CHAPTER SEVEN

STATISTICAL ANALYSIS AND INTERPRETATION OF RESULTS

7.1 INTRODUCTION

As mentioned in paragraph 1.2, the aim of this study was to analyze the determinants of the self-regulated learning abilities of students from an environmentally deprived community; and to determine the relationship between self-regulated learning and the academic achievement in English and maths of the above-mentioned students. In this chapter, the hypotheses are stated (paragraph 7.2) followed by a discussion of the subjects (paragraph 7.4), the classification of the independent variables (paragraph 7.5), the summary statistics and correlation coefficients are given (paragraph 7.6) and the testing of hypotheses are discussed in paragraph 7.7).

7.2 HYPOTHESES

Three hypotheses were set which each differentiated into three sub-hypotheses, i.e.:

7.2.1 HYPOTHESIS 1

There is a relationship between personal, environmental and behavioural variables and self-regulated learning.

7.2.1.1 Sub-hypothesis 1.1

There is a relationship between personal variables and self-regulated learning.

7.2.1.2 Sub-hypothesis 1.2

There is a relationship between environmental variables and self-regulated learning.

7.2.1.3 Sub-hypothesis 1.3

There is a relationship between behavioural variables and self-regulated learning.

7.2.2 HYPOTHESIS 2

There is a relationship between personal, environmental and behavioural variables and academic achievement in English.

7.2.2.1 Sub-hypothesis 2.1

There is a relationship between personal variables and academic achievement in English.

7.2.2.2 Sub-hypothesis 2.2

There is a relationship between environmental variables and academic achievement in English.

7.2.2.3 Sub-hypothesis 2.3

There is a relationship between behavioural variables and academic achievement in English.

7.2.3 HYPOTHESIS 3

There is a relationship between personal, environmental and behavioural variables and academic achievement in maths.

7.2.3.1 Sub-hypothesis 3.1

There is a relationship between personal variables and academic achievement in maths.

7.2.3.2 Sub-hypothesis 3.2

There is a relationship between environmental variables and academic achievement in maths.

7.2.3.3 Sub-hypothesis 3.3

There is a relationship between behavioural variables and academic achievement in maths.

7.3 *PROCEDURE*

A series of one way analyses of variance (ANOVA) and t-tests were first calculated to discuss the subjects (see paragraph 7.4). Before the hypotheses could be tested it was necessary to classify the independent variables into personal, environmental and behavioural variables (paragraph 7.5). To test the hypotheses, a series of stepwise regression analyses were performed to determine the relationship between personal, environmental and behavioural variables and self-regulated learning (i.e., hypothesis 1, paragraph 7.7), academic achievement in English (i.e., hypothesis 2, paragraph 7.8) and academic achievement in maths (i.e., hypothesis 3, paragraph 7.9).

7.4 *DISCUSSION OF SUBJECTS*

On the basis of the information from the biographical questionnaire (paragraph 6.4.1), a detailed description of the sample is possible by considering the relationship between the various biographical variables and academic achievement in English and maths. Although caution was taken to make sure that the subjects understood the test, some subjects did not complete all the items which has resulted in missing data affecting the number of the subjects and making it inconsistent. The total number of subjects for example was 374, but in most of the tables the numbers of the subjects vary because of missing data.

7.4.1 *AGE OF THE SUBJECTS*

TABLE 7.1: Age distribution of subjects.

Age in years	13	14	15	16	17	18	19	20	21	22	23	24	27	30
Number of subjects	24	72	79	69	52	34	15	17	3	4	1	2	1	1

The average age of std 7 students who have never failed a year and started school at the age of 6 years ought to be 14 years and 15 years for those students who started school at the age of 7. The mean age of standard 7 students can therefore be considered to be 14 to 15 years. Table 7.1 reveals that 24 of the 374 subjects are below the average age (i.e., 13 yrs). Only 151 of the subjects are of the age expected from std 7 students while 189 are above the average age (16-30 yrs), which implies that most of the subjects have either failed or missed more than one year of schooling or started school at an age later than 7 years.

Students who are below the average age may not perform well academically, because younger children have limited knowledge resources (Weinstein *et al.*, 1986:317). Those who are above the average age may also not perform well educationally. Mathebula (1992:66; also see paragraph 5.4.4) reports that the academic achievement of students who have failed more than one year or missed school, decreases progressively according to the number of years they have failed or missed school.

A one-way analysis of variance has revealed a statistically significant difference in academic achievement in English between younger and older students - $F(13,309)=3,33$; $p<0,05$. Tukey's *post hoc* comparison revealed that each of the students in the 14 and 15 year age groups achieved significantly better marks than students from the older age groups. It can therefore be concluded that younger students who have never failed or missed a year were better achievers in English than older students who had failed a year or more or missed a number of school years.

The academic achievement in maths were not affected by age differences.

7.4.2 SEX OF THE SUBJECTS

An analysis of table 7.4 reveals that there was a statistically significant difference in the academic achievement in maths ($t=2,18$; $p<0,05$, $d=0,2$) between boys and girls. Boys achieved higher marks in maths than girls. This difference though, is not of practical significance because of the small effect size ($d=0,2$).

The academic achievements in English of the boys and girls were not affected by age differences.

7.4.3 FAMILY CHARACTERISTICS

Family characteristics involve, *inter alia*, the socio-economic status the parents' educational levels, their employment status, family configuration and study related variables (also see table 7.2).

7.4.3.1 The socio-economic status

Socio-economic status is defined in this study as the father and mother's educational levels, their aspirations for their children, the type of employment of the parents and the possession of a car and TV and whether their houses were electrified or not.

A one way analysis of variance revealed a statistically significant difference in academic achievement in English between students from high socio-economic status families and students from low socio-economic status families - $F(4,318)=13,15$; $p<0,05$; $f=0,16$. Tukey's *post hoc* comparison revealed that students from high socio-economic status families achieved significantly better in English than students from low socio-economic status families. The effect size ($f=0,16$) though is small, therefore, the difference is of little educational or practical significance. With relation to maths though, the relationship was reversed. A one way analysis of variance revealed a statistically significant difference in maths achievement between students from high socio-economic status families and students from low socio-economic status families - $F(4,309)=2,61$; $p<0,05$; $f=0,06$. Tukey's *post hoc* comparison revealed that students who were from low socio-economic status families achieved statistically significantly better in maths than students from high socio-economic status families. The effect size though is small ($f=0,06$) therefore the difference is of little educational or practical significance. To explain this relationship, one may make an assumption that students from high socio-economic status families spend too much time watching TV at home, and have less time to practice or study maths than students from low socio-economic status families who have more time to practice or study maths as they have no TV at home to keep them away from studying.

TABLE 7.2: Family characteristics.

Father's educational level	Std 5 or lower				Standard 6	7	8	9	10	Post matric		
Number of subjects	122				54	13	28	18	33	43		
Mother's educational level	Std 5 or lower				Standard 6	7	8	9	10	Post matric		
Number of subjects	156				54	19	30	27	25	43		
Parent's employment status	Both employed				Mother employed only					Father employed only		
Number of subjects	108				106					139		
Family size (number of members)	02	03	04	05	06	07	08	09	10	11	12	13 or more
Number of subjects	6	8	29	63	58	49	51	38	22	9	15	11
Sibsize	1st born	2nd	3rd	4th	5th	6th	7th	8th	9th	10th born		
Number of subjects	26	38	62	47	69	61	33	15	7	6		
Birth order	1st born	2nd	3rd	4th	5th	6th	7th	8th	9th	10th born		
Number of subjects	61	60	54	58	43	30	21	9	8	16		

TABLE 7.2: Family characteristics (continues).

