

CHAPTER SEVEN

RESULTS AND DISCUSSION

7.1 INTRODUCTION

The results of the empirical study described in the previous chapter are presented, interpreted and discussed in this chapter. The presentation will proceed as follows:

SECTION 1: EVALUATION OF THE PSYCHOMETRIC PROPERTIES OF THE TWO MEASURES OF LEARNING STYLES, THE LEARNING STYLE INVENTORY (LSI) AND THE LEARNING STYLE QUESTIONNAIRE (LSQ)

- The results of the evaluation of the psychometric properties of the two measures of learning style (LSI and LSQ) will be reported. It was decided that the instruments should be evaluated before the results of the investigation of the interaction of the SDS, LSI and LSQ are presented. As the construct validity of the LSI and LSQ can only be meaningfully discussed once all the results have been presented, the construct validity is reported on in section 7.4.
- Firstly, a description of the sample will be given. The order in which the two measures of learning styles was completed was varied to control for a possible effect due to answering two measures of learning styles at the same test session. Hotelling's T test will be used to test for such an effect and the results will be reported.
- Secondly, the following procedure will be followed for the LSI and the LSQ:
 - Item analysis will be done and the item means, standard deviations and item-scale correlations will be reported.
 - Intercorrelations for the four learning ability scales (AC, CE, AE, RO) will be reported.
 - The alpha coefficients for the four learning ability scales will be reported.

the model.

7.2 SECTION 1: EVALUATION OF THE PSYCHOMETRIC PROPERTIES OF THE TWO MEASURES OF LEARNING STYLE, THE LEARNING STYLE INVENTORY (LSI) AND THE LEARNING STYLE QUESTIONNAIRE (LSQ)

7.2.1 Description of the sample

As the SDS results are not required for the evaluation of the psychometric properties of the LSI and LSQ the subsample sizes used in SECTION 1 are larger than for the subsample used in SECTION 2. All completed and usable answer sheets for the LSI and LSQ were used for the evaluation of the psychometric properties of these two instruments. As explained in section 6.3.2 when scoring the LSI and LSQ missing or ambiguous responses were substituted with the group average score for the relevant item, for a maximum of two items on a questionnaire. For the LSI the group average score was substituted for one item in 43 cases and for two items in 9 cases. For the LSQ the group average score was substituted for one item in 39 cases and for two items in 4 cases. The sample sizes for the total sample tested and for the LSI and LSQ, as well as the distribution for gender, home language, cultural group and field of study (degree) for these two instruments are given in Table 6.1. The subsamples are described in Chapter 6 (see 6.3.1).

The order in which the instruments were completed was as follows: first the Biographical Information questionnaire, followed by the two learning style instruments, and finally the SDS. The order in which the LSI and LSQ were answered was varied to control for a possible effect due to answering two measures of learning abilities and styles at the same test session. Two groups were formed. Group 1 first answered the LSI followed by the LSQ, and Group 2 first answered the LSQ followed by the LSI. The distribution of gender, language, cultural group and field of study (degree) for the LSI and LSQ subsamples according to the order in which the two instruments were completed (Group 1 and Group 2) is given in Table 6.5. The subsamples for Group 1 and Group 2 are described in Chapter 6 (see 6.4.3.1).

Hotelling's T test was used to test the statistical significance of the differences between the means of the four scales of the LSI and LSQ for Group 1 and Group 2.

The following hypothesis was tested:

Ho1: Group 1 and Group 2 have equal vector of means for the four scales of the LSI and LSQ.

Hi1: Group 1 and Group 2 do not have equal vector of means for the four scales of the LSI and LSQ.

The results are reported in Table 7.1.

TABLE 7.1 HOTELLING'S T TEST FOR GROUP 1 AND GROUP 2

Hotelling T square	7.45
F value	0.92
Degrees of freedom	8, 419
Critical value	1.94 at the 5% level of significance

The null hypothesis as stated above was accepted. It would appear that the order in which the LSI and LSQ were completed did not effect the scores obtained for the two instruments.

Subjects were assigned learning styles based on the two composite scores AC-CE and AE-RO. If a zero score was obtained for one of the composite scores (i.e. a zero score on one bipolar axis), then the subject was allocated two learning styles. If zero scores were obtained for both composite scores (i.e. zero scores on both axes), then the subject was not allocated a learning style. The distributions of learning styles for the BSc and BA groups for the LSI and the LSQ are reported in section 7.4.

7.2.2 Item analysis of the LSI

Item analysis was done for the LSI (see Appendix B) and the item means, standard deviations and item-scale correlations are given in Table 7.2. A total of 419 answer

sheets were available for analysis (see Table 6.1). However the N per item in Table 7.2 varies according to the number of students who completed each item. As a rule of thumb an item-scale correlation of at least .30 is deemed acceptable. Most of the items have item-scale correlations $> .30$, but there are a few items with item-scale correlations at about the .30 level. For example, for the AC scale item 10 (.34), for the CE scale items 18 (.29) and 22 (.31), for the AE scale item 17 (.33), and for the RO scale item 8 (.30). Furthermore, for item 18 (*I learn best when I am receptive and open minded.*) 86% of respondents endorsed options 4 and 5 (Somewhat like me and Very much like me) and for item 17 (*I learn best when I work hard to get things done.*) 85% of respondents endorsed options 4 and 5.

High item-scale correlations provide evidence of high reliability and the above items could be inspected with a view to possibly improving or replacing items. However, high item-scale correlations do not necessarily provide evidence of high test validity.

A five-point Likert scale was used for the LSI where:

- 1 = Not at all like me
- 2 = Somewhat unlike me
- 3 = Neutral
- 4 = Somewhat like me
- 5 = Very much like me

Options 1 and 2 were endorsed at most by 35% of respondents. For 28 out of 48 items options 1 and 2 were used by 10% or less of respondents. The relatively high item means (see Table 7.2) reflect this. This could indicate a response bias with respondents favouring socially acceptable responses.

The scale intercorrelations for the LSI are given in Table 7.3. All are positive and range from 0.254 to 0.454. Theoretically the AC and CE scales and the AE and RO scales are bipolar so one would expect negative correlations between AC and CE, and between AE and RO.

TABLE 7.2 ITEM ANALYSIS FOR THE LSI

SCALE	ITEM	N per item	Item mean	Item var.	Item-scale correlation
Abstract Conceptualisation	4	418	4.057	1.040	.49
	6	418	3.978	0.916	.57
	10	418	3.689	1.066	.34
	11	417	3.664	1.115	.44
	19	416	3.947	0.867	.61
	24	417	3.695	1.344	.49
	25	416	3.464	1.201	.53
	26	417	3.964	1.382	.56
	29	417	4.000	0.892	.59
	32	416	3.868	0.951	.46
	43	412	4.180	0.798	.60
47	412	3.990	0.980	.59	
Concrete Experience	1	418	3.179	1.669	.55
	7	418	3.620	1.312	.44
	14	417	2.983	1.662	.61
	15	418	3.718	1.322	.50
	18	417	4.386	0.616	.29
	22	416	3.272	1.256	.31
	28	416	2.971	1.658	.59
	31	417	3.065	1.317	.58
	33	416	3.387	1.261	.56
	38	414	4.251	0.739	.39
	42	413	4.157	0.859	.45
45	414	3.418	0.847	.42	
Active Experimentation	5	418	4.091	1.064	.49
	12	417	4.132	0.915	.45
	13	418	4.043	1.242	.52
	17	417	4.393	0.747	.33
	20	417	4.189	0.854	.43
	34	417	3.902	0.957	.44
	35	417	3.986	1.180	.54
	37	414	4.316	0.791	.51
	39	413	4.126	0.933	.56
	41	414	4.169	0.971	.62
44	414	3.773	1.330	.56	
48	413	4.743	0.360	.44	
Reflective Observation	2	418	4.299	0.966	.46
	3	418	3.651	1.600	.47
	8	418	4.053	0.978	.30
	9	417	3.796	1.237	.36
	16	417	4.122	0.889	.50
	21	416	3.950	1.029	.37
	23	417	3.779	0.915	.43
	27	417	3.674	1.390	.50
	30	416	4.070	1.060	.57
	36	417	4.000	0.892	.55
	40	413	3.969	0.917	.59
46	412	3.104	1.428	.44	

TABLE 7.3 INTERCORRELATIONS FOR THE SCALES OF THE LSI

	AC	CE	AE	RO
AC	1.000	0.335	0.439	0.411
CE	0.335	1.000	0.454	0.254
AE	0.439	0.454	1.000	0.305
RO	0.411	0.254	0.305	1.000

7.2.3 Reliability of the LSI

The alpha coefficients for the four scales of the LSI are given in Table 7.4. Geiger *et al.* (1993) reported internal consistency reliabilities based on alpha coefficient for the LSI as follows: CE = .83, RO = .77, AC = .86, AE = .84. Coefficients in the order of 0.7 are deemed acceptable for use in research and based on the results of this study the LSI could be said to demonstrate sufficient internal consistency for use as a research instrument. Internal consistency is only one measure of reliability and the construct validity of the instrument is also important when considering the use of an instrument.

TABLE 7.4 ALPHA COEFFICIENTS FOR THE SCALES OF THE LSI

	AC	CE	AE	RO
Alpha	0.799	0.741	0.799	0.717

7.2.4 Item analysis of the LSQ

Item analysis was done for the LSQ and the item means, standard deviations and item-scale correlations are given in Table 7.5. A total of 415 answer sheets were available for analysis (see Table 6.1). However the N per item in Table 7.5 varies according to the number of students who completed each item. Item-scale correlations are well above the rule of thumb .30 level providing evidence of high reliability.

