# Patterns of response to an approaches to studying inventory across contrasting groups and contexts

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*The development of the Approaches and Study Skills Inventory for Students (ASSIST) is reported, which incorporates a revised version of the Approaches to Studying Inventory. This questionnaire was completed by three separate samples; 1284 mainly first-year students from six British universities, 466 first-year students from a Scottish technological university; and 219 students from a 'historically disadvantaged' South African university. Analyses of these data were designed to explore the patterns of response found in sub-groups which varied in terms of their levels of attainment and contexts. Maximum likelihood analysis of the largest sample confirmed the expected three factors of deep, surface apathetic, and strategic approaches to studying, and almost identical patterns were also found in the other two samples, and in students having contrasting levels of attainment. There were, however, some interesting minor differences in the South African sample. K-means relocation cluster analysis was then carried out on the largest sample and produced clusters with generally coherent patterns of response. However, one persistent low attainment cluster showed unexpected, dissonant patterns of response, combining moderately high scores on the sub-scales of both deep and surface apathetic approaches, associated with low scores on the strategic approach.*

## Introduction

The *Approaches to Studying Inventory (ASI)* (Entwistle & Ramsden, 1983) and its more recent revisions (Entwistle & Tait, 1990; Tait & Entwistle, 1996) have been used in a large number of studies, and the relationships between the sub-scales produce a recognisable pattern. Three or four factors typically emerge from item analyses which represent deep, surface, strategic and apathetic approaches to studying. Relationships with academic performance are also fairly consistent, with positive correlations normally being found with the strategic approach, and negative correlations with both surface and apathetic approaches (Entwistle & Ramsden, 1983). High scores on the deep approach are more likely to relate to academic success in the later years of a degree course, and wherever the assessment procedure directly rewards a demonstration of conceptual understanding. However, particularly in the first year, in science departments, and wherever fact-oriented assessment is used, strategic surface approaches may prove adaptive.

Most studies using the *ASI* have reported that the combination of apathetic and surface approaches to studying are commonly found among students at risk of failure, but Meyer and his colleagues have found that another group seem to be the most vulnerable of all. They used unfolding analysis, which locates individual students within the common space created by axes representing the main dimensions of studying. While most students lie within the boundaries of the space created by the inventory scales, some students are essentially 'outliers', occupying positions often far removed from the common space occupied by the vast majority of students. In exploring the characteristics of these atypical students, Meyer, Parsons, and Dunne (1990) found that a majority of them were academically weak. He and his colleagues therefore carried out an unfolding analysis of failing students and found that the space created by their ratings represented a total disintegration of the expected patterns of relationships between approaches to studying and perceptions of the learning context. The analysis showed that, for failing students, the usual linkages between approaches to learning and perceptions of the learning environment were rarely found. Instead, apparently random sets of association occurred.

This intriguing finding provoked a re-examination of some of the data previously collected in Edinburgh to explore the inter-relationships between approaches to studying, evaluations of teaching, and preferences for deliberately contrasted types of teaching. The data derived from a questionnaire in three parts. The first part contained a short version of the *ASI* containing 28 items covering the four main factors of approaches to studying (see Entwistle, Meyer, & Tait, 1991, for further details). Cronbach alpha reliability values for these short scales lay between 0.55 and 0.71. The second section contained items asking students to evaluate the course they were attending; these items were condensed on the basis of previous factor analyses into five two-point evaluation sub-scales. The third part contained preferences for contrasting learning environments which again were reduced to a series of two-item scales on the same basis. These sets of coupled items were chosen to contrast environments expected to encourage deep approaches to studying with those likely to support surface approaches.

This questionnaire had been given to 123 first-year students at the University of Edinburgh who were taking an electrical engineering course, 43 of whom had failed the end of year examination. Maximum likelihood analyses were computed separately for the 80 students who had passed the course satisfactorily and those who had failed, and rotated pattern matrices were obtained for three factors with delta set at zero. Table 1 presents the factor analyses of the two samples. The successful students showed the expected pattern of relationships even more clearly than in the analysis of the whole sample (Entwistle & Tait, 1990). The first factor linked the deep approach with three of the four features of a learning environment expected to facilitate a deep approach to learning, while the second factor brought together the surface approach with all four equivalent aspects of the environment. The third factor related the strategic approach to positive evaluations of lectures.

Among the failing students, however, the expected pattern did not materialise, with the exception of the evaluation factor. The first two factors produced bizarre and uninterpretable

combinations of loadings. The first factor was particularly strange as it was defined in terms of high positive loadings on all four approaches to studying, in spite of the fact that two are essentially the converse of the others. The second factor made more sense in relation to approaches to studying, showing surface approaches associated negatively with deep ones, but that was then linked to preferences for aspects of both deep and surface learning environments. In earlier analyses, dissonant patterns of response had taken the form of unexpected and uninterpretable linkages between approaches to learning and perceptions of the learning environment (Meyer, 1991). The two factors shown in Table 1 thus contained loadings which were just what would be expected in correlational terms, were the phenomenon of dissonance to have occurred in this sample too.

