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The interplay of perceptions of the learning environment, personality and learning strategies: a study amongst International Business Studies students

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Previous research on students’ learning strategies has examined the relationships between either perceptions of the learning environment or personality and learning strategies. The focus of this study was on the joint relationships between the students’ perceptions of the learning environment, their personality, and the learning strategies they used. This study was conducted in an International Business Studies programme, with 522 students participating in the research project. Path analyses were conducted to assess the nature of the relationships between personality traits, perceptions of the learning environment and learning strategies. The first path analysis revealed that two personality traits, conscientiousness and openness to experience, are related to learning strategies. The second path analysis indicated that students’ perceptions of the various elements of the learning environment influence their learning strategies. A third path analysis revealed that personality traits are only slightly related to perceptions of the learning environment. Finally, the path analysis of the full model indicated both direct and indirect relationships between conscientiousness, openness to experience, and learning strategies. Perceptions of learning environment components mediated the relationships between the other personality traits and learning strategies.

Introduction

Since Marton and Säljö (1976) introduced the constructs of deep and surface approaches to learning, educators in higher education have been interested in stimulating deep learning. One of the ways of doing so is by redesigning the learning environment (e.g. Gibbs, 1992; Kember et al., 1997; Nijhuis et al., 2005). Such interventions are based on the assumption that learning is influenced by the students’

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perceptions of the learning environment (Biggs, 1987; Ramsden, 1988). In addition, researchers (Biggs, 1993; Sadler-Smith, 1999) have argued that learning is influenced by enduring characteristics of the learner which have been brought to the learning situation. Factors such as locus of control (Rose et al., 1996), thinking styles (Zhang, 2000), cognitive styles (Sadler-Smith, 1999) and personality traits (Zhang, 2003) also seem to play a role. Previous research on learning strategies has examined the relationships between either the learner’s characteristics or perceptions of the learning environment and learning strategies. As Lizzio et al. (2002) indicated, ‘studies to date have also not included a direct test of the relative influence of personal and perceived situational presage factors’ (p. 31). The focus of this study is on the separate and joint relationships between the students’ perceptions of the learning environment, their personality and the learning strategies they use. The article is organised as follows. First, we will discuss the relationships between perceptions of the learning environment, personality and students’ learning. Second, after describing the research method, the empirical findings are reported. This is followed by a discussion and the conclusion.

Theoretical background

Learning environment perceptions and student learning

A vast amount of research indicates that when students are exposed to a particular context, they are differentially responsive to the learning environment, according to their perceptions of the teaching and learning context and its requirements (Biggs, 1987; Entwistle, 1988; Ramsden, 1988, 1997; Meyer & Muller, 1990; Meyer et al., 1990).

For example, Prosser (2000) factor analysed the scores of a sample of about 1600 Australian first-year university science students on the Study Process Questionnaire (Biggs, 1987) and the Course Experience Questionnaire (Ramsden, 1991), resulting in a two-factor solution. In the first factor, deep learning was associated with good teaching, clear goals and independent learning. The second factor revealed relations between appropriate workload, appropriate assessment and a deep approach. These findings were confirmed by Lizzio et al. (2002), using a cross-disciplinary sample of 2130 Australian undergraduate students. A multiple regression analysis indicated that perceptions of good teaching, clear goals, appropriate assessment and independent learning served as good predictors for a deep approach. Students’ perception of appropriate assessment and appropriate workload, however, correlated negatively with a surface approach.

International studies indicate that these results can be generalised for populations of different countries. A study by Sadlo and Richardson (2003) provides a case in point. They used data from six different schools for occupational therapy located in six different western countries. These schools used different teaching methods, namely, subject-based, problem-based and hybrid curricula. The total sample consisted of 225 students. Again, good teaching, appropriate assessment and independent learning
Personality and learning strategies

were positively—although to a low to moderate degree—related to deep learning. Values for correlations (r) ranged from 0.18 to 0.23. As in the Australian studies, students’ perceptions of good teaching, clear goals, appropriate workload, appropriate assessment and independent learning were negatively related to a surface approach. They found values for correlations (r) ranging between -0.47 and -0.21.

In general, the consistent finding is that there is a positive, although low to moderate, relationship between employing a deep approach and the students’ perceptions of good teaching, clear goals and the extent to which they are encouraged to learn independently. The perceptions of appropriate workload and assessment are negatively related to a surface approach. All these studies treat students as independent replicates: that is, they are considered as repeated measurements when analysing the association between the variables described. It is assumed that associations between variables are independent of certain student characteristics. The question arises, however, as to whether this is a valid assumption.