Each item of the LSQ (see Appendix C) consists of a word pair on a five-point semantic differential scale. Each of the two words in an item represent opposite learning abilities. In the list of word pairs below the item number is given and the word highlighted was endorsed by less than 20% of the respondents using one of the two response options GENERALLY (Most of the time) or OVER HALF THE TIME:

The Abstract Conceptualisation scale

- 15 consider **impulsive**
- 17 reason **hunch**
- 26 careful **emotional**
- 27 logical **sentimental**
- 29 thinking **instinctive**
- 34 resolving **feeling**
- 36 intellectual **emotional**

The Concrete Experience scale

- 4 **sensing** thinking
- 5 **premonition** reason
- 12 **perceptual** intellectual
- 18 **impulsive** planning
- 25 **intuitive** reasoning
- 30 **hunch** logical

The Active Experimentation scale

6	active	reserved
23	involved	distant
39	solve	reflect
40	exercise	view

The Reflective Observation scale

31	passive	active
37	reflective	productive

The above could reflect a response bias in which "logical" (Abstract Conceptualization) words are favoured over "feelings" (Concrete Experience) words, and "active" (Active Experimentation) words are favoured over "passive/reflective" (Reflective Observation) words. The "logical" and "active" words may be perceived to be more socially correct in a learning context. It must also be remembered that the majority of the students are not English first language speakers (see Table 6.1) and may have experienced difficulty with the meanings of some of the words. The words more commonly endorsed may be words they are more familiar with.

The scale intercorrelations for the LSQ are given in Table 7.6. Negative correlations between the AC and CE scales, as well as between the AE and RO scales are in line with the theoretical proposal that these scales are bipolar. The remaining correlations are small.

37	408	2,488	1,188
38	408	2,848	1,288
39	410	3,027	1,407
40	411	2,377	1,388
41	411	2,488	1,887
42	410	2,588	1,287
43	408	2,848	1,288
44	408	2,848	1,288
45	408	2,848	1,288
46	408	2,848	1,288
47	408	2,848	1,288
48	408	2,848	1,288
49	408	2,848	1,288
50	408	2,848	1,288

TABLE 7.5 ITEM ANALYSIS FOR THE LSC

SCALE	ITEM	N per item	Item mean	Item var.	Item-scale correlation
Abstract Conceptualisation	10	412	3.061	1.217	.41
	15	408	3.706	1.100	.50
	17	410	4.034	0.887	.50
	24	411	3.384	1.555	.66
	26	410	3.734	1.366	.63
	27	413	3.731	1.475	.66
	29	411	3.723	1.276	.52
	34	410	3.471	1.298	.57
	36	408	3.461	1.307	.68
	38	411	3.117	1.621	.52
Concrete Experience	1	410	2.717	1.671	.47
	4	406	2.328	1.619	.63
	5	410	2.098	1.254	.62
	12	409	2.518	1.159	.57
	14	408	2.765	1.601	.47
	18	411	2.241	1.404	.54
	21	408	2.426	1.666	.69
	25	410	2.315	1.299	.66
	28	408	2.517	1.431	.54
	30	412	2.170	1.112	.59
Active Experimentation	6	408	3.811	1.374	.60
	7	406	3.475	1.772	.64
	11	412	3.260	1.352	.54
	13	408	2.904	1.748	.50
	16	407	2.875	1.569	.62
	19	407	3.359	1.473	.54
	23	409	3.814	1.286	.61
	32	407	3.523	1.468	.70
	39	410	3.863	1.142	.44
	40	412	3.595	1.537	.62
Reflective Observation	2	408	2.777	1.913	.66
	3	408	2.645	1.518	.60
	8	409	2.973	1.840	.70
	9	410	2.766	1.823	.72
	20	410	3.054	1.387	.50
	22	411	2.489	1.661	.48
	31	411	2.277	1.359	.60
	33	410	3.027	1.407	.49
	35	409	2.545	1.285	.57
	37	408	2.488	1.186	.55

TABLE 7.6 INTERCORRELATIONS FOR THE SCALES OF THE LSQ

	AC	CE	AE	RO
AC	1.000	-0.424	0.265	0.033
CE	-0.424	1.000	0.077	0.252
AE	0.265	0.077	1.000	-0.521
RO	0.033	0.252	-0.521	1.000

7.2.5 Reliability of the LSQ

The alpha coefficients for the four scales of the LSQ are given in Table 7.7. Marshall and Merritt (1986) reported internal consistency reliabilities based on alpha coefficient for the LSQ as follows: CE = .78, RO = .86, AC = .85, AE = .88. Coefficients in the order of 0.8 are deemed acceptable for clinical use and the LSQ could thus be said to demonstrate sufficient internal consistency for use as a clinical instrument in, for example, career counselling. Internal consistency is only one measure of reliability and the construct validity of the instrument is also important when considering the use of an instrument.

TABLE 7.7 ALPHA COEFFICIENTS FOR THE SCALES OF THE LSQ

	AC	CE	AE	RO
Alpha	0.823	0.801	0.839	0.812

7.3 SECTION 2: INVESTIGATION OF THE INTERACTION OF THE SELF-DIRECTED SEARCH (SDS), THE LEARNING STYLE INVENTORY (LSI) AND THE LEARNING STYLE QUESTIONNAIRE (LSQ) FOR THE BSc AND BA GROUPS

7.3.1 Description of the sample

The analysis sample as described in Chapter 6 consists of first-year university students registered for English courses at the University of Pretoria. The sample is divided into two broad fields of study referred to as BSc and BA. The composition of the analysis sample according to gender and cultural group given in Tables 6.2 and 6.3 is given here again for convenience in Tables 7.8 and 7.9. It will be noted that the N for the analysis sample is less than for the total sample ($N = 464$) that appears in Table 6.1. The reason for the loss of data is that some subjects either did not complete all the measurement instruments, or only partially completed or incorrectly completed some of the instruments.

TABLE 7.8 COMPOSITION OF THE SAMPLE ACCORDING TO FIELD OF STUDY AND GENDER

GENDER	FIELD OF STUDY		N
	BSc	BA	
Males	66	15	81
Females	66	77	143
TOTAL	132	92	224

Two students in the BSc group did not indicate their gender.

TABLE 7.9 COMPOSITION OF THE SAMPLE ACCORDING TO FIELD OF STUDY AND CULTURAL GROUP

CULTURAL GROUP	FIELD OF STUDY		N
	BSc	BA	
White	60	37	97
African	51	52	103
Coloured	0	1	1
Indian	23	1	24
Asian	0	1	1
TOTAL	134	92	226

7.3.1.1 Analysis of the test characteristics

The arithmetic mean, standard deviation, skewness and kurtosis for each of the 18 variables for the combined sample as well as for the two fields of study (BSc and BA) are given in Tables 7.10 to 7.12. These descriptive statistics are given so that the results that follow can be interpreted within this context.

The codes used for the variables are provided below.

The codes for the SDS questionnaire are as follows:

- R - Realistic
- I - Investigative
- A - Artistic
- S - Social
- E - Enterprising
- C - Conventional

The codes used for the LSI are as follows:

- LSI-AC** - Abstract Conceptualization
- LSI-CE** - Concrete Experience
- LSI-AE** - Active Experimentation
- LSI-RO** - Reflective Observation
- LSI-VERT** - AC-CE
- LSI-HOR** - AE-RO

The codes used for the LSQ are as follows:

- LSQ-AC** - Abstract Conceptualization
- LSQ-CE** - Concrete Experience
- LSQ-AE** - Active Experimentation
- LSQ-RO** - Reflective Observation
- LSQ-VERT** - AC-CE
- LSQ-HOR** - AE-RO

GENDER	BA	EA
Male	10	10
Female	10	10
TOTAL	20	20

Investigative	1
Artistic	A
Social	2
Enterprising	E
Conventional	C

TABLE 7.10 MEANS, STANDARD DEVIATIONS, SKEWNESS AND KURTOSIS FOR THE DISTRIBUTION OF VARIABLES FOR THE COMBINED GROUP

Variable	N	Mean	* SD	Skewness	Kurtosis
R	226	14.70	8.48	0.85	0.37
I	226	28.63	8.54	-0.40	-0.47
A	226	20.59	10.83	-0.39	-0.74
S	226	29.77	8.78	-0.31	-0.43
E	226	21.73	8.73	0.17	-0.43
C	226	15.83	6.64	0.69	0.21
LSI-AC	226	46.35	6.69	-0.33	0.06
LSI-CE	226	42.22	6.41	-0.13	0.01
LSI-AE	226	50.03	5.86	-0.40	-0.09
LSI-RO	226	46.28	5.90	-0.36	0.18
LSI-VERT	226	4.14	8.00	-0.05	0.88
LSI-HOR	226	3.75	7.43	0.61	0.77
LSQ-AC	226	35.92	6.65	-0.55	0.60
LSQ-CE	226	24.06	7.06	0.60	0.26
LSQ-AE	226	35.02	7.82	-0.32	-0.50
LSQ-RO	226	27.04	7.98	0.18	-0.43
LSQ-VERT	226	11.86	12.38	-0.42	0.37
LSQ-HOR	226	7.97	14.50	-0.27	-0.19

* Standard deviation

TABLE 7.11 MEANS, STANDARD DEVIATIONS, SKEWNESS AND KURTOSIS FOR THE DISTRIBUTION OF VARIABLES FOR THE BSc GROUP

Variable	N	Mean	* SD	Skewness	Kurtosis
R	134	16.90	9.14	0.63	-0.13
I	134	33.04	5.81	-0.25	-0.07
A	134	17.65	10.18	0.69	-0.27
S	134	26.45	7.89	-0.23	-0.48
E	134	20.92	8.34	0.16	-0.36
C	134	14.65	6.14	0.79	0.67
LSI-AC	134	48.27	5.60	-0.26	-0.16
LSI-CE	134	41.78	6.38	-0.16	-0.35
LSI-AE	134	50.49	5.71	-0.48	0.07
LSI-RO	134	46.22	6.27	-0.41	0.09
LSI-VERT	134	6.49	7.44	-0.09	1.19
LSI-HOR	134	4.28	8.20	0.59	0.52
LSQ-AC	134	37.38	6.30	-0.97	1.71
LSQ-CE	134	22.58	6.77	0.56	0.12
LSQ-AE	134	35.55	7.59	-0.20	-0.81
LSQ-RO	134	26.37	8.14	0.22	-0.70
LSQ-VERT	134	14.80	11.86	-0.57	0.36
LSQ-HOR	134	9.19	14.66	-0.17	0.73

