The relationship between personality, approach to learning and academic performance

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Abstract

This study considers the relationship between students’ approaches to learning, as measured by a short-form of Entwistle and Tait’s (1995) Revised Approaches to Studying Inventory (RASI), the Big Five personality factors, as measured by Cattell’s 16PFi, and the background variables of age, gender and prior educational achievement and academic performance. Subjects were 146 social science undergraduate students at a university in Scotland. Structural equation modelling identifies the Big Five personality factor scores account for between 22.7% and 43.6% of the variance across scores on the three approach to learning dimensions. Four of the Big Five personality factors and the three approach to learning dimensions were found to be poor predictors of academic performance. A linear regression analysis with academic performance as the dependent variable and age, prior educational attainment and conscientiousness as independent variables, accounted for 24.1% of the variance in performance. Our investigation suggests approach to learning is a subset of personality. However, we conclude it makes sense to measure these two groups of variables separately in educational settings.

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1. Introduction

1.1. Approaches to learning

Work considering ways in which students approach learning has been of interest to educational researchers for over 30 years. The seminal work of Marton and Saljo (1976) identified student
learning could be categorised into two general strategies: deep processing and surface processing. Applying these concepts, researchers in various locations, have extended Marton and Saljo’s efforts to develop models and inventories which purport to measure students’ approaches to learning (SAL). Although subtle differences exist between these models, they all recognise three fundamental approaches to learning. These ‘defining’ approaches to learning are labelled as deep approach, surface approach and strategic approach. An individual adopting a deep approach is said to look for meaning in the matter being studied and relates those ideas to other experiences and ideas with a critical approach. A surface approach reflects a reliance on rote-learning and memorization in isolation to other ideas. A third defining approach, labelled a strategic approach, is associated with an emphasis on organisation, study skills, and a desire to achieve the highest grades.

1.2. Modelling approaches to learning

Traditional predictive models of academic performance focus on the importance of variables such as intelligence and motivation. Personality is often included as a predictor alongside these variables (see Furnham, 1995 for a review). However, educational psychologists from the SAL school see learning as contextually-based and ‘bottom-up’ and criticise traditional theoretical models, as being ‘top-down’ and ‘acontextual’. SAL researchers claim their instruments are based on a theoretical rationale grounded in how students actually go about learning tasks in educational settings, for example, classrooms and lecture halls (Watkins, 1998). Ramsden (1992) suggests students’ learning outcomes are directly influenced by their orientation to learning. An individual’s orientation to learning is likely to be influenced by their prior educational experiences. Their approach to learning is a function of both their learning orientation and their perceptions of the task requirements. Learning task perceptions are in turn influenced by the context of learning (curriculum, teaching processes and assessment methods).

A deep approach is likely to be encouraged where: the learning task is perceived to be relevant to students’ interests (Fransson, 1977); the instructor is supportive and demonstrates interest and enthusiasm (Ramsden, 1979); and students are provided with the opportunity to manage their own learning (Ramsden & Entwistle, 1981). By contrast, a surface approach is more likely to occur when assessment methods reward reproducing information (Dart & Clarke, 1991); excessive anxiety (Fransson, 1977); or a heavy workload (Ramsden, 1992). A strategic approach is characterized by a highly organised approach to study and high achievement motivation (Watkins, 1982).

1.3. Approaches to learning instruments

A number of instruments have been developed to measure students’ approaches to learning, including: Biggs’ (1987) Study Processes Questionnaire, developed in Australia; Schmeck, Ribich, and Ramaniah (1977) creation of the Inventory of Learning Processes in the United States; in the Netherlands, Vermunt’s (1994) Inventory of Learning Styles (ILS); and in the UK, the Approaches to Studying Inventory (ASI) (Entwistle, Hanley, & Hounsell, 1979).

Since its development in the 1970s, the ASI (Entwistle et al., 1979) has been one of the most widely used questionnaires considering student learning in higher education (HE) settings in the
Reflecting relatively recent changes in higher education (e.g. mass higher education, significantly reduced per capita funding, reduction in student grants and the imposition of fees), the ASI was revised several times during the mid-1990s to create the Revised Approaches to Studying Inventory (RASI), measuring three constructs of deep approach, surface approach and strategic approach. A 30-item short-form version of the RASI has been shown to yield scores with satisfactory psychometric properties (Duff, 1997, 1999, 2002, 2003) and takes around 10–15 minutes to administer.