Trigwell et al. (1996) conducted some in-depth analyses to find out whether this assumption holds true. They introduced the notion of disintegrated perceptions when trying to understand the association between perceptions of the learning environment and measured outcomes. Based on a cluster analysis, they discerned three groups of students. In the first group, students adopting a deep approach perceived the learning environment as characterised by good teaching, clear goals, appropriate workload and assessment, and allowing independence in learning. In the second group, characterised by a high score on the surface approach, students perceived, in comparison with the first group, lower scores on components of the learning environment. The third group seemed insensitive to the learning environment. They concluded that this group had characteristics which are consistent with the idea of disintegrated perceptions introduced by Entwistle et al. (1991):

It suggests (as may be expected) that many students see no particular influence of the environment on their approach to learning, and hence no influence on the quality of their learning. In attempts to encourage deep approaches to learning, more work may need to be done in addressing factors that influence students’ perceptions. (p. 4)

**Personality and students’ learning**

One of the factors that might influence students’ learning approaches directly, as well as indirectly via students’ perceptions, is students’ personality. In this respect, research in the field of psychology, especially in the domain of personality and individual differences, might offer interesting insights. One of the major achievements in this field is the big five personality traits model, as described by Costa and McCrae (1992). This five-factor model contains the following personality traits (Piedmont, 1998):

- Emotional stability describes the way individuals deal with psychological distress. A high score on this dimension indicates that people are calm, relaxed, feel confident and are not easily disturbed.
Extroversion is about social interaction with other people. People scoring high on this dimension tend to be sociable, assertive and like to work with other people.

Agreeableness is about the attitude of an individual towards other people. People with high scores on this scale are characterised as being forgiving, readily helpful and peaceable.

Conscientiousness deals with someone’s level of organisation, persistence and goal-directed behaviour. People with a high score tend to be strong-willed, responsible, neat and well organised.

Openness refers to proactive search behaviour and tolerance of and exploring the unfamiliar. People who score highly on this scale tend to be open-minded, imaginative and independent of judgement by others.

A few studies have indeed demonstrated the effects of the five-factor model of personality on learning approaches. An interesting study was conducted by Zhang (2003), who examined the responses of 420 Chinese university students in different academic disciplines, such as psychology, mathematics, physics and arts. She concluded that conscientiousness and openness are good predictors of the deep approach, and that there is a negative relationship between emotional stability and surface learning. However, the degree of variance in learning approaches explained by the personality traits is limited. The multiple $R^2$ values ranged from 0.14 (surface strategy) to 0.25 (deep strategy). In a second study, Diseth (2003) collected information from Norwegian students on an undergraduate course in psychology ($n = 142$) and an introductory course in philosophy ($n = 162$). In the psychology course, the personality traits extroversion, openness and conscientiousness were positively related to deep learning, and the traits emotional stability, extroversion and conscientiousness were negatively related to surface learning. The correlation ($r$) ranged from 0.24 to 0.54. In the philosophy course the findings were less convincing, with fewer statistically significant relationships. The personality trait openness was positively related to deep learning and negatively to surface learning, while emotional stability was also negatively related to surface learning. The correlation ($r$) ranged from 0.25 to 0.46. Finally, in their study, Duff et al. (2004) used a sample of 146 social science undergraduates at a university in Scotland. In this study, students reporting high scores on extroversion, openness and conscientiousness were more likely to employ deep learning approaches. A surface approach to learning was found to be associated with the traits emotional stability and agreeableness. Bivariate correlations ($r$) ranged between 0.21 and 0.44.

In conclusion, although the limited number of studies indicates that there are significant relationships between personality traits and learning approaches, important degrees of variance in approaches to learning remain unexplained by personality traits. These limited research results with regard to, on the one hand, the effect of the perceptions of the learning environment on learning approaches, and, on the other hand, the effects of personality on learning approaches, lead us to the question: to what extent does the interplay between students’ perceptions of the learning environment and their personality influence their learning approaches?
In this study, we extend the previous studies, which focused on separate and direct relationships, by looking at the combined direct and indirect effects of personality and perceptions of the learning environment upon students’ learning approaches. Given that personality is conceived to be a stable individual characteristic and students’ perceptions of the learning environment are seen to be contextually dependent, it might be expected that personality can influence students’ learning approaches both directly and indirectly. The indirect relationships refer to the mediating role that students’ perceptions of the learning environment might play.