Brothers & sisters in high school	0	1	2	3	4	5	6	7	8	9 or more
Number of subjects	101	116	69	25	14	6	5	4	1	16

Subjects living with:	both parents	mother	father	relatives	friends
Number of subjects	255	155	14	26	3

Parents' aspiration for their child	Standard				
	Std 7 or lower	8	9	10	Post matric
Number of subjects	1	1	1	35	331

Place to study	No	Yes
Number of subjects	81	273

Hours studying at home	1	2	3	4	5	6 or more
Number of subjects	95	125	73	40	13	16

Parents homework expectations	No	Yes
Number of subjects	70	302

Help with homework at home	No	Yes
Number of subjects	137	234

Number of rooms	1	2	3	4	5	6 or more
Number of subjects	31	61	69	77	46	71

7.4.3.2 The educational level of the parents

The educational level of the parents was defined as the highest school standard the parents had attained. From table 7.2 it can be inferred that only 43 of the subjects' fathers as well as mothers have higher qualifications than std 10. The table further reveals that 122 of the subjects' fathers and 156 mothers have not attempted std 6. Fathers of 18 of the subjects as well as 27 mothers have attained std 9, while 33 fathers and 25 mothers of the subjects have attained std 10. Parents who have not continued their education beyond std 6 may not consider education important because of ignorance (Le Roux, 1994:44), hence they may not encourage or support their children to study.

Mothers and fathers with college education have a positive influence on the academic achievements of their children because they have had formal education (Caldas, 1993:206; Baker and Stevenson, 1986:156). They can manage the education of their

children by guiding them to study and to do their homework (Baker and Stevenson, 1985:156). They know more about their children's performance and have more social contact with their children's teachers, as well as participating in school meetings (Lee and Croninger, 1994:289; also see paragraphs 5.2.4.1 and 5.2.4.2).

A one-way analysis of variance revealed a statistically significant difference in both English - $F(6,282)=5,38$; $p<0,05$; $f=0,10$ - and maths achievement - $F(6,273)=2,55$; $p<0,05$; $f=0,05$ - between students with fathers with a higher educational level and students with less educated fathers. Tukey's *post hoc* comparison revealed that students whose fathers had a post matric qualification achieved significantly better in both English and maths than students whose fathers had less than a standard 5 (English) or standard 6 maths. The effect sizes of English ($f=0,10$) and maths ($f=0,05$) though are small therefore the difference is of little educational or practical significance.

7.4.3.3 The parents' employment status

An analysis of table 7.2 reveals that only 108 of the subjects' parents were both employed, 106 of the subjects' mothers were employed, while 139 fathers of the subjects were employed.

Parents who are both employed may be associated with a higher socio-economic status, and their children may be characterized by higher academic achievement than children of parents where only the mothers or fathers are employed. Parents who are both employed have sufficient income to be able to provide, for example, books for their children, a balanced diet, educational tours and to offer a study place which may positively influence their children's academic achievement (Belsky and Eggebeen, 1991:1085).

Children of whom only the mothers or fathers are employed may be associated not only with a low socio-economic status, but also with poor academic achievement because the income of the parents may be insufficient to cater for their children's educational needs such as tours, trips, a balanced diet and study places (Tozer *et al.*, 1993:306).

TABLE 7.3: Means, standard deviations, and t-values of the parents' employment status and some physical characteristics of the home and academic achievement in English.

Variables	Number of subjects	Mean ac achieve	Std deviation	t-value	DF	p-value	Effect size (d)
Only 1 parent employed	222	121,6	48,4	-2,61	140	0,0101	0,3
Both parents employed	94	140,8	64				
No electricity	191	120,2	49,8	-2,82	245	0,0052	0,3
House electrified	130	137,9	58,8				
House	253	132,8	54,7	5,91	131	0,0001	0,6
Shack	60	98,5	36,2				
No TV at home	170	116,2	47,7	-3,91	294	0,0001	0,4
TV at home	153	139,4	58,1				
House not built with bricks*	113	112,1	47,3	-3,82	263	0,0002	0,4
House built with bricks	205	134,6	55,5				
Not owning a car	245	121,9	49,8	-3,0	106	0,0034	0,4
Owning a car	76	145,4	62,5				

Small effect d = 0,2
Medium effect d = 0,5
Large effect d = 0,8

* Some houses are built of poles, reeds and stones.

An analysis of table 7.3 and 7.4 reveals that there was a statistically significant difference in the academic achievement in both English ($t=-2,41$; $p<0,05$, $d=0,3$) and maths ($t=2.32$; $p<0,05$, $d=0,3$) of students whose parents were both employed and students with only one parent (either father or mother) employed. Students whose parents were both employed achieved higher marks in English than students with only one parent employed. With relation to maths, the opposite to that of English was found. Students with only one parent employed achieved higher marks than students whose parents were both employed. This difference though, is not of practical significance because of the small effect sizes for English ($d=0,3$) and maths ($d=0,3$).

7.4.3.4 Family size

Family size is defined as the number of people that constitute a family. An analysis of table 7.2 reveals that 6 subjects were from families which comprised 2 members only, this may mean that the subject was either living with the father or mother only. Families of 8 of the subjects comprised 3 members which means the parents had only one child or that a family consisted of two children with either the father or mother. A family with 4 members may mean that two subjects were living with both the father and mother. It may also imply that either the mother or father was living with three children in a family of four members. The table further reveals that some subjects were from families with 5-6 members (i.e., small families) and others were from families comprising 7-8, 9-10, 11-12 and 13 or more members (i.e., above avarage to large families). A large family can be a family which has 7 or more members (i.e., a father, mother, and five or more children).

Small families are associated with the higher academic achievement of the child, because in small families parents have more time to attend to their children than in large families (Mwamwenda, 1989:21; also see paragraph 5.2.1.1). In a large family, parents do not have sufficient time to attend to the individual needs of all their children and their intellectual development because of the large number of children. Parents of large families may also lack the necessary financial support, nutrient food and good shelter, hence, their children perform poorly on academic tasks (Van der Westhuizen, 1987:81; Schutte, 1994:49; also see paragraph 5.2.1.1).

No differences with relation to family size were found in the academic achievement in either English or maths.

7.4.3.5 Sibsize

Sibsize is defined as the number of children (brothers and sisters) in the family (Steelman, 1985:354; also see paragraph 5.2.1.2). An analysis of table 7.2 reveals that 26 of the subjects had neither brothers nor sisters, therefore one may assume that they were the only children in the family. The table further reveals that 38 of the subjects had 2 brothers and/or sisters which means that there were three siblings in the family. Some had 3-4 brothers and/or sisters whereas other subjects had 5-9 or more brothers and sisters. An analysis of the table further reveals that with an average sibsize of 5 children, the majority of the subjects (173) came from smaller families and 122 from large familes.

Children who have few siblings may perform effectively in academic tasks. A family with fewer siblings is associated with a better learning environment and higher socio-economic status because parents are better able to support them in comparison with a large sibsize (Steelman, 1986:374). When there are less children to attend to at home, parents may have enough time to attend to their children's needs and afford to support them financially.

Sibsize can play a positive role in the child's intellectual development. In the absence of the parents, e.g., when the parents are away at work, older siblings may interact with younger siblings at home by teaching them how to read and write. Thus, older siblings serve as intellectual resources for the younger siblings in the family (Mwamwenda, 1989:35; also see paragraph 5.2.1.2). A family with fewer siblings is also associated with a higher learning environment and higher socio-economic status because parents are able to support them in contrast with a family with a large sibling size (Steelman, 1986:374).

No differences in academic achievement in either English or maths were found with relation to sibsize in this study.

7.4.3.6 Birth order

Birth order is defined as the relative rank of a child in the age hierarchy among the siblings in the family (Steelman, 1985:354; also see paragraph 5.2.1.3). An analysis of table 7.2 reveals that 61 of the subjects were first borns or only-children in the family, 60 were second borns, 54 were third borns, 58 fourth borns up to tenth borns or more.

Subjects who are second, third, fourth and fifth borns may have better opportunities for cognitive development because they are in an environment where older siblings may attend to them, help them with homework and teach them how to read and write better than the first borns and the only children (Powell and Steelman, 1993:337).

No differences in academic achievement in either English or maths were found with relation to birth order in this study.

7.4.3.7 Brothers and sisters in high school

Brothers and sisters in high school refer to the number of brothers and sisters the subjects have in high school. It can be inferred from table 7.2 that only 101 of the subjects had no older brothers and sisters in high school while 273 subjects had at least one brother or

sister in high school. Being the first child of a family to attend high school may be an advantage but also a disadvantage. A disadvantage because of a lack of knowledge of what high school learning entails and how it differs from primary school. It may be assumed that families with more than one child in high school who makes the most of schooling, may be characterized by a culture of learning which is to the advantage of younger children. If the older siblings though, are poor high school students with a negative and disruptive attitude towards school, a culture of learning may be absent. In the latter case, it may then be to the child's advantage if he/she has no sibs who attend high school.