* Standard deviation

TABLE 7.12 MEANS, STANDARD DEVIATIONS, SKEWNESS AND KURTOSIS FOR THE DISTRIBUTION OF VARIABLES FOR THE BA GROUP

Variable	N	Mean	* SD	Skewness	Kurtosis
R	92	11.51	6.21	0.67	-0.38
I	92	22.22	7.80	0.25	-0.40
A	92	24.88	10.35	0.09	-0.81
S	92	34.61	7.73	-0.81	0.83
E	92	22.91	9.19	0.13	-0.53
C	92	17.55	7.00	0.51	-0.18
LSI-AC	92	43.57	7.17	-0.01	0.09
LSI-CE	92	42.85	6.44	-0.11	0.57
LSI-AE	92	49.36	6.05	-0.27	-0.19
LSI-RO	92	46.38	5.37	-0.21	0.25
LSI-VERT	92	0.72	7.50	0.05	1.57
LSI-HOR	92	2.98	6.10	0.31	0.13
LSQ-AC	92	33.80	6.61	-0.05	0.60
LSQ-CE	92	26.22	6.95	0.74	0.32
LSQ-AE	92	34.24	8.11	-0.43	-0.26
LSQ-RO	92	28.03	7.67	0.17	0.13
LSQ-VERT	92	7.59	11.92	-0.31	1.07
LSQ-HOR	92	6.21	14.16	-0.48	0.63

* Standard deviation

7.3.1.2 Discussion of the test characteristics: means, standard deviations, skewness and kurtosis

The coefficient of skewness = 0 for perfectly symmetrical curves, such as the normal distribution (Spiegel, 1988). The coefficient of kurtosis = 3, but "*kurtosis is sometimes defined by $(b_2 - 3)$, which is positive for a leptokurtic distribution, negative for a platykurtic distribution, and zero for the normal distribution.*" (Spiegel, 1988, p. 112). Steyn, Smit and du Toit (1984) define the coefficient of kurtosis as follows:

$b_2 = 0$	Normal kurtosis
$b_2 < 0$	Negative kurtosis
$b_2 > 0$	Positive kurtosis

The Univariate Procedure statistical package (SAS Institute Inc., 1990) used to calculate the kurtosis equates the coefficient of kurtosis with zero for a normal distribution. Given that for a normal distribution the coefficient of skewness = 0 and the coefficient of kurtosis = 0, the following conclusions can be drawn from Tables 7.10 to 7.12.

Skewness and kurtosis

For the combined sample the distributions for some of the variables such as R, C, LSI-HOR, and LSQ-CE are positively skewed indicating that more students obtained scores in the low range on these variables. For the BSc group the distributions for some variables such as R, A, C, LSI-HOR and LSQ-CE are positively skewed. The distributions for other variables such as LSQ-AC and LSQ-VERT are negatively skewed indicating that more students in this group obtained scores in the high range on these variables. These tendencies are in line with theoretical expectations for the BSc group. For the BA group the distributions for variables such as R and LSQ-CE are positively skewed and the distribution for the variable S is negatively skewed. Theoretically one would expect LSQ-CE scores for this group to be in the high score range and not the low score range as is the case here. Otherwise the tendencies are in line with theoretical expectations for this group.

Kurtosis indicates the degree of peakedness of a distribution relative to a normal distribution. A negative coefficient indicates a distribution which is flat-topped and

a positive coefficient indicates a distribution with a high peak.

7.3.3 HOTELLING'S T test

Hotelling's T test was applied to the BSc and BA groups to test the following hypothesis:

Ho2: The Bsc and BA groups have equal vector of means for all dependent variables.

Hi2: The Bsc and BA groups do not have equal vector of means for all dependent variables.

The results are given in Table 7.13.

TABLE 7.13 HOTELLING'S T TEST FOR THE BSc AND BA GROUPS

Hotelling T square	267.93
F value	18.03
Degrees of freedom	14, 211
Critical value	1.75 at the 5% level of significance

The alternate hypothesis as stated above was accepted and *post-hoc* pair comparisons of the means for the BSc and BA groups was carried out (Hays, 1994). The results are reported in Table 7.14 on the following page.

Post hoc pair comparison of the means for the two groups indicated that the BSc group obtained significantly higher means than the BA group for the following variables: R, I, LSI-AC and LSQ-AC. The BA group obtained significantly higher means for the following variables: A, S, C and LSQ-CE.

These results indicate that the BSc and BA groups differ according to certain vocational personality and learning ability characteristics.

The BSc group is characterized by Realistic and Investigative personality characteristics and by the Abstract Conceptualization learning ability. They are thus inclined to be more practically inclined and to prefer a logical, analytical orientation. They are more "thinking" oriented than "feeling" oriented.

The BA group on the other hand is characterized by Artistic, Social and Conventional personality characteristics and by the Concrete Experience learning ability. They are thus inclined to be more "feeling" and people oriented than "thinking" oriented.

TABLE 7.14 POST HOC: t TEST RESULTS FOR THE BSc AND BA GROUPS

VARIABLE	BSc		BA		t VALUE
	MEAN	SD §	MEAN	SD §	
R	16.90	9.14	11.51	6.21	5.27**
I	33.04	5.81	22.22	7.80	11.32**
A	17.65	10.18	24.88	10.35	-5.19**
S	26.45	7.89	34.61	7.73	-7.73**
E	20.92	8.34	22.91	9.19	-1.66
C	14.65	6.14	17.55	7.00	-3.22*
LSI-AC	48.27	5.60	43.56	7.17	5.28**
LSI-CE	41.78	6.38	42.85	6.44	-1.23
LSI-AE	50.49	5.71	49.36	6.05	1.42
LSI-RO	46.22	6.27	46.38	5.37	-0.21
LSQ-AC	37.38	6.30	33.80	6.61	4.07**
LSQ-CE	22.58	6.77	26.22	6.95	-3.90**
LSQ-AE	35.55	7.59	34.24	8.11	1.23
LSQ-RO	26.37	8.14	28.03	7.67	-1.57

§ Standard deviation

* $p \leq 0.01$

** $p \leq 0.001$

7.3.4 DISCRIMINANT ANALYSIS

As described in Chapter 6 group membership for each subject was determined using discriminant analysis. The results of the discriminant analysis are reported as follows:

- Firstly the classification function is given in table form;
- This is followed by the F-test to indicate differences between fields of study;
- Lastly, the classification matrix in which the percentage subjects correctly and incorrectly classified is given.

The above steps were performed using the variables of the SDS, LSI and LSQ for the combined sample consisting of the BSc and BA groups.

After each presentation of discriminant analysis results for a specific instrument, the results are discussed in an attempt to answer the hypotheses posed in Chapter 6 regarding the relationships between students' field of study, personality type and learning ability type. A summary of the findings appears at the end of the chapter.

TABLE 7.15 DISCRIMINANT ANALYSIS OF THE COMBINED BSc AND BA GROUP WITH THE SDS AS VARIABLE: Classification function, F-Matrix and Classification matrix.

Classification function

VARIABLE	F-VALUE	CLASSIFICATION FUNCTIONS	
		BSc	BA
I	142.53	0.71	0.45
S	42.90	0.28	0.42
A	6.82	0.08	0.14
C	4.16	0.14	0.23
E	5.62	0.16	0.10
Constant		- 19.60	- 17.76

GROUP	BSc
BA	48.45

Degrees of freedom = 5 ; 220

Critical value 2.21 at the 5% level of significance

Classification matrix

GROUP	PERCENT CORRECT	NUMBER OF CASES CLASSIFIED INTO GROUP	
		BSc	BA
BSc	87.3	117	17
BA	79.3	19	73
TOTAL	84.1	136	90

In terms of Table 7.15 the following deductions can be made:

The discriminant analysis indicates that five of the six Holland personality types (I S A C E) make a significant contribution in distinguishing between the two fields of study (BSc and BA). The five variables correctly classified 87.3% of the BSc students and 79.3% of the BA students. The null hypothesis is thus rejected as a result of the discriminant analysis:

Ho3: It is not possible to discriminate between fields of study using personality type as measured by the SDS.

The alternate hypothesis is accepted:

Hi3: It is possible to discriminate between fields of study using personality type as measured by the SDS.

GROUP WITH THE LSI AS VARIABLE: Classification function, F-Matrix and Classification matrix.

Classification function

VARIABLE	F-VALUE	CLASSIFICATION FUNCTIONS	
		BSc	BA
LSI-AC	30.53	1.00	0.86
LSI-CE	8.30	0.72	0.79
Constant		- 39.74	- 36.19

F-Matrix

GROUP	BSc
BA	19.91

Degrees of freedom = 2 ; 223

Critical value 3.00 at the 5% level of significance

Classification matrix

GROUP	PERCENT CORRECT	NUMBER OF CASES CLASSIFIED INTO GROUP	
		BSc	BA
BSc	67.2	90	44
BA	68.5	29	63
TOTAL	67.7	119	107

In terms of Table 7.16 the following deductions can be made:

The discriminant analysis indicates that two of the four learning abilities of the LSI (AC and CE) make a significant contribution in distinguishing between the two fields of study (BSc and BA). The two variables correctly classified 67.2% of the BSc students and 68.5% of the BA students. The null hypothesis is thus rejected as a result of discriminant analysis:

Ho4: It is not possible to discriminate between fields of study using learning abilities as measured by the LSI.

The alternate hypothesis is accepted:

Hi4: It is possible to discriminate between fields of study using learning abilities as measured by the LSI.

