Southern Drift: The Learning Styles of First- and Third-Year Students of the Built Environment

Richard Tucker

School of Architecture and Building, Waterfront Campus, Deakin University, 1 Gheringhap Street, Geelong, Victoria 3217, Australia
Tel: 61 3 5227 8308; Fax: 52278341; E-mail: rtucker@deakin.edu.au

Submitted 16 February 2007; accepted 7 May 2007

Abstract: This paper investigates learning processes across a built environment design curriculum through the recognition of the four learning styles defined in the experiential learning theory of Kolb, i.e., 'accommodating', 'diverging', 'assimilating' and 'converging'. The paper focuses on the results of a cross-curriculum learning style survey. The results of the survey appear to explain why many prior studies of the personality characteristics, learning and cognitive styles of practitioners and of design students at different stages of their education appear conflicting. The hypothesis tested to resolve these inconsistencies asked whether design-learning styles are fixed or change as students' progress through their studies. The survey provides evidence of a statistically significant relationship between learning styles and year of study. The evidence suggests a southern drift (the term refers to the spatial interrelationship of styles in the two-dimensional Kolb Learning Style Index [LSI] cycle) towards the abstract conceptualisation mode of the learning process as students near the completion of their studies. This fluidity in learning style remains a hypothesis until further research is able to study one cohort for the entirety of a degree program. The paper argues that the possibility of learning style fluidity needs determining if learning style theory is to provide a workable model for informing the teaching of architecture.

Keywords: Architectural education, Design, Learning styles, Pedagogy

Learning Style Differences among Architecture Students

To explore the relationships between different learning styles and teaching approaches in design education, the research introduced in this paper has focused on design studio teaching through the recognition of reported learning styles. The conceptual frame adopted in this is the most commonly applied learning model to design education research, namely the 'accommodating', 'diverging', 'assimilating' and 'converging' categories defined in the experiential learning theory of Kolb (1984). The research recognises that, as Dunn, Grigg, Olsen, Beasley and Gorman (1995) have shown, students whose learning styles are accommodated in teaching methodologies are typified by learning achievements far higher than students whose styles are not accommodated.

This paper is restricted to an analysis of the results of a cross-curriculum learning style survey conducted in the preliminary stages of our research. The survey aimed to determine the effects of the prime variables known to inform learning styles amongst tertiary students; namely, culture, socio-economic background, gender, course of study and higher education learning experience. This paper is restricted to an examination of the impact on learning styles of only the latter two of these variables: course of study and higher education learning experience. We will investigate through this examination a question that is central to current debate on how learning styles might inform teaching. In order to speculate on whether and how studio group teaching can respond to learning style differences, or, on the other hand, on whether the problems of learning style differences in groups can be resolved by changes in studio teaching, it is first required to determine if architecture students' learning styles respond to changes in teaching. In other words, is there fluidity in the learning styles of architecture students? Although much has been written on whether learning styles are fixed or fluid (eg, Bloomer & Hodkinson, 2000; Curri, 1983, 1990; Freeman & Stumpf, 1980; Reynolds, 1997), the question has been largely neglected by researchers of design teaching. This neglect might explain apparent inconsistencies in pedagogical research indicating that the learning styles of architectural practitioners, educators and students at different stages of their education may be quite different.

1 An earlier version of this paper was presented at the Australia and New Zealand Architectural Science Association (ANZAScA) Conference, Adelaide, Australia, November 2006.
Before moving on in this paper to consider the possibility of learning-style fluidity in design students, it will be necessary first to contextualise this enquiry through a brief overview of learning style theory and learning style research in design education.