No differences in academic achievement in either English or maths were found with relation to brothers and sisters in high school in this study.

7.4.3.8 The people living with the child

From table 7.2 it is inferred that 255 of the subjects were living with both parents (i.e., intact families), 155 of the subjects were living with their mothers (single-parent families), 14 subjects were living with their fathers (single-parent families), while the other 26 were living with relatives and 3 with friends.

Children living with both parents usually are characterized by higher academic achievement than children living with a single-parent (Jubber, 1994:139). Single-parent families may have a negative influence on the academic achievement of the child because of a low income (Lawson, Gaushell and Karst, 1993:288). Children also miss the company of both the mother and father, especially when they are living with a single-parent or relatives and friends because they do not receive the warmth and comfort that the children from intact families receive, hence they fail at school (also see paragraph 5.2.2).

No differences in academic achievement in either English or maths were found with regard to living with both parents, mother, father, relatives or friends.

7.4.3.9 Parents' aspirations

Parents' aspirations are defined as parents' expectations for the education of their children. An analysis of table 7.2 reveals that 331 parents of the subjects would have liked them to attain post matric qualifications. Most parents thus had high expectations for their children's academic achievement. Jubber (1988:294) asserts that parental expectations play a motivating role in children's education as the child will try his utmost

to learn when he/she realizes that his/her parents' expectations of him/her are high. On the other hand, when the child works very hard, i.e., exerts more effort in his academic tasks, it helps to shape the parents' expectations of him unlike if the child's progress shows no success (Jubber, 1988:294; also see paragraph 5.3.3).

No differences in academic achievement in either English or maths were found with regard to parents aspirations in this study.

7.4.3.10 A place to study

A place to study is a study-related variable which required the subjects to indicate if they had a place to study at home. From table 7.2, it can be inferred that 81 of the subjects had no place to study, whereas 273 of the subjects had a place to study.

Students who do not have a study area, and have to study where there is loud music or television and a lot of distractions or noisy children perform poorly on academic tasks in comparison with students who have a quiet study place (Pintrich, 1989:134; also see paragraph 3.7.2).

No differences in academic achievement in either English or maths were found with regard to place to study in this study.

7.4.3.11 Studying at home

The hours of study at home is a related variable required the subjects to indicate how many hours they studied daily. An analysis of table 7.2 reveals that 95 of the subjects studied for 1 hour while 267 of the subjects studied for 2-6 hours or more.

No differences in academic achievement in either English or maths were found with regard to hours studying at home in this study.

7.4.3.12 Parents' homework expectations

Parents' homework expectations is a study related variable which required the subjects to indicate if their parents expect them to do homework at home. An analysis of table 7.2 reveals that 70 of the subjects parents did not expect them to do homework, while 302 of the parents of the subjects expected them to do their homework.

Parental expectations involve factors such as parental knowledge of formal education and life prospects. Parents who have a knowledge of formal education may play a more

motivating role in their children's education and also direct them how to do their homework than parents who have no formal education because they are academically ignorant (Jubber, 1988:294; also see paragraph 5.3.3). When the child realizes that his parents' expectations of him are high he might spend more effort to attain his academic goals than the children from parents who have no expectations of them (Pendarvis, Howley and Howley, 1990:104; also see paragraph 5.3.3).

No differences in academic achievement in either English or maths were found with regard to parents' homework expectations.

7.4.3.13 Help with homework at home

Help with homework at home is a variable which required the subjects to indicate if there was someone at home who helped them with homework. From table 7.2 it can be inferred that 137 of the subjects had no one to help them with homework at home, while 234 of the subjects had someone to help them thus, most of the subjects had people to help them with homework at home.

An analysis of table 7.4 reveals that there was a statistically significant difference in the academic achievement in maths ($t=2,38$; $p<0,05$, $d=0,3$) between students who had someone to help them with their homework at home and students who had no one to help with homework at home. Students who had someone to help with homework at home achieved higher marks in maths than students who had no one to help with homework at home. This difference though is not of practical significance because of the small effect size ($d=0,3$).

No differences were found with reference to English.

7.4.4 HOME-RELATED CHARACTERISTICS

Home-related variables refer to variables such as the availability of electricity, whether the house has been built with concrete/bricks or not, living in a shack or not, number of rooms, possession of a TV and of a car (see table 7.4).

TABLE 7.4: Means, standard deviations, and t-values of parents' employment status and some physical characteristics of the home and academic achievement in maths.

Variables	Number of subjects	Mean ac achieve	Std deviation	t-value	DF	p-value	Effect size (d)
Boys	159	59,7	42,5	2,18	304	0,0308	0,2
Girls	154	50,1	35,3				
Only 1 parent employed	211	58,4	40	2,32	195	0,0214	0,3
Both parents employed	96	47,5	37,4				
No electricity	181	61,1	43,3	3,45	310	0,0006	0,3
House electrified	131	46,6	31,4				
House	253	57,4	40,4	2,87	88	0,0052	0,4
Shack	52	42,9	31,7				
No TV at home	162	59,8	41,7	2,30	309	0,0225	0,2
TV at home	152	49,8	36				
No help with homework	110	62,8	46,5	2,38	174	0,0183	0,3
Help with homework	203	50,8	34,2				

Small effect d = 0,2
Medium effect d = 0,5
Large effect d = 0,8

7.4.4.1 Electricity

From table 7.3 one can infer that 191 of the subjects' homes had no electricity while 130 of the subjects' homes had electricity. Subjects from homes without electricity may not progress in academic tasks because of the unavailability of lights for studying in the evenings (Sherron, 1991:69; Miller-Jones:1988:82). Children for example, may not study well if there is no electricity at home. They are forced to use candles and other means of lighting which may affect their eyes or they do not study at all, hence they perform poorly in academic achievement in comparison with children from homes with electricity. This kind of situation is associated with low socio-economic status because parents cannot afford to install electricity, hence their children suffer with regard to studying in the evenings.

An analysis of table 7.3 and 7.4 reveals that there was a statistically significant difference in the academic achievement in both maths ($t=3,45$; $p<0,05$, $d=0,3$) and English ($t=2,82$; $p<0,05$, $d=0,3$) of students whose houses were electrified and students whose houses were not electrified. Students whose houses were electrified achieved higher marks in maths and English than students whose houses were not electrified. This difference though, is not of practical significance because of the small effect size ($d=0,3$).

7.4.4.2 Houses built with bricks

An analysis of table 7.3 reveals that 113 of the subjects' houses were not built with bricks, while 205, the majority of the subjects, lived in houses built with bricks. It can be concluded that children who were living in houses built with bricks were associated with higher socio-economic status because their parents could afford to build such houses. Parents in affluent families also tend to bear fewer children than lower socio-economic status families which enable them to better support their families, hence their children perform better in academic tasks than children from low socio-economic status (Steelman, 1985:557; Jubber, 1988:289; also see paragraph 5.2.5).

An analysis of table 7.3 reveals that there was a statistically significant difference in the academic achievement in English ($t=-3,82$; $p<0,05$, $d=0,4$) of the students whose houses were built with bricks and students whose houses were not built with bricks. This difference approaches avarage practical significance ($d=0,4$). Students who were living in houses built with bricks achieved higher marks in English than students living in houses not built with bricks.

No difference in maths achievement was found.

7.4.4.3 Living in a shack or not

A shack is an informal type of a house made of corrugated iron usually found in informal settlements. An analysis of table 7.3 reveals that 253 of the subjects' homes had houses and not shacks, whereas 60 of the subjects were living in shacks. It can be inferred from the table that most of the subjects lived in houses, and may be associated with a richer learning environment, hence they may perform better in academic achievement than children living in shacks (Kelly, 1994:5227; also see paragraph 5.2.4).

An analysis of tables 7.3 and 7.4 reveals that there was a statistically significant difference in the academic achievement in both maths ($t=2,87$; $p<0,05$, $d=0,4$) and

English ($t=5,91$; $p<0,05$, $d=0,6$) between students who were living in houses and students who were living in shacks. Students who were living in houses achieved higher marks in both English and maths than students who were living in shacks. This difference approaches average/medium practical significance in maths ($d=0,4$) and is of average practical significance in English ($d=0,6$).