Klecka (1980) stated that within two groups one can expect to get 50% of the predictions correct by pure random assignment. Therefore although the correct predictions in the high sixty percent range of the discriminant function are statistically significant, for practical purposes they are not a large improvement on random assignment. It would thus not be recommended to use the LSI for selection or career guidance purposes.

TABLE 7.17 DISCRIMINANT ANALYSIS OF THE COMBINED BSc AND BA GROUP WITH THE LSQ AS VARIABLE: Classification function, F-Matrix and Classification matrix.

Classification function

VARIABLE	F-VALUE	CLASSIFICATION FUNCTIONS	
		BSc	BA
LSQ-AC	16.89	0.91	0.82
Constant		- 17.61	- 14.53

F-Matrix

GROUP	BSc
BA	16.89

Degrees of freedom = 1 ; 224

Critical value 3.84 at the 5% level of significance

Classification matrix

GROUP	PERCENT CORRECT	NUMBER OF CASES CLASSIFIED	
		INTO GROUP	
		BSc	BA
BSc	65.7	88	46
BA	63.0	34	58
TOTAL	64.6	122	104

In terms of Table 7.17 the following deductions can be made:

Of the four learning abilities of the LSQ, only the AC variable was able to discriminate meaningfully between the BSc and BA groups. The AC-scale correctly classified 65.7% of the BSc students and 63% of the BA students.

The null hypothesis is thus rejected as a result of discriminant analysis:

Ho5: It is not possible to discriminate between fields of study using learning abilities as measured by the LSQ.

The alternate hypothesis is accepted:

Hi5: It is possible to discriminate between fields of study using learning abilities as measured by the LSQ.

As was stated in the case of the LSI, in practical terms correct predictions in the sixty

percent range are a small improvement on random assignment and it is recommended that the LSQ not be used for selection or career counselling purposes.

TABLE 7.18 DISCRIMINANT ANALYSIS OF THE COMBINED BSc AND BA GROUP WITH THE SDS, LSI AND LSQ AS VARIABLES:
Classification function, F-Matrix and Classification matrix.

Classification function

VARIABLE	F-VALUE	CLASSIFICATION FUNCTIONS	
		BSc	BA
I	142.53	0.45	0.20
S	42.90	0.25	0.38
A	6.82	0.01	0.08
LSI-AC	6.64	1.02	0.94
C	4.49	0.12	0.21
E	4.46	0.09	0.04
Constant		- 37.98	- 33.36

F-Matrix

GROUP	BSc
BA	42.22

Degrees of freedom = 6 ; 219

Critical value 2.10 at the 5% level of significance.

Classification matrix

GROUP	PERCENT CORRECT	NUMBER OF CASES CLASSIFIED INTO GROUP	
		BSc	BA
BSc	87.3	117	17
BA	81.5	17	75
TOTAL	85.0	134	92

In terms of Table 7.18 the following deductions can be made:

The discriminant analysis indicates that five of the six Holland personality types (I S A C E) and one of the learning abilities of the LSI (AC) make a significant contribution in distinguishing between the two fields of study (BSc and BA). The six variables correctly classified 87.3% of the BSc students and 81.5% of the BA students. The learning abilities as measured by the LSQ did not contribute to the discriminant function. The null hypothesis is thus partially rejected as a result of the discriminant analysis:

Ho6: It is not possible to discriminate between fields of study using personality type as measured by the SDS together with learning ability as measured by the LSI and LSQ.

The alternate hypothesis is partially accepted:

Hi6: It is possible to discriminate between fields of study using personality type as measured by the SDS together with learning ability as measured by the LSI and LSQ.

It will be noted that the results in Table 7.18 are a very minor improvement over the results of Table 7.15. The two learning styles inventories do not make much of a contribution in discriminating between the two groups whereas personality type as measured by the SDS succeeds in discriminating between the two groups.

7.3.5 FACTOR ANALYSIS

The principal factor method was used to extract factors followed by a direct quartimin (oblique) rotation of factors. This procedure was applied to the combined BSc and BA group, as well as to the individual BSc and BA groups, using the BMDP4M factor analysis statistical package (BMDP Statistical Software Inc., 1993). The oblique rotated factor loadings that were obtained for the three groups are given in Tables 7.19 to 7.21. Factors with eigenvalues greater than 1.00 were interpreted. Factor loadings greater than 0.3 were used in the interpretation of factors (Child, 1990). An interpretation of the factor matrix is given after each table.

TABLE 7.19 FACTOR ANALYSIS OF THE COMBINED BSc AND BA GROUP

Oblique rotated factor loadings on all the variables

VARIABLE	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
R	-0.031	-0.068	0.114	-0.006	0.638
I	0.196	0.057	-0.111	0.217	0.329
A	-0.145	0.069	0.283	0.073	-0.182
S	0.015	-0.119	0.455	0.102	-0.575
E	-0.039	-0.112	0.953	-0.127	0.307
C	0.073	0.033	0.387	0.049	-0.066
LSI-AC	0.353	0.057	0.122	0.476	0.229
LSI-CE	-0.300	-0.136	0.121	0.652	-0.046
LSI-AE	0.045	-0.423	-0.081	0.561	0.007
LSI-RO	0.185	0.354	-0.035	0.426	-0.074
LSQ-AC	1.039	-0.017	0.058	-0.045	-0.097
LSQ-CE	-0.623	0.161	0.020	0.050	-0.079
LSQ-AE	0.154	-0.722	0.048	0.093	-0.042
LSQ-RO	-0.040	0.926	0.015	-0.019	-0.057
EIGENVALUE	1.812	1.771	1.414	1.242	1.058

Five factors are interpreted for the factor matrix for the combined group.

The **first factor** is a bipolar factor representing the vertical axis (AC versus CE) of the two learning style measures (LSI and LSQ) and the **second factor** is a bipolar factor representing the horizontal axis (RO versus AE) of the two learning style measures. The bipolar learning dimensions as theorized by Kolb (see Figure 4.1) are confirmed for the two normative measures of learning style used in this study.

The **third factor** is a group factor consisting of the Holland personality pattern ESC and is interpreted to represent a people-oriented factor. The Enterprising component of the factor is the strongest and this would seem to indicate that this factor represents a group of students who are extroverted, gregarious, assertive and venturesome. The Enterprising personality type tends to be characterized by tough mindedness, rather than empathy. (See 5.2.1).

The **fourth factor** is a group or mixed factor consisting of the four learning abilities (CE AE AC RO) as measured by the LSI. This could possibly reflect a diversity of learning abilities in the combined BSc and BA group.

The **fifth factor** is a bipolar factor consisting of the Holland personality pattern REI versus S. This factor would appear to differentiate between two groups of students who differ in the way in which they are people-oriented. Students who are characterized by the R and I personality types tend to be people-oriented in an Enterprising way versus students who are people-oriented in a Social way. As was stated above, the Enterprising type is typically more tough minded, whereas the Social type is more empathic. The REI grouping represents an occupational code similar to the occupational codes (RIE or IRE) usually assigned to engineering, technology, science and biological sciences occupations (Taljaard & von Mollendorf, 1987). This factor is interpreted to represent the BSc versus the BA components of this composite group.

The five factors extracted for the combined BSc and BA group can be summarized as follows:

- two bipolar factors confirm the bipolar learning dimensions (AC versus CE) and (RO versus AE) theorized by Kolb for the two measures of learning styles;
- one group factor represents a diversity of learning abilities in the group and consists of all the learning abilities as measured by the LSI;
- one group factor represents a people-oriented personality pattern ESC with strong Enterprising characteristics;
- one bipolar factor represents two opposite personality patterns (REI versus S): one personality pattern with practical, scientific and enterprising characteristics possibly representing the BSc group; and another personality pattern with social, empathic and caring characteristics, possibly representing the BA group.

None of the factors represent an interaction between vocational personality and learning ability and thus do not contribute to the validation of the integrated model proposed in Chapter 5.

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
LSI	0.850	0.000	0.000	0.000	0.000
ESC	0.000	0.850	0.000	0.000	0.000
REI	0.000	0.000	0.850	0.000	0.000
S	0.000	0.000	0.000	0.850	0.000
AC	0.000	0.000	0.000	0.000	0.850
CE	0.000	0.000	0.000	0.000	0.000
RO	0.000	0.000	0.000	0.000	0.850
AE	0.000	0.000	0.000	0.000	0.000
EIGENVALUE	1.811	1.771	1.771	1.771	1.771

TABLE 7.20 FACTOR ANALYSIS OF THE BSc GROUP

Oblique rotated factor loadings on all the variables

VARIABLE	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
R	-0.179	0.031	0.319	-0.166
I	0.027	0.213	-0.029	0.038
A	0.151	-0.075	0.248	0.052
S	-0.064	0.010	0.272	0.203
E	-0.181	-0.028	0.973	-0.111
C	0.046	0.059	0.373	0.041
LSI-AC	0.129	0.616	0.267	0.206
LSI-CE	-0.132	-0.079	0.054	0.966
LSI-AE	-0.452	0.080	-0.036	0.349
LSI-RO	0.436	0.290	-0.066	0.119
LSQ-AC	-0.006	0.812	0.001	-0.269
LSQ-CE	0.187	-0.800	0.017	0.100
LSQ-AE	-0.792	-0.031	0.016	0.026
LSQ-RO	0.924	-0.088	-0.047	-0.123
EIGENVALUE	2.039	1.839	1.407	1.295

Interpretation of the factor matrix for the BSc group

Four factors are interpreted for the factor matrix for the BSc group.

The **first factor** is a bipolar factor representing the horizontal axis (RO versus AE) of the two learning style measures (LSI and LSQ). The **second factor** is a bipolar factor representing the vertical axis (CE versus AC) for the LSQ. However, whereas the AC

dimension of the LSI is included in this factor, LSI-CE is not included. The bipolar learning dimensions as theorized by Kolb (see Figure 4.1) are confirmed for the LSQ and partially confirmed for the LSI for this group. (Only the RO-AE bipolar dimension for the LSI is confirmed for this group.)