Learning Styles and Kolb’s Experiential Learning Theory

It has been argued that individuals’ habitual information processing models (or what have been categorised by researchers as cognitive styles) determine their learning behaviours (learning styles) and inform predispositions (learning preferences) and responses towards particular aspects of the learning environment (learning strategies: e.g., Curry, 1983; Riding & Rayner, 1998; Sadler-Smith & Smith, 2004). The idea of a style reflecting a person’s habitual mode of problem-solving, thinking, perceiving, and remembering was initially introduced by Allport (1937). Since then, researchers have, with the ultimate aim of tailoring teaching methods to student learning preferences, developed various theories for defining and categorising the learning and teaching styles of individuals, and for explaining the relationships between cognitive styles, learning styles and learning preferences (Curry, 1983; Kagan & Kogan, 1970; Riding & Cheema, 1991; Sternberg & Grigorenko, 1997).

In an examination of the research on learning styles, Grigorenko and Sternberg (1995) found three general approaches. The first approach is cognition-centred and deals with cognitive styles. The second approach is personality-centred, such as the theory of Myers and Myers (1980) that is based on the work of Jung (1921). The third approach is activity-centred and focuses on styles of learning and teaching. Kolb adopted the third approach when he applied Piaget’s (1972) theory to identify a number of commonly used learning and teaching preferences and whether each was helpful to a particular learning style. Kolb argued that students must physically interact with study material to understand it completely (1984). Physical interaction then gives rise to learning in a continuous cycle in which the student forms abstract concepts, tests the implications of these concepts in new situations via concrete experience and then reflects on what they have observed.

The next time students come upon the same situation they will utilise the knowledge gained during the first cycle to move on to experiences that are more complex. The Kolb cycle and the positive feedback loop central to it are familiar to design students; for, as Stumpf (2001) argued, they echo the cyclical process of reading, questioning and argument, testing, and reformulating — of reflection-in-action and then reflection-on-action — that is characteristic of design progression. Kolb argued for the adoption of experiential learning strategies throughout education by the use of teaching models that help students move round the learning cycle to achieve ‘deep’ learning. Although architectural education has yet to acknowledge the Kolb cycle explicitly as a pedagogical theory that underpins its teaching frameworks, it is clear, as Webster (2001) pointed out, that design teaching promotes experiential learning in much the same way as other fields of professional education. It is perhaps fitting, therefore, that Kolb’s model has been utilised most commonly by researchers evaluating the learning styles of design students. In order to draw upon and evaluate this earlier research, in our study the Kolb model and its testing instrument the Learning Style Inventory (LSI) was utilised. The pedagogical aim of the LSI within the learning context of the design studio was to bring to students’ attention their preferred learning dispositions, to alert them to the way they approach learning situations and to the limitations of their predispositions.

As with much research on learning styles, Kolb’s LSI has received criticism. An area frequently questioned has been the reliability and validity of the measure (Fox, 1985; Freeman & Stumpf, 1980; Garner, 2000; Holman, Pavlice, & Thorpe, 1997; Lamb & Cerro, 1978; Rule & Grippin, 1988; West, 1982). Results have indicated that test/retest measurements for the LSI are often inconsistent and do not therefore reliably assess learning styles. This inconsistency is at odds with Kolb’s claim for learning style stability, which draws on the positive feedback loop of Tyler’s (1978) possibility processing. When discussing the difficulties of demonstrating stability through consistent testing and retesting, Reynolds (1997) suggested that perceiving learning styles as ‘stable’ misleadingly implies that learning styles are independent of and decontextualized from cultural and social milieu. Garner (2000) saw the difficulty of demonstrating learning style stability as a contradiction rather than an inconstancy when suggesting that - seeing Kolb’s learning styles as essentially fixed denies the cyclical flexibility (or what has been termed “flexible stability” (e.g., Coffield, Moseley, Hall & Ecclestone, 2004) for which Kolb argues in his experiential learning theory.

Although learning styles are thought to be a permanent part of human behaviour (Curry, 1983; Honey & Mumford, 1986; Kolb, 1984), they are considered by some to be flexible structures rather than unchangeable personality traits (see, for example, Fielding, 1994). Although Curry’s (1983) ‘onion model’ offers clarification of the malleability of learning styles, the extent to which learning styles can be changed remains a moot point. Support for the notion of learning style fluidity (or what has been termed as “drift” in our study), as oppose to style rigidity, is one that we shall address in the concluding sections of this paper.