7.4.4.4 The number of rooms

An analysis of table 7.2 reveals that some of the subjects lived in houses with only 1-2 rooms, and some lived in houses with 3-5 rooms while other subjects came from homes with 6 or more rooms.

Children from homes whith single-rooms can be associated with a low socio-economic status which may have a negative effect on their academic achievement (Lawson, Gaushell and Karst, 1993:288). Four people, for example, sharing one room leads to overcrowdedness, hence it becomes a very small space for many people to share. If four people are living in a six-roomed house (e.g., father, mother and two children) each person has enough living space. Each child would have his or her own room to live and study, hence they perform better in academic tasks than children from a one-roomed house.

A one-way analysis of variance revealed a statistically significant difference in both English - $F(5,305)=2,21$; $p<0,05$; $f=0,03$ and maths - $F(5,296)=4,30$; $p<0,05$; $f=0,06$ achievement between students from larger homes and students from smaller homes. Tukey's *post hoc* comparison revealed that students from larger homes scored significantly better in both English and maths than students from smaller homes. The effect sizes of English ($f=0,03$) and maths ($f=0,06$) are small, therefore the difference is of little educational or practical significance.

7.4.4.5 The possession of a TV

From table 7.3 and 7.4, it can be inferred that the majority of the subjects did not have television at home, while a minority of the subjects had television sets at home. Children from homes with television may be associated with a richer or intellectually more stimulating environment which may have a positive influence on cognitive development and achievement (Jubber, 1988:289). By observing or listening to other people perform on television, children may imitate the process and hence, develop cognitively unlike children from homes which have no television (Schunk, 1988:8; also see paragraph 4.3.2.1).

An analysis of table 7.3 and 7.4 reveals that there was a statistically significant difference in the academic achievement in both the maths ($t=2,30$; $p<0,05$, $d=0,2$) and English ($t=-3,91$; $p<0,05$, $d=0,4$) of students who had TV at home and students who didn't have TV at home. Students who had TV at home achieved lower marks in maths and higher marks in English than students who didn't have TV at home. The difference in academic achievement approaches average practical significance ($d=0,4$) in the case of English but is of small practical significance ($d=0,2$) with reference to maths.

7.4.4.6 The possession of a car

From table 7.3, it can be inferred that 245 families of the subjects did not own cars while 76 of the subjects' families owned cars. Families owning cars were associated with higher socio-economic status, a richer learning environment and interest in their children's educational success (Jubber, 1988:289). Children from such families can be transported on a daily basis to schools which have learning facilities such as laboratories, large libraries, various subject choices and different career choices (Tozer *et al.*, 1993:306). Parents from high socio-economic status families can also take their children to educational places, such as game reserves and other places of nature conservations, museums, beaches, habours and airports in contrast with parents from low socio-economic status families (Tozer *et al.*, 1993:306).

An analysis of table 7.3 reveals that there was a statistically significant difference in the academic achievement in English ($t=-3,0$; $p<0,05$, $d=0,4$) of students whose parents owned a car and students whose parents owned no car. Students whose parents owned a car achieved higher marks in English than students whose parents owned no car at home. This difference in academic achievement in English though, approaches average practical significance because ($d=0,4$).

No difference was found with reference to maths.

7.5 CLASSIFICATION OF THE INDEPENDENT VARIABLES

To test the hypotheses it was necessary to classify the independent variables into personal (paragraph 7.5.1), environmental (paragraph 7.5.2) and behavioural variables (paragraph 7.5.3).

7.5.1 PERSONAL VARIABLES

The following variables were classified as personal variables: age, attitude, goal setting, motivation, anxiety, self-efficacy for academic achievement, self-efficacy for self-regulated learning, self-efficacy for enlisting parents and community support, self-efficacy for social resources, goal setting and intrinsic value.

7.5.2 ENVIRONMENTAL VARIABLES

The following variables were classified as environmental variables: socio-economic status, living space, home support and teacher support.

7.5.3 BEHAVIOURAL VARIABLES

The following behavioural variables were used: concentration, time management, information processing, the selection of main ideas, study aids, self-testing, test-taking strategies and strategy use.

To test hypotheses 2 and 3, the same sets of variables were used together with self-regulation which was included as variable to test these two hypotheses.

With relation to hypothesis 1, goal setting was defined by combining the English goal and the maths goal. With relation to hypothesis 2, goal setting was defined as the English goal, and with relation to hypothesis 3, goal setting was defined as the maths goal.

7.6 SUMMARY STATISTICS AND CORRELATION COEFFICIENTS

The summary statistics for each variable and the correlation coefficients between these variables and self-regulated learning, English and maths, were calculated (see table 7.5).

TABLE 7.5: Summary statistics and correlation coefficients.

Variables	Mean	Standard deviation	Smallest value	Largest value	Correlation coefficients with SRL	English	Maths
Age	16,07	2,25	13	30	-0,16	-0,23	-0,07
Sex	1,50	0,50	1	2	-0,20	0,05	-0,11
Socio-economic status	16,59	5,15	7	27	0,20	0,34**	-0,20
Family	13,50	5,64	2	30	-0,22	-0,12	-0,04
Living space	2,49	2,04	0,3	12	-0,11	-0,12	0,20
Maths goal	161,01	62,13	34	200	-0,02	-0,05	-0,02
English goal	193,22	79,18	26	300	0,06	-0,0	0,13
Goal setting	347,59	121,75	75	500	0,07	0,02	0,11
Attitude	15,23	6,13	8	36	0,06	0,16	-0,09
Motivation	27,16	3,20	16	40	0,47***	0,25**	0,08
Time management	17,98	3,26	12	32	0,14	0,19	-0,02
Anxiety	16,40	4,33	10	33	0,01	0,07	-0,06
Concentration	17,87	5,41	11	40	0,12	0,22	-0,02
Information processing	33,88	5,14	19	41	0,24	0,03	0,16
Selecting main ideas	13,80	2,43	8	25	0,29**	0,22	0,06
Study aids	34,24	4,73	19	40	0,26**	0,03	0,10
Self-testing	34,72	4,63	17	40	0,29**	0,06	0,14
Test-taking strategies	15,45	6,42	8	37	0,06	0,16	-0,06
Self-efficacy for social resources	23,62	4,52	4	28	0,32**	0,07	0,11
Self-efficacy for academic achievement	54,04	8,00	31	63	0,34**	0,15	0,14
Self-efficacy for self-regulated learning	67,00	9,15	27	77	0,36**	0,11	0,16
Self-assertive self-efficacy	21,76	5,44	4	28	0,04	-0,11	0,07
Self-efficacy for enlisting parents and community support	23,68	4,36	4	28	0,32**	0,08	0,07
Intrinsic value	53,95	9,34	17	63	0,45***	0,02	0,27**
Strategy use	75,76	9,56	41	91	0,44**	0,11	0,12
Father support	32,24	8,76	8	40	0,08	0,07	0,05
Mother support	34,26	6,37	8	40	0,20	0,10	0,09
Teacher support	34,55	5,99	8	40	0,15	-0,04	0,09
Home support	63,65	16,76	8	80	0,16	0,09	0,05
Self-regulated learning (SRL)	43,74	5,65	20	63	1,00	0,30**	0,15
English	127,04	53,88	16	292	-	1,00	0,14
Maths	54,66	39,32	5	190	-	-	1,00

* Small effect r = 0,10
** Medium effect r = 0,30
*** Large effect r = 0,50

7.7 *THE RELATIONSHIP BETWEEN PERSONAL, ENVIRONMENTAL AND BEHAVIOURAL VARIABLES AND SELF-REGULATED LEARNING*

To test hypothesis 1 that *there is a relationship between personal, environmental, and behavioural variables and self-regulated learning*, all the independent variables mentioned in paragraph 7.5.1 (also see table 7.6) were subjected to a multiple regression analysis with self-regulated learning as a dependent variable to determine the collective and individual contribution of the independent variables to R^2. An analysis of table 7.6 reveals that the complete set of independent variables explains 54,03 percent (R^2=0,5403; R^2_a=0,4588) of the variance in self-regulated learning.

TABLE 7.6: The collective and individual contribution of the complete set of variables to R^2. Criterion: self-regulated learning.