Table 1

*Factor patterns for passing and failing students (adapted from Entwistle, Meyer, & Tait, 1991)*

| Scale | Passing exam (N=80) | | | Failing exam (N=43) | | |
|---|---|---|---|---|---|---|
| | I | II | III | I | II | III |
| *Approaches to studying* | | | | | | |
| Deep | .49 | | | .69 | -.44 | .28 |
| Strategic | | | .35 | .48 | | .56 |
| Surface | | .66 | | .75 | .44 | |
| Apathetic | | .59 | | .57 | | -.63 |
| *Evaluations of course* | | | | | | |
| Good level, well organised | | | .69 | | | .71 |
| Pace too fast, heavy workload | | .41 | | | | |
| Good explanations, enthusiastic | | | .88 | | | .56 |
| Books available, handouts good | | | | | | .56 |
| Staff approachable, provide advice | | | | | | |
| *Preferences for learning environments which* | | | | | | |
| *Encourage understanding through* | | | | | | |
| Lectures deep | .52 | | | | .40 | |
| Tutorials deep | .69 | | | .33 | .39 | .33 |
| Exams deep | .45 | -.31 | | .57 | .30 | |
| Course deep | | | .36 | .53 | | |
| *Transmit information through* | | | | | | |
| Lectures surface | | .37 | | | .46 | |
| Tutorials surface | | .41 | | .43 | | |
| Exams surface | | .54 | | | .40 | |
| Course surface | | .64 | | | .65 | |

*Note.* Factor loadings below .30 have been omitted.

The samples used in these analyses were really too small for factor analyses, with the probability of unstable patterns of factor loadings. However, the data had been analysed independently by Meyer using unfolding analysis, for which these sample sizes are quite adequate. That analysis had found these same atypical patterns of relationship between the approach dimensions found among the students who failed.

Another limitation of this study was the use of a version of the *ASI* which was too short to generate the sub-scale scores normally used in analysing the full version of the inventory. In the present paper, we shall be presenting analyses from three studies which have used a longer and more recent version of the *ASI*, with larger samples of students from a wider range of subject areas, and with one sample from a totally different background and culture (South Africa). In this way, the findings from the earlier small scale study can be explored more convincingly.

## Development work on the ASI

A new questionnaire has been designed to provide a wider range of indices of study behaviour, skills and strategies, and to describe the sub-scale titles in more 'user friendly' (less psychological) terms. *ASSIST* (Approaches and Study Skill Inventory for Students – see Tait & Entwistle, 1996; Tait, Entwistle, & McCune, 1998) consists of seven sections, together with a self-rating on academic progress. These are:

Section A   Learning orientations, based on the work of Beaty, Gibbs, and Morgan (1997).
Section B   Preparation for higher education in terms of knowledge and study skills.
Section C   Conceptions of learning, based on the work of Säljö (1979).
Section D   Approaches to studying, developed out of the *ASI* (Entwistle & Ramsden, 1983).
Section E   Learning and study skills, being self-ratings on skills often covered in workshops.
Section F   Influences on studying, such as working, travelling, or personal relationships.
Section G   Preferences for deep or surface features of the learning environment (as above).

For the current study, only those sections which corresponded quite closely to the scales included in the earlier study were included in the analyses, namely Sections D and G. The description of preferences for learning environments remained the same, except that the ratings on tutorials (which took different forms across the areas of study included in the current study) were replaced with a contrast between books which 'challenge and provide explanations' and those which 'give you facts and information ... which can be easily learned'. Factor analysis of the items confirmed that the eight items fell into two groupings describing preferences for an environment encouraging a deep approach and one supporting a surface approach.

The sub-scales within the section covering approaches to studying had been substantially revised to take account of more recent research findings, and also to avoid duplication of sub-scales. For example, the sub-scales of the *ASI* describing Pask's style of learning (comprehension and operation learning) were dropped, while retaining *relating ideas* and *use of evidence* which were seen to be equivalent to them. The scale 'deep approach' within the ASI was renamed *seeking meaning,* leaving the previous label for the whole factor (to bring it into line with more general usage of the term). Intrinsic motivation was renamed *interest in ideas.* 'Strategic approach' within the ASI became the label for the whole factor, which was substantially reconstructed to emphasise aspects of organised studying and self-regulation in studying. The four strategic sub-scales in *ASSIST* are now *organised studying, time management, monitoring effectiveness* (maintaining a clear focus in studying in relation to both personal goals and assessment requirements), and *achievement motivation* (retained from the original inventory). A subsequent study has necessitated the addition of a fifth aspect (*alertness to assessment*), particularly for use with students beyond their first year of study.