Learning Style Research in Design Education

Much has been written about learning differences among tertiary students (e.g., Jonassen & Grabowski, 1993; Riding & Rayner, 1998; Sims & Sims, 1995) and how these differences might inform teaching (e.g., Charkins, O’Toole, & Wetzel, 1985), but only a few studies have been applied to design or architectural education. Newland, Powell and Creed (1987) researched the relationships between the learning styles, perception and cultural bias of architects using Kolb’s learning theory as a basis for testing. The Newland study stated support for using Kolb in the work of Powell, Cooper and Lera (1984), who had previously used the LSI to test undergraduate architecture students. Newland et al., concluded that architects’ learning styles are slightly biased towards the upper left (north west, borrowing Talbot’s (1982) visually descriptive presentation of the Kolb scores that refers to the spatial location of styles in the two-dimensional LSI cycle) of the Kolb typology. Learners such as these Kolb would term as “accommodators” – i.e., people with the ability to learn from primarily “hands-on” experience who prefer “action-oriented careers” (Kolb, Boyatzis & Mainemelis, 2000).

Others have employed the Myers-Briggs-type indicator (MBTI), based on Jung’s (1921) psychological types, to identify the personality profiles of designers (Brown, Hallett, & Stoltz,
Brown et al. (1990), McCaulley (1990). Brown et al. found that the dominant profiles in landscape architecture students are intuitive-thinking types. Lawson (1993) also observed that architecture students tend to adopt more intuitive approaches when engaging with design. Durling (1994; McCaulley, 1990). Brown et al. found that the dominant profiles in landscape architecture students are intuitive-thinking types. Lawson (1993) also observed that architecture students tend to adopt more intuitive approaches when engaging with design. Durling, Cross and Johnson (1996) reported a personality survey of art-based design students also using the MBTI and reported that it was possible to discriminate designers both from a normal population and from cognate professionals. Durling et al., conclude that designers from the UK largely prefer teaching that begins with the exploration of concepts before explaining details that are structured loosely to allow for guided exploration, that is logical and analytical of objective data and that is based on the knowledge of exemplars. This list of teaching preferences accurately describes studio models common to architectural education in the UK. A third of the designers tested in Durling’s sample preferred, however, more subjectivity, a person-centred approach, and value judgements, which confirms the findings of other studies - namely that no single kind of design learning is suitable for all designers.

More recently, Demirbas and Demirkan (2003) and then Kvan and Yunyan (2005) attempted to relate the design process undertaken by student architects to Kolb’s cycle of experiential learning (Kolb, 1984). Demirbas and Demirkan found that significantly fewer first-year learners preferred the accommodating style to other learning styles; and that most students (65%) were assimilators and convergers. Demirbas and Demirkan also showed statistically significant differences between the performances of students with different learning styles at different stages of the design process. The results of Kvan and Yunyan (2005) also demonstrated a correlation between learning style and students’ academic performance in design studios. Their study suggested that a test of learning styles conducted in the early phase of design studio, and teacher awareness of the need to accommodate diverse learning styles, might inform changes in studio programs.

Singhasiri, Darasawang and Srimavirun (2004) investigated the learning styles of first-year architecture students in Thailand in order to see if the curriculum and materials catered for these styles, and found that most first year architects were concrete learners – i.e., accommodators and divergers. In 2006, Roberts (2006) considered the relationship between cognitive styles and student progression in architectural design education. In contrast to the generally held view that students with a tendency to think holistically may have an advantage over more analytic students, Roberts’ research suggested the reverse of this hypothesis; namely, that students categorised as ‘analytic’ performed better, especially in the early stages of their architectural education. The study concluded that “although analytic students appear to have an advantage in their early years, by the time they graduate cognitive style may have little effect upon their performance in design project work” (Roberts, 2006, p 179).