R^2=0,5403 (R^2_a=0,4588); Cp=24,0

Variables	Regression coefficient	Contribution to R^2	F-value	Effect size f^2
Age	0,11	0,0017		
Attitude	0,07	0,0009		
Motivation	0,05	0,0003		
Time management	0,24	0,0067		
Anxiety	0,16	0,0035		
Concentration	0,19	0,0059		
Information processing	-0,02	0,00		
Selecting main ideas	0,44	0,0124	3,36	0,03
Study aids	0,42	0,0320	8,64**	0,07
Self-testing	-0,15	0,0032		
Test-taking strategies	0,02	0,0		
Self-efficacy for academic achievement	0,11	0,0024		
Self-efficacy for self-regulated learning	0,05	0,0013		
Self-efficacy for enlisting parents and community support	0,17	0,0042		
Intrinsic value	0,19	0,0206	5,56*	0,04
Strategy use	0,16	0,0094	2,53	0,02
Socio-economic status	0,42	0,0042		
Living space	0,13	0,0012		
Goal setting	-0,01	0,0161	4,34*	0,03
Self-efficacy for social resources	-0,25	0,0104	2,81	0,02
Home support	-0,08	0,0022		
Teacher support	0,06	0,0029		

* $p<0,05$
** $p<0,01$

Small effect $f^2 = 0,02$
Medium effect $f^2 = 0,15$
Large effect $f^2 = 0,35$

By using the BMDP-9R procedure with method = RSQ the best subset of independent variables i.e., the smallest subset of independent variables that contributes the most to R^2 was identified by applying the Cp criterion (see table 7.6). This subset was then subjected to a further multiple regression analysis to determine the contribution of each independent variable to R^2 (see table 7.7).

TABLE 7.7: The collective and individual contribution of the variables in the best subset of variables to R^2. Criterion: self-regulated learning.

$R^2=0,4062$ ($R^2_a=0,3844$); Cp=3,21

Variables	Regression coefficient	Contribution to R^2	F-value	Effect size f^2
Attitude	0,1996	0,0116	4,46*	0,02
Concentration	0,2533	0,0189	7,28**	0,03
Selecting main ideas	0,4163	0,0214	8,23**	0,04
Study aids	0,3012	0,0287	11,04**	0,05
Self-efficacy for enlisting parents and community support	0,1588	0,0083	3,2	0,01
Intrinsic value	0,1653	0,0238	9,14**	0,04
Strategy use	0,1346	0,0176	6,75**	0,03
Goal setting	-0,0038	0,0071	2,74	0,01
	* $p<0,05$ ** $p<0,01$	Small effect Medium effect Large effect	$f^2 = 0,02$ $f^2 = 0,15$ $f^2 = 0,35$	

An analysis of table 7.7 reveals that the eight independent variables comprising the best subset of variables together explain 40,62 percentage ($R^2=0,4062$; $R^2_a=0,3844$) of the variance in self-regulated learning.

7.7.1 THE RELATIONSHIP BETWEEN PERSONAL VARIABLES AND SELF-REGULATED LEARNING

With relation to subhypothesis 1.1 that *there is a relationship between personal variables and self-regulated learning*, an analysis of table 7.5 reveals that the correlation coefficients between the following personal variables and self-regulated learning were of a statistical and also of an average to large practical or educational significance (the effect sizes range from 0,32 to 0,47; approximated 0,3-0,5): motivation (r=0,47), self-efficacy for social resources (r=0,32), self-efficacy for academic achievement (r=0,34), self-efficacy for self-regulated learning (r=0,36), self-efficacy for enlisting parents and community support (r=0,32) and intrinsic value (r=0,45). It thus seems that there is a strong relationship between self-regulated learning and motivation, a positive intrinsic

value, strong positive self-efficacy beliefs to use social resources and to enlist parents' and community support.

An analysis of table 7.7 reveals that only two of the variables that are included in the best subset are personal variables. These variables viz., attitude and intrinsic value make a statistically significant contribution to R^2. The effect sizes of attitude ($f^2=0,02$) and intrinsic value ($f^2=0,04$) are small, thus of little educational or practical significance.

Although the effect sizes are small ANOVA's with Tukey's *post hoc* comparison were calculated to determine how the attitude and intrinsic value of students who were more self-regulated differed from those of students who were less self-regulated.

Attitude explains 1,16 percent (contribution to $R^2=0,0116$; $f^2=0,02$) of the variance in self-regulated learning. A one-way analysis of variance revealed a statistically significant difference in attitude between highly self-regulated students and low self-regulated students $F(4,328)=3,33$; $p<0,05$; $f=0,04$. Tukey's *post hoc* comparison revealed that students who were self-regulated had a more positive attitude towards learning than students who were less self-regulated. The effect size ($f=0,04$) though is small, therefore the difference is of little educational or practical signifince.

Intrinsic value explains 2,38 percent (contribution to $R^2=0,0238$; $f^2=0,04$) of the variance in self-regulated learning. A one-way analysis of variance revealed a statistically significant difference in intrinsic value between more self-regulated students and less self-regulated students $F(4,328)=11,7$; $p<0,05$; $f=0,14$. Tukey's *post hoc* comparison revealed that more self-regulated students were more interested in learning than less self-regulated students. The effect size ($f=0,14$) though, indicates that this difference is of little educational or practical significance.

Sub-hypothesis 1.1 that *there is a relationship between personal variables such as attitude, intrinsic value and self-regulated learning* can therefore be accepted.

7.7.2 THE RELATIONSHIP BETWEEN ENVIRONMENTAL VARIABLES AND SELF-REGULATED LEARNING

With reference to sub-hypothessis 1.2 that *there is a relationship between environmental variables and self-regulated learning* an analysis of table 7.5 reveals that there are statistically significant correlation coefficients between some of the environmental variables and self-regulated learning. There is a statistically significant relationship between socio-economic status ($r=0,24$), family ($r=-0,22$), mother support ($r=0,20$)

and self-regulated learning. These relationships though, only approach a medium rate of practical significance.

An analysis of table 7.7 reveals that no environmental variables make a statistically significant contribution to R^2.

Sub-hypothesis 1.2 that *there is a relationship between environmental variables and self-regulated learning* can therefore not be accepted.

7.7.3 THE RELATIONSHIP BETWEEN BEHAVIOURAL VARIABLES AND SELF-REGULATED LEARNING

With relation to sub-hypothesis 1.3 that *there is a relationship between behavioural variables and self-regulated learning*, table 7.5 reveals that there are statistically significant correlations between information processing (r=0,24), selecting main ideas (r=0,29), study aids (r=0,26), self-testing (r=0,29), strategy use (r=0,44) and self-regulated learning. The relationship between these behavioural variables and self-regulated learning is of medium to large practical significance (the effect sizes range from 0,24 to 0,44; approximated 0,2-0,4).

An analysis of table 7.7 reveals that only four behavioural variables, i.e., selecting main ideas, concentration, study aids and strategy use make a statistically significant contribution to R^2. An analysis of the effect sizes of these variables reveals that the effect sizes are small, and thus of little educational or practical significance.

Although the effect sizes were small, ANOVA's with Tukey's *post hoc* comparison were performed to determine how students who were more self-regulated differed from students who were not self-regulated as far as selecting main ideas, concentration, study aids and strategy use were concerned.

The selection of main ideas explains 2,14 percent (contribution to $R^2=0,0214$; $f^2=0,04$) of the variance in self-regulated learning. A one-way analysis of variance revealed a statistically significant difference in selecting main ideas between students who were self-regulated and students who were not self-regulated $F(3,329)=10,20$; $p<0,05$; $f=0,09$. Tukey's *post hoc* comparison revealed that self-regulated students were better at selecting main ideas when learning than less self-regulated students. The effect size ($f=0,09$) though is small, therefore the difference is of little educational significance.

Concentration explains 1,89 percent (contribution to $R^2=0,0189$; $f^2=0,03$) of the variance in self-regulated learning. A one-way analysis of variance revealed a

statistically significant difference in concentration between students who were self-regulated and students who were not self-regulated $F(4,328)=3,49$; $p<0,05$; $f=0,05$. Tukey's *post hoc* comparison revealed that self-regulated students concentrated better when learning than students who were not self-regulated. The effect size ($f=0,05$) though is small, therefore the difference is of little practical significance.

