Learning Styles Among Mature Age Students: Some Comments on the Approaches to Studying Inventory (ASI-S)

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Abstract

The short form of Entwistle's (1981, 1983) Approaches to Studying Inventory (ASI-S) was administered to 503 mature-aged students, most of whom identified themselves as disadvantaged and were returning to study after many years absence. Analysis of the 503 responses showed that internal consistency estimates for the seven subscales of the ASI-S were generally low but that confirmatory factor analysis could recover two major dimensions corresponding to deep and surface orientations to learning. To examine the predictive validity of the ASI-S with this population, results for a maths unit they were studying were regressed on factor scores. Results of the structural analysis indicated that the deep orientation was unrelated to academic progression in mathematics but that high scores on the surface orientation were associated with poor academic performance (R^2 = .092). These findings indicate that broad learning orientations are fundamental and can be indentified in a group of students returning to study after a long absence. The study also emphasises the importance of examining the particular study context when evaluating the effect of learning orientations. The effect of deep and surface orientations may be positive or negative depending on the subject area and the learning context.

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The Australian higher education system has experienced extraordinary growth in the last 50 years. In particular, since 1989 government policy and funding has directed that growth towards increasing the diversity of the student population. Today we see an increasing number of students who have gained access to university through bridging or preparatory courses and who have little or no experience of formal study. Many of these students come from disadvantaged backgrounds and are unfamiliar with the culture of tertiary learning. The present study set out to examine the structure of learning orientations of these students and to examine whether these learning orientations are able to predict academic achievement. The framework for the study was based on the work of Entwistle and his colleagues, rather than on well-known models proposed by other researchers (e.g., Thomas & Bain, 1982; Biggs, 1987).

Entwistle and Ramsden (1983), following earlier work by Marton and Saljo (1976), used the terms deep and surface to describe the two main approaches to learning. A deep approach is characterised by an intention on the student's part to understand the meaning of the material, to relate its contents to what is already known, and to make some judgement about the validity of the arguments presented. A surface approach, on the other hand, is characterised by an intention to memorise the parts of the information students consider likely to be examined. Svensson (1977) went on to show that there is a relationship between learning orientations and exam performance with a deep approach more often associated with successful performance. Entwistle and Ramsden also linked their ideas about learning approaches with Pask's (1976) notions of learning styles. Pask talked about a 'comprehension' learning style and an 'operation' learning style. The former involves 'building descriptions of what is known'; the latter is concerned with 'mastering procedural details'. Pask used the terms 'holist' and 'serialist' to describe the strategies adopted by individuals employing either of these styles. The ideas of Marton and Pask formed the conceptual basis for much of the work undertaken by Entwistle and Ramsden in their attempts to develop good operational measures of different learning orientations. In the course of this work, they introduced a number of measures, culminating in the Approaches to Studying Inventory (ASI: Entwistle, Hanley & Hounsell, 1979, Entwistle & Ramsden, 1983, Ramsden & Entwistle, 1981).

The early versions of the ASI are described in Entwistle and Ramsden (1983). As these authors point out, in the early stages of scale development the theoretical constructs that they sought to tap were themselves in an evolutionary state. The result of these early efforts was a 64-item inventory containing 16 subscales measuring four broad learning dimensions. The first two of these dimensions were labelled "meaning orientation" and "reproducing orientation", reflecting the distinction between deep and surface approaches to learning. The third dimension, "achieving orientation", was added to measure what appeared to be a third reliable approach to study. The last dimension, "styles and pathologies of learning", was added to capture variance created by Pask's (1976) learning styles.

Despite the fact that the original internal consistency estimates for many of these 16 subscales were rather low (Entwistle & Ramsden, 1983), the 64-item version of the ASI has been widely used. In fact, it has been described as perhaps the most widely used questionnaire on student learning in higher education (Richardson, 1994). Not surprisingly, it has also attracted the attention of researchers. Richardson (1990) reported a number of studies that had examined psychometric properties of the ASI, including further investigation of its internal consistency and its latent structure. The main outcomes of this research were continuing concern with the low internal consistency estimates for the 16 subscales and doubts about the validity of the 16 latent factors. The two traits that did consistently emerge in factor analytic research were “meaning orientation” and “reproducing orientation. Some newer versions of the ASI now concentrate on just those two factors (e.g., Richardson, 1990).