The research presented in this paper investigates the learning styles of 152 undergraduates. It evaluates and compares the different learning styles of students from two different year groups – first and third year – enrolled in three undergraduate courses: Bachelor of Arts (Architecture), Bachelor of Construction Management, and a double degree Bachelor of Architecture/Construction Management (CM). Learning style preferences were gathered through the Kolb (1984) LSI. Using this instrument, the following questions were considered: firstly, are there marked differences between the learning style profiles of the three-degree programs? Secondly, are there marked differences between the learning style profiles of the first and third year cohorts that may suggest evidence of fluid learning styles and, consequently, indicate the ability to inform learning styles through teaching?

Methodology

Participants and Materials of the Learning Style Survey

All first and third year architecture and CM students enrolled in 2006 were asked to complete a questionnaire and learning style inventory. 104 first year students and 48 third year students participated in this study. Of the first year participants, 27 were CM students, 52 were architecture students and 25 students were enrolled in the combined architecture/construction management double degree. Of the first-year students, 63 were male and 41 were female, and their ages ranged from 17 to 25. Of the third year students, 29 were studying architecture and 19 the double degree. The third year cohort contained 27 males and 21 females, and the students’ ages ranged in third year between 19 and 25.

The Learning Style Inventory (LSI) was first developed by Kolb in 1971 (LSI 1) and revised later in 1985 (LSI 2), in 1993 (LSI 2a), in 1999 (LSI 3) and again in 2005 (LSI 3a). For this study, LSI 2 (Kolb, 1985) was utilised.

Procedure

Twelve multiple-choice questions have four different responses in the LSI. Each question asks respondents to rank four sentence endings to describe best their learning preference. After answering the questions, four scores were calculated using the test key. These scores are clustered under four modes of the learning cycle as CE (concrete experience), RO (reflective observation), AC (abstract conceptualisation), and AE (active experience). In the next stage, by subtracting the CE from AC and RO from AE scores, two combined scores are determined that show the position of the individual learner in two bipolar scales. The two scores refer to the different ways by which students learn: the first (AC–CE) is how a student perceives new information or experience, and the second (AE–RO) is how a student processes what they perceive. In other words, the combined score indicates the learning style preference of that individual. Following normal practice in the Kolb (1985) model, the axes that distinguish the learning spaces of the four learning styles have been shifted in this study from the zero, zero point to an empirical norm (AC-CE = 3.4; AE-RO = 5.6).

Ethics

Issues of impartiality and ethics were resolved through independent moderation by tutors unconnected to the research and through data collection and analysis by an impartial research assistant and an investigator from outside the institution.

Results

Table 1 and the Kolb learning style graphs illustrated in Figures 1 and 2 show the learning style profiles of eight cohorts. Kolb and Wolfe (1981) suggested there are disciplinary differences in learning styles and that the dominant style in architects is accommodator (highly inclined to doing and slightly inclined to feeling). This latter finding is in contrast to the studies of Demirbas
and Demirkan (2003) and Kvan and Yunyan (2005) who found accommodators in the minority for architecture students. Our findings are far closer to these latter two studies than to Kolb and Wolfe’s, for accommodator was the least common learning style in third year architects and the second least common in first year architects and the sample as a whole. Assimilators and convergers, each at around 34% of the entire cohort of architects, were the most common type. This is consistent again with Demirbas and Demirkan’s sample, which indicated 31.8% of first-year architectural students to be assimilating and 33% converging. As can be seen from Figure 2, perhaps the most noticeable difference in learning styles is not between disciplines but rather between year cohorts, for the diverse distribution of styles seen in first year contrasts starkly to a distribution seen in third year that is heavily loaded to converging and assimilating learning. We shall consider the reasons for this contrasting distribution in the concluding sections of this paper.

