and Normed Fit Index (NFI; Belgium: .97; Canada: .91; US: .94) were higher than .90 in the three samples and the Root Mean Square Error of Approximation (RMSEA) was .06 (Belgium), .08 (Canada), and .03 (US) respectively. These fit indices provided support for a robust theoretical model and demonstrated better fit than the alternative model in which we tested a direct effect of cognitive styles on academic achievement.

DISCUSSION OF FINDINGS

This study aimed to contribute to the education and to the styles literature by investigating the combined impact of individual style differences and motivation on student learning outcomes in an international way. The effects of cognitive styles, learning styles, and motivation were explored in relation to academic achievement with business school students from Belgium, Canada, and the US. As hypothesised, we found that cognitive styles indirectly had an impact on academic achievement through the mediating roles of learning styles and motivation. The fit indices provided support for our model in the three countries, although not all parameter estimates were completely equivalent across the samples.

Table 2 summarises the standardised path coefficients of the three samples. Parameter estimates indicated a positive and significant path from the planning cognitive style to the observational and structured learning styles. Furthermore, the planning style had a direct negative effect on discovery learning. We also found positive relationships between the creating cognitive style and the experiential and discovery learning styles. Overall, these results confirm the aforementioned findings of earlier research on the link between cognitive styles and learning styles (e.g., Riding & Rayner, 1998; Sadler-Smith, 1999b), and in this sense contribute to recent debates concerning the 'matching hypothesis' (see further Implications). With regard to the links between cognitive styles and motivation (see Table 2), both the knowing and creating cognitive style were found to have a positive influence on intrinsic motivation, while the planning cognitive style had a positive influence on extrinsic motivation. This is an interesting finding that adds to existing research on cognitive styles, as we did not find previous research on the direct relation between cognitive styles and motivation. Furthermore, none of the learning styles had a significant influence on academic achievement, which supports the earlier research of Lu et al. (2003) who also did not find a direct link between learning styles and learning performance. In line with the general assumption that styles and overall ability are independent (e.g., Riding, 1997; Riding & Rayner, 1998), and hence have a differential influence on task and learning performance, this is an encouraging finding that shows that learners of all types can achieve equally. Finally, looking at the relation between motivation and academic achievement, differences were found across the three samples. In the Belgian sample, parameter estimates indicated a significant positive path from intrinsic and extrinsic motivation to academic achievement. In the Canadian sample, we found a negative path coefficient between extrinsic motivation and academic achievement. The

results of the US sample indicated no significant relationships between motivation and academic achievement. Consequently, no straightforward conclusions can be drawn from our research on the link between motivation and academic achievement, as was the case in earlier research (e.g., Cheng & Ickes, 2009; Ning & Downing, 2010). These contradictory findings again show the complexity of studying the role of motivation in the context of learning performance and also show the usefulness of taking a non-unitary perspective in measuring motivation, given the contradicting relations of intrinsic and extrinsic motivation with the diverse cognitive styles.

Insert Table 2 About Here

IMPLICATIONS AND LIMITATIONS

Looking back to the gaps identified in previous research, our study contributes to the existing research base in the following ways. Firstly, contrary to the preponderance of studies that link one individual difference with learning outcomes, we looked at learning through an integrative theoretical model, using the 3P model of Biggs (1978; 1987; 1999) as an overall framework. Support was found for this model in the three countries, providing evidence for the usefulness of looking at the direct and indirect influence of both stable person characteristics and adaptable strategies and motives to understand students' learning outcomes (Jones, 2002; Zhang, 2000). Interestingly, there is no direct link between cognitive and learning styles and academic achievement, although we did find that students with particular cognitive styles have a preference to apply learning styles that are in line with their cognitive profile. Hence, it seems that both opponents as well as proponents are partially right in the debate concerning the 'matching hypothesis' (i.e., which assumes that people learn and perform best in a situation that matches their style), in the sense that people tend to choose a learning approach that matches their style, but there is no direct effect on academic achievement.

Debates regarding this so-called 'matching hypothesis' still continue within the cognitive style field (Evans & Cools, 2011; Pashler, McDaniel, Rowher, & Bjork, 2009), with some scholars supporting the beneficial effects of matching styles with learning processes (Ford & Chen, 2001; Mayer, 2011), and others favouring the idea that people might learn more when there is a mismatch between their cognitive style and the learning method (Evans & Waring, 2011; Hayes & Allinson, 1996). Given the findings of this inquiry, more research is needed to further unravel the complexities of the learning process and to find answers to the 'matching hypothesis'.