Research method

Setting

The research setting for the present study was a course on International Business Strategy at a Faculty of Economics and Business Administration. This faculty uses problem-based learning (PBL) as its leading educational approach. In implementing this approach, the aim is not only to foster the development of knowledgeable managers, but also to enable students to employ deep learning approaches. PBL, as initially developed by Barrows and Tamblyn (1980), typically involves students working on problems in groups of 5–12 students: so-called ‘tutorial groups’. These problems are processed in a fairly structured manner, normally covering two sessions. In the first session, problems are analysed and result in the formulation of learning goals, which subsequently guide the independent study of the literature at home. In the second session, the problems are analysed in depth on the basis of the theoretical framework developed through the literature study, possible solutions are discussed, and the relevance of the theoretical framework for novel problems is argued (Gijselaers, 1996; Moust et al., 2001). A tutor coaches the group by monitoring the group process and helping the students to identify the knowledge that is needed to solve the problem.

Although PBL is the general approach in the faculty, individual course coordinators may make modifications in adapting the course format to their own needs, and this can result in different levels of structuring of the learning processes of students (Nijhuis et al., 2005). Courses can differ, for example, in the complexity of the problems, number of clues for finding problem statements, and the detail of suggestions for finding literature. However, the general idea in all courses is that students assume a considerable degree of responsibility for regulating their own learning and the setting of their learning goals.

The participants in the present study were two consecutive cohorts of business students following the obligatory course on International Business Strategy in the second year of the International Business programme. This course lasts seven weeks, with a workload of 20 hours per week, and is completed with a written examination. There are two group sessions per week, each lasting two hours. Topics discussed during the course are: the international business environment (for example, economic regions, country selection), the strategy process, internationalisation strategies (for
example, exporting, joint ventures, foreign direct investment), and strategy implementation issues (for example, organisational structure, plant location and control).

Measurements

Students responded to the self-report questionnaires, consisting of statements that had to be rated on a 5-point scale (from 1 = disagree or not accurate to 5 = agree or accurate). In Table 1, sample items of these scales, with regard to personality traits, learning environment and learning strategy, are illustrated.

Personality traits were measured using Goldberg’s questionnaire (Goldberg, 2001). This questionnaire consists of 50 items, resulting in the five personality dimensions as conceptualised in the Big Five Model.

Students’ learning strategies were measured using a shortened version of the Study Process Questionnaire (SPQ) (Biggs, 1987). The standard questionnaire contains 42 questions, measuring three learning approaches: surface, deep and achievement. Each approach comprises two subscales: motive and strategy. Curry’s (2002) argument that learning concepts closest to the learning environment are the most likely to be sensitive

<table>
<thead>
<tr>
<th>Variable</th>
<th>Subscale</th>
<th>Sample item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning environment</td>
<td>Good teaching</td>
<td>Teaching staff gave me helpful feedback on how I am doing.</td>
</tr>
<tr>
<td></td>
<td>Clear goals</td>
<td>I had a clear idea of where I was going and what was expected of me.</td>
</tr>
<tr>
<td></td>
<td>Appropriate assessment</td>
<td>Too many staff asked us questions just about facts*</td>
</tr>
<tr>
<td></td>
<td>Appropriate workload</td>
<td>The workload was too heavy*</td>
</tr>
<tr>
<td></td>
<td>Independent learning</td>
<td>Students have been given a lot of choice in the work they have to do.</td>
</tr>
<tr>
<td>Personality trait</td>
<td>Agreeableness</td>
<td>I am the life of the party.</td>
</tr>
<tr>
<td></td>
<td>Openness to experience</td>
<td>I have a vivid imagination.</td>
</tr>
<tr>
<td></td>
<td>Conscientiousness</td>
<td>I am always prepared.</td>
</tr>
<tr>
<td></td>
<td>Emotional stability</td>
<td>I am relaxed most of the time.</td>
</tr>
<tr>
<td></td>
<td>Extroversion</td>
<td>I am interested in people.</td>
</tr>
<tr>
<td>Learning strategy</td>
<td>Deep learning</td>
<td>I was continually reminded of material I already know and see that material in a new light.</td>
</tr>
<tr>
<td></td>
<td>Surface learning</td>
<td>I learned some things by rote, going over and over them until I know them by heart</td>
</tr>
</tbody>
</table>

*Score reversed given negative formulation.
to change was adopted. In this research, therefore, only the students’ learning strategies are measured. A further refinement was that that we did not include the achieving strategy scale. This scale deals with ego enhancement, as reflected, for example, in striving for higher grades (Biggs, 1993). Activities such as organising time, planning ahead and working space belong to this strategy, and as such do not describe cognitive processes when working on a learning task (Biggs, 1988). This scale was, therefore, not included in the research. Both internal and external validity are well documented in the literature. Furthermore, the SPQ has been used in many cultures and settings.