**Data Screening and Analysis**

A number of analyses of variance were conducted with the AC-CE and AE-RO dimensions of the LSI as dependent variables, and with discipline, gender, age and enrolment year as the independent variables. Note that with the increased number of analyses of variance the probability of a Type 1 error increases. To correct for this increased error rate, a corrected Bonferroni adjusted alpha (alpha < 0.05 / n (number of comparisons = 14)) level of 0.003 could have been utilised. However, as it is the aim of this paper to provide an overview of the pattern of results, and as the 0.003 alpha was considered too stringent for these exploratory aims, findings were interpreted at the more common alpha < 0.05 significance level. Caution was also exercised in consideration of skewed distributions. When the distributions of AC-CE and AE-RO were examined for normality, one of the third-year cases was excluded because it remained an extreme outlier on both the AC-CE and AE-RO dimensions. A number of other outliers were found, but their exclusion did not affect the outcomes of the analysis. The distribution of scores on the AE-RO dimension was negatively skewed (skew = -0.281, SE skew = 0.19) but was non-significant at the 0.01 level (Kolmogorov-Smirnov .082, p < 0.014). The distribution of the AC-CE dimension was also slightly negatively skewed (skew = -0.288, SE skew .197) but was non-significant at the 0.05 level (Kolmogorov-Smirnov .057, p < 0.200). Standard data transformations failed to improve the distribution. Since the value of skewness was small, and though one was significant, the following analyses were conducted on untransformed data.

**Differences between the Learning Styles of Three Built Environment Degree Programs**

Selecting only first-year students, differences were sought in the learning styles of students according to their discipline (Table 2). A one-way analysis of variance (with AC-CE and AE-RO as dependent variables and study discipline as the independent

<p>| Table 1: Learning styles distributions in first and third years. |
|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>Cohort</th>
<th>Accommodators</th>
<th>Divergers</th>
<th>Assimilators</th>
<th>Convergers</th>
</tr>
</thead>
<tbody>
<tr>
<td>The entire sample</td>
<td>18.6%</td>
<td>17.9%</td>
<td>32.1%</td>
<td>31.4%</td>
</tr>
<tr>
<td>1st years</td>
<td>21.3%</td>
<td>19.4%</td>
<td>28.7%</td>
<td>30.6%</td>
</tr>
<tr>
<td>3rd years</td>
<td>12.5%</td>
<td>14.6%</td>
<td>39.6%</td>
<td>33.3%</td>
</tr>
<tr>
<td>1st year architects</td>
<td>19.6%</td>
<td>14.3%</td>
<td>32.1%</td>
<td>33.9%</td>
</tr>
<tr>
<td>3rd year architects</td>
<td>17.9%</td>
<td>14.3%</td>
<td>39.3%</td>
<td>28.6%</td>
</tr>
<tr>
<td>Architects (1st and 3rd years combined)</td>
<td>19.0%</td>
<td>14.3%</td>
<td>34.5%</td>
<td>34.2%</td>
</tr>
<tr>
<td>Double degree architecture/CM students (combined)</td>
<td>18.1%</td>
<td>20.4%</td>
<td>29.6%</td>
<td>31.9%</td>
</tr>
<tr>
<td>Construction managers (1st years only)</td>
<td>14.8%</td>
<td>25.9%</td>
<td>29.6%</td>
<td>29.6%</td>
</tr>
</tbody>
</table>

Figure 1: Graph showing Kolb Learning Style Distributions of the entire sample of first and third years combined.
variable) confirmed that first-year students adopted similar learning styles irrespective of discipline (AC-CE: $F(2, 101) = 1.223, p > 0.29$; AE-RO: $F(2, 101) = 0.693, p > 0.503$). The analysis was repeated for students in their third year of study (Table 3). Results revealed there to be no significant difference between third year students studying architecture compared with third year students studying a combined degree on either the AE-RO dimension ($F(1, 46) = 0.862, p > 0.36$), or the AC-CE dimension ($F(1, 46) = 0.986, p > 0.36$). When learning style responses were combined for first and third year architecture and combined degree students (Table 4), a one way analysis of variance revealed that there was no difference between all architecture students and all combined degree students on either the AE-RO dimension ($F(1, 122) = 0.27, p > 0.65$), or the AC-CE dimension ($F(1, 122) = 0.22, p > 0.65$).