A confirmatory factor analysis, carried out on our data by Gustafsson (unpublished), also influenced the design of *ASSIST.* It confirmed the existence of deep and strategic dimensions, which combined within the first factor extracted to suggest a general study effectiveness dimension – the skilful student, or what Janssen (1996) has called the *studax.* Most of the other sub-scales of the *ASI* could also be justified as making smaller contributions to explaining the variance, but the surface approach, as such, did not remain as a separate grouping. Rather a combination of items from the two previous factors indicated a surface apathetic approach, containing sub-scales of *lack of understanding* (similar to 'surface approach' in the *ASI,* and indicating reliance on routine rote memorisation), and *lack of purpose* (overlapping 'negative attitudes'), as well as *syllabus-boundness* and *fear of failure* from the original *ASI.*

## Method

The present paper brings together three sets of data to explore the relationships between the sub-scales of *ASSIST,* and also to consider item-level analyses where appropriate. The

three samples consisted of 1284 first-year students from three long established and three recently established British universities covering a spread of areas of study, 466 first-year students from a Scottish technological university, and 219 students from a 'historically disadvantaged' South African university. The last sample was included to provide a severe test of the instrument, the development work for which had been carried out in a totally different culture and educational context. Moreover, evidence of dissonant study orchestrations had been reported in several previous studies of educationally disadvantaged students in South Africa (see, for example, Cliff, 1992).

The largest sample was used to investigate the factor structure of *ASSIST* at sub-scale level, and to carry out cluster analyses to determine the extent to which patterns of sub-scales scores retained their integrity across contrasting groups of students. Both these sets of analyses were carried out using SPSS. The other two samples were used to compare the item and factor structure of approaches to studying within *ASSIST* in the two differing contexts. Although the largest group and the South African sample did have a self-rating of academic progress, this was not considered to be a convincing basis for dividing the sample into contrasting performance groups. We were, however, provided with the actual end of session marks for students in the technological university. It was thus possible to look at the sub-scale factor structure for students who did well and those who did relatively poorly in their end of session assessments (course work and examinations), with the cut off taken at an average mark of 55%. This cut off was chosen to provide sufficient numbers of students to carry out a comparative analysis between relatively more and less successful students. It should, however, be noted that the fail mark in this institution was 40%, and very few students obtained an average mark below 40%. An analysis was also carried out with the cut off at 45%, but this much smaller sample created no change in the pattern and has not been reported here.

Factor analysis describes the relationships between *variables* in ways which show the broad overall pattern clearly, but cannot identify different patterns of relationship which may exist in sub-groups within a population (Meyer, this issue). Cluster analysis groups together *individuals* who have responded to items in similar ways, and by considering how the samples differ on additional variables not included in the cluster analysis, a clearer picture of the nature of the clusters can be obtained. A detailed comparison of several methods of clustering, including both hierarchical and relocation methods, had previously indicated that the k-means relocation analysis of raw inventory scores was appropriate for the purposes of this type of study (Entwistle & Brennan, 1971). It was therefore used here.


## Results

### The factor structure of ASSIST sub-scales

The first analysis looked at the rotated factor pattern of the sub-scales of approaches to studying for the largest and most diverse sample. The results of the maximum likelihood analysis of this sample, with delta set at zero, are shown in Table 2. These show the usual pattern of relationships, with each sub-scale contributing to the expected factor. The new scale of 'monitoring effectiveness' loaded on both deep and strategic factors, but that is entirely understandable in conceptual terms.

Cronbach alpha coefficients are used to indicate the internal reliability of psychological measures – the extent to which the defined scales contain items which are internally consistent and coherent. Table 2 lists these values, indicating that both the full scales and the sub-scales have values which are acceptable for scales of their respective length and type. (The four items describing 'fear of failure' can be used to indicate the highest level to be expected of scales of this type and length, as these items are similar to those often used to describe the relatively stable and well-established personality trait of neuroticism.)

Table 2

*Factor loadings and Cronbach α coefficients for ASSIST sub-scales*

| | Factor | | | |
| --- | --- | --- | --- | --- |
| | I | II | III | (α) |
| *Approaches to Studying* | | | | |
| *Deep Approach* | | | | (0.84) |
| Seeking meaning | .67 | | | (0.57) |
| Relating ideas | .79 | | | (0.59) |
| Use of evidence | .75 | | | (0.53) |
| Interest in ideas | .65 | | | (0.76) |
| *Surface Apathetic Approach* | | | | (0.80) |
| Lack of understanding | | .77 | | (0.54) |
| Lack of purpose | | .37 | | (0.68) |
| Syllabus boundness | | .35 | -0.30 | (0.62) |
| Fear of failure | | .68 | | (0.76) |
| *Strategic Approach* | | | | (0.87) |
| Organised studying | | | .77 | (0.57) |
| Time management | | | .86 | (0.76) |
| Monitoring effectiveness | .42 | | .48 | (0.55) |
| Achievement motivation | | | .78 | (0.69) |
| *Preferences for learning environments* | | | | |
| Deep (Encouraging understanding) | 0.55 | | | (0.62) |
| Surface (Transmitting information) | | 0.38 | | (0.69) |
| *Self-rating of academic progress* | | -0.31 | 0.47 | (not applicable) |
| Correlations between factors | I | II | III | |
| Factor I (Deep) | 1.00 | | | |
| Factor II (Surface Apathetic) | -0.20 | 1.00 | | |
| Factor III (Strategic) | 0.35 | -0.22 | 1.00 | |

*Note.* N=1284; factor loadings below .30 have been omitted; variance accounted for 58%.