The **third factor** is a group factor consisting of the Holland personality pattern ECR. The Enterprising type forms the strongest component of this factor and would appear to represent a people-oriented group of students who are extroverted, gregarious, assertive and venturesome. The Enterprising personality type tends to be characterized by tough mindedness, rather than empathy. (See 5.2.1). Theoretically one would expect an Investigative component (see Table 3.1a), rather than the strong Enterprising component, in a factor from the BSc group. However, the C and R elements in the factor (see Tables 3.1a and 3.1b) represent preferences for the manipulation of data, as well as mechanically, agriculturally and technically related activities. These preferences are in line with preferences associated with the BSc group.

The **fourth factor** consists of the CE and AE dimensions of the LSI possibly representing an Accommodator learning style (see Tables 4.3 and 4.4b). An Accommodator's greatest strengths lie in doing things, carrying out plans and tasks, and getting involved with new experiences. The people-oriented, extrovert AE dimension corresponds to the Enterprising component of the third factor described above. Theoretically one would expect a Converger learning style (see Table 4.3) for the BSc group. A Converger learning style emphasizes problem solving and the practical application of ideas, and is associated with technology careers (see Table 4.4a). The Accommodator learning style represented by this factor is associated with careers in marketing and sales (see Table 4.4b).

The four factors extracted for the BSc group can be summarized as follows:

- one bipolar factor confirms the RO versus AE bipolar learning dimension theorized by Kolb for the two measures of learning style;
- one bipolar factor confirms the CE versus AC bipolar learning dimension theorized by Kolb for the LSQ;

- one group factor represents a people-oriented personality pattern ECR with strong Enterprising characteristics, but also includes Conventional and Realistic components;

- one group factor consists of the CE and AE learning abilities as measured by the LSI and is seen to represent the Accommodator learning style.

None of the factors represent an interaction between vocational personality and learning ability and thus do not contribute to the validation of the integrated model proposed in Chapter 5.

	LSI-RO	LSI-AE	LSI-CE	LSI-RO	LSI-AE	LSI-CE	EIGENVALUE
LSI-RO	0.852	-0.101	0.008	0.852	-0.101	0.008	1.928
LSI-AE	-0.101	0.727	-0.083	-0.101	0.727	-0.083	1.515
LSI-CE	0.008	-0.083	0.483	0.008	-0.083	0.483	1.288
LSI-RO	0.008	-0.083	0.483	0.008	-0.083	0.483	1.288
LSI-AE	-0.101	0.727	-0.083	-0.101	0.727	-0.083	1.515
LSI-CE	0.008	-0.083	0.483	0.008	-0.083	0.483	1.288
LSI-RO	0.008	-0.083	0.483	0.008	-0.083	0.483	1.288
LSI-AE	-0.101	0.727	-0.083	-0.101	0.727	-0.083	1.515
LSI-CE	0.008	-0.083	0.483	0.008	-0.083	0.483	1.288
EIGENVALUE	1.928	1.515	1.288	1.928	1.515	1.288	1.928

TABLE 7.21

FACTOR ANALYSIS OF THE BA GROUP

Oblique rotated factor loadings on all the variables

VARIABLE	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4
R	-0.003	-0.165	0.002	-0.037
I	0.346	0.098	0.105	-0.027
A	0.022	0.015	-0.114	0.274
S	0.079	0.019	-0.041	0.624
E	-0.215	-0.091	-0.010	0.756
C	0.011	0.033	0.136	0.347
LSI-AC	0.658	-0.103	0.100	0.085
LSI-CE	0.483	-0.091	-0.331	0.301
LSI-AE	0.727	-0.452	-0.074	-0.050
LSI-RO	0.632	0.101	0.009	-0.074
LSQ-AC	0.312	0.023	0.911	0.100
LSQ-CE	0.034	0.159	-0.580	0.042
LSQ-AE	0.195	-0.575	0.163	0.220
LSQ-RO	0.156	0.989	-0.053	-0.067
EIGENVALUE	1.928	1.615	1.365	1.328

Interpretation of the factor matrix for the BA group

Four factors are interpreted for the factor matrix for the BA group.

The **first factor** consists of the four learning abilities (AE AC RO CE) as measured by the LSI, as well as the I personality type and the AC learning ability as measured by the LSQ. This factor is similar to the fourth factor for the combined BSc and BA

group (see Table 7.19) and could indicate that the BA group is more diverse in learning ability attributes than the BSc group. For the BA group this factor has an logical, analytical, thinking component represented by the I personality type and the AC learning ability as measured by the LSQ (see Tables 3.1a and 4.2). Theoretically one would not associate the Investigative personality type or the AC learning ability with the BA group. One would expect people-oriented characteristics as represented by the Social and Enterprising personality types and the CE and AE learning abilities (see Tables 3.1b and 4.2).

The **second factor** is a bipolar factor representing the horizontal axis (RO versus AE) for the LSQ. However, whereas the AE dimension of the LSI is included in this factor, LSI-RO is not included. The **third factor** is a bipolar factor representing the vertical axis (AC versus CE) for the LSQ. However, whereas the CE dimension of the LSI is included in this factor, the LSI-CE is not included. The bipolar learning dimensions as theorized by Kolb (see Figure 4.1) are confirmed for the LSQ and partially confirmed for the LSI for this group.

The **fourth factor** is a group factor consisting of the Holland personality pattern ESC, as well as the CE learning ability of the LSI. It is interpreted to represent a people-oriented factor similar to the third factor for the combined BSc and BA group (see Table 7.19 and the discussion which follows). The CE learning ability focuses on being involved in experiences and dealing with immediate human situations in a personal way (see Table 4.2). It thus complements the people-oriented interpretation of this factor.

The four factors extracted for the BA group can be summarized as follows:

- one group factor represents all the learning styles as measured by the LSI, all associated with the Investigative personality type as well as the AC learning ability as measured by the LSQ;
- one bipolar factor confirms the RO versus AE bipolar learning dimension theorized by Kolb for the LSQ;
- one bipolar factor confirms the AC versus CE bipolar learning dimension theorized

by Kolb for the LSQ;

- one general factor represents a people-oriented personality pattern ESC associated with the CE learning ability as measured by the LSI.

Two factors in the factor matrix for the BA group represent an interaction between vocational personality and learning ability. The first factor associates the Investigative personality type with a diversity of learning abilities and therefore does not contribute to the validation of the integrated model proposed in Chapter 5. The fourth factor associates a people-oriented personality pattern (ESC) with the CE learning ability. In the integrated model proposed in Chapter 5 (see 5.3 and Figure 5.1) the Enterprising personality type is associated with the Accommodator learning style which includes the CE learning ability. The Social personality type is strongly associated with the CE learning ability. The fourth factor of the factor matrix for the BA group thus confirms this aspect of the integrated model.

Comparison of the three factor matrices for the combined BSc and BA group, the BSc group and the BA group

The bipolar CE versus AC learning dimension theorized by Kolb (see Figure 4.1) was confirmed for the LSQ by bipolar factors in all three the matrices (see Tables 7.19 to 7.21). This dimension was confirmed for the LSI by a bipolar factor only for the combined BSc and BA group (see Table 7.19).

The bipolar RO versus AE learning dimension theorized by Kolb (see Figure 4.1) was confirmed for the LSQ by bipolar factors in all three the matrices (see Tables 7.19 to 7.21). This dimension was confirmed for the LSI by a bipolar factor for the combined BSc and BA group, and for the BSc group, but not for the BA group (see Tables 7.19 to 7.21).

Geiger *et al.* (1993) reported that principal factor analysis with varimax rotation procedures applied to the items of the normative version of Kolb's LSI-1985 (also used in this study) did not yield any bipolar dimensions, but strong support was obtained for the four separate learning abilities. Scale scores were used in the factor analysis of this study. Marshall and Merritt (1986), the authors of the LSQ used in this study, reported that least squares factor analysis with varimax rotation performed

on the items of the LSQ yielded two bipolar factors representing the two learning dimensions and four learning abilities as theorized by Kolb. Studies (other than those referred to in this paragraph) reported on in section 4.2.3 used the LSI-1976 and the LSI-1985 which are ipsative measures. When factor analysis was done in these studies ipsative data was treated normatively and it is felt that it is inappropriate to compare such results with the results of the normative instruments of this study.

Two group factors representing personality patterns emerged. For the combined BSc and BA group a factor representing an ESC personality pattern emerged (see Table 7.19). This factor is similar to the fourth factor for the BA group which also includes the CE learning ability (see Table 7.21). For the BSc group a factor representing an ERC personality pattern emerged (see Table 7.20). In all cases the Enterprising personality type constituted a strong component of the factor. These factors are discussed above in the interpretation section following the relevant factor matrix.

A bipolar factor representing the personality patterns REI versus S emerged for the combined BSc and BA group (see Table 7.20). This factor is discussed above in the interpretation section following Table 7.20.

Two group factors combining learning abilities emerged. For the combined BSc and BA group a mixed factor consisting of all four the learning abilities (CE AE AC RO) as measured by the LSI emerged (see Table 7.19). This is similar to the first factor for the BA group which also includes the Investigative personality type and the LSQ-AC learning ability (see Table 7.21). For the BSc group a factor combining the CE and AE learning abilities emerged (see Table 7.20) and this was interpreted to represent the Accommodator learning style. These factors are discussed above in the interpretation section following the relevant factor matrix.

This empirical study anticipated an interaction between vocational personality type and learning ability. The results of the factor analysis do not provide strong support for such an interaction. Only two factors in the factor matrix for the BA group (see Table 7.21) represent such an interaction. The first factor associates a diversity of learning abilities with the Investigative personality type. The fourth factor associates a people-oriented personality pattern ESC with the CE learning ability as measured by the LSI. These factors are discussed above in the interpretation section following Table 7.21.