Previous studies have shown that student learning style distributions differ significantly within the specific area of specialisation of their choice (Kolb, 2000). These findings are congruent with Kolb’s assertion (Kolb & Wolfe, 1981) that individuals tend to choose academic fields and careers that provide a learning environment which values and nurtures their own style of learning. Although there was no statistically significant difference in our study between Kolb learning styles across degree types, trends indicate that students studying architecture tended to report a smaller proportion of diverging learning styles than did CM students. For whilst among architects (in both the first and third years) the proportion of divergers was low at 14% (compared to the eclectic spread of learning styles expected in those studying a generalist field of study; Nulty & Barrett, 1996), the CM cohort was comprised of nearly twice as many divergers.

**Differences between the Learning Styles of First- and Third-Year Architecture and Architecture/Construction Management Double-Degree Students**

Kolb suggested that individual experience gradually shapes learning styles. Nulty and Barrett (1996) suggested that this change is the result of a gradual process of adaptation to learning demands and to the reward systems students experience. As these demands and rewards are likely to vary in different disciplines, we might view students’ adaptation to them as a gradual induction into the academic culture of their chosen discipline. It follows that a generalist educational experience prior to university would result in a comparatively diverse approach to study, for high school students, in order to be successful, could not risk aligning themselves too strongly with the learning style of one particular discipline. In contrast, students’ attention at university is likely, as Nulty and Barrett’s findings confirm, “to be focused more on an in-depth study of a narrower range of disciplines. The nature of this experience is more likely to present particular learning demands which were not apparent at the secondary school level” (Nulty & Barrett, 1996, p 336). The suggestion in Nulty and Barrett’s study of fluidity in learning styles over time could be seen to be borne out by Kvan and Yunyan (2005), who found that the proportion of accommodators increased from 16.2% in second year to 20.4% in third year. Of course, an alternative, or parallel, explanation might be that those individuals whose learning style is less compatible with the university rewards system are more likely to drop out.

Our results (as shown in Table 5) revealed that third-year students had significantly higher ratings on the dimension of AC-CE ($M = 4.40, SD = 6.41$) compared to first-year students ($M = 5.58, SD = 10.31$) ($F(1, 149) = 5.469, p < 0.021$). There was, unlike Kvan and Yunyan’s sample, no significant difference between first and third year ratings on the dimension of AE-RO ($F(1, 149) = 3.62, p > 0.548$, not significant). However, as Levene’s test for homogeneity of variance was violated for the AC-CE dimension ($F(1, 149) = 8.982, p < 0.003$), these results need to be interpreted with caution. Levene’s test was, however, satisfied for the AE-RO dimension ($F(1, 149) = 0.014, p > 0.907$). A one-way

### Table 2: First-year Kolb LSI (II) results.

<table>
<thead>
<tr>
<th></th>
<th>Construction</th>
<th>Architecture</th>
<th>Combined</th>
<th>df</th>
<th>f</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AERO</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>4.68</td>
<td>13.45</td>
</tr>
<tr>
<td>ACCE</td>
<td>4.59</td>
<td>11.09</td>
<td>7.11</td>
<td>10.13</td>
<td>3.48</td>
<td>9.7</td>
</tr>
</tbody>
</table>

### Figure 2: Graphs showing Kolb Learning Style Distributions of two 2006 cohorts, 1) all first-year students, 2) all third-year students.
analysis of variance also examined the relationship between age and gender on the learning style dimensions of AE-RO and AC-CE. Although there was no significant interaction between age and learning dimension: AE-RO (F (1,149) 1.216, p>.272) and ACCE (F (1, 149) .069, p>.793), a significant effect was found for gender (Table 2b). A one-way analysis of variance revealed that females (M 8.58, SD 9.05) had significantly higher ratings on the dimension of AC-CE (F(1, 149) 3.937, p<.049) compared to males (M 5.51, SD 9.52). No significant difference was found between males and females on the dimension of AE-RO (F (1, 149) .847, p>.359). As homogeneity of variance was not violated for either dimension AE-RO (F (1, 149) .469, p>.495); AC-CE (F (1, 149) .009, p>.952) the results for gender can be interpreted with confidence.