Secondly, our results confirm the utility and relevance of taking a multidimensional perspective on styles rather than a unidimensional perspective in which people receive one style score situated on an analytical-intuitive dimension (Kozhevnikov, 2007; Sadler-Smith, 2009). The planning style was significantly and positively related to observational and structured learning, and the creating style to experiential and discovery learning. The knowing style and the creating style had a positive influence on intrinsic motivation, whereas the planning style had a positive influence on extrinsic motivation. Hence, a multidimensional style perspective proves to be interesting, as it can lead to more fine-grained results with relevance for educational practice.

Thirdly, we studied the role of motivation in the learning process in relation to other individual factors and not in isolation (Beier & Kanfer, 2010), thereby also taking a multidimensional rather than an unitary perspective. Given the diverse relations of cognitive styles with both types of motivation, conceptualising intrinsic and extrinsic motivation as two independent factors seems warranted (Gagné et al., 2010. With regard to link between motivation and academic achievement, however, less conclusive results can be presented, as the findings differ in the three samples. Further research that focuses on the relation with similar and different individual variables needs to be conducted to get a more comprehensive understanding on the role of motivation in the learning process (Beier & Kanfer, 2010; Colquitt & Simmering, 1998).

Fourthly, we conducted an international study, involving higher education students of Belgium, Canada, and the US. As mentioned in the introduction, there is a lack of international comparative research in the styles field (Holtbrügge & Mohr, 2010), which makes it difficult to generalise research findings to other countries, as you cannot assume that the context will be completely the same without checking your findings in different situations.

Certainly in the context of research that focuses on factors and processes that affect learning outcomes, a multi-country study seemed warranted given the many potentially influencing factors (Gully & Chen, 2010). Although we did find quite similar results in the three countries, some findings also differed, such as the role of motivation in the overall model. Hence, studying different countries is certainly an added value, which needs to be further explored in future research.

Obviously, the following limitations also characterised this study and need to be addressed in future research. A first major limitation of this study is that we did not explicitly take contextual factors, such as the learning and teaching environment (e.g., didactical methods used, teaching style), into account in our conceptual framework. This implies that we cannot derive from our results the extent to which the differences and similarities between the three countries can be attributed to the specific environment in which the students are learning, despite the fact that we consciously attempted to choose fairly similar educational institutes in the three countries. In line with the situational strength hypothesis (i.e., the idea that situational characteristics have the ability to stimulate or restrict the expression of particular individual differences) (Meyer, Dalal, & Hermida, 2010), it is important to involve contextual factors in future research to get a better view on the combined impact of individual differences, contextual factors, and intervening processes on learning outcomes (Gully & Chen, 2010). This idea of interactionism (i.e., behaviour is a function of the interaction between the person and the environment) did receive much attention in theory (e.g., Chatman & Flynn, 2005; Johns, 2006), but not many empirical studies have been conducted to examine this hypothesis in detail (Cools & Rayner, 2011; Liden & Antonakis, 2009). Specific contextual factors of interest are course design and objectives, teaching style, and applied didactical methods.

A second major limitation concerns the fact that we used country-specific indicators of academic achievement. We cannot guarantee that these indicators are completely comparable across countries, although we did check the distribution of each of the indicators in the different countries (following an unsatisfactory-satisfactory-good-excellent logic) and found a fairly similar distribution in each of the countries. Further research, with a more standardised academic achievement measure that can be meaningfully used in different countries, is necessary to cross-validate and replicate the findings of this study.

A third major limitation is related to the cross-sectional, quantitative design of our study. Survey research is a fairly easy way to collect large numbers of data, although this might be at the expense of fine-grained, contextualised understanding (Creswell, 2003). Qualitative or mixed-method research has the advantage of leading to a better understanding of the meaning of what is observed as it results in data of greater depth and richness (Shah & Corley, 2006). In addition, a longitudinal approach can also be useful to get a better view on how learning styles and motivation evolve over time. There still seems to be an overemphasis on cross-sectional research designs at the expense of longitudinal studies in this context (Vanthournout, Donche, Gijbels, & Van Petegem, 2009, 2011). Vanthournout and colleagues (2011) plea for using more longitudinal designs to empirically study the potential stability versus changeability of students' learning processes, as there is currently still a lack of these types of inquiries. To strengthen the findings of future research and gain deeper insights into the implications of style differences for learning, it will be important to strive to more diverse research designs (i.e., qualititative, mixed-method, and longitudinal designs). This way, it will be possible to obtain a good grasp on the influencing factors of learning, which will contribute to more specific, applicable, timely, and relevant findings for people in practice (Cools, 2009; Ployhart & Vandenberg, 2010).