Study aids explain 2,87 percent (contribution to $R^2=0,0287$; $f^2=0,05$) of the variance in self-regulated learning. A one-way analysis of variance revealed a statistically significant difference in using study aids between more self-regulated students and less self-regulated students $F(4,328)=5,99$; $p<0,05$; $f=0,08$. Tukey's *post hoc* comparison revealed that students who were self-regulated used more study aids when learning than students who were less self-regulated. The effect size ($f=0,08$) though is small, therefore the difference is of little educational or practical significance.

Strategy use explains 1,76 percent (contribution to $R^2=0,0176$; $f^2=0,03$) of the variance in self-regulated learning. A one-way analysis of variance revealed a statistically significant difference in strategy use between highly self-regulated students and less self-regulated students $F(4,328)=27,88$; $p<0,05$; $f=0,34$. Tukey's *post hoc* comparison revealed that highly self-regulated students used more strategies when learning than students who were not self-regulated. The effect size ($f=0,34$) is large, therefore the difference is of large educational or practical significance.

Sub-hypothesis 1.3 that *there is a relationship between behavioural variables such as selecting main ideas, concentration, study aids, strategy use and self-regulated learning* can therefore be accepted.

7.8 *THE RELATIONSHIP BETWEEN PERSONAL, ENVIRONMENTAL AND BEHAVIOURAL VARIABLES AND ACADEMIC ACHIEVEMENT IN ENGLISH*

To test hypothesis 2 that *there is a relationship between personal, environmental and behavioural variables and academic achievement in English*, all the independent variables mentioned in paragraph 7.5.1 (also see table 7.8) were subjected to a multiple regression analysis with academic achievement in English as dependent variables to determine the collective and individual contribution of the independent variables to R^2. An analysis of table 7.8 reveals that the complete set of independent variables explains 43,60 percent ($R^2=0,4360$; $R^2_a=0,3145$) of the variance in academic achievement in English (see table 7.8).

TABLE 7.8: The collective and individual contribution of the complete set of variables to R^2. Criterion: academic achievement in English.

$R^2 = 0{,}4360$ ($R^2_a = 0{,}3145$); $Cp = 26{,}0$

Variables	Regression coefficient	Contribution to R^2	F-value	Effect size f^2
Age	-3,38	0,0126	3,82	0,02
Attitude	-1,10	0,0017		
Motivation	1,74	0,0035		
Time management	2,60	0,0064		
Anxiety	-3,94	0,0176	5,33*	0,03
Concentration	4,75	0,0304	9,22**	0,05
Information processing	1,08	0,0016		
Selecting main ideas	0,23	0,0000		
Study aids	-1,47	0,0031		
Self-testing	2,87	0,0102	3,08	0,02
Test-taking strategies	0,81	0,0011		
Self-efficacy for academic achievement	0,32	0,0002		
Self-efficacy for self-regulated learning	0,87	0,0028		
Self-efficacy for enlisting parents and community support	-0,95	0,0011		
Intrinsic value	-3,26	0,0501	15,18**	0,09
Strategy use	1,91	0,0211	6,40*	0,04
Socio-economic status	17,04	0,0590	17,86**	0,10
Family	-0,57	0,0019		
Living space	1,29	0,0008		
Self-efficacy for social resources	2,19	0,0060		
Home support	-0,03	0,0001		
English goal	0,09	0,0025		
Teacher support	-0,51	0,0018		
Self-regulated learning	1,51	0,0089		

* $p < 0{,}05$
** $p < 0{,}01$

Small effect $f^2 = 0{,}02$
Medium effect $f^2 = 0{,}15$
Large effect $f^2 = 0{,}35$

By using the BMDP-9R procedure with method=RSQ the best subset of independent variables i.e., the smallest subset of independent variables that contributes the most to R^2 was identified by applying the Cp criterion (see table 7.8). This subset was then subjected to a further multiple regression analysis to determine the contribution of the individual variables to R^2 (see table 7.9)

TABLE 7.9: The collective and individual contribution of the variables in the best subset to R^2. Criterion: academic achievement in English.

$R^2 = 0,2868$ ($R^2_a = 0,2586$); $Cp = 26,0$

Variables	Regression coefficient	Contribution to R^2	F-value	Effect size f^2
Age	-2,2977	0,0079	2,64	0,01
Motivation	2,6354	0,0172	5,73*	0,02
Anxiety	-2,1945	0,0110	3,67	0,02
Concentration	3,1936	0,0353	11,76**	0,05
Intrinsic value	-1,9313	0,0284	9,46**	0,04
Strategy use	1,5460	0,0230	7,65**	0,03
Socio-economic status	11,5867	0,0485	16,12**	0,07
Self-efficacy for social resources	1,4896	0,0069	2,3	0,01
Self-regulated learning	1,7926	0,0180	6,01*	0,03
	* $p<0,05$	Small effect	$f^2 = 0,02$	
	** $p<0,01$	Medium effect	$f^2 = 0,15$	
		Large effect	$f^2 = 0,35$	

An analysis of table 7.9 reveals that the nine independent variables comprising the best subset of variables together explain 28,68 percent ($R^2=0,2868$; $R^2_a=0,2586$) of the variance in academic achievement in English.

7.8.1 THE RELATIONSHIP BETWEEN PERSONAL VARIABLES AND ACADEMIC ACHIEVEMENT IN ENGLISH

With reference to sub-hypothesis 2.1 that *there is a relationship between personal variables and academic achievement in English* an analysis of table 7.5 reveals that the correlation coefficients between the following personal variables and academic achievement in English are of statistical significance: age ($r=-0,23$), motivation ($r=0,25$), concentration ($r=0,22$) and academic achievement in English ($r=0,30$). The effect sizes of all these variables range from small (0,03) to medium effect (0,03), which implies that the relationship of these variables and academic achievement in English are of small to medium educational or practical significance.

An analysis of table 7.9 reveals that only two of the personal variables i.e., motivation, and intrinsic value that constitute the best subset of variables make a statistically significant contribution to R^2. The effect sizes of motivation ($f^2=0,02$) and intrinsic value ($f^2=0,04$) are small, thus of little educational or practical significance.

Although the effect sizes were small, ANOVA's with Tukey's *post hoc* comparison were calculated to determine how motivation and the intrinsic value of highly self-regulated students who related to a high level of academic achievement in English differed from those of students who related to a low level of academic achievement in English.

Motivation explains 1,72 percent (contribution to $R^2=0,0172$; $f^2=0,02$) of the variance in academic achievement in English. A one way analysis of variance revealed a statistically significant difference in motivation between students who perform well in English and students who don't perform well in English $F(4,318)=9,01$; $p<0,05$; $f=0,11$. Tukey's *post hoc* comparison revealed that students who perform well in English are more motivated to learn English than students who don't perform well in English. The small effect size ($f=0,11$) though, indicates that this difference is of little educational significance.

Intrinsic value explains 2,84 percent (contribution to $R^2=0,0284$; $f^2=0,04$) of the variance in academic achievement in English. A one-way analysis of variance revealed a statistically significant difference in intrinsic value between students who performed at a higher level in English and students who performed at a lower level in English $F(4,318)=0,95$; $p<0,05$; $f=0,01$. Tukey's *post hoc* comparison revealed that students who performed at a higher level in English achieved higher marks than students who performed at a lower level in English. The small effect size ($f=0,01$) though indicates that this difference is of little educational or practical significance.

Sub-hypothesis 2.1 that *there is a relationship between personal variables such as motivation, intrinsic value and academic achievement in English* can therefore be accepted.

7.8.2 THE RELATIONSHIP BETWEEN ENVIRONMENTAL VARIABLES AND ACADEMIC ACHIEVEMENT IN ENGLISH

With reference to sub-hypothesis 2.2 that *there is a relationship between environmental variables and academic achievement in English*, an analysis of table 7.5 reveals that there is statistically significant correlation coefficient between only one environmental variable i.e., socio-economic status ($r=0,34$) and academic achievement in English. The effect size of this variable is of medium effect which means that the relationship between socio-economic status and academic achievement in English is of average educational or practical significance.