Evidence for learning styles in third year student differs from those of first-year students is confirmed in the sample by one-way analysis of variance (ANOVA), see Table 6. This analysis demonstrates that first year students (M 26.16, SD 6.78) had significantly higher scores on the Kolb concrete experience mode than third year students (M 23.19, SD 4.11) (F(1, 154) = 7.946, p<.005). As there was no significant difference between first and third years on any of the other Kolb learning style dimensions, this shift away from the concrete experience mode accounts for the significant increase in learners at third year whose style can be plotted below the AE-RO (x) axis on the Kolb distribution graph.

The two graphs in Figure 2 highlight the learning style drift. Here the eclectic scatter of learning styles seen for all first-year students is replaced by a range that has predominantly shifted south for all third-year students towards converging and assimilating learning – styles termed byAbbey, Hunt and Weiser (1985) as “Southerner.” The analysis of variance results has been qualified by a chi square analysis examining the relationship between student year-level and the southern and northern dimensions of the Kolb learning cycle (see Figure 3). Although not significant at the .05 alpha level, the analysis revealed a move towards a significant trend in the data (χ² (1, N = 151) 3.109, p>.07) in the direction of Southerner learning in third year. Moreover, comparing percentages across year level for the dimensions of north and south in the Kolb learning cycle shows that for first year students there is a fairly even spread across the northern (40.4%) and southern dimensions (59.60%), while for the third year sample 74.5% of students were in the southern dimension. The southern drift from first to third year here is confirmed in Figure 4, which illustrates movement south in the mean learning styles of the three cohorts available for comparison in the data; namely, all first-year students compared to all third years, first compared to third year double degree students and first compared to third year architects. If, as Nutley and Barrett suggested (1996), learning style transformation is evidence of students’ gradual induction into the academic culture of their chosen discipline, then it follows that the Southerner learning style is that which we might expect to dominate final year architecture and double degree cohorts and the academic discipline as a whole.

Indeed, bias towards Southerner learning in those who teach architects is confirmed in studies by Kolb (1982), which showed that the majority of individuals who give design guidance to be ‘assimilators.’ This persuasive evidence for what might be
termed a ‘Southern Drift’ in latter study cohorts towards the Southerner learning of architectural academia is in line, too, with the findings of Demirbas and Demirkan (2003) who found the style distribution in freshman architects loaded north towards concrete experience. It is also consistent with the findings of Nulty and Barret (1996), which indicate that students in the first third of their studies adopt learning styles similar to each other, irrespective of main discipline, while the learning styles of students in the final third of their studies tend to be specialised in relation to their chosen academic discipline. Of course, the studies of Kolb and Wolfe (1981) and of Newland et al., (1987) showing the majority of architectural practitioners (rather than students or academics) to be accommodating learners might be evidence of a further learning style transition during architectural practice.

Specialisation

Evidence of learning specialisation is provided by a comparison of first and third year cohorts that examines the dimension identified by Kolb as a measure of bias towards one particular learning style; i.e., the distance of a learner on the Kolb grid from the point at its centre of perfectly balanced learning (Kolb, 1999). Accordingly, the closer the learning style is to the centre of the grid the more balanced is that style. As shown in Figure 6, when comparing distances from the grid centre for the mean learning styles of first and third years, in every case the learning of the third year cohorts is more specialised, i.e., further from the origin.

Conclusions

As our conclusions are extensive they will be discussed in three sections; namely, results, limitations and future research, and broader implications.

The study reported here was prompted by an investigation into the possibility of adjusting design pedagogy to acknowledge diverse learning styles among architecture students in the context of a third year collaborative design project. This led to an examination of the learning style characteristics of 152 first and third year students enrolled in architecture and/or construction management (CM). In the course of this study, we have sought to answer two questions we shall consider now in turn.