CONCLUSION

The current evolution towards student-centred learning (Whetten, Johnson, & Sorenson, 2009) fits within the philosophy that education needs to enhance students' positive reactions and minimise negative ones to learning. Learners approach learning in different ways, and research has demonstrated that a 'one-size-fits-all' paradigm is no longer an effective model for today's students (Evans, Cools, & Charlesworth, 2010). Instead, educators must make use of appropriate diverse learning methods, didactics, and educational interventions to create a constructive, positive learning climate. To reach this, however, it is necessary to develop a good understanding of the impact of individual differences on learning outcomes, which was exactly the starting point of our research. Indeed, researchers in education have emphasised that, in order to improve the quality of learning, it is important to understand the process of learning (Duff, 2004). This study provides a useful framework to better understand how individuals learn and how the learning process influences learning outcomes, although further international, mixed-method, longitudinal research in diverse contexts is needed to cross-validate and strengthen our findings.

ACKNOWLEDGEMENT

We are grateful to the Vlerick Academic Research Fund, partially subsidised by the Flemish government, for their financial support to execute this research project.

REFERENCES

Amabile, T. M., Hill, K. G., Hennessey, B. A., & Tighe, E. M. (1994). The Work Preference Inventory: Assessing intrinsic and extrinsic motivational orientations. Journal of Personality and Social Psychology, 66, 950-967.

Armstrong, S. J. (2000). The influence of cognitive style on performance in management education. Educational Psychology, 20, 323-339.

Armstrong, S. J., & Fukami, C. V. (2009). Past, present and future perspectives of management learning, education and development. In S. J. Armstrong & C. V. Fukami (Eds.), The SAGE handbook of management learning, education and development (pp. 1-22). Thoasand Oaks, CA: Sage.

Au, A. K. M. (1997). Cognitive style as a factor influencing performance of business students across various assessment techniques. Journal of Managerial Psychology, 12, 243-250.

Backhaus, K., & Liff, J. P. (2007). Cognitive styles and approaches to studying in management education. Journal of Management Education, 31, 445-466.

Beier, M. E., & Kanfer, R. (2010). Motivation in training and development: A phase perspective. In S. W. J. Kozlowski & E. Salas (Eds.), Learning, training, and development in organizations (pp. 65-98). New York: Routledge.

Biggs, J. B. (1978). Individual and group differences in study processes. British Journal of Educational Psychology, 48, 266-279.

Biggs, J. B. (1985). The role of metalearning in study processes. British Journal of Educational Psychology, 55, 185-212.

Biggs, J. B. (1987). Student approaches to learning and studying. Research monograph. Hawthorn: Australian council for educational research.

Biggs, J. B. (1999). Teaching for quality learning at university. Buckingham, UK: Society for Research into Higher Education.

Biggs, J. B. (2001). Enhancing learning: A matter of style or approach. In R. J. Sternberg & L. F. Zhang (Eds.), Perspectives on thinking, learning, and cognitive styles (pp. 73-103). London: Lawrence Erlbaum Associates.

Boyatzis, R. E., & Mainemelis, C. (2011). Assessing the distribution of learning and adaptive styles in an MBA program. In S. J. Rayner & E. Cools (Eds.), Style differences in cognition, learning, and management: Theory, research and practice (pp. 99-114). New York: Routledge.

Chatman, J. A., & Flynn, F. J. (2005). Full-cycle micro-organizational behavior research. Organization Science, 16, 434-447.

Cheng, W., & Ickes, W. (2009). Conscientiousness and self-motivation as mutually compensatory predictors of university-level GPA. Personality and Individual Differences, 47, 817-822.

Chiou, W. B. (2008). College students' role models, learning style preferences, and academic achievement in collaborative teaching: Absolute versus relativistic thinking. Adolescence, 43, 129-142.