7.3.6 INTERCORRELATIONS FOR HOLLAND PERSONALITY TYPES AND KOLB LEARNING ABILITIES

The Spearman correlation coefficients for Holland personality types as measured by the SDS and Kolb learning abilities as measured by the LSI and the LSQ for the BSc and BA groups are given in Tables 7.22 to 7.25. The correlations in all cases are small and are of the order of those reported by Highhouse and Doverspike (1987) (see Table 5.1).

In the case of the BSc group with the LSI as measurement instrument (see Table 7.22) the CE scale was significantly correlated with the Social scale. The RO scale was significantly negatively correlated with the Enterprising scale, and the AC scale was significantly correlated with the Artistic, Investigative and Enterprising scales. With the LSQ as measurement instrument (see Table 7.24) the RO scale was significantly negatively correlated with the Enterprising and Realistic scales, and the AE scale was significantly correlated with the Enterprising scale.

In the case of the BA group with the LSI as measurement instrument (see Table 7.23) the CE scale was significantly correlated with the Artistic and Enterprising scales. Both the AC and AE scales were significantly correlated with the Investigative scale. With the LSQ as measurement instrument (see Table 7.25) the AC scale was significantly correlated with the Investigative scale and the AE scale was significantly correlated with the Enterprising scale.

The significant intercorrelations reported here and their relationship with the proposed integrated model (see Chapter 5) are discussed in section 7.5.

7.3.7 FREQUENCY DISTRIBUTIONS OF HOLLAND PERSONALITY TYPES AND KOLB LEARNING STYLES

In SECTION 2 where the results of the investigation into the interaction of the SDS, LSI and LSQ are reported, only the four scales of **learning abilities** (CE, RO, AC, AE) were used in the various procedures. It was decided to look at the frequency distribution of personality types and **learning style** types for the LSI and LSQ, for the two fields of study.

TABLE 7.22 INTERCORRELATIONS FOR HOLLAND PERSONALITY TYPES AND KOLB LEARNING ABILITIES AS MEASURED BY THE LSI FOR THE BSc GROUP

	CE	RO	AC	AE
Realistic	- 0.07	- 0.11	0.04	0.11
Investigative	0.07	0.10	0.21*	0.01
Artistic	0.08	- 0.01	0.25**	- 0.08
Social	0.27**	- 0.00	0.11	0.15
Enterprising	0.10	- 0.21*	0.18*	0.12
Conventional	0.10	0.07	0.06	0.12

* $p \leq .05$

** $p \leq .01$

TABLE 7.23 INTERCORRELATIONS FOR HOLLAND PERSONALITY TYPES AND KOLB LEARNING ABILITIES AS MEASURED BY THE LSI FOR THE BA GROUP

	CE	RO	AC	AE
Realistic	- 0.06	0.11	0.04	0.03
Investigative	- 0.07	0.04	0.26**	0.27**
Artistic	0.27**	- 0.04	0.05	- 0.00
Social	0.18	0.06	0.03	0.12
Enterprising	0.21*	- 0.08	0.02	0.01
Conventional	0.12	0.00	0.14	0.06

* $p \leq .05$

** $p \leq .01$

TABLE 7.24 INTERCORRELATIONS FOR HOLLAND PERSONALITY TYPES AND KOLB LEARNING ABILITIES AS MEASURED BY THE LSQ FOR THE BSc GROUP

	CE	RO	AC	AE
Realistic	- 0.05	- 0.19*	- 0.02	0.04
Investigative	- 0.08	- 0.01	0.11	0.00
Artistic	0.16	0.06	- 0.13	- 0.05
Social	- 0.01	- 0.13	0.01	0.14
Enterprising	- 0.05	- 0.30**	- 0.01	0.23**
Conventional	- 0.04	- 0.02	0.05	0.04

* $p \leq .05$

** $p \leq .01$

TABLE 7.25 INTERCORRELATIONS FOR HOLLAND PERSONALITY TYPES AND KOLB LEARNING ABILITIES AS MEASURED BY THE LSQ FOR THE BA GROUP

	CE	RO	AC	AE
Realistic	- 0.04	- 0.16	- 0.01	0.19
Investigative	- 0.15	0.07	0.25*	0.10
Artistic	0.10	0.04	- 0.09	0.09
Social	0.07	- 0.06	0.06	0.19
Enterprising	0.06	- 0.19	- 0.10	0.22*
Conventional	- 0.12	- 0.06	0.13	0.05

* $p \leq .05$

The method of allocating a learning style to a subject is described in section 6.3.2. Due to the method used a subject could be allocated two learning styles and therefore the totals reflected in Tables 7.26 to 7.29 differ somewhat from the totals for the analysis sample (see Tables 6.1, 7.8 and 7.9)

The frequencies of Holland personality types as measured by the SDS and Kolb learning style types as measured by the LSI and the LSQ for the BSc and BA groups were calculated using the FREQ procedure of the SAS statistical package (SAS Institute Inc., 1990) and the results are reported in Tables 7.26 to 7.29. Due to the low frequencies in most cells a Chi-square test was deemed to be invalid and a test for significance cannot be reported. The results thus cannot be interpreted, but patterns in the results will be commented on.

For the BSc group, for both the LSI (see Table 7.26) and the LSQ (see Table 7.28) data, a similar pattern emerged. The most frequent personality type was the Investigative type (LSI 63%, LSQ 65%), followed by the Social personality type (LSI 22%, LSQ 21%). Only small numbers of the remaining personality types occurred. Investigative personality types tended to be associated most frequently with the Converger learning style, followed by the Assimilator learning style. The Social personality type in the BSc group tended to be associated most frequently with the Converger learning style. Theoretically Social types have more in common with the people-oriented Diverger and Accommodator learning styles.

For the BA group, for both the LSI (see Table 7.27) and the LSQ (see Table 7.29), the most common personality type was the Social type (LSI 64%, LSQ 66%). For the LSI all four the learning styles were associated with the Social type. For the LSQ the Social type was most frequently associated with the Converger learning style and to a lesser extent with the Assimilator and Accommodator learning styles. None of the Social types in the BA group had a Diverger learning style and this learning style had the lowest frequency for the LSQ in the BA group.

TABLE 7.26 FREQUENCIES OF HOLLAND PERSONALITY TYPES AND KOLB LEARNING STYLE TYPES AS MEASURED BY THE LSI FOR THE BSc GROUP

Learning style	Self-Directed Search: Holland personality type						
	R	I	A	S	E	C	Σ
Diverger	0	4	0	0	0	0	4 (2.6%)
Assimilator	1	33	5	8	2	0	49 (32.7%)
Converger	4	48	2	18	6	0	78 (52%)
Accommodator	1	10	1	7	0	0	19 (12.7%)
Σ	6 (4%)	95 (63.4%)	8 (5.3%)	33 (22%)	8 (5.3%)	0	150 (100%)

TABLE 7.27 FREQUENCIES OF HOLLAND PERSONALITY TYPES AND KOLB LEARNING STYLE TYPES AS MEASURED BY THE LSI FOR THE BA GROUP

Learning style	Self-Directed Search: Holland personality type						
	R	I	A	S	E	C	Σ
Diverger	0	0	6	10	2	0	18 (15.6%)
Assimilator	1	2	2	14	0	0	19 (16.5%)
Converger	1	8	6	29	2	1	47 (40.9%)
Accommodator	0	1	5	21	4	0	31 (27%)
Σ	2 (1.7%)	11 (9.6%)	19 (16.5%)	74 (64.3%)	8 (7%)	1 (0.9%)	115 (100%)

TABLE 7.28 FREQUENCIES OF HOLLAND PERSONALITY TYPES AND KOLB LEARNING STYLE TYPES AS MEASURED BY THE LSQ FOR THE BSc GROUP

Learning style	Self-Directed Search: Holland personality type						Σ
	R	I	A	S	E	C	
Diverger	0	2	0	2	0	0	4 (2.6%)
Assimilator	2	26	3	8	1	0	40 (26.3%)
Converger	4	66	2	17	7	0	96 (63.2%)
Accommodator	0	4	3	5	0	0	12 (7.9%)
Σ	6 (3.9%)	98 (64.5%)	8 (5.3%)	32 (21%)	8 (5.3%)	0	152 (100%)

TABLE 7.29 FREQUENCIES OF HOLLAND PERSONALITY TYPES AND KOLB LEARNING STYLE TYPES AS MEASURED BY THE LSQ FOR THE BA GROUP

Learning style	Self-Directed Search: Holland personality type						Σ
	R	I	A	S	E	C	
Diverger	0	0	4	0	1	0	5 (4.4%)
Assimilator	0	4	5	19	1	0	29 (25.9%)
Converger	0	6	8	41	4	1	60 (53.6%)
Accommodator	0	1	1	14	2	0	18 (16.1%)
Σ	0 (9.8%)	11 (16.1%)	18 (16.1%)	74 (66.1%)	8 (7.1%)	1 (0.9%)	112 (100%)

7.4 CONSTRUCT VALIDITY OF THE LSI AND THE LSQ

7.4.1 Construct validity of the LSI

Post hoc pair comparisons of the means for the BSc and BA groups for the LSI demonstrated that the BSc group obtained a significantly higher mean score for the AC learning ability than did the BA group (see section 7.3.3 and Table 7.14). This is in line with theoretical predictions.

Discriminant analysis of the combined BSc and BA group with the LSI as variable demonstrated that two of the four learning abilities of the LSI, namely AC and CE, were able to distinguish between the two fields of study in a theoretically predicted way (see Table 7.16). This lends some support for the validity of the two learning abilities and the theoretically proposed AC-CE bipolar axis.

Factor analysis for the combined BSc and BA group (see Table 7.19) provided support for the AC-CE and AE-RO bipolar learning dimensions as theorized by Kolb (see Figure 4.1) for the LSI. In the case of factor analysis of the BSc group (see Table 7.20) only the bipolar AE-RO axis appeared as a factor for the LSI. Neither bipolar axes were demonstrated for the LSI by factor analysis for the BA group (see Table 7.21). Only partial support for the bipolar theory was obtained for the LSI. A factor representing a personality pattern combining the ESC personality types with the LSI-CE learning ability emerged for the BA group (see Table 7.21). The two components of this factor are both people-orientated and this lends some support to the validity of the CE learning ability. A factor combining the CE and AE learning types and thus representing the Accommodator learning style emerged for the BSc group (see Table 7.20) and this lends some support to the validity of the Accommodator learning style for the LSI.