1.4. Approaches to learning, personality and background variables

The idea that the way an individual learns is related to their personality is not new. For example, Messick (1984, p. 61) suggests an individual’s learning style can be thought of as a “characteristic self-consistency in information processing that develop in congenial ways around underlying personality trends”. Recent empirical work has found support for the hypothesis that an individual’s learning orientation is related to their personality (Busato, Prins, Elshout, & Hamaker, 1999, 2000). These findings suggest SAL research may be complemented by considering the role an individual’s personality may play in the learning process. Other research using other descriptions of learning orientation (style) such as Kolb’s experiential learning model (Kolb, 1984) measured using Honey and Mumford’s Learning Styles Questionnaire (LSQ), indicate learning style is simply a subset of personality (Jackson & Lawty-Jones, 1996) or a learnt component of personality (Furnham, Jackson, & Miller, 1999).

SAL researchers however have paid more attention to the role demographic variables such as the age and gender of an individual might play in determining their approach to learning. In part, this could be attributed to changes in the nature of higher education (HE) in the UK. HE in the UK has undergone a process of rapid expansion in the past 10 years to create a more heterogeneous student population, with many older students now pursuing tertiary education. Consequently, age has become an important variable for SAL researchers to consider. Those studies considering the relationship between age and approach to learning have consistently shown age is positively related to scores on deep approach and negatively correlated with surface approach scores (Duff, 1999; Richardson, 1995; Richardson, Morgan, & Woodley, 1999; Sadler-Smith, 1996; Sadler-Smith & Tsang, 1998).

The findings concerning gender differences in approaches to learning are less clear. Wilson, Smart, and Watson (1996) reviewed work using either the ASI or the SPQ. Investigations utilising the SPQ “offer a far from definitive picture on gender difference” (Wilson et al., 1996, p. 60). By comparison, research using versions of the RASI identifies males scoring higher on Deep Approach and females scoring higher on surface approach (Duff, 1999, 2002; Sadler-Smith, 1996; Sadler-Smith & Tsang, 1998).

We propose therefore to modify Ramsden’s (1992) contextual model of student learning by including age, gender and personality, in addition to prior educational experience, as variables which influence an individual’s learning orientation (see Fig. 1).

Despite the vigorous research activity in the fields of personality and individual differences and students’ approaches to learning, work considering the relation personality may play in determining an individual’s approach to learning is still in its infancy. A general consensus exists within the personality and individual differences literature that personality is best described by a
five-factor model (e.g. Costa & McCrae, 1992, 1995; De Raad & Schouwenburg, 1996; Furnham, 1996, but see Block (1995) for a more critical perspective). The so-called Big Five factors are usually labelled extraversion, neuroticism, openness to experience, agreeableness and conscientiousness.

Two studies conducted in the Netherlands (Busato et al., 1999, 2000) have investigated the relationship between approach to learning measured by Vermunt’s (1994) ILS and personality, using the 5PFT (Elshout & Akkerman, 1975), which measures the Big Five personality factors. The results of these investigations are relatively consistent, with the Meaning Directed dimension positively correlated with openness to experience ($r = 0.35$ and $0.36$ respectively). Reproduction oriented is positively related to both agreeableness ($r = 0.21$ and $0.21$ respectively) and conscientiousness ($r = 0.23$ and $0.21$ respectively). Undirected is positively associated with neuroticism ($r = 0.21$ and $0.19$ respectively).

Vermunt’s model of student learning corresponds approximately with Entwistle and his colleagues’ notions of approaches to learning. Although no published empirical work has compared Vermunt’s ILS and the RASI, meaning directed concept is similar to the deep approach dimension, and the undirected and reproduction directed dimensions correspond to descriptions of a surface approach. However, the conceptual relationship of Vermunt’s application directed scale to the RASI is less obvious. Likewise, the strategic approach dimension of the RASI does not appear to be captured by the ILS, with Busato et al. (1999, 2000) separately administering a test of achievement motivation which is conceptually related to strategic approach.