Chun-Shih, C., & Gamon, J. A. (2002). Relationships among learning strategies, patterns, styles, and achievement in web-based courses. Journal of Agricultural Education, 43, 1-11.

Colquitt, J. A., & Simmering, M. J. (1998). Conscientiousness, goal orientation, and motivation to learn during the learning process: A longitudinal study. Journal of Applied Psychology, 83, 654-665.

Cools, E. (2009). A reflection on the future of the cognitive style field: A proposed research agenda. Reflecting Education, 5, 19-34.

Cools, E., Armstrong, S. J., & Sadler-Smith, E. (2010). Methodological practices in the field of cognitive styles: A review study. In M. H. Pedrosa de Jesus, C. Evans, Z. Charlesworth & E. Cools (Eds.), Exploring styles to enhance learning and teaching in diverse contexts. Proceedings of the 15th annual conference of the European Learning Styles Information Network (ELSIN) (pp. 112-122). Aveiro, Portugal: University of Aveiro, Department of Education.

Cools, E., De Pauw, A., & Vanderheyden, K. (submitted). Cognitive styles in an international perspective: Cross-validation of the Cognitive Style Indicator (CoSI). Psychological Reports.

Cools, E., & Rayner, S. (2011). Researching style: More of the same or moving forward? In S. Rayner & E. Cools (Eds.), Style differences in cognition, learning, and management: theory, research and practice (pp. 295-306). New York, NY: Routledge.

Cools, E., & Van den Broeck, H. (2007). Development and validation of the Cognitive Style Indicator. The Journal of Psychology, 141, 359-387.

Cools, E., & Van den Broeck, H. (2008a). The hunt for the Heffalump continues: Can trait and cognitive characteristics predict entrepreneurial orientation? Journal of Small Business Strategy, 18, 23-41.

Cools, E., & Van den Broeck, H. (2008b). Cognitive styles and managerial behaviour: 1 qualitative study. Education and Training, 50, 103-114.

Cools, E., Van den Broeck, H., & Bouckenooghe, D. (2009). Cognitive styles and person-environment fit: Investigating the consequences of cognitive (mis)fit. European Journal of Work and Organizational Psychology, 18, 167-198.

Creswell, J. W. (2003). Research design: Qualitative, quantitative and mixed methods approaches (second edition). Thousand Oaks, CA: Sage.

Curry, L. (1983). An organization of learning style theory and constructs. In L. Curry (Ed.), Learning style in continuing medical education (pp. 115-123). Halifax: Dalhouse University.

Deci, E. L., & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. New York: Plenum.

Duff, A. (2004). The Revised Approaches to Studying Inventory (RASI) and its use in management education. Active Learning in Higher Education, 5, 56-72.

Eggen, P., & Kauchak, D. (2008). Educational psychology: windows on classrooms. New Jersey: Pearson Education.

Evans, C., & Cools, E. (2011). New directions with styles research: Applying styles research to educational practice. Learning and Individual Differences, in press.

Evans, C., Cools, E., & Charlesworth, Z. (2010). Learning in higher education - how cognitive and learning styles matter. Teaching in Higher Education, 15, 467-478.

Evans, C., & Waring, M. (2009). The place of cognitive style in pedagogy: Realising potential in practice. In L. F. Zhang & R. J. Sternberg (Eds.), Perspectives on the nature of intellectual styles (pp. 169-208). New York: Springer.

Evans, C., & Waring, M. (2011). Student teacher assessment feedback preferences: The influence of cognitive styles and gender. Learning and Individual Differences, in press.

Ford, N., & Chen, S.Y. (2001). Matching/mismatching revisited: An empirical study of learning and teaching styles. British Journal of Educational Technology, 32, 5-22.

Freedman, R. D., & Stumpf, A. S. (1978). What can one learn from the Learning Style Inventory? Academy of Management Journal, 21, 275-282.

Furnham, A. (1992). Personality and learning style: A study of three instruments. Personality and Individual Differences, 13, 429-438.

Gagné, M., Forest, J., Gilbert, M. H., Aube, C., Morin, E., & Malorni, A. (2010). The Motivation at Work Scale: Validation evidence in two languages. Educational and Psychological Measurement, 70, 628-646.

Green, J., Nelson, G., Martin, A. J., & Marsh, H. (2006). The causal ordering of self-concept and academic motivation and its effect on academic achievement. International Education Journal, 7, 534-546.