Students’ perceptions of the learning environment were measured by the Course Experience Questionnaire (CEQ) (Wilson et al., 1997). There are several versions of the CEQ, which differ in the number of scales and the number of items per scale. In this study, two versions were combined. The shorter version provides the basis for our research. The items involving the scale for generic skills were omitted since these are a measurement of output. Items concerning the independent learning scale from another version were included because of its relationship to learning approaches and its role in PBL. These adjustments resulted in 22 items covering five indicators or scales:

(i) good teaching in relation to the quality of the staff;
(ii) clear goals, indicating whether it was clear to the students what the course was about, and the knowledge and skills developed;
(iii) appropriate assessment, indicating the extent to which facts had to be known (a low score on this scale indicates a focus on reproduction);
(iv) appropriate workload, as a measurement of the learner’s perceptions of the time available for understanding the things students had to learn; and
(v) independent study as an indication of the degree of choice students had in the work they carried out. The CEQ is a well-known instrument that has been used in many settings in order to measure components of learning environments.

Procedures

The data for this study were collected as part of a larger research project on the relationships between student characteristics, the learning environment and student learning. All the questionnaires were processed in the tutorial groups. In this manner, the problems students faced when answering the questions could be resolved directly. Furthermore, this involved no extra investment of time by the students, which improved the response rate. Because of the number of questions, the questionnaire was split into two parts, which were processed in different sessions. In the first session, the personality questionnaire was processed. In the final session of the course, students were asked to formulate their experiences with the course and their learning strategies.

Methods of analysis

In order to analyse the separate correlations between the different variables, Pearson correlations were employed. With regard to the simultaneous analysis of the structural
relationships between personality traits, the learning environment and learning strategies, a path model was tested using the software package EQS 6.1 (Bentler, 2004).

A number of indicators of the fit of the model to the data are available. One of the most commonly used is the chi square statistic. Due to its sensitivity to sample size and the problems with many degrees of freedom, this indicator is often adjusted by dividing it in terms of degrees of freedom. Hu and Bentler (1999) suggest a two-index presentation strategy, which combines an incremental and an absolute fit. In this way the researcher can better control for both type I and type II errors. They recommend the root mean squared residual (SRMR) supplemented with one other fit index. We followed their recommendations and used the SRMR, which focuses on the discrepancies between the implied and observed covariance matrices. The lower bound of the index is 0, and low values are taken to indicate good fit. Additionally, the comparative fit index (CFI) is reported. The following cut-off criteria were used. A ratio of the chi square to the number of degrees between 2 and 5 is acceptable. CFI should have values of larger than 0.95, and SRMR has to be smaller than 0.08, to indicate an adequate fit of the model to the data.

Because of the exploratory nature of the research, the general approach was to link all the dependent and independent variables. After running the model, relationships with a level of significance above 5% were removed from the model, and the revised model was run again. If necessary, this procedure was repeated until a model resulted with relationships significant at the 5% level. \( R^2 \) was also calculated in order to get an insight into the explanatory power of exogenous variables. However, this figure is only relevant for describing the fit between the relationships in the model, and not how well the model fits the data.

Results

Descriptives

The first cohort comprised 406 students and involved 29 tutorial groups. Eleven tutors supervised these groups. The second cohort comprised 312 students in 24 tutorial groups. There were nine tutors for this course. The group size for both courses ranged between 13 and 15 participants. In both cohorts, the ratio of men to women was 55% to 45%. The nationalities were distributed as follows: 70% Dutch, 12% German and 18% other (mainly European) countries.

In total 718 students were enrolled on the course. In the first tutorial group session, 624 students were present and collaborated in the research. Of this group, 522 students also participated in the final session, which indicates a survival rate of 84%.

Table 2. Descriptive statistics of the variables

There is considerable variation in the reliability of the different scales. The Cronbach alpha coefficients of all personality scales and three learning environment scales are acceptable (> 0.70). The reliability of the deep learning scale (0.62) is lower, but is still acceptable in exploratory research. Three scales are lower than 0.60, which means that conclusions need to be considered with some caution.
Personality and learning strategies

We report the results step by step by first analysing the separate relationships (both bivariate correlations and the path model), and subsequently present the joint relationships. In doing so, we can compare our findings with the separate analyses in other studies and, by doing so, can provide more insight into the effects of using more advanced statistical techniques.