Most of the above studies looked at the validity of the ASI in traditional settings; that is, with students who have gained admission to higher education via the normal entry mechanisms. A handful of studies have examined the validity of the ASI in other settings. For example, there have been a number of studies of the ASI within different cultures (e.g., Harper & Kember, 1989, Myer & Parsons, 1989). There have also been studies of the applicability of the ASI to different types of students; for example, distance eduation students (Harper & Kember, 1986). These studies have not always supported the claims made for the validity of the ASI. The main aim of the present study was to examine the construct validity of a shortened version of the ASI (Entwistle, 1981: ASI-S) when used with a large sample of students attempting to gain admission to university via a preparatory studies programme. The purpose of this programme is to help people, many of whom have identifed themselves as coming from disadvantaged backgrounds, who have not studied for some time and lack the credentials to qualify for study at the university level. The lack of recent formal educational experience makes this category of higher education student a particularly interesting one in the context of learning orientations.

The second aim of this study was to examine the predictive validity of the ASI-S in this population. Ramsden and Entwistle (1981) found correlations between scales of the ASI and perceived adacemic success. However, Clarke (1986) found no correlations between learning orientations and end-of-year assessments for medical students. In contrast, Newstead (1992), using another shortened version of the ASI, found that academic success had positive correlations with the Meaning and Achieving subscales of that particular version of the ASI but not with the Reproducing subscale. In the present study, measures of academic achievement were available, so it was possible to relate scores on the ASI-S to academic success.

There are not many studies in the literature on approaches to learning that have employed a broad validation approach. Most have either examined the psychometric properties of different versions of the ASI, or checked relations between scale scores and academic progress. The present study encompassed both of these aims and, in so doing, contributes much-needed information about the overall validity of the shortened version of the ASI for an increasingly important section of the higher education market in

Australia: mature age students preparing for university study by completing distance education training packages designed to improve subject knowledge and general study skills.

It was hypothesised that the subscales of the ASI-S would capture the two broad dimensions consistently identified with the ASI, meaning orientation and reproducing orientation (Richardson, 1990), and that these dimensions would be related to academic achievement.

Method

Participants

The 503 students (195 females) had an average age of 31 years. All were undertaking a maths unit as part of a preparatory study skills course to qualify for university admission. All students were studying at a distance. On average, they had not studied for 12 years and many had not studied maths for a longer period than that.

Measures

ASI-S

Entwistle had earlier experimented with a shortened version of the ASI that used 30 items to measure seven subscales including meaning orientation and reproducing orientation (ASI-S: Entwistle, 1981). According to Richardson (1990), this shortened scale has been used “with a degree of success” (p.158) in a number of studies. It is the version of the scale used in this study. The ASI-S comprises 30 statements to which students respond by circling one of five categories: 4 “Definitely agree”, 3 “Agree with reservations”, 2 “Item does not apply or impossible to give an answer”, 1 “Disagree with reservations”, 0 “Definitely disagree”.

The ASI-S contains seven subscales. The three major ones are Achieving Orientation, Reproducing Orientation, and Meaning Orientation. Each of these has six indicator items. The minor subscales are Comprehension Learning, Operation Learning, Improvidence, and Globetrotting, each with just three indicator items. It is possible to combine some of these scales but this was not done in the present study. All seven scales were formed from different items.

Academic Achievement

Students were enrolled in a preparatory mathematics course intended to prepare them for university study. The maths course differed from more conventional course in that it was written particularly for adults returning to study and integrated study and communication skills within the mathematics. Assessment was through assignment and examination and focussed on a student’s understanding of the topics rather than ability to reproduce formulas. Measures of academic success were available in the form of grades. These were based on achievement in six assignments (30% of total) and a final examination (70% of total) and ranged from High Distinction, A, B, C, to Fail. These grades were coded as 7, 6, 5, 4, 3 respectively for the purposes of statistical analyses.

Procedure

Students were sent the questionnaires with the first mailing of their study materials. They were provided with return mail envelopes and asked to complete the inventory before starting any of their enclosed course materials. The majority of students enrolled in the maths units complied with this request.

Results

Analyses were conducted using SPSS for Windows and the AMOS (Arbuckle, 1997) structural equation modelling package. Descriptive statistics for the seven subscales will be reported first, followed by the analyses of the measurement and structural models.