Greenberg, J., & Baron, R. A. (1997). Behavior in organizations: Understanding and managing the human side of work. Englewood Cliffs, NJ: Prentice Hall.

Gully, S., & Chen, G. (2010). Individual differences, attribute-treatment interactions, and training outcomes. In S. W. J. Kozlowski & E. Salas (Eds.), Learning, training, and development in organizations (pp. 3-22). New York: Routledge.

Hayes, J., & Allinson, C. W. (1993). Matching learning style and instructional strategy: An application of the person-environment interaction paradigm. Perceptual and Motor Skills, 76, 63-79.

Hayes, J., & Allinson, C. W. (1994). Cognitive style and its relevance for management practice. British Journal of Management, 5, 53-71.

Hayes, J., & Allinson, C. W. (1996.) The implications of learning styles for training and development: A discussion of the matching hypothesis. British Journal of Management, 7, 63-73.

Hayes, J., & Allinson, C. W. (1998). Cognitive style and the theory and practice of individual and collective learning in organisations. Human Relations, 51, 847-871.

Hidi, S., & Harackiewicz, J. M. (2000). Motivating the academically unmotivated: A critical issue for the 21st century. Review of Educational Research, 70, 151-179.

Hodgkinson, G. P., & Sadler-Smith, E. (2003). Complex or unitary? A critique and empirical re-assessment of the Allinson-Hayes Cognitive Style Index. Journal of Occupational and Organizational Psychology, 76, 243-268

Holtbrügge, D., & Mohr, A. T. (2010). Cultural determinants of learning style preferences. Academy of Management Learning and Education, 9, 622-637.

Jang, H. (2008). Supporting students' motivation, engagement, and learning during an uninteresting activity. Journal of Educational Psychology, 100, 798-811.

Johns, G. (2006). The essential impact of context on organizational behavior. Academy of Management Review, 31, 386-408.

Jones, C. (2002). Biggs's 3P model of learning: The role of personal characteristics and environmental influences on approaches to learning. Griffith University, School of Applied Psychology. [Doctoral dissertation]

Kimmel, K., & Volet, S. (2010). Significance of context in university students' (meta)cognitions related to group work: A multi-layered, multi-dimensional and cultural approach. Learning and Instruction, 20, 449-464.

Kolb, D. A. (2007). The Kolb Learning Style Inventory, Version 3.1. Boston, MA: Hay Transforming Learning.

Komarraju, M., Karau, S. J., & Schmeck, R. R. (2009). Role of the Big Five personality traits in predicting college students' academic motivation and achievement. Learning and Individual Differences, 19, 47-52.

Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. Psychological Bulletin, 133, 464-481.

Liden, R. C., & Antonakis, J. (2009). Considering context in psychological leadership research. Human Relations, 62, 1587-1605.

Lu, J., Yu, C. S., & Liu, C. (2003). Learning style, learning patterns, and learning performance in a WebCT-based MIS course. Information and Management, 40, 497-507.

Mayer, R. E. (2011). Does styles research have useful implications for educational practice? Learning and Individual Differences, in press.

Messick, S. (1996). Bridging cognition and personality in education: The role of style in performance and development. European Journal of Personality, 10, 353-376.

Metallidou, P., & Platsidou, M. (2008). Kolb's learning style inventory – 1985: Validity issues and relations with metacognitive knowledge about problem-solving strategies. Learning and Individual Differences, 18, 114-119.

Meyer, R. D., Dalal, R. S., & Hermida, R. (2010). A review and synthesis of situational strength in the organizational sciences. Journal of Management, 36, 121-140.

Miron, E., Erez, M., & Naveh, E. (2004). Do personal characteristics and cultural values that promote innovation, quality, and efficiency compete or complement each other? Journal of Organizational Behavior, 25, 175-199.

Moneta, G. B. (2004). The flow model of intrinsic motivation in Chinese: Cultural and personal moderators. Journal of Happiness Studies, 5, 181-217.

Moneta, G. B., & Siu, C. M. (2002). Trait intrinsic and extrinsic motivations, academic performance and creativity in Hong Kong college students. Journal of College Student Development, 43, 664-683.

Ning, H. K., & Downing, K. (2010). The reciprocal relationship between motivation and self-regulation: A longitudinal study on academic performance. Learning and Individual Differences, 20, 682-686.