It has been proposed that the three Big Five factors of extraversion, conscientiousness and openness to experience are relevant in an educational setting (De Raad & Schouwenburg, 1996). Based on the empirical findings of Busato et al. (1999, 2000) and the review of De Raad and Schouwenburg (1996) we have developed the following expectations. Deep approach will be positively related to both the openness to experience and extraversion dimensions, reflecting the association of intellect and openness to experience (Costa & McCrae, 1992), and the need for
those adopting a deep approach to collaborate, consult and discuss with others, being facets of extraversion (Entwistle, Tait, & McCune, 2000). Surface approach is expected to be positively related to neuroticism reflecting the surface learners ‘fear of failure’ motivation displayed by pessimism and anxiety about academic outcomes (Entwistle et al., 2000). We anticipate a strategic approach will be positively related to conscientiousness as a consequence of strategic learners’ desire for organised studying, time management and their monitoring of their own effectiveness (Digman & Takemoto-Chock, 1981; Tait & Entwistle, 1996; 16PFi Manual, 2000). Costa and McCrae (1992) also suggest scores on the conscientiousness scale provide a useful supplement to ability measures as predictors of academic performance and success in later life.

1.5. Aims

This paper has three specific aims. First, to assess the empirical relationship between the Five Factor model of personality and the three ‘defining’ approaches to learning. Second, to assess the fit of a hypothesised model which includes the Big Five factors, the three defining approaches to learning dimensions, and the demographic variables of age, gender and prior academic attainment. Third, using linear regression analysis, to establish the ability of approaches to learning, the Big Five factor model, and age, gender and prior academic attainment to predict academic performance.

2. Method

2.1. Participants

The participants were social science undergraduate students at the University of Paisley, a medium-sized university in Scotland. The RASI and 16PFi were administered during classtime in one session taking approximately one hour in April 2001. Participation was entirely voluntary and participants received written feedback using a computer-generated package of their personality profile as an incentive to take part in the study. After ‘listwise’ analysis in the statistical package SPSS, subjects with missing values were omitted, leaving a total sample of 146 participants. 82 were first-year students, 37 second-year students and 27 third-year students. 109 were female, 37 were male. The ages of the participants ranged from 17 to 52 years of age, mean 24.3 years. This sample may be considered a representative one of social science undergraduates from the University of Paisley.

2.2. Instrument—Revised Approaches to Studying Inventory (RASI)

Students’ approaches to learning were measured by a short-form 30-item RASI (Duff, 1997; Tait & Entwistle, 1996). Other dimensions such as lack of direction, metacognitive awareness and academic self-confidence have been included within various versions of the RASI, but have been shown to possess certain psychometric limitations (Duff, 2001), and were consequently not included in the research instrument. The inventory is scored on a five-point Likert scale (1: strongly disagree to 5: strongly agree) and measures the three ‘defining’ approaches to learning. Examples of items include:
I'm not prepared just to accept things I'm told; I have to think them out for myself (deep approach)
I often have trouble making sense of the things I have to remember (surface approach)
I know what I want to get out of this course and I'm determined to achieve it (strategic approach).

2.3. Instrument—16PFi

The study used the 16PFi Form A (Cattell, Eber, & Tatsuoka, 1970; 16PFi Manual, 2000) to measure the Big Five personality factors. The instrument contains 200 items scored on a trichotomous scale (labelled 1: disagree; 2: do not know; 3: agree). The 16PFi Form A assesses 16 primary factors, each comprised of 12 items, and five second-order factors measuring the Big Five factors originally identified by Tupes and Christal (1961). Examples of items include:

- People say I'm a happy-go-lucky person (extraversion)
- I sometimes find myself feeling bored and fed-up for no particular reason (neuroticism)
- I have been described as something of an idealist (openness to experience)
- I dislike telling people what to do (agreeableness)
- I keep most things filed away neatly (conscientiousness).

2.4. Academic performance

Academic performance is measured as a composite measure, a grade-point average (GPA) achieved over the course of an academic year in eight taught modules. GPA scores ranged from 25% to 73%, mean = 54.1%, standard deviation = 8.4%.