Are perceptions of the learning environment and learning strategies related?

There are several statistically significant correlations, although only low to moderate, between the perceptions of the learning environment and learning strategies (see Table 3). The coefficients illustrated in Table 3 suggest that both deep and surface learning are influenced by the learning environment. Students’ perceptions of the clarity of the goals and the appropriateness of assessment and workload appear be

<table>
<thead>
<tr>
<th>Scale</th>
<th>n items</th>
<th>Average</th>
<th>Std</th>
<th>Cronbach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agreeableness</td>
<td>10</td>
<td>34.9</td>
<td>6.5</td>
<td>0.84</td>
</tr>
<tr>
<td>Extroversion</td>
<td>10</td>
<td>38.8</td>
<td>4.8</td>
<td>0.79</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>10</td>
<td>33.6</td>
<td>5.7</td>
<td>0.76</td>
</tr>
<tr>
<td>Emotional stability</td>
<td>10</td>
<td>34.4</td>
<td>6.5</td>
<td>0.83</td>
</tr>
<tr>
<td>Intellect</td>
<td>10</td>
<td>35.6</td>
<td>4.7</td>
<td>0.74</td>
</tr>
<tr>
<td>Learning environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good teaching*</td>
<td>5</td>
<td>16.2</td>
<td>3.5</td>
<td>0.80</td>
</tr>
<tr>
<td>Clear goals</td>
<td>4</td>
<td>13.6</td>
<td>2.9</td>
<td>0.72</td>
</tr>
<tr>
<td>Appropriate assessment</td>
<td>3</td>
<td>10.0</td>
<td>2.1</td>
<td>0.53</td>
</tr>
<tr>
<td>Appropriate workload</td>
<td>4</td>
<td>12.6</td>
<td>3.7</td>
<td>0.85</td>
</tr>
<tr>
<td>Independent learning</td>
<td>6</td>
<td>16.7</td>
<td>3.0</td>
<td>0.52</td>
</tr>
<tr>
<td>Learning approach</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep learning</td>
<td>7</td>
<td>23.1</td>
<td>3.3</td>
<td>0.62</td>
</tr>
<tr>
<td>Surface learning</td>
<td>6</td>
<td>16.9</td>
<td>3.2</td>
<td>0.44</td>
</tr>
</tbody>
</table>

*1 question left out due to misinterpretation by the students.

<table>
<thead>
<tr>
<th>Learning environment element</th>
<th>Deep learning</th>
<th>Surface learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good teaching</td>
<td>.28**</td>
<td>0.02</td>
</tr>
<tr>
<td>Clear goals</td>
<td>.30**</td>
<td>−.14**</td>
</tr>
<tr>
<td>Appropriate assessment</td>
<td>.12**</td>
<td>−.20**</td>
</tr>
<tr>
<td>Appropriate workload</td>
<td>.20**</td>
<td>−.26**</td>
</tr>
<tr>
<td>Independent learning</td>
<td>.28**</td>
<td>.08*</td>
</tr>
</tbody>
</table>

*p < .05, **p < .01.
related to learning strategies. More positive perceptions are related to more deep learning strategies and less to surface strategies. Perceptions of a high quality of teaching and a high degree of independent learning seem to be related to the adoption of more deep learning, but not to the employment of surface strategies.

A path analysis of the simultaneous relationships between components of the learning environment and learning strategies results in the model shown in Figure 1. In the figures describing the models, only the significant \((p < .05)\) relationships between the independent and dependent variables are shown. For the purposes of readability, the mutual relationships between independent variables and between dependent variables are excluded.

The statistics indicate that there is a good fit to the data: \(\chi^2 = 9.75, \text{df} = 5, p = .08;\) CFI = 0.99; SRMR= 0.02—this to say that all indicators fit their criteria. The path analysis results in three groups of relations. Firstly, students who perceive the goals as clear and the teaching of good quality tend to adopt deep learning strategies. Secondly, when they perceive the workload and the assessment as appropriate, they do not tend to adopt surface learning strategies. Thirdly, the perception of the amount of independent learning positively stimulates students to undertake both deep as well as surface-learning strategies. Although the model fits the criteria, only limited variance in the dependent variables is explained by the independent variables, with \(R^2 = 0.16\) for deep learning and \(R^2 = 0.12\) for surface learning.