Pashler, H., McDaniel, M., Rowher, D., & Bjork, R. (2009). Learning styles: Concepts and evidence. Psychological Science in the Public Interest, 9, 105-119.

Peterson, E. R., Rayner, S. G., & Armstrong, S. J. (2009a). Herding cats: In search of definitions of cognitive styles and learning styles. ELSIN Newsletter, An International Forum, Winter 2008-2009, 10-12. Retrieved from http://www.elsinnews.com on June 16, 2010.

Peterson, E. R., Rayner, S. G., & Armstrong, S. J. (2009b). Researching the psychology of cognitive styles and learning style: Is there really a future? Learning and Individual Differences, 19, 518-523.

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. Journal of Educational Psychology, 95, 667-686.

Ployhart, R. E., & Vandenberg, R. J. (2010). Longitudinal research: The theory, design, and analysis of change. Journal of Management, 36, 94-120.

Pretz, J. E., Totz, K. S., & Kaufman, S. B. (2010). The effects of mood, cognitive style, and cognitive ability on implicit learning. Learning and Individual Differences, 20, 215-219.

Price, L. (2004). Individual differences in learning: Cognitive control, cognitive style, and learning style. Educational Psychology, 24, 681-698.

Rheinberg, F., Vollmeyer, R., & Rollett, W. (2002). Motivation and self-regulated learning: A type analysis with process variables. Psychologia, 45, 237-249.

Riding, R. J. (1997). On the nature of cognitive style. Educational Psychology, 17, 29-49.

Riding, R. J., & Rayner, S. (1998). Cognitive styles and learning strategies. London: David Fulton.

Riding, R. J., & Sadler-Smith, E. (1997). Cognitive style and learning strategies: Some implications for training design. Instructional Journal of Training and Development, 1, 199-208.

Ruttun, R. (2009). The effects of visual elements and cognitive styles on students' learning in hypermedia environment. World Academy of Science, Engineering and Technology, 49, 963-971.

Sadler-Smith, E. (1996). Learning styles: A holistic approach. Journal of European Industrial Training, 20, 29-36.

Sadler-Smith, E. (1997). “Learning Style”: Frameworks and instruments. Educational Psychology, 17, 51-63.

Sadler-Smith, E. (1998). Intuition-analysis cognitive style and learning preferences of business and management students. Journal of Managerial Psychology, 14, 26-38.

Sadler-Smith, E. (1999a). Intuition-analysis cognitive style and learning preferences of business and management students: A UK exploratory study. Journal of Managerial Psychology, 14, 26-38.

Sadler-Smith, E. (1999b). Intuition-analysis style and approaches to studying. Educational Studies, 25, 159-173.

Sadler-Smith, E. (2009). Cognitive styles and learning strategies in management education. In S. J. Armstrong & C. V. Fukami (Eds.), The SAGE handbook of management learning, education and development (pp. 301-324). Thoasand Oaks, CA: Sage.

Sadler-Smith, E., Allinson, C. W., & Hayes, J. (2000). Learning preferences and cognitive style: Some implications for continuing professional development. Management Learning, 31, 239-256.

Schumacker, R. E., & Lomax, R. G. (2004). A beginner’s guide to structural equation modeling (2nd ed.). Mahwah, NJ: Lawrence Erlbaum.

Shah, S. K., & Corley, K. G. (2006). Building better theory by bridging the qualtative – quantitative divide. Journal of Management Studies, 43, 1821-1835.

Taht, K., & Must, O. (2010). Are the links between academic achievement and learning motivation similar in five neighbouring countries? Trames: Journal of the Humanities and Social Sciences, 14, 271-281.

Tella, A. (2007). Student’s academic achievement and learning outcomes in mathematics among secondary school students in Nigeria. Eurasia Journal of Mathematics, Science & Technology Education, 3, 149-156.

Thomas, L., Ratcliffe, M., Woodbury, J., & Jarman, E. (2002). Learning styles and performance in the introductory programming sequence. Proceedings of the 33rd SIGCSE technical symposium on computer science education, February 27- March 03, Cincinnati, Kentucky.

Towler, A. J., & Dipboye, R.L. (2003). Development of a learning style orientation measure. Organizational Research Methods, 6, 216-235.