*Integrity of item and sub-scale structures across contrasting samples*

The main purpose of the current set of analyses was to explore the factor structures produced by students with contrasting levels of academic performance, and to explore the possibility of dissonant patterns of response. These may be seen either at individual item level (seeing the extent to which individual items hang together in understandable ways), or at sub-scale level (looking for the expected groupings of sub-scales under the main factors of deep, strategic, and surface apathetic). Analyses were, therefore, carried out at both these level for the samples from the Scottish technological university and the South African university, using the same statistical procedure as reported above. The three factors identified in the scale-level analysis were also found at item level and were examined to identify items which did not fit into their expected sub-scale. Only a summary of this analysis can, however, be provided here (Table 3).

Table 3

*Items from sub-scales in which 'errant' loadings were detected*

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*Items from 'seeking meaning' (SM) and 'relating ideas' (RI) intended to load on 'deep'*

*South African sample only*

*Items loading as expected on the 'deep' factor*

SM 30. When I am reading I stop from time to time to reflect on what I am trying to learn from it.

RI 11. I try to relate ideas I come across to those in other topics or other courses whenever possible.

*Item loading exclusively on the strategic factor*

SM 17. When I'm reading an article or book, I try to find out for myself exactly what the author means.

*Items loading on both 'deep' and 'strategic ' factors*

SM 43. Before tackling a problem or assignment, I first try to work out what lies behind it.

RI 21. When I'm working on a new topic, I try to see in my own mind how all the ideas fit together.

*Items failing to load above 0.25 on any factor*

SM 4. I usually set out to understand for myself the meaning of what we have to learn.

RI 33. Ideas in course books or articles often set me off on long chains of thought of my own.

RI 46. I like to play around with ideas of my own even if they don't get me very far.

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*Items from 'syllabus-boundness' intended to load on 'surface apathetic'*

*Item loading as expected on the surface apathetic factor in the Scottish sample (no loading in SA)*

SB 51. I like to be told precisely what to do in essays or other assignments.

*Items loading as expected in SA sample and negatively with strategic in the Scottish sample*

SB 12. I tend to read very little beyond what is actually required to pass.

SB 25. I concentrate on learning just those bits of information I have to know to pass.

*Item loading positively on 'strategic' in SA sample (no loading in Scottish sample)*

SB 38. I gear my studying closely to just what seems to be required for assignments and exams.

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In the Scottish sample, the only sub-scale which showed 'errant' items was 'syllabus-boundness'. The sub-scale was designed as part of the 'surface apathetic' factor, but two of the items (12 and 25) instead loaded negatively on the strategic factor, while a third one (38) had a loading below 0.25. In the South African sample, items 12 and 25 fitted into the expected pattern, but item 38 loaded positively on the strategic factor, while item 51 had a loading below 0.25.

The main disruption in the item pattern was found in two sub-scales within the 'deep' factor – 'seeking meaning' (which is the defining sub-scale) and 'relating ideas'. These sub-scales fitted the expected pattern in the Scottish sample, but only one item (30) was recognisably and exclusively in that factor within the South African sample. Item 17 loaded exclusively on 'strategic', and two other items (43 and 21) showed loadings above 0.25 on that factor, although with higher loadings on 'deep'. Two items (33 and 46) did not load above 0.25 on any factor. The items mentioned above were examined in an attempt to discover whether any of their positioning within the factors suggested dissonant relationships, or could be interpreted in other ways.

The disintegration identified in the analysis reported in Table 1 brought together contradictory elements, deep and strategic – the sub-scales related to high performance – with surface and apathetic – the sub-scales associated with weak performance and failure. No such pattern was seen among the discrepant items. The inconsistency is mainly between deep and strategic, which generally have a positive correlation and in some samples have been found to load on the same factor. There is only one of the items shown in Table 3 which loads in a contradictory direction (SB 38) – a syllabus bound item loading positively on the strategic factor. The other loadings suggest that 'seeking meaning' and 'relating ideas' in the South African sample are more closely related with the strategic approach, than are the 'use of evidence' and 'interest in ideas'. The items which have the lowest loadings (<0.25) seemed to describe a holist style of learning without any direct focus on academic tasks or achievement – to have no element of strategic in them at all. This somewhat changed emphasis within part of the 'deep' factor may reflect the different educational context within which the South African students are operating, but such a conclusion would be highly speculative on the basis of this slight evidence.

Another way of checking for possible differences between the pattern of responses is by computing the Cronbach alpha reliability coefficients separately for the Scottish and South African samples. The values are shown below in Table 4. The weakest sub-scales in the South African sample are 'relating ideas' and 'syllabus-boundness', as might have been expected from the item factor analysis. It should be noted, however, that the Cronbach values for these scales are not seriously out of line whith previous results, and the full scale values for the three main approaches are all above 0.70 for the 16 item scales.