Discriminant and factor analysis was done using the four learning **abilities** as variables. It was decided to look at the distribution of learning **styles** to see if a pattern consistent with theoretical predictions occurred. The subsamples used for determining the distribution of learning styles are described in section 7.2.1. The frequency of learning styles as measured by the LSI for the BSc and BA fields of study is given in Table 7.30. The method of allocating a learning style to a subject is

described in section 6.3.2 and accounts for the small discrepancies between the sample sizes reported in Table 6.1 and those reflected in Table 7.30. The Chi-square statistic was calculated and has a value of 27.184 with three degrees of freedom which is significant at the 5% level of significance. There is thus a strong association between field of study and learning style as measured by the LSI. There are more Divergers in the BA group, more Convergengers in the BSc group and more Accommodators in the BA group. Assimilators are fairly equally represented in the BSc and BA groups. Except that one would have expected more Assimilators in the BSc group than the BA group, these results are in line with the theoretical descriptions of the learning styles (see Tables 4.3, 4.4a and 4.4b) and thus provide some evidence of validity for the learning style constructs for the LSI.

TABLE 7.30 FREQUENCY OF LEARNING STYLES AS MEASURED BY THE LSI FOR THE BSc AND BA FIELDS OF STUDY

LEARNING STYLE	BSc	BA	TOTAL
Diverger Frequency Column %	7 3.45%	33 14.16%	40 9.17%
Assimilator Frequency Column %	56 27.59%	55 23.61%	111 25.46%
Converger Frequency Column %	109 53.69%	85 36.48%	194 44.50%
Accommodator Frequency Column %	31 15.27%	60 25.75%	91 20.87%
TOTAL	203 46.56%	233 53.44%	436 100%

The Chi-square has a value of 27.184 with three degrees of freedom which is significant at the 5% level of significance.

7.4.2 Construct validity of the LSQ

Post hoc comparisons of the means for the BSc and BA groups for the LSQ demonstrated that the BSc group obtained a significantly higher mean score for the AC learning ability, whereas the BA group obtained a significantly higher mean score for the CE learning ability (see section 7.3.3 and Table 7.14). This is in line with theoretical predictions.

Discriminant analysis of the combined BSc and BA group with the LSQ as variable demonstrated that only the AC learning ability was able to distinguish between the two fields of study in a theoretically predicted way (see Table 7.17). This lends some support for the validity of the AC learning ability scale.

Factor analysis of the combined BSc and BA groups (see Table 7.19), as well as for the BSc group (see Table 7.20) and the BA group (see Table 7.21), consistently demonstrated both the AC-CE and AE-RO bipolar learning dimensions for the LSQ as theorized by Kolb (see Figure 4.1) providing support for their validity. The only other instance of a LSQ variable contributing to a factor was in the case of the BA group (see Table 7.21) where a group factor emerged combining the four learning abilities of the LSI, the AC learning ability of the LSQ and the Investigative personality type. The combination of the AC learning ability with the Investigative personality type is in accordance with theoretical predictions.

Discriminant and factor analysis was done using the four learning **abilities** as variables. It was decided to look at the distribution of learning **styles** to see if a pattern consistent with theoretical predictions occurred. The sample used for determining the distribution of learning styles is described in section 7.2.1. The frequency of learning styles as measured by the LSQ for the BSc and BA fields of study is given in Table 7.31. The method of allocating a learning style to a subject is described in section 6.3.2 and accounts for the small discrepancies between the sample sizes reported in Table 6.1 and those reflected in Table 7.31. The Chi-square statistic was calculated and has a value of 8.238 with three degrees of freedom which is significant at the 5% level of significance. There is thus an association between field of study and learning style as measured by the LSQ. There are more Accommodators in the BA group than the BSc group. Divergers, Assimilators and Convergents are about equally

represented in the BSc and BA groups. The association of Accommodators with the BA group is in line with the theoretical descriptions of the learning style (see Tables 4.3 and 4.4b) and corresponds with the results for the LSI (see Table 7.30). The differences in distribution of the various learning styles between the two fields of study are less pronounced for the LSQ than for the LSI.

TABLE 7.31 FREQUENCY OF LEARNING STYLES AS MEASURED BY THE LSQ FOR THE BSc AND BA FIELDS OF STUDY

LEARNING STYLE	BSc	BA	TOTAL
Diverger Frequency Column %	7 3.70%	12 5.43%	19 4.63%
Assimilator Frequency Column %	45 23.81%	50 22.62%	95 23.17%
Converger Frequency Column %	125 66.14%	127 57.47%	252 61.46%
Accommodator Frequency Column %	12 6.35%	32 14.48%	44 10.73%
TOTAL	189 46.10%	221 53.90%	410 100%

The Chi-square has a value of 8.238 with three degrees of freedom which is significant at the 5% level of significance.

7.4.3 Comparison of the LSI and the LSQ

The results of the investigation in this study into the psychometric properties of the LSI and the LSQ would appear to indicate that the internal reliability of the LSQ is somewhat higher than that of the LSI. The alpha coefficients for the learning ability

scales of the LSQ ranged from 0.801 to 0.839 and those for the LSI ranged from 0.717 to 0.799 (see Tables 7.4 and 7.7).

The results of the factor analysis consistently yielded the two bipolar AC-CE and AE-RO learning dimensions as theorized by Kolb (see Figure 4.1) for the LSQ for the combined BSc and BA group (see Table 7.19), the BSc group (see Table 7.20) and the BA group (see Table 7.21). The two bipolar learning dimensions were only demonstrated for the LSI in the combined BSc and BA group (see Table 7.19) and only the AE-RO dimension was demonstrated for the BSc group (see Table 7.20).

Kolb has retained the rank ordering format through two revisions of his Learning Style Inventory because he strongly believes people make choices in learning situations between the four learning abilities and he feels that the instrument should reflect this (see Chapter 4). In this light the semantic differential of the LSQ used in this study retains an element of forcing respondents to make choices while providing a normative rather than an ipsative instrument.

The presence of a response bias on both instruments was suspected (see 7.2.2 and 7.2.4) and this would have to be investigated further.

From the results of this study it would appear that the LSI was more successful than the LSQ in differentiating learning abilities and styles in the sample used.

- Discriminant analysis of the combined BSc and BA group with the LSI as variable indicated that two of the four learning abilities (AC and CE) made a significant contribution in distinguishing between the two fields of study (see Table 7.16), whereas with the LSQ as variable only the AC learning ability made a significant contribution in distinguishing between the two fields of study (see Table 7.17).
- Factor analysis yielded only one factor that could be interpreted as a learning style. The factor, seen to represent the Accommodator learning style, consisted of a combination of the CE and AE learning abilities as measured by the LSI (see Table 7.20).
- Intercorrelations for Holland personality types and Kolb learning abilities as

measured by the LSI yielded more significant correlations than for the LSQ (see Tables 7.22 to 7.25).

- Frequency distributions of Holland personality types and Kolb learning styles demonstrated more differentiated patterns for the LSI than for the LSQ (see Tables 7.30 and 7.31).

It is difficult to make recommendations concerning the use of the LSI and the LSQ on the limited results of this study. The reliability and validity of the instruments should be investigated further. Suffice it to say the instruments show promise for both research and clinical applications.

7.5 SECTION 3: DISCUSSION OF RESULTS PERTAINING TO THE PROPOSED INTEGRATED MODEL OF VOCATIONAL PERSONALITY TYPES, AND LEARNING ABILITIES AND STYLES

The research results of this study relevant to the integrated model proposed in Chapter 5 will be discussed. The integrated model is described in section 5.3 and depicted in Figure 5.1.

The **Investigative** personality type is associated with the **Assimilator** quadrant in Figure 5.1. In the empirical part of this study factor analysis yielded only one factor that combined the Investigative personality type with learning abilities. The factor occurred in the factor matrix for the BA group (see Table 7.21) and consisted of all four the learning abilities (AE AC RO CE) as measured by the LSI, together with the AC learning ability as measured by the LSQ and the Investigative personality type. The association of the Investigative personality type with all four the learning abilities as measured by the LSI does not provide validation for the integrated model. However, the association of the Investigative personality type with the AC learning ability as measured by the LSQ is in line with the integrated model depicted in Figure 5.1.

Intercorrelations for personality types and learning abilities are reported in Tables 7.22 to 7.25. The Investigative personality type was significantly correlated with the AC learning ability for the BSc group with the LSI as measure of learning ability, as well as for the BA group with both the LSI and LSQ as measure of learning ability. This

confirms the association of the Investigative personality type with the AC learning ability as depicted in the integrated model in Figure 5.1. The Investigative type was also significantly correlated with the AE learning ability for the BA group with the LSI as measure of learning ability. This is not in line with the proposed integrated model in Figure 5.1 and this finding is not accommodated by the integrated model.

Frequency distributions of personality types and learning styles are given in Tables 7.26 to 7.29. These results cannot be interpreted, but there was a tendency for the Investigative type to be associated with the Converger and Assimilator learning styles for the BSc group with both the LSI and the LSQ as measure of learning style. The Converger learning style shares the AC learning ability with the Assimilator style. As the Investigative type is associated with the Assimilator learning style and the AC learning ability in the proposed integrated model in Figure 5.1, this result is not seen to disconfirm the model.

The **Artistic** personality type is associated with both the **Diverger** and **Accommodator** learning style quadrants in Figure 5.1. Intercorrelations for personality types and learning abilities are reported in Tables 7.22 to 7.25. The Artistic type was significantly correlated with the AC learning ability for the BSc group with the LSI as measure of learning ability. This result is contrary to the proposed integrated model in Figure 5.1 and is not accommodated by the integrated model. The Artistic type was also significantly correlated with the CE learning ability for the BSc group with the LSI as measure of learning ability. This confirms the association of the Artistic type with the CE learning ability as depicted in the integrated model in Figure 5.1.