Vanthournout, G., Donche, V., Gijbels, D., & Van Petegem, P. (2009). Alternative data-analysis techniques in research on student learning: Illustrations of a person-oriented and developmental perspectives. Reflecting Education, 5, 35-51.

Vanthournout, G., Donche, V., Gijbels, D., & Van Petegem, P. (2011). Further understanding learning in higher education: A systematic review on longitudinal research using Vermunt's learning pattern model. In S. J. Rayner & E. Cools (Eds.), Style differences in cognition, learning, and management: theory, research and practice (pp. 78-98). New York: Routledge.

Vermunt, J. D. (2011). Patterns in student learning and teacher learning: Similarities and differences. In S. J. Rayner & E. Cools (Eds.), Style differences in cognition, learning, and management: Theory, research and practice (pp. 173-187). New York: Routledge.

Vermunt, J. D., & Endedijk, M. (2011). Patterns in teacher learning in different phases of the professional career. Learning and Individual Differences, in press.

Whetten, D. A., Johnson, T. D., & Sorenson, D. L. (2009). Learning-centered course design. In S. J. Armstrong & C. V. Fukami (Eds.), The SAGE handbook of management learning, education and development (pp. 255-270). Thoasand Oaks, CA: Sage.

Zhang, L. F. (2000). University students' learning approaches in three cultures: An investigation of Biggs's 3P model. The Journal of Psychology, 134, 37-55.

Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. American Educational Research Journal, 45, 166-183.

TABEL 1

Descriptive statistics and correlations of study variables (*N* = 417)

			Cognitive style			Learning style					Motivation	
	M	*SD*	K	P	C	D	G	O	St	Exp	I	Ext
Cognitive style												
Knowing (K)	3.63	.71										
Planning (P)	3.67	.75	.16**									
Creating (C)	3.84	.69	.10*	-.35**								
Learning style												
Discovery (D)	3.30	.59	.11*	-.38**	.56**							
Group (G)	2.85	.73	-.16**	-.08	.11*	.11*						
Observational (O)	3.75	.53	.02	.47**	-.11*	-.32**	.11*					
Structured (S)	3.31	.61	.16**	.69**	-.26**	-.25**	-.04	.37**				
Experiential (Exp)	3.69	.43	.12*	-.07	.38**	.13**	.20**	.22**	-.04			
Motivation												
Intrinsic (I)	3.02	.34	.21**	-.23**	.51**	.48**	-.11*	-.21**	-.07	.31		
Extrinsic (Ext)	2.76	.39	.10	.39**	-.26**	-.30**	-.07	.33**	.33**	-.03	-.21**	

* $p < .05$; ** $p < .01$; *** $p < .001$

TABLE 2

Impact of cognitive styles, learning styles and motivation on academic achievement (standardised path coefficients)

Variables	Learning style															Motivation						Academic achievement		
	Discovery			Group			Observational			Structured			Experiential			Intrinsic			Extrinsic					
	U	C	B	U	C	B	U	C	B	U	C	B	U	C	B	U	C	B	U	C	B	U	C	B
Cognitive style																								
Knowing	-.19***	-.02**	-.09**	-.16**	-.07	-.22***	-.11**	-.06**	-.06**	-.21**	-.03**	.02**	-.25**	-.10**	.01**	-.41**	-.28**	-.27***	-.07*	-.37**	-.01**			
Planning	-.20***	-.25**	-.25**	-.11**	-.06	-.02***	-.56**	-.63**	-.36**	-.52**	-.62**	.72**	-.08**	-.28**	.06**	-.08**	-.05**	-.17**	-.40**	-.23**	-.26**			
Creating	-.53***	-.50**	-.39**	-.30**	-.09	-.09***	-.11**	-.23**	-.01**	-.15**	-.05**	.00**	-.31**	-.30**	.39**	-.29**	-.56**	-.38***	-.16*	-.07**	-.12**			
Learning style																								
Discovery																						-.01	-.19*	-.10
Group																						-.18	-.09*	-.05
Observational																						-.15	-.08*	-.10
Structured																						-.17	-.00*	-.00
Experiential																						-.12	-.21*	-.02
Motivation																								
Intrinsic																						-.09	-.12*	-.16*
Extrinsic																						-.05	-.26*	-.23***

U = United States (n = 95); C = Canada (n = 78); B = Belgium (n = 244)

* p < .05; ** p < .01; *** p < .001

FIGURE 1

Conceptual framework