2.5. Prior academic achievement

Prior academic achievement is measured by a points score in the Scottish Higher Examinations for the best five passes. Higher examinations are taken by school students in Scotland as a form of leaving examination, where students will typically take five examinations. The higher points variable is scored where grade A equals 6 points, grade B equals 4 points and grade C equals 2 points. The maximum higher points score therefore equals 30 points. Higher points ranged from 2 to 26 (mean 9.74).

2.6. Statistical analyses

First, alpha coefficients are calculated for each of the Big Five factors, and the three ‘defining’ approaches to learning to estimate the internal consistency reliability of scores produced by the 16PFi and RASI respectively. Second, Pearson correlation coefficients are calculated to assess the effect size and statistical significance of the univariate relationship between the Big Five factors, the three defining approaches to learning, GPA, and the background variables of prior academic achievement, age and gender. Gender is treated as a dichotomous variable with females coded 0
and males coded 1. Third, maximum likelihood estimation via AMOS v4.0 was used to perform structural equation modelling, a form of multivariate analysis.

To evaluate the fit of the measurement models, several fit statistics are reported. First, chi-square ($\chi^2$), a measure of the fit of the reproduced covariance matrix implied by the model to the covariance matrix of the sample data, is reported. Second, the goodness-of-fit index (GFI) is reported as an evaluation of how much better the model fits the data, compared with no model at all, by providing a measure of the variance and covariance explained by the model. Third, the Tucker–Lewis index (TLI) (Tucker & Lewis, 1973) and relative noncentrality index (RNI) (McDonald & Marsh, 1990) are reported. Although no precise standards exist to indicate what value of indices are needed for a satisfactory fit, typical guidelines are that the TLI and RNI should exceed 0.95.

Third, to assess the predictive validity of scores produced by the Five Factor model, the three ‘defining’ approaches to learning dimensions and age, gender and prior academic achievement, three linear regression analyses are reported. Each uses GPA as the dependent variable.

3. Results

3.1. Internal consistency reliability

Alpha coefficients for scores on the three RASI dimensions ranged from 0.73 (surface approach) to 0.82 (strategic approach), and from 0.78 (openness to experience) to 0.90 (neuroticism) for Big Five factor scores (see Table 1). The alpha coefficients calculated are indicative of satisfactory to excellent internal consistency reliability (Nunnally, 1978).

3.2. Correlation between all variables

Table 2 reports the correlations between personality factors, approaches to learning, age, prior academic achievement and academic performance. The correlations between academic performance and Big Five factor scores and approaches to learning are modest and not statistically significant at $p < 0.05$. As expected, both deep approach and strategic approach are positively associated with academic performance, and surface approach negatively related to academic performance.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Alpha coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extraversion</td>
<td>0.87</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>0.90</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>0.78</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>0.81</td>
</tr>
<tr>
<td>Openness to experience</td>
<td>0.85</td>
</tr>
<tr>
<td>Deep approach</td>
<td>0.81</td>
</tr>
<tr>
<td>Surface approach</td>
<td>0.73</td>
</tr>
<tr>
<td>Strategic approach</td>
<td>0.82</td>
</tr>
</tbody>
</table>
performance, however, the magnitude of these relationships are slight. Of the personality factors, conscientiousness showed the strongest association with academic success ($r = 0.14$), a result that is consistent with the findings of Busato et al. (2000).

An examination of the approaches to learning and personality factors’ correlation matrix reveals results consistent with our prior expectations. Deep approach is positively correlated with both extraversion ($r = 0.21$) and openness to experience ($r = 0.34$) and negatively correlated with neuroticism ($r = -0.18$). Surface approach is positively related to neuroticism ($r = 0.44$) and agreeableness ($r = 0.21$). Finally, strategic approach is positively related to extraversion ($r = 0.38$) and conscientiousness ($r = 0.42$) and negatively related to neuroticism ($r = 0.24$). These findings are broadly consistent with Busato et al.’s (1999, 2000) investigations which employed Vermunt’s (1994) ILS, where meaning-directed (deep approach) was positively correlated with openness to experience and an undirected learning style (surface approach) was positively related to neuroticism. However the magnitude of the correlation coefficients of the present investigation are larger than those reported by Busato et al. (1999, 2000), indicating a stronger relationship between personality and Entwistle and his colleagues’ notions of approaches to learning than those measured by Vermunt’s (1994) ILS.