An analysis of table 7.9 revealed that socio-economic status made a statistically significant contribution to R^2. The effect size of socio-economic status ($f^2=0,07$) is small, thus of little educational or practical significance.

Although the effect size was small an ANOVA with Tukey's *post hoc* comparison were performed to determine how students from a higher socio-economic status differed from those of students from a lower socio-economic status with reference to their academic achievement in English.

Socio-economic status explains 4,85 percent (contribution to $R^2=0,0485$; $f^2=0,07$) of the variance in academic achievement in English. A one-way analysis of variance revealed a statistically significant difference in English achievement between students from high socio-economic status families and students from low socio-economic status families $F(4,318)=13,15$; $p<0,05$; $f=0,16$. Tukey's *post hoc* comparison revealed that students from high socio-economic status families achieved better in English than students from a low socio-economic status (also see paragraph 7.5.3.1). The effect size ($f=0,16$) though is small, therefore the difference is of little educational or practical significance.

Sub-hypothessis 2.2 that *there is a relationship between environmental variables such as socio-economic status and academic achievement in English* can therefore be accepted.

7.8.3 THE RELATIONSHIP BETWEEN BEHAVIOURAL VARIABLES AND ACADEMIC ACHIEVEMENT IN ENGLISH

With relation to sub-hypothesis 2.3 that *there is a relationship between behavioural variables and academic achievement in English*, an analysis of table 7.5 reveals that the correlation coefficients between selecting main ideas ($r=0,22$), concentration ($r=0,22$), self-regulated learning ($r=0,30$) and academic achievement in English are of statistical significance. The effect sizes of these variables approach medium effect which means that the relationship of these variables and academic achievement in English is of a medium educational or practical significance ($f=0,20$).

An analysis of table 7.9 reveals that two of the behavioural variables i.e., concentration and self-regulated learning that constitute the best subset of variables make a statistically significant contribution to R^2. The effect sizes of concentration ($f^2=0,05$) and self-regulated learning ($f^2=0,03$) are small, thus of little educational or practical significance.

Although the effect sizes were small, ANOVA's with Tukey's *post hoc* comparison were performed to determine how concentration and self-regulated learning of students who related to a high level of academic achievement in English differed from those of students who related to low level of academic achievement in English.

Concentration explains 3,53 percent (contribution to $R^2=0,0353$; $f^2=0,05$) of the variance in academic achievement in English. A one-way analysis of variance revealed a statistically significant difference in concentration between students on a higher level of academic achievement in English and students at a lower level of academic achievement in English $F(4,318)=5,08$; $p<0,05$; $f=0,06$. Tukey's *post hoc* comparison revealed that students who performed at a high level of academic achievement in English maintained a higher level of concentration when learning English than students who performed at a lower level of academic achievement in English. The effect size ($f=0,06$) though is small, therefore the difference is of little educational or practical significance.

Although strategy use explains 2,30 percent (contribution to $R^2=0,0230$; $f^2=0,03$) of the variance in academic achievement in English, a one-way analysis of variance did not reveal a statistically significant difference in strategy use between students who perform at a higher level of academic achievement in English and students who perform at a lower level of academic achievement in English $F(4,318)=0,62$; $p>0,05$.

Self-regulated learning explains 1,80 percent (contribution to $R^2=0,0180$; $f^2=0,03$) of the variance in academic achievement in English. A one-way analysis of variance revealed a statistically significant difference in self-regulated learning between students who performed at a higher level of academic achievement in English and students who performed at a lower level of academic achievement in English $F(5,317)=8,08$; $p<0,05$; 0,12. Tukey's *post hoc* comparison revealed that students who performed at a higher level of academic achievement in English are more self-regulated in academic achievement in English than students who performed at a lower level of academic achievement in English. The effect size ($f=0,12$) though indicates that this difference is of little educational or practical significance.

Sub-hypothesis 2.3 that *there is a relationship between behavioural variables such as concentration, strategy use, self-regulated learning and academic achievement in English* can be accepted.

It was established that concentration, self-regulated learning and strategy use influenced academic achievement in English. It was also established that students who performed at a higher level of academic achievement in English maintained concentration longer and

were more self-regulated in achievement in English. In contrast, students who performed at a lower level of academic achievement in English could not concentrate well and were less self-regulated in achievement in English.

Although strategy use was found to influence academic achievement in English, no differences were found between high achievers and low achievers in English.

7.9 *THE RELATIONSHIP BETWEEN PERSONAL, ENVIRONMENTAL AND BEHAVIOURAL VARIABLES AND ACADEMIC ACHIEVEMENT IN MATHS*

To test hypothesis 3 that *there is a relationship between personal, environmental and behavioural variables and academic achievement in maths*, all the independent variables mentioned in paragraph 7.5.1 (also see table 7.10) were subjected to a multiple regression analysis with academic achievement in maths as a dependent variable to determine the collective and individual contribution of the independent variables to R^2. An analysis of table 7.10 revealed that the complete set of independent variables explains 26,95 percent ($R^2=0,2695$; $R^2_a=0,1078$) of the variance in academic achievement in maths (see table 7.10).

TABLE 7.10: The collective and individual contribution of the complete set of the variables to R^2. Criterion: academic achievement in maths.

$R^2=0,2695$ ($R^2_a=0,1078$); Cp=26,0

Variables	Regression coefficient	Contribution to R^2	F-value	Effect size f^2
Age	-2,96	0,0182	2,84	0,02
Attitude	1,51	0,0066		
Motivation	0,46	0,0005		
Time management	0,65	0,0008		
Anxiety	-2,86	0,0193	3,02	0,03
Concentration	0,34	0,0003		
Information processing	0,14	0,0001		
Selecting main ideas	-0,76	0,0006		
Study aids	-1,72	0,0079		
Self-testing	1,15	0,0034		
Test-taking strategies	-0,15	0,0001		
Self-efficacy for academic achievement	2,03	0,0128	2,00	0,02
Self-efficacy for self-regulated learning	-0,40	0,0009		

(TABLE 7.10: continued)

Self-efficacy for enlisting parents and community support	-3,00	0,0232	3,62	0,03
Intrinsic value	1,09	0,0103	1,62	0,02
Strategy use	-0,97	0,0103	1,62	0,02
Socio-economic status	-6,33	0,0163	2,54	0,02
Family	-1,63	0,0329	5,14*	0,04
Living space	5,68	0,0365	5,70*	0,05
Goal setting	0,07	0,0131	2,05	0,02
Self-efficacy for social resources	1,64	0,0072		
Home support	-0,01	0,0000		
Maths goal	-0,14	0,0123	1,93	0,02
Teacher support	-0,14	0,0003		
Self-regulated learning	1,64	0,0200	3,11	0,03
	* $p<0,05$	Small effect	$f^2 = 0,02$	
	** $p<0,01$	Medium effect	$f^2 = 0,15$	
		Large effect	$f^2 = 0,35$	

By using the BMDP=9R procedure with method=RSQ the best subset of independent variables i.e., the smallest subset of independent variables that contributes the most to R^2 was identified by applying the Cp criterion (see table 7.11).

TABLE 7.11: The collective and individual contribution of the variables in the best subset of variables to R^2. Criterion: academic achievement in maths.

$R^2=0,1823$ ($R^2_a=0,1583$); Cp=26,0

Variables	Regression coefficient	Contribution to R^2	F-value	Effect size f^2
Age	-3,9688	0,0359	10,88**	0,04
Self-efficacy for academic achievement	1,2225	0,0199	6,03*	0,02
Self-efficacy for enlisting parents and community support	-1,6656	0,0107	3,24	0,01
Socio-economic status	-10,0954	0,0513	15,55**	0,06
Family	-0,5775	0,0053	1,66	0,01
Living space	3,8140	0,0234	7,09**	0,03
Self-regulated learning	1,2649	0,0244	7,39**	0,03
	* $p<0,05$	Small effect	$f^2 = 0,02$	
	** $p<0,01$	Medium effect	$f^2 = 0,15$	
		Large effect	$f^2 = 0,35$	

This subset was then subjected to a further multiple regression analysis to determine the contribution of each independent variable to R^2 (see table 7.11). An analysis of table 7.11 reveals that the seven independent variables comprising the best subset of variables

together explain 18,23 percent (R^2=0,1823; R^2_a=0,1583) of the variance in academic achievement in maths.