The **Social** personality type is associated with both the **Diverger** and **Accommodator** quadrants in Figure 5.1. In the empirical part of this study factor analysis yielded a factor that combined the Social personality type with a learning ability. The factor occurred in the factor matrix for the BA group (see Table 7.21) and consisted of the personality pattern ESC together with the CE learning ability as measured by the LSI. This confirms the association of the Social type with the CE learning ability in the proposed integrated model in Figure 5.1.

Intercorrelations for personality types and learning abilities are reported in Tables 7.22 to 7.25. The Social type was significantly correlated with the CE learning ability for

the BSc group with the LSI as measure of learning ability. This again confirms the association of the Social type with the CE learning ability in the proposed integrated model in Figure 5.1.

Frequency distributions of personality types and learning styles are given in Tables 7.26 to 7.29. These results cannot be interpreted, but there was a tendency for the Social type to be associated with the Converger learning style for the BSc group with both the LSI and the LSQ as measure of learning style. This result is contrary to the proposed integrated model in Figure 5.1 and is not accommodated by the integrated model. The Social type was associated with all four the learning styles for the BA group with the LSI as measure of learning style, and with the Converger, Assimilator and Accommodator learning styles with the LSQ as measure of learning style. This diverse result does not provide validation for the integrated model.

The **Enterprising** personality type is associated most strongly with the **Accommodator** quadrant and to some extent with the **Converger** quadrant in Figure 5.1. In the empirical part of this study factor analysis yielded a factor that combined the Enterprising personality type with a learning ability. The factor occurred in the factor matrix for the BA group (see Table 7.21) and consisted of the personality pattern ESC together with the CE learning ability as measured by the LSI. The Accommodator learning style combines the CE and AE learning abilities. As the Enterprising type is associated with the Accommodator learning style and the CE learning ability in the proposed integrated model in Figure 5.1, this result is not seen to disconfirm the model.

Intercorrelations for personality types and learning abilities are reported in Tables 7.22 to 7.25. The Enterprising type was significantly negatively correlated with the RO learning ability for the BSc group with both the LSI and the LSQ as measure of learning ability. The Enterprising type was significantly correlated with the AE learning ability for both the BSc and BA groups with the LSQ as measure of learning ability. The Enterprising type was significantly correlated with the CE learning ability for the BA group with the LSI as measure of learning ability. All these results are seen to confirm the association of the Enterprising type with the Accommodator learning style in the proposed integrated model in Figure 5.1. The Enterprising type was also significantly correlated with the AC learning ability for the BSc group with the LSI as

measure of learning ability. This result is contrary to the proposed integrated model in Figure 5.1 and is not accommodated by the integrated model.

The **Conventional** personality type is associated with the **Converger** quadrant in Figure 5.1. In the empirical part of this study factor analysis yielded a factor that combined the Conventional personality type with a learning ability. The factor occurred in the factor matrix for the BA group (see Table 7.21) and consisted of the personality pattern ESC together with the CE learning ability as measured by the LSI. The association of the Conventional type with the CE learning ability is not in line with the proposed integrated model in Figure 5.1 and this finding is not accommodated by the model.

The Conventional type showed no significant correlations with any learning ability scales (see Tables 7.22 to 7.29). There is no evidence in this study that confirms the proposed association of the Conventional type with the Converger learning style in the integrated model in Figure 5.1.

The **Realistic** personality type is associated with the **Converger** quadrant in Figure 5.1. Intercorrelations for personality types and learning abilities are reported in Tables 7.22 to 7.25. The Realistic personality type was significantly negatively correlated with the RO learning ability for the BSc group with the LSQ as measure of learning ability. This result is seen to confirm the association of the Realistic type with the AE learning ability in Figure 5.1.

In the findings reported above there are more results confirming the proposed integrated model described in section 5.3 and depicted in Figure 5.1. than disconfirming it. Those results which cannot be accommodated by the model are directly opposed to the arguments used for the theoretical integration of the model (see section 5.3). For example, the Investigative type correlated with the AE learning ability, the Artistic and Enterprising types correlated with the AC learning ability and the Conventional type correlated with the CE learning ability. It was decided not to modify the proposed integrated model in the light of the present research findings. More research is needed to explore the validity of the proposed model.

7.6 SUMMARY

The following is a summary of the results obtained in the investigation.

(i) Evaluation of the psychometric properties of the LSI and LSQ

- Item analysis of the LSI yielded item-scale correlations in the range .29 to .62. Under-utilisation of options 1 and 2 (*Not at all like me* and *Somewhat unlike me*) of the five-point Likert scale could indicate the presence of a response bias favouring socially acceptable responses.
- Intercorrelations for the four learning ability scales (CE RO AC AE) of the LSI are all positive and range from 0.254 to 0.454.
- Alpha coefficients for the four learning ability scales of the LSI range from 0.717 to 0.799.
- The frequency distribution of learning styles for the LSI for the BSc and BA groups demonstrated more Divergers in the BA group, more Convergers in the BSc group and more Accommodators in the BA group. Assimilators are fairly equally represented in the BSc and BA groups.
- Item analysis of the LSQ yielded item-scale correlations in the range .41 to .72. A preference in endorsing words representing the AC and AE scales could indicate the presence of a response bias favouring responses perceived to be more socially correct in a learning context or it could indicate that the subjects, many of whom are not English first language speakers, experienced difficulty in understanding some of the words used in the semantic differential scale.
- Intercorrelations for the four learning ability scales (CE RO AC AE) of the LSQ range from -0.424 to 0.265. Negative correlations were obtained between the AC and CE, as well as between the AE and RO scales.
- Alpha coefficients for the four learning ability scales of the LSQ range from 0.801 to 0.839.

- The frequency distribution of learning styles for the LSQ for the BSc and BA groups demonstrated more Accommodators in the BA group. Divergers, Assimilators and Convergors are about equally represented in the BSc and BA groups.

(ii) **Interaction of the SDS, LSI and LSQ**

- Post hoc pair comparisons of the means for the BSc and BA groups indicated that the BSc group obtained significantly higher means than the BA group for the following variables: R, I, LSI-AC and LSQ-AC. The BA group obtained significantly higher means for the following variables: A, S, C and LSQ-CE.
- Discriminant analysis of the combined BSc and BA group with the SDS as variable indicated that five of the six Holland personality types (I S A C E) made a significant contribution in distinguishing between the two fields of study.
- Discriminant analysis of the combined BSc and BA group with the LSI as variable indicated that two of the four learning abilities (AC and CE) made a significant contribution in distinguishing between the two fields of study.
- Discriminant analysis of the combined BSc and BA group with the LSQ as variable indicated that one of the four learning abilities (AC) made a significant contribution in distinguishing between the two fields of study.
- Discriminant analysis of the combined BSc and BA group with the SDS, LSI and LSQ as variables indicated that five of the six Holland personality types (I S A C E) and one of the four learning abilities (LSI-AC) made a significant contribution in distinguishing between the two fields of study.
- Factor analysis of the combined BSc and BA group yielded five factors:
 - two bipolar factors representing the AC-CE and RO-AE learning abilities axes of the two learning style instruments;
 - a people-oriented factor consisting of the personality pattern ESC;
 - a group factor comprising the four learning abilities (AC CE AE RO) of the LSI;
 - and a bipolar personality pattern factor REI versus S.

- Factor analysis of the BSc group yielded four factors:
 - a bipolar factor representing the AE-RO learning abilities axis for both learning style instruments;
 - a bipolar factor representing the AC-CE learning abilities axis for the LSQ
 - a group factor representing a personality pattern ERC;
 - and a group factor representing the Accommodator learning style (CE and AE) for the LSI.
- Factor analysis of the BA group yielded four factors:
 - a group factor consisting of the four learning abilities (AC CE AE RO) of the LSI, the AC learning ability of the LSQ and the I personality type;
 - a bipolar factor representing the AE-RO learning abilities axis for both learning style instruments;
 - a bipolar factor representing the AC-CE learning abilities axis for the LSQ;
 - and a personality pattern factor combining a ESC personality pattern with the CE learning ability of the LSI.
- Intercorrelations for Holland personality types and Kolb learning abilities as measured by the LSI for the BSc group demonstrated the following:
 - the CE learning ability was significantly correlated with the Social personality type;
 - the RO learning ability was significantly negatively correlated with the Enterprising personality type;
 - the AC learning ability was significantly correlated with the Artistic, Investigative and Enterprising personality types.
- Intercorrelations for Holland personality types and Kolb learning abilities as measured by the LSI for the BA group demonstrated the following:
 - the CE learning ability was significantly correlated with the Artistic and Enterprising personality types;
 - both the AC and AE learning abilities were significantly correlated with the

Investigative personality type.

- Intercorrelations for Holland personality types and Kolb learning abilities as measured by the LSQ for the BSc group demonstrated the following:
 - the RO learning ability was significantly negatively correlated with the Enterprising and Realistic personality types;
 - the AE learning ability was significantly correlated with the Enterprising personality type.
- Intercorrelations for Holland personality types and Kolb learning abilities as measured by the LSQ for the BA group demonstrated the following:
 - the AC learning ability was significantly correlated with the Investigative personality type;
 - the AE learning ability was significantly correlated with the Enterprising personality type.

A comparison of the psychometric properties of the LSI and the LSQ is given in section 7.4.3. Results pertaining to the proposed integrated model of vocational personality types, and learning abilities and styles are discussed in section 7.5. Although there are some findings contrary to the proposed integrated model, most of the findings reported in this chapter confirm the model. It was decided not to modify the model as proposed in Chapter 5 in the light of the present research findings.

In the following chapter a summary of the research report will be given and recommendations based on the findings of the study will be made.