*Are personality traits and learning strategies related?*

The Pearson correlation coefficients, indicating the separate relationships between the variables, show some statistically significant correlations. However, these correlations

![Figure 1. The relationships between learning environment elements and learning strategies](image-url)
are low to moderate. Adoption of deep learning strategies is related to being extrovert, conscientious and open. Surface learning is correlated with agreeableness, extroversion and openness. However, the direction of these relationships is negative. Being emotionally stable has no relation with either learning strategy (see Table 4).

Analysis of the relationships between personality traits and learning strategies simultaneously, based upon path analysis, resulted in the model shown in Figure 2. The statistics indicate that there is a good fit to the data: $\chi^2 = 1.97$, $df = 2$, $p = .37$; CFI = 1.00; SRMR = 0.02—all indicators fit their criteria. The existing six statistically significant bivariate correlations are reduced to three relationships in the path model. Two out of five personality traits, conscientiousness and openness, appear in the model. The coefficients indicate that being conscientious is related to deep learning. Students who are open can show deep as well as surface learning strategies. Although the model possesses good fit scores, only limited variance in the dependent variables is explained by the independent variables: for deep learning $R^2$ is 0.06; for surface learning $R^2$ is 0.13.

Are personality traits and perceptions of the learning environment related?

There are some significant ($p < .05$) correlations between personality traits and perceptions of the learning environment (see Table 5). The personality trait extroversion is related to three elements of the learning environment: good teaching,
clear goals and appropriate assessment. This is to say that students who have a positive attitude to other people are more likely to appreciate the staff better, know what is expected from them, and perceive the assessment as focusing upon understanding instead of upon memorising. Conscientiousness is related to clear goals. For students who are neat and well organised, there is greater clarity as to what is expected of them in comparison to students who are less well organised. Emotional stability is related to an appropriate workload. Students who can deal with psychological stress take the view that they have sufficient time to complete the work. Students who score high on openness also consider that they have sufficient time to complete the work. The personality trait of agreeableness is not related to any component of the learning environment. The perception of independent learning is not related to any personality trait. Several personality traits appear to be related to the perception of the learning environment. However, the pattern is rather fragmented.

A path model was established with all possible relationships between the scales describing personality traits and students’ perceptions of the learning environment. Not all of these relationships, however, were statistically significant. The results are illustrated in Figure 3.

From the statistics it can be concluded that the path model is significant: \( \chi^2 = 45.66, \text{df}=22, p = .002; \text{CFI}= 0.95; \text{SRMR} = 0.05. \) From this analysis, it seems that the five personality traits are related to the five discerned environmental factors. Students who are more conscientious perceive the goals as clearer. Extrovert students tend to perceive the teaching as of better quality and the workload as more appropriate. Students who are open and emotionally stable perceive the assessment as more appropriate. However, students who tend to score high on agreeableness tend to perceive assessment as less appropriate. Furthermore, it appears that students who are more open tend to have less positive perceptions of independent learning. Although the model is statistically significant, only limited variance in the dependent variables is explained by the independent variables, as indicated by the high scores for the error coefficients.

### Table 5. Bivariate correlations between personality traits and perceptions of the learning environment (\( n = 520 \))

<table>
<thead>
<tr>
<th>Personality trait</th>
<th>Good teaching</th>
<th>Clear goals</th>
<th>Appropriate assessment</th>
<th>Appropriate workload</th>
<th>Independent learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreeableness</td>
<td>.06</td>
<td>.05</td>
<td>.07</td>
<td>.01</td>
<td>-.03</td>
</tr>
<tr>
<td>Extroversion</td>
<td>.11*</td>
<td>.11*</td>
<td>.20**</td>
<td>.03</td>
<td>.05</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>.07</td>
<td>.11*</td>
<td>.04</td>
<td>.02</td>
<td>.03</td>
</tr>
<tr>
<td>Emotional stability</td>
<td>.05</td>
<td>.08</td>
<td>.07</td>
<td>.19**</td>
<td>.03</td>
</tr>
<tr>
<td>Openness</td>
<td>.07</td>
<td>.08</td>
<td>.04</td>
<td>.14**</td>
<td>-.07</td>
</tr>
</tbody>
</table>

*\( p < 0.05, **p < 0.01.\)
Considering the various low to moderate significant correlations presented earlier, it is an interesting question as to whether there is a relation between the various variables discerned. Therefore the full model, incorporating the relationships derived in the sub-models, was tested, with both personality traits and components of learning environments taken into account. Due to the relationships between personality traits and the components of learning environments, all the personality traits are taken into account, instead of the two traits used in sub-model 2. The results are in Figure 4.