3.3. SEM to assess empirical relationship between approaches to learning and Big Five model

The first structural equation model (SEM) estimated specifies eight predictor variables: the scores on the three approach to learning dimensions and the five personality factors. Table 3 reports the standardised regression weights for the model. The model identifies a strong relationship between the scores on the five personality factors and three approaches to learning dimensions. The Big Five model of personality accounts for 22.7%, 43.6% and 30.6% of the variance of scores on the deep approach, surface approach and strategic approach dimensions respectively.
The goodness-of-fit indices calculated for the SEM indicate the model estimated provides a good fit to the data ($\chi^2/df = 2.93;135/(113)$; $\chi^2 = 2.394; TLi = 0.968; RNI = 0.979$).

The second SEM extends the previous model tested to include the background variables of age, gender and prior academic achievement. Estimation of the hypothesized model resulted in a fit of

<table>
<thead>
<tr>
<th>Extraversion</th>
<th>Deep approach</th>
<th>Surface approach</th>
<th>Strategic approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.143</td>
<td>0.270</td>
<td>0.018</td>
<td></td>
</tr>
<tr>
<td>-0.221</td>
<td>0.532</td>
<td>-0.186</td>
<td></td>
</tr>
<tr>
<td>0.376</td>
<td>-0.020</td>
<td>0.189</td>
<td></td>
</tr>
<tr>
<td>-0.165</td>
<td>0.308</td>
<td>-0.074</td>
<td></td>
</tr>
<tr>
<td>0.323</td>
<td>-0.135</td>
<td>0.430</td>
<td></td>
</tr>
<tr>
<td>0.227</td>
<td>0.436</td>
<td>0.309</td>
<td></td>
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$\chi^2/df = 293.135(113); \chi^2 = 2.394; TLi = 0.968; RNI = 0.979$

Fig. 2. (a) Proposed SEM of Big Five factors, age, gender, prior academic achievement and approaches to learning; (b) standardised path coefficients and square multiple correlations of Big Five factors, age, gender, prior academic achievement and approaches to learning.

The goodness-of-fit indices calculated for the SEM indicate the model estimated provides a good fit to the data ($\chi^2/df = 293.135(113); \chi^2 = 2.394; TLi = 0.968; RNI = 0.979$). The second SEM extends the previous model tested to include the background variables of age, gender and prior academic achievement. Estimation of the hypothesized model resulted in a fit of
The fit indices suggest a good fit of the data to the hypothesized model. The standardised path coefficients are presented in Fig. 2. The square multiple correlations for the three dependent variables of approach to learning ranged from 33.0% (strategic approach) to 46.7% (surface approach).

### 3.4. Regressions of variables on to dependent measure of academic achievement \((GPA)\)

Table 4 shows the results of the regression of all variables on to the dependent variable of GPA. The regression was statistically significant \((F\text{ level} = 3.968, p < 0.01)\), predicting 34.2% of the variance in GPA scores.

A more parsimonious model was tested on the basis of the \(t\) scores shown in Table 4 using the independent variables of age, prior educational achievement and the Big Five factor of conscientiousness (see Table 5). This model was statistically significant \((F\text{ level} = 9.940, p < 0.01)\), predicting 24.1% of the variance in GPA scores.

### 4. Discussion

The primary purpose of this study was to examine the relationship between personality, approach to learning, and academic performance. Consistent with our expectations, based on our
interpretation of previous research (Busato et al., 1999, 2000; De Raad & Schouwenburg, 1996), deep approach was positively associated with extraversion and openness to experience. Surface approach was positively related to neuroticism and agreeableness. Strategic approach correlated positively with extraversion and conscientiousness and negatively with neuroticism. An examination of the correlation coefficients calculated indicates the magnitude of the effect size is greater in the present investigation than the investigations of Busato et al. (1999, 2000), suggesting that the approach to learning model of the RASI is more closely related to personality traits than Vermunt’s ILS, at least when administered to university students in Scotland.