7.9.1 THE RELATIONSHIP BETWEEN PERSONAL VARIABLES AND ACADEMIC ACHIEVEMENT IN MATHS

With reference to sub-hypothesis 3.1 that *there is a relationship between personal variables and academic achievement in maths*, an analysis of table 7.5 reveals that there is a statistically significant correlation between only one personal variable i.e., intrinsic value (r=0,27), and academic achievement in maths. The effect size of this variable has a medium effect, which means that the relationship of this variable and academic achievement in maths is of medium educational or practical significance (the effect size is 0,27).

An analysis of table 7.11 reveals that only two of the personal variables (i.e., age and self-efficacy for academic achievement form part of the best subset of variables that constitute a statistically significant contribution to R^2. The effect sizes of age (f^2=0,06) and self-efficacy for academic achievement (f^2=0,02) are small, thus of little educational or practical significance.

Although the effect sizes were small, ANOVA's with Tukey's *post hoc* comparison were performed to determine how age and self-efficacy for academic achievement differed between younger and older students with regard to their academic achievement in maths.

Although age explains 3,59 percent (contribution to R^2=0,0359; f^2=0,04) of the variance in academic achievement in maths, a one way analysis of variance did not reveal a statistically significant difference in maths achievement between younger and older students $F(13,300)=0,89$; $p>0.05$.

Although self-efficacy for academic achievement explains 1,99 percent (contribution to R=0,0199; f=0,02) of the variance in academic achievement in maths, a one way analysis of variance did not reveal a statistically significant difference in maths achievement between students who perform at a higher level of academic achievement in maths and students who perform at a lower level of academic achievement in maths $F(5,308)=0,85$; $p>0,05$.

Sub-hypothesis 3.1 that *there is a relationship between personal variables and academic achievement in maths* could only be accepted with reference to personal variables such as age and self-efficacy for academic achievement.

It was established that age and self-efficacy for academic achievement influenced academic achievement in maths, but it could not be established whether there were differences in maths achievement between younger and older students and between students with a high self-efficacy for academic achievement and those with lower self-efficacy for academic achievement.

7.9.2 THE RELATIONSHIP BETWEEN ENVIRONMENTAL VARIABLES AND ACADEMIC ACHIEVEMENT IN MATHS

With relation to sub-hypothesis 3.2 that *there is a relationship between environmental variables and academic achievement in maths*, an analysis of table 7.5 reveals that there are statistically significant correlations between some of the environmental variables and academic achievement in maths. There is a statistically significant relationship between socio-economic status ($r=-0,20$) and living space ($r=0,20$) and academic achievement in maths. The effect sizes of these variables indicate a medium effect which implies that the relationship of these variables and academic achievement in maths are of medium educational or practical significance (the effect sizes of both variables equal 0,20).

An analysis of table 7.11 reveals that socio-economic status and living space form part of the best subset of variables that make a statistically significant contribution to R^2. The effect sizes of socio-economic status ($f^2=0,06$) and living space ($f^2=0,03$) are small, thus of little educational or practical significance.

Although the effect sizes were small, ANOVA's with Tukey's *post hoc* comparison were performed to determine how socio-economic status and living space of students who related to a high level of academic achievement in maths differed from those of students who related to a low level of of academic achievement in maths.

Socio-economic status explains 5,13 percent (contribution to $R^2=0,0513$; $f^2=0,06$) of the variance in academic achievement in maths. A one-way analysis of variance revealed a statistically significant difference in maths achievement between students from high socio-economic status families and students from low socio-economic status families $F(4,309)=2,61$; $p<0,05$. Tukey's *post hoc* comparison revealed that students who were from low socio-economic status families achieved significantly better in maths than students from high socio-economic status families (also see paragraph 7.5.3.1).

Living space explains 2,34 percent (contribution to $R^2=0,0234$; $f^2=0,03$) of the variance in academic achievement in maths. A one-way analysis of variance revealed a statistically significant difference in living space between students who had enough living

space and students who had less living space $F(5,308)=4,16$; $p<0.05$; $f=0,06$. Tukey's *post hoc* comparison revealed that students who had less living space achieved better in maths than students who had enough living space. The effect size though, is small ($f=0,06$), therefore the difference is of little educational or practical significance.

Sub-hypothesis 3.2, that *there is a relationship between environmental variables such as socioeconomoc status, living space and academic achievement in maths* can therefore be accepted.

7.9.3 THE RELATIONSHIP BETWEEN BEHAVIOURAL VARIABLES AND ACADEMIC ACHIEVEMENT IN MATHS

With reference to sub-hypothesis 3.3 that *there is a relationship between behavioural variables and academic achievement in maths*, table 7.5 indicates that there are no statistically significant correlations between the behavioural variables, viz., time management, information processing, selecting main ideas, study aids, self-testing, test-taking strategies, and strategy use and academic achievement in maths. It can therefore not be concluded that there is no relationship between the behavioural variables and academic achievement in maths in this research.

An analysis of table 7.11 also reveals that there is only one behavioural variable (i.e., self-regulated learning) that constitutes the best subset of variables that make a statistically significant contribution to R^2. The effect size of self-regulated learning ($f^2=0,03$) is small, thus of little educational or practical significance.

Although the effect size was small, an ANOVA with Tukey's *post hoc* comparison were performed to determine the influence of self-regulated learning between students who related to a high level of academic achievement in maths differ from those students who related to a low level of academic achievement in maths.

Although self-regulated learning explains 2,4 percent (contribution to $R^2=0,0244$; $f^2=0,03$) of the variance in academic achievement in maths, a one-way analysis of variance did not reveal a statistically significant difference in the infuence of self-regulated learning between students who related to a high level of academic achievement in maths and students who related to a low level of academic achievement in maths $F(5,308)=1,72$; $p>0,05$.

Sub-hypothesis 3.3, that *there is a relationship between behavioural variables and academic achievement in maths* could only be accepted with reference to such behavioural variable as self-regulated learning.

It was established that self-regulated learning influenced academic achievement in maths, but it could not be established whether there was a difference in the maths of high achievers and low achievers in maths. There were differences between groups of subjects (the ANOVA's) but these differences are of little educational or practical significance, except for strategy use, socio-economic status and self-regulated learning.

7.10 CONCLUSION

TABLE 7.12: Comparison between independent variables that have an influence upon the three dependent variables, i.e., self-regulated learning, English and maths.

Independent variables	Dependent variables		
	SRL	English	Maths
Personal variables			
1. Age			✓
2. Attitude	✓		
3. Self-efficacy for academic achievement			✓
4. Intrinsic value	✓	✓	
5. Motivation		✓	
Environmental variables			
6. Socio-economic status		✓	✓
7. Living space			✓
Behavioural variables			
8. Concentration	✓	✓	
9. Selecting main ideas	✓		
10. Study aids	✓		
11. Strategic use	✓	✓	
12. Self-regulated learning		✓	✓

An analysis of table 7.12 reveals that in comparing self-regulated learning, academic achievement in English and maths, intrinsic value (a personal variable) and the behavioural variables concentration and strategy use influenced both self-regulated learning and academic achievement in English.

Self-regulated learning was further influenced by attitude, selecting main ideas and study aids, while academic achievement in English was influenced by motivation.

A comparison of the variables that affect academic achievement in English and maths reveals that both were influenced by socio-economic status (an environmental variable) and self-regulated learning (a behavioural variable) while intrinsic value, motivation, concentration and strategy use affected achievement in English, but not maths and age, self-efficacy for academic achievement and living space affected achievement in maths, but not English.

It was also established that students who were more self-regulated had a more positive attitude towards learning, were characterised by higher intrinsic value, were better at selecting main ideas, could maintain concentration longer, used more study aids and more learning strategies than students who were less self-regulated. These differences though, were not of much educational significance, except for strategy use, socio-economic status and self-regulated learning. Students who were self-regulated and from high socio-economic status families differed significantly in strategy use from less self-regulated students.

With reference to the variables that affect academic achievement in English, it was established that high achievers in English were more motivated, were characterised by higher intrinsic value, came from high socio-economic status homes, could maintain concentration longer and were more self-regulated than low achievers in English. Thus, it could be inferred from table 7.12 that intrinsic value influenced self-