Descriptive Statistics

Means, standard deviations, and Cronbach alpha estimates for all subscales are shown in Table 1. It can be seen that the reliabilities for all scales were rather low with a maximum of .60 for Comprehension Learning and a minimum of .31 for Operation Learning. These reliabilities are better than those reported by Watkins (1984) but still raise doubts about the internal consistency of the subscales themselves. Watkins suggested that the low internal consistency estimates could be due to the small number of items in each scale. If that were so, one would expect the smaller scales to have the lowest estimates. There is no evidence of that here. In fact, the scale with the highest reliability has only three items. Reliabilities could have been improved by deleting items - the estimate for Achieving, for example, rose to .60 if a single item was deleted - but this was not done so that subscales remained intact.

Analysis of Measurement and Structural Models

The AMOS (Arbuckle, 1997) structural equation modelling (SEM) package was used to evaluate a hypothetical two-factor measurement model underlying the correlations among the seven ASI-S subscales and, at the same time, to evaluate a structural model wherein these two factors were used to predict achievement in the maths course. Because of previous criticism of the measurement model for the ASI, a two-stage process was used wherein the measurement model was evaluated in stage one and the structural model in stage two. To conserve space, Figure 1 displays the parameters obtained in both stages but we will present the results for the two stages separately. The two factors in the measurement model corresponded to the meaning (deep) and reproducing (surface) orientations identified by Entwistle and Ramsden (1983) as forming the basic approaches to learning and as consistently identified in factor analytic research (Richardson, 1990). The first factor was defined by Achieving, Comprehension, Meaning, and Operation Learning subscales whilst the second orthogonal factor was defined by the Reproducing, Improvidence, and Globetrotting subscales. The maximum likelihood parameters corresponding to the traditional factor loadings are shown above the arrows leading from the latent constructs to the indicator variables in Figure 1.

Table 1

Descriptive Statistics for Seven Subscales of ASI-S

Scale	Mean	S.D.	Reliability
Achievement	17.21	3.29	.46
Meaning	17.93	3.45	.59
Comprehension	9.30	2.08	.60
Operation Learning	9.27	1.97	.31
Reproduction	14.82	3.71	.49
Improvidence	6.24	2.43	.39
Globetrotting	5.73	2.57	.43