*Inter-relationships between the sub-scales*

The next step in the analysis was to carry out factor analyses at sub-scale level for three samples – the Scottish sample broken down into students who had higher marks and those who had lower marks, and the whole South African sample. Although both the eigen value and the scree plot criteria suggested that four factors could be extracted, the four factor solution created factors with a very high loading on just one sub-scale ('syllabus-boundness' in the more successful Scottish students, and 'lack of purpose' in the less successful ones). For this reason, and to continue the comparisons with earlier analyses, the three factor solution was preferred, with the factor pattern being reported in Table 4.

The overall factor pattern is closely similar to that found with the large British sample (Table 2), and there are few noticeable differences between the Scottish and South African samples. Not surprisingly in view of the item analysis, 'relating ideas' plays less part in defining the deep factor (I) in the South African sample than in the Scottish sample, and the contribution of 'achievement motivation' to the strategic factor (II) is also weaker. Perhaps the only different pattern which may have some educational significance is the way 'fear of failure' loads on both the deep factor (I) and the surface apathetic factor (III) among the South African students.

*Cluster analyses of the largest sample*

Meyer (this issue) has suggested that the use of factor analysis may disguise the existence of important variations in the relationships between approaches to studying within particular subgroups. He has argued that cluster analysis offers an appropriate additional analytic tool which would allow this possibility to be explored. Using factor scores produced from a two-factor analysis of our large sample, he constructed an approximation to an interference model (Meyer, this issue), and was able to demonstrate that dissonant relationships existed in the factor structure of at least one cluster (personal communication).

Table 4

*Factor loadings and Cronbach α coefficients for ASSIST inventory sub-scales in contrasting samples*

| | Scottish technological university | | | | | | South African | | | Cronbach α | |
| | High Marks (N=302, 58.8% variance) | | | Low marks (N=103, 54.3%) | | | All marks (N=219, 54.9%) | | | | |
| | Factor | | | Factor | | | Factor | | | | |
| Sub-scales | I | II | III | I | II | III | I | II | III | (Scot) | (S. Af.) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Deep Approach* | | | | | | | | | | (0.82) | (0.71) |
| Seeking meaning | .70 | | | .66 | | | .62 | | | (0.51) | (0.43) |
| Relating ideas | .76 | | | .78 | | | .45 | | | (0.55) | (0.36) |
| Use of evidence | .79 | | | .59 | | | .72 | | | (0.46) | (0.50) |
| Interest in ideas | .64 | | | .55 | | | .59 | | | (0.73) | (0.71) |
| *Surface Apathetic Approach* | | | | | | | | | | (0.80) | (0.75) |
| Lack of understanding | | .85 | | | .73 | | | .86 | | (0.55) | (0.42) |
| Lack of purpose | | .55 | | | .59 | | | .65 | | (0.68) | (0.57) |
| Syllabus-boundness | | .34 | | | .43 | | | .60 | | (0.57) | (0.38) |
| Fear of failure | | .63 | | | .59 | | .43 | .36 | | (0.74) | (0.56) |
| *Strategic Approach* | | | | | | | | | | (0.86) | (0.82) |
| Organised studying | | | .74 | | | .77 | | | .75 | (0.52) | (0.50) |
| Time management | | | .94 | | | .85 | | | .89 | (0.73) | (0.65) |
| Monitoring effectiveness | .47 | | .41 | .38 | | .34 | .36 | | .50 | (0.55) | (0.50) |
| Achievement motivation | | | .78 | | | .75 | | | .53 | (0.66) | (0.49) |
| *Preferences for learning environments* | | | | | | | | | | | |
| Deep (Encouraging understanding) | .40 | | | .51 | | | .37 | | | (0.68) | (0.66) |
| Surface (Transmitting information) | | .31 | | | | | | .43 | | (0.68) | (0.55) |
| Correlations between factors | I | II | III | I | II | III | I | II | III | | |
| Factor I (Deep) | 1.0 | | | 1.0 | | | 1.0 | | | | |
| Factor II (Surface) | -0.20 | 1.0 | | -0.20 | 1.0 | | 0.13 | 1.0 | | | |
| Factor III (Strategic) | 0.41 | -0.25 | 1.0 | 0.33 | -0.32 | 1.0 | 0.50 | -0.12 | 1.0 | | |

*Note. Factor loadings below 0.30 have been omitted.*

Following up this initial analysis, it was decided to follow our previous procedure and retain all the sub-scale scores within the k-means relocation analysis. This method allows the fullest possible description of the clusters. As the defining features of clusters vary as increasing numbers of clusters are selected, it is important to check the stability of these features both through the cluster levels and from split-half solutions at the same level (Entwistle & Brennan, 1971; Entwistle & Ramsden, 1983). For these purposes, the six, twelve and eighteen cluster solutions were examined, with the eighteen level giving the clearest differences. The full sample was then split randomly into comparable halves using the appropriate SPSS procedure, and the eighteen cluster solution repeated for samples of 665 and 619 students respectively.