Are there marked differences between the learning style profiles of the three-degree programs? We found the most significant difference between cohorts when comparing CM students to architects, for while the proportion of divergers was low for architects at 14.3%, the CM cohort was comprised of 25.9% divergers and only 25% accommodators. Thus, the learning styles of architecture students tended to lie to the south of construction managers in terms of spatial location in the two-dimensional LSI cycle.

Are there marked differences between the learning style profiles of the first and third year cohorts? As a large part of design education is concerned with the development of new learning skills, values and knowledge so that eventually students are able to think independently, following the skills and knowledge of their teachers, we might expect learning styles to move away from the diversity of high school students to the specialist learning styles of built environment academics. The research of Kolb (1982), Nulty and Barret (1996) and Demirbas and Demirkan (2003), while all reporting different learning style profiles in different kinds of cohorts and teacher groups, is entirely consistent with this hypothesis. Indeed, the statistically significant relationship found in our study between learning styles and year of study might explain why many studies of the personality characteristics, learning and cognitive styles of practitioners and of students at different stages of their education appear conflicting.

Our study establishes the case for what is called here a “southern drift” from years one to three. Further understanding of this finding will be available after continued evaluation of the cohorts allows for learning style surveys of students throughout the five years of their tertiary design education. Of course, even if cohorts are tested regularly, there would always remain the vexing question of whether retset differences were evidence of learning style fluidity or evidence, rather, of the unreliably of the LSI
for assessing (re-testing and re-assessing) learning styles. Thus, further research might well use a number of measures for testing learning styles that have known high test-retest reliability. Such measures are the Cognitive Style Index (CSI) of Allinson and Hayes (Allinson & Hayes, 1996) (which is recommended in the meta-analysis of Coffield and colleagues (Coffield et al., 2004)) and Vermunt’s (1992) Inventory of Learning Styles (ILS), which is being used widely in northern Europe to research the learning of undergraduates. It may be possible through these measures to determine not only learning style fluidity, but also whether design students’ learning styles are dynamic – i.e., the likelihood that although student learning is informed predispositions manifested as preferred learning styles, students are able to adapt their learning styles dynamically to the varying challenges of different learning contexts throughout the curriculum.

A wider limitation of this study is identified but acknowledged as beyond the scope of the present study. This concerns the question of placing faith in any simple learning style inventory to inform pedagogical intervention. With the qualification that all educators should be highly circumspect in deciding which learning style theories and measures to apply, Coffield et al., (2004) perhaps best answer how learning styles should be used when they conclude in their meta-analysis of the field that “knowledge of learning styles can be used to increase the self-awareness of students and tutors about their strengths and weaknesses as learners” (p 119) enabling, therefore, as Saddler-Smith (2001) wrote, “individuals to see and to question their long-held habitual behaviours” (p 300). Moreover, by understanding more fully the potential ‘dynamic’ nature of learning styles it may also be possible in future research to make learning style theory a more workable model for understanding how design students adapt their learning to teaching and, importantly, to assessment. In the long term it might even be possible, therefore, to address a problem identified as prevalent in higher education (Boyle, Duffy & Dunleavy, 2003; Desmedt, Carrette & Derese, 2003), namely, that of encouraging ‘surface’ and ‘strategic’ learning, which produces students who are interested not in learning but in grades.

If further research demonstrates learning style fluidity amongst architecture students then the implications for design education could be significant. For example, ignorance of this fluidity and failure to acknowledge it in teaching might prove especially problematic for the high numbers of international students arriving in Australian schools at various stages of education, where their experience of learning is not always equivalent to their Australian peers. Indeed, experience has suggested that such a mismatch in learning styles might be the cause of many reported problems of international students in their early years in Australia, especially when these international students have to design collaboratively with peers often with different learning experiences and from different design education backgrounds. The possibility of learning style fluidity might indeed facilitate the learning style changes international students need to make in order to adapt to a new foreign pedagogy.

**Acknowledgements**

We acknowledge the input of the educational advisor on the design of this research project, Dr. Di Challis, and two diligent research assistants: Catherine Reynolds and Gail Flunker.

**References**