The goodness of fit indices indicate that the model provides a good fit with the data: $\chi^2 = 58.7$ df = 34 $p = .005$; CFI = 0.97; SRMR = 0.05. The five personality traits, as well as the five learning environment variables, have an influence on learning strategies, whether directly or indirectly.

The adoption of deep learning strategies is directly as well as indirectly influenced by two personality traits, namely, conscientiousness and openness. Students who tend to be strong willed, responsible, neat and well organised (highly conscientiousness) tend to perceive clear goals and use deep learning strategies. Furthermore, students who are proactively searching and who are tolerant of the exploration of the unfamiliar (i.e. they are highly open) tend to use more deep learning strategies and less surface learning strategies. There is, however, a mediating effect of their perceptions of the extent of independent learning. The relationship between openness and this learning environment variable is close to zero. Extroversion has indirect effects. It influences both deep and surface learning as mediated by students’ perceptions of the quality of teaching and the appropriateness of the workload. Extrovert students,
who perceive the quality of the teaching to be good, are more likely to adopt deep learning strategies. Furthermore, extrovert students who perceive the workload as appropriate are not likely to adopt surface learning strategies. Agreeableness and emotional stability play a less important role in the model and are only indirectly related to surface learning.

In a similar manner to the model (Figure 1) which describes the relationships between the learning environment and learning strategies, there are three kinds of variables in the full model. First, clear goals and good teaching are positively related to deep learning. Second, appropriate workload and appropriate assessment are negatively related to surface learning. Third, independent learning is related to both deep and surface learning.

The regression coefficients in the full model have similar values to those in the sub-models. This means that no relationships disappeared or appeared. In this sense, the full model is an addition of the two sub-models. The model is significant, with $R^2 = 0.19$ for deep learning, and $R^2 = 0.21$ for surface learning.

**Discussion**

In order to foster students’ utilisation of deep learning strategies, educationalists seek to optimise the learning environments they employ. What is the power of learning environments, however, to influence students’ learning strategies? Are students’ approaches to dealing with study tasks more related to their stable personal characteristics, rather than their being adaptable to learning environments? In order to
answer such questions, this research analysed different models in looking for direct and indirect relationships between students’ personality, their perceptions of the learning environment and their learning strategies. Empirical evidence was gathered in the context of second-year university business students who were following a problem-based course on International Business Strategy.

The full model—consisting of the learning environment, personality traits and learning strategies—indicated several direct relationships between personality traits and learning strategies. Furthermore, there are indirect relationships, where components of the learning environment mediated between personality traits and learning strategies. The results with respect to the direct relationships confirm previous research findings (Diseth, 2003; Zhang, 2003). Students who can be characterised as conscientious and open are more willing to employ deep learning strategies. In contrast, students scoring high on openness to experience have lower scores for surface learning.

As Zhang’s study (2003) indicated, there are statistically significant relationships between extroversion and deep and surface learning. This is partly confirmed in a study by Duff et al. (2004), showing positive relationships between extroversion and deep learning. However, in our study, these relationships are indirect. Students’ perceptions of the quality of teaching and the appropriateness of the workload play a mediating role. Although in Zhang’s study, agreeableness seemed to be related to surface learning, this was not confirmed in our study. Emotional stability is not related to any learning strategy, although several authors did find relationships between this trait and surface learning (e.g. Duff et al., 2004).

With regard to the direct relationships between perceptions of the learning environment and the students’ learning strategies, our results confirm in general the previous research of Prosser (2000) and Lizzio et al. (2002). The perception of clear goals, good teaching and independent learning exerts a positive influence on deep learning strategies, while there is a negative influence on surface learning in terms of the perception of appropriate assessment and workload. Surprisingly in our research, independent learning seems to be positively related to both deep and surface learning. This is probably because students working in a PBL environment have to work independently for a large amount of their study time, and studying during this period can take place in either a surface or a deep manner.