Table 5

*Pattern of means describing cluster centroids in the 6 cluster solution*

| Sub-scales | Cluster means | | | | | |
|---|---|---|---|---|---|---|
| | 1 (n=206) | 2 (n=246) | 3 (n=299) | 4 (n=215) | 5 (n=183) | 6 (n=135) |
| *Deep Approach* | | | | | | |
| Seeking meaning | 16.4 | 12.3 | 14.8 | 12.8 | 13.9 | 10.1 |
| Relating ideas | 16.1 | 11.8 | 14.4 | 13.6 | 14.2 | 10.0 |
| Use of evidence | 16.5 | 12.7 | 15.1 | 13.7 | 14.7 | 10.8 |
| Interest in ideas | 16.6 | 9.7 | 14.4 | 13.6 | 13.9 | 8.4 |
| *Surface Apathetic Approach* | | | | | | |
| Lack of understanding | 8.9 | 11.2 | 13.0 | 9.8 | 13.4 | 13.9 |
| Lack of purpose | 6.1 | 8.7 | 8.9 | 7.5 | 11.3 | 12.3 |
| Syllabus-boundness | 10.2 | 14.0 | 14.3 | 14.3 | 15.6 | 16.9 |
| Fear of failure | 10.6 | 11.0 | 16.2 | 10.4 | 16.9 | 14.9 |
| *Strategic Approach* | | | | | | |
| Organised studying | 14.3 | 12.8 | 13.9 | 9.7 | 9.9 | 8.8 |
| Time management | 15.2 | 13.5 | 14.4 | 8.4 | 9.0 | 8.2 |
| Monitoring effectiveness | 15.8 | 13.2 | 15.3 | 11.8 | 13.1 | 10.2 |
| Achievement motivation | 16.7 | 14.8 | 15.5 | 11.9 | 11.5 | 10.6 |
| *Preferences for learning environments* | | | | | | |
| Deep (Encouraging understanding) | 16.9 | 12.6 | 14.8 | 14.0 | 14.0 | 10.6 |
| Surface (Transmitting information) | 16.2 | 17.8 | 18.0 | 17.1 | 17.6 | 18.4 |
| *Descriptive statistics (not used in forming the clusters)* | | | | | | |
| Self-rating of academic progress | 6.6 | 6.1 | 5.8 | 5.5 | 4.6 | 4.4 |

Here, only the six and eighteen cluster solutions are considered, as the twelve cluster solution showed no distinctively different features. The six cluster solution for the full sample of 1284 students, shown in Table 5, is presented in descending order of self-rating of academic progress. Five of the six clusters show the expected pattern between the three main areas, with the levels of the most adaptive approaches to studying covarying as expected with levels of perceived performance, although with variations between clusters at sub-scale level. Cluster 5, with the second-lowest attainment level, did however produce an unlikely combination of moderately high scores on all four components of the deep approach together with equally high levels of all four indicators of a surface apathetic approach. While a deep approach associated with 'fear of failure' is also found in Cluster 3, it is the high scores on the other three surface apathetic sub-scales which contradict the attempt to seek meaning and understanding implied by high scores on deep approach. That pattern has, however, been found in other reports of dissonance described in this issue, and elsewhere.

Another feature of this analysis is the way in which the relative strength of preference for deep and surface learning environments mirrors the students' own approaches to studying. However, only in the most academically self-confident group is preference for a deep learning environment higher than that for a surface one, and then only marginally so. Indeed, these mainly first-year students preferred teaching and books which concentrated on information transmission and provided notes suitable for fact-orientated assessment procedures.

Table 6

*Pattern of means describing the centroids of clusters with contrasting self-ratings on academic progress within the 18 cluster solution*