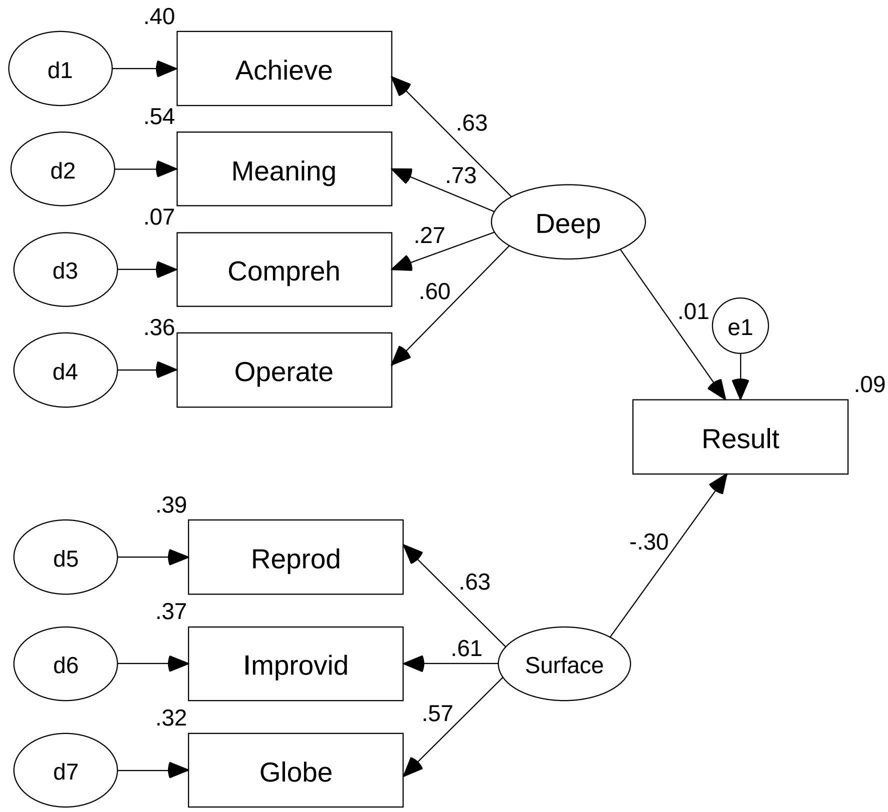

Figure 1Measurement and Structural Model for Subscale Structure of ASI

All factor loadings were significant (p<.05). Despite this, however, some fit indices for the measurement model were quite marginal. Like other packages of its kind, AMOS produces a large number of fit measures. Arbuckle (1997, p.572) follows Browne and Mels (1992) in recommending a subset of these. The traditional chi-square test was unsatisfactory (χ^2 , 14 = 75.49, p < .001). The relative chi-square (χ^2 /*df*) measure of 5.39 was beyond the 2:1 ratio recommended by some researchers (e.g., Byrne, 1989, p.55). The root mean square error of approximation (RMSEA) recommended by Browne and Cudeck (1993) was also used as a measure of fit. Browne and Cudeck suggest that an RMSEA value below .05 indicates a close fit and that values up to .08 are still acceptable. The value in the present case was .094, again quite marginal. The final measure of fit was the Non-Normed Fit Index (NNFI), also known as the Tucker-Lewis coefficient, and recommended by McDonald and Marsh (1990). Its value should be above .90 but in the present instance was .82. Although a number of other measures of fit were quite acceptable, overall one would have to conclude that the model provided only a marginal fit to the data.

The structural model involved a test of the hypothesis that scores on the two broad factors were related to academic progression. The measure of academic progression was the grade achieved in the preparation maths unit these students were all studying. Because the measurement model contained uncorrelated factors, the beta weights shown in Figure 1 can be interpreted unambiguously. The deep orientation factor was not associated with the dependent variable and could make no contribution to the equation. The surface orientation factor, on the other hand, had a regression coefficient of -.30 and was totally responsible for the explained variance (z = -4.98, p < .001). A high score on this dimension was prejudicial to success in study. Fit indices for the overall model were a little better with the inclusion of the structural component but just failed to reach the criteria outlined above.

Factor scores are not as easily accessible as subscale scores, so standard regression analyses were conducted with maths result regressed on the seven subscales of the ASI-S. The correlation matrix for the variables involved in the regression analysis is shown in Table 2. It is clear from this matrix that the only variables that correlated with grade result were those measuring surface orientation. The regression equation predicted 5.4% of the variance in grade result, F(7,467) = 4.83, p < .001), compared with 9.2% in the structural model. Thus, the prediction was markedly inferior when the somewhat unreliable subscale scores were used as predictors.

Table 2
Correlations Among ASI-S Subscales and Academic Results (N = 503)

Variable	Result	Ach.	Mean.	Comp.	Operat.	Repr.	Impr.	Globe.
Result	1.00							
Achieving	.03	1.00						
Meaning	.01	.<u>47</u>	1.00					
Comprehension	.07	.<u>42</u>	.<u>52</u>	1.00				
Operation Learning	.01	.<u>42</u>	.<u>43</u>	.<u>41</u>	1.00			
Reproducing	-.<u>19</u>	-.06	-.11	-.12	.02	1.00		
Improvidence	-.<u>20</u>	.09	.06	-.08	.03	.<u>38</u>	1.00	
Globe Trotting	-.<u>16</u>	-.08	-.08	-.<u>17</u>	-.08	.<u>37</u>	.<u>35</u>	1.00

Note:
Correlations underlined are significant at the .001 level.

Posthoc analyses were conducted to determine whether there was any benefit in combining subscales to form two major subscales, Deep and Surface. When this was done, alpha reliability estimates increased to .75 for the Deep subscale and .68 for the Surface subscale. Further increments were possible if items were deleted. Although this improved the measurement properties of the ASI-S, it made little difference to the prediction of academic achievement with the coefficient of determination remaining near 5.5%.