As a consequence of the specific focus of this study, the indirect relationships between personality traits and learning strategies—with the mediating role of the students’ perceptions of variables in the learning environment—are of special interest. When taking into account the influence of personality, as well as students’ perceptions of the learning environment, upon their learning strategies, path analysis results in a different model from that used when analysing separate relationships. The full model indicates the interplay between various personality traits, the perceptions of various elements of the learning environment, and students’ learning strategies. Students scoring high on conscientiousness—that is to say being well organised and goal-directed—seem to perceive the goals in the problem-based course investigated as clear, and, in turn, they are more inclined to adopt deep learning strategies.
An explanation could be that these students, because they are so well organised and goal-directed, are able to put the goals in perspective, and that they are, therefore, clearer to them. Extrovert students perceive the workload as more appropriate, which in turn leads to less use of surface learning strategies. They probably have more social contacts with peer students, as well as teachers, and are able, therefore, to better cope with the demands of the course. Students scoring high on openness also perceive the assessment as being more appropriate and, in turn, adopt fewer surface learning strategies. More appropriate assessment refers to staff concentrating more on understanding and less on reproducing facts. An explanation could be that open-minded students place more value on the demand for understanding, as they are themselves more analytical. The same relationships appeared for emotionally stable students—those who are calm, relaxed and able to deal with stress and possess self-confidence. The question here is whether emotionally stable students can deal more effectively with the stress of assessment. Finally, agreeableness is about the attitudes an individual holds towards other people, such as being compassionate, trusting, forgiving and soft-hearted. This is positively related to appropriate assessment and, in turn, leads to less surface learning strategies. A possible explanation could be that the perception is more concerned with the assessor (in this case the tutor) than the assessment as such.

**Limitations**

We identify five limitations which are indicative for future research. One point for discussion is the exploratory power of the model. The full model, taking into account personality as well as students’ perceptions of the learning environment, explains 19–21% of the total variation in learning strategies. This implies that other variables play a role. Further research should extend the model by including variables that have previously been shown to have direct, if moderate, effects on students’ learning approaches, such as students’ prior experiences within the discipline studied and how they conceive the nature of their field of study (e.g. Crawford et al., 1998).

Additionally, the present study was conducted at one point in time, measuring students’ perceptions and strategies at that point, under the currently prevalent conditions. Longitudinal studies, repeatedly measuring students’ personality, perceptions and study approaches, could offer additional insights as to whether, and at which points in time, students’ study approaches alter, and to what extent this is influenced by the interplay between personality and perceptions of the learning environment.

Furthermore, the research was done in a very specific setting, using second-year business students, within a specific course with PBL as the main instructional approach. Future research should consider other samples involving other courses, teaching systems and student groups.

Fourthly, cooperative learning is central to PBL. In our use of the Course Experience Questionnaire, we did not pay attention to the social aspects of learning. Future research could take this aspect into account by incorporating items that refer to working together with, and learning from, peers.
Finally, the exclusive reliance on self-reported responses is related to the use of the questionnaires. There were no other measures to validate that the ways in which students responded to the questionnaires were a reflection of their normal behaviour. The Cronbach alpha for some scales is slightly lower than 0.6, which suggests that interpretation of the results should be undertaken with considerable caution.

**Practical implications**

A final but important question refers to the practical implications of this study. If we wish to influence students’ learning strategies, is it worthwhile to invest in optimising the learning environment or are the mainly stable personality variables responsible for determining the students’ ways of tackling study tasks? The first implication concerns the effect of the learning environment upon learning. Given that students’ perceptions of the learning environment seem to influence their learning strategies—although only to a moderate extent—deep learning could be enhanced by improving the quality of various components of the learning environment, while at the same time supporting students to be gradually able to define their learning goals and to study independently. A further implication results from the influence of personality traits on learning. As indicated by this study, personality traits also play both direct as well as indirect roles. Assuming that these traits are generally stable, this contributes a stable component to perceptions of the learning environment and learning strategies. For educationalists, this suggests that supporting students also implies helping them to reflect on the opportunities and threats they face when studying in learning environments which are designed to enhance deep learning. The student counsellor can play an important role in this critical self-reflection. In this respect, self-reflection should focus upon students’ conscientiousness and openness, since these are both directly and indirectly related to students’ learning strategies. A third implication is based upon the relationships between personality traits and students’ perceptions of the learning environment. As these relationships are rather weak, this implies that the personality traits play only a limited role in predicting the perception of the learning environment. The educational system does not seem to favour any particular kind of student: this is a comforting finding.

**Conclusion**

The focus of this study was on the separate and joint relationships between students’ perceptions of the learning environment, their personality and the learning strategies they use. Three separate analyses revealed that there are several statistically significant relationships. First, students’ perceptions of clear goals, good teaching and independent learning are associated with deep learning. Students’ perceptions of appropriate workload, transparent assessment and independent learning influence their surface learning. Second, the results demonstrate that the personality traits of conscientiousness and openness are related to learning strategies. Finally, students’ perceptions of the learning environment are related to personality traits.
Analysis of the relationships established in this research suggests that all personality traits and components of learning environments play a role in explaining learning strategies. There are direct relationships between conscientiousness, openness and learning strategies. Perceptions of components of the learning environment mediated the relationships between the students’ personality traits and their learning strategies.

References