As predicted, both deep approach and strategic approach were positively correlated with academic performance. Surface approach was negatively correlated with academic performance, consistent with earlier research (see Entwistle, 1998 for a discussion).

Overall, the relationship between the Big Five factors and the three ‘defining’ approaches to learning is surprisingly strong, with square multiple correlations ranging from 22.7% to 43.6%. The model also provided an excellent fit to the data. Our findings provide some support to the hypothesis that approaches to learning have a foundation in personality. When the background variables of age, gender and prior educational achievement are added to this model, the square multiple correlations increased, to range from 33.0% to 46.7%. These results indicate strong support for our hypothesised model, shown in Fig. 1, that the presage factors of age, gender, personality and prior educational achievement are significant determinants of an individual’s orientation to learning.

De Raad and Schouwenburg (1996) suggest the Big Five factors of extraversion, conscientiousness and openness to experience are most relevant in an educational setting. In the present study, each of these three factors were positively correlated with academic success although the correlation coefficients for openness to experience and extraversion were negligible. Similar to the Busato et al. (2000) study, conscientiousness produced the largest correlation coefficient between the Big Five factors and academic performance. Our finding that neuroticism is negatively correlated with academic performance supports De Raad and Schouwenburg’s (1996, p. 326) suggestion that “particularly at a university level, highly neurotic students are probably handicapped compared to low neurotics”.

Our regression analysis clearly indicates at a general level, that personality and approach to learning are poor predictors of academic performance. However, this finding should be interpreted with caution. Ramsden’s (1992) contextual model of student learning indicates environmental variables and students’ perceptions of the learning environment, will influence the strategies or approaches students adopt when undertaking a learning activity. The learning environment will naturally vary from class to class. A second factor to consider is the nature of assessment, which will influence the predictive power of the approaches to learning model. For example, Duff (2003) using samples of MBA students identifies RASI scores are a good predictor of performance in coursework or written-project assessment activities, but when applied to closed-book examinations and oral assessments display rather less predictive validity. For example, surface approach scores are likely to predict performance in a test of knowledge requiring rote-learning (e.g. of taxation rules in an accounting course). Deep approach scores are likely to predict performance where an assessment requires analysis, synthesis and critical thinking. Instruments such as the RASI are also intended for use with students at an individual level, to identify strengths and weaknesses in individual study behaviour. The RASI also has a diagnostic value.
when used with students at an individual level for the identification of issues such as identifying students ‘at risk’ through poor study strategies (Tait & Entwistle, 1996).

Our SEM supports the idea that learning orientation is to some degree a subset of personality. However, as academic performance is more closely correlated to the approach to learning dimensions than four of the Big Five factors suggests that an individual’s learning orientation can be considered a learnt component of personality. Prior research indicates approaches to learning are dynamic and dependent on the demand placed on students by the educational environment (e.g. Zeegers, 2000). Learnt components of personality are likely to be changeable and dynamic over time, explaining why approaches to learning are better predictors than personality as a whole (Furnham et al., 1999).

Arguably, the strength of any research study lies in the recognition of its limitations. First, the study utilises a relatively small sample size ($N = 146$), which is taken from one institution. Second, the sample includes a relatively high proportion of females. Third, like most measures of academic performance, the data suffers from a restriction of range of the criteria, causing underestimation of the true size of the relationship between the Big Five factors, approaches to learning dimensions and criteria. Fourth, academic performance is a composite measure, aggregating performance in a variety of different learning activities, which means the power of correlational analyses with contextually-dependent approach to learning dimensions is rather weak.

5. Conclusion

In conclusion, this investigation reports that an individual’s learning orientation, and therefore their approach to learning, is partially determined by their personality. We encourage the development of further research examining the relationship between personality and other approach to learning inventories, in other cultural contexts. It might also be interesting to examine the predictive validity of the model by examining performance in different types of assessments, rather than the use of a global grade point average, to gain more specific knowledge about the relationship between personality, approach to learning and academic performance.

References