Discussion

The two aims of this study were to examine the construct validity of the ASI-S and also its predictive validity in a group of people returning to study after many years. Internal consistency estimates for the seven subscales of the ASI-S would not meet conventional standards (e.g., De Vellis, 1991). This has been a long-standing criticism of both short and long forms of the ASI, so it is not a feature of these data alone. Watkins (1984) obtained alpha coefficients ranging between .18 and .46 with this same scale. The estimates obtained in the present study (.31 to .60) are well above those figures. They are comparable to those obtained by Richardson (1990) with another shortened (32 item) version of the ASQ. Despite the low internal consistency estimates for the subscales of the ASI-S, there was some support for the hypothesis that it measures two underlying factors corresponding to Entwistle and Ramsden’s (1983) meaning orientation (deep) and reproducing orientation (surface) dimensions. These factors are quite obvious in the correlation matrix shown in Table 2. There was also evidence that satisfactory reliability estimates could be achieved by merging subscales to form the two broader scales defined by the factor analysis. Similar improvements may be possible with other versions of the ASI.

Thus, the findings of the present study confirm what was already known about the ASI itself and various cut-down versions of this instrument. As Richardson (1990) suggests, it may be better to concentrate on the deep and reproducing orientations rather than on the various minor scales of the ASI. Although the selected fit indices for the two-factor measurement model were outside acceptable limits, all variables did achieve significant loadings on their respective latent constructs and exploratory factor analyses (unreported) employing root one criterion with oblique rotation suggested that a two-factor solution accounted for 60% of the variance. The identification of these two broad subscales with a sample that is returning to study after many years absence extends the range of populations for which this scale has been shown to possess some relevance. It demonstrates that broad learning orientations can emerge in populations that might be somewhat deficient in actual study skills.

As far as predictive validity is concerned, it is clear from Figure 1 that only one of the broad dimensions is related to academic success. Surface orientation has a path coefficient of -.30, indicating that students with this orientation did not achieve high grades in the maths unit. It is interesting to see from Table 2 that the three surface orientation subscales all had negative correlations with academic success, as measured by grade result in the single preparatory studies unit completed by these students. Not one of the deep subscales, on the other hand, was related to academic success. The strong implication is that although it was not particularly helpful for these students to have a deep orientation, it was actually somewhat harmful to have a surface orientation. This finding is quite different from that obtained by Newstead (1992), who reported that academic success was positively correlated with Achieving and Meaning subscale scores but uncorrelated with Reproducing subscale scores.

The contrasting findings are equally compatible with Entwistle's (1981) model but they indicate a surprising difference in the way that learning orientations can affect academic outcomes. Biggs (1993) alluded to this possibility when he emphasised the importance of "the context, the task, and the individual's encoding of both" (p.7). Perhaps the explanation for the difference lies in the nature of the maths course and the nature of the students. The maths course had been designed to encourage a deeper understanding of mathematics and to discourage reproducing behaviours. However, the relatively small size of the coefficient of determination means this curriculum approach has only been partially successful with students who have not engaged in study for an average of 9 years and had not studied maths for some 12 years. Given these conditions, their study skills may have been so weak that even with some basic help they were able to derive little benefit from a Deep orientation. That is to say, their learning orientations may have been appropriate but without adequate study skills, the orientation was ineffective. This would explain the failure to obtain a positive correlation between academic success and deep orientation. The negative relationship between academic success and surface orientation is quite compatible with this explanation. The learning habits encouraged by this orientation are also capable of considerable development. A student returning to study after many years who has a surface orientation will probably suffer in two respects: not only is the orientation perhaps inappropriate, but the skills that support this orientation are also weakly developed. This would account for the negative correlations observed with this sample but not elsewhere (e.g., Newstead, 1992).

In conclusion, we question the advisability of using primary or first-order subscales from the ASI-S, or other derivatives of the ASI. They are not reliable enough. They can be combined, however, to form major subscales that do have acceptable reliability and useful relations with outcome variables such as academic success. This is demonstrated in the structural model shown in Figure 1. It would not be worthwhile to talk about other changes that could be made to the ASI-S because it has now been replaced by a computer-based version of the ASI (Tait & Entwistle, 1996). The new scale was not used here because it was not available at the commencement of the study. Whether it overcomes the reliability problems that have plagued earlier versions of the ASI remains to be seen. We recommend that validation studies of the new version adopt the approach used in the present study where structural equation modelling was used to evaluate issues of construct and predictive validity simultaneously. Future studies might also extend the range of outcome variables to include subjects that are very different from mathematics. Mature-aged students studying in the off-campus mode form an important part of the overall student population in Australia and the data gathered in the present study are useful for gauging the implications of their study orientation in mathematics, but these findings need to be generalised to other subject areas.

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