| | Cluster means | | | | | | |
|---|---|---|---|---|---|---|---|
| Sub-scales | 7 | 8 | 9 | 10 | 11 | 12 | |
| (*N*=in 1284 sample) | (60) | (73) | (96) | (67) | (43) | (22) | |
| (*N*=in 665 sample) | (32) | (58) | (46) | (27) | (39) | (15) | |
| (*N*=in 619 sample) | (32) | (62) | (19) | (47) | (26) | (fragmented) | |
| *Deep Approach* | | | | | | | |
| Seeking meaning | 17.2 | 15.7 | 15.1 | 10.5 | 13.4 | 9.1 | |
| Relating ideas | 16.3 | 15.1 | 15.8 | 10.5 | 14.4 | 9.2 | |
| Use of evidence | 16.6 | 15.7 | 15.8 | 11.6 | 14.5 | 9.8 | |
| Interest in ideas | 16.9 | 15.9 | 15.9 | 9.4 | 13.0 | 6.6 | |
| *Surface Apathetic Approach* | | | | | | | |
| Lack of understanding | 7.9 | 9.9 | 8.3 | 15.6 | 14.2 | 12.2 | |
| Lack of purpose | 5.0 | 5.8 | 7.0 | 13.2 | 14.1 | 15.8 | |
| Syllabus-boundness | 8.7 | 12.3 | 11.5 | 17.0 | 16.5 | 18.0 | |
| Fear of failure | 8.8 | 14.1 | 8.8 | 17.2 | 17.1 | 13.4 | |
| *Strategic Approach* | | | | | | | |
| Organised studying | 16.4 | 14.4 | 11.4 | 9.4 | 8.7 | 7.3 | |
| Time management | 17.2 | 14.9 | 11.5 | 8.7 | 7.1 | 6.2 | |
| Monitoring effectiveness | 16.8 | 15.8 | 14.0 | 11.3 | 11.5 | 7.6 | |
| Achievement motivation | 18.0 | 16.5 | 14.5 | 11.6 | 9.2 | 7.9 | |
| *Preferences for learning environments* | | | | | | | |
| Deep (Encouraging understanding) | 17.4 | 15.6 | 16.7 | 11.4 | 13.4 | 10.2 | |
| Surface (Transmitting information) | 16.2 | 17.5 | 15.6 | 18.8 | 17.5 | 18.6 | |
| *Descriptive statistics (not used in forming the clusters)* | | | | | | | |
| Self-rating of academic progress | 6.8 | 6.7 | 6.3 | 4.2 | 4.0 | 3.5 | (% in total sample) |
| % of cluster in pre-1990s university | 80.0 | 71.3 | 71.9 | 67.2 | 48.8 | 59.1 | (68.7) |
| % science and engineering | 56.6 | 48.0 | 52.1 | 52.2 | 62.8 | 77.3 | (55.8) |
| % male | 46.7 | 34.2 | 58.3 | 55.2 | 58.1 | 68.2 | (54.0) |

The eighteen cluster solutions, from both the complete sample and the split-half analyses, sharpened up the definition of clusters. Table 6 reports the three highest and three lowest clusters in terms of self-rating of academic progress, and includes descriptive statistics which provide additional information about cluster membership. Several of the sub-scales show a perfect ordering in progression from the highest to the lowest attainment clusters – 'lack of purpose' and three of the four strategic sub-scales. Other variables show a marked difference between high and low attainment clusters, but with variations in pattern among each group of three clusters. The two clusters reporting the highest levels of attainment both have a higher than average proportion of women and students in pre-1990s universities. The predominance of women is particularly marked in Cluster 8, which also contains a higher proportion of students from the arts and social sciences. The lowest levels of attainment are found among male students in the new universities taking science and engineering.

The anomalous combination of relatively high deep and surface apathetic scores is now found in Cluster 11 and was repeated in a similar form, but with slight variations at sub-scale level, in both the split-half analyses. And this cluster is the second-lowest in terms of self-rating of academic progress, and can now be seen to contain a particularly high proportion of students from the new universities, and with slightly more students taking science or engineering than other subjects.

## Discussion

### *The interpretation of dissonant study orchestrations*

Although our analyses, in themselves, do not suggest any explanation for the theoretically dissonant sets of loadings in the first two factors of the failing students in Table 1, and in clusters- 5 and 11, other studies provide some indications of what may be happening. Meyer (this issue) has summarised the findings of several recent studies, which suggest that dissonance is associated with a mismatch between approaches to studying and perceptions of the learning environment, or between internal and external regulation of studying. In an earlier study, too, Calder (1989) described what seems to be a similar phenomenon. He identified a 'surface, confused' grouping of items from a factor analysis of the *ASI*, which was associated with students who appeared to be 'disorganised, highly anxious, and being unable to concentrate on their studies' (p. 269). Other students within this group, however, 'appeared to be basically deep learners who could not apply that mode of learning appropriately' (p. iii). Our Cluster 11 portrays students who are similarly disorganised in their studying, highly anxious and with confusion being seen in the contrast between their responses – their intention to seek meaning and declared interest in the ideas in the course, on the one hand, and their syllabus-boundness and weak levels of understanding on the other. They also show a relatively greater preference for learning environments which support deep approaches than do the other two low attainment groups.

Calder's description suggests that academically weak students may well contain rather different students. One group give responses to the inventory which fit the normal pattern (surface, anxious, poor study organisation) and are represented in our study by Cluster 12. The other group has the confused mixture of responses (seeking a deep approach, but not knowing how to achieve it) perhaps implied by our Cluster 11. In our correlational analyses, only the first pattern of response was identified, indicating more the limitations of this method of analysis than the absence of dissonance among some of the academically weak students.

### *Patterns of response to ASSIST*

In this paper, two different approaches have been adopted to investigate patterns of response to the inventory – factor analysis and cluster analysis – and they seem to have complementary strengths. Factor analysis shows the general patterns which exist among responses, while cluster analysis allows discrepancies in this general pattern to be identified. Both focuses are important in trying to understand the ways in which students tackle academic tasks, and why some students fair badly in assessments.

Taking the general pattern first, the substantial correlation between deep and strategic factors suggests that there is a hierarchical structure within study skill, reminiscent of the structure found among tests of intellectual ability (Gustafsson, 1988). Implicit in the present analyses seems to be a general factor of deep, strategic approaches to studying, which breaks down into two main factors – deep/strategic and surface/apathetic – which could conceptually be seen to include the four main factors of the original ASI (although here the empirical evidence seems weaker). This suggested pattern is shown in Figure 1.

Further decomposition of these factors would almost certainly overlap substantially with the eight factors described by Janssen (1996). (The central factor in his 3 x 3 matrix represents the general factor of effectiveness in studying.) Continuing decomposition would also be likely to fit in with the twenty components described by Vermunt (1996). However, further development of this idea must await the use of the STREAMS program developed by Gustafsson (1996) which has already been successfully used to analyse hierarchical structures in intellectual abilities. As any decomposition proceeds, the form of the factors would, of course, depend increasingly on the underpinning theory used to select the items, and to date there is insufficient agreement about such a theory to provide convincing conceptualisation to guide item selection.
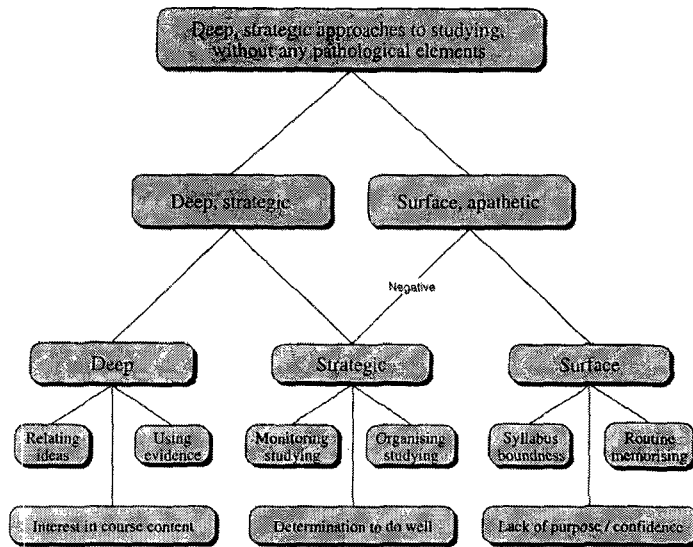
*Figure 1.* Conceptual map of components of effective studying within ASSIST

The cluster analyses convey an important warning against assuming that the general pattern applies to *all* students. Meyer (this issue) reports cluster analysis based on factor scores from an initial two-factor analysis. This procedure is designed to draw attention to discrepant patterns of response. The use of raw sub-scale scores focuses, in contrast, on the location of the cluster centroids in hyperspace, rather than their internal structure. When only a few clusters are extracted, some blurring of cluster definitions is likely, but when substantial numbers of clusters are produced clear-cut distinction are more likely to emerge. Many of these clusters represent no more than slight, inconsequential variations on the general relationships shown by the factor analysis. But among the distinct clusters, there can be a few potentially important clusters which suggest unusual response patterns, and provoke further reflection.

It was through cluster analysis in our study that a substantial sub-group of students was identified which showed the now familiar features of dissonance. This phenomenon suggests that the weak academic performance of some students lies in a mismatch between the deep outcomes they are seeking and their ability to achieve them, or perhaps in a tension between personal intentions and either the general learning environment provided or the pressures to conform to external assessment requirements. The precise nature of this dissonance may not yet be clear, but there is mounting evidence that it is well worth further investigation.

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*Les auteurs rendent compte du développement d'un questionnaire intitulé 'Approaches and Study Skills Inventory' for Students' (ASSIST) qui incorpore une version révisée de 'Approaches to Studing Inventory'. Le questionnaire a été rempli par trois échantillons distincts: 1284 étudiants de première année de six universités britanniques, 466 étudiants de première année d'une université technologique écossaise, et 219 étudiants d'une université sud-africaine connue pour son public socialement défavorisé. Les analyses de données ont été conduites pour explorer les patterns de réponses trouvées dans les sous-groupes présentant des variations dans leurs niveaux d'acquisition et dans leurs contextes. L'analyse des données réalisée sur le plus grand échantillon confirme l'existence des trois facteurs attendus d'indifférence profonde, d'indifférence de surface et de stratégies d'approche dans les études; des patterns presque identiques ont été également trouvés dans les deux autres échantillons et pour des étudiants ayant des niveaux contrastés d'acquisitions. On a cependant trouvé quelques différences mineures intéressantes dans l'échantillon sud-africain. Une analyse de cluster a ensuite été effectuée sur le plus grand échantillon et a produit des clusters avec des patterns de réponse en général cohérents. On a cependant observé un cluster récurrent et inattendu chez les étudiants en difficulté concernant un pattern dissonant de réponse combinant des scores modérément élevés aux deux sous-échelles d'indifférence profonde et de surface associés à des scores faibles d'approche stratégique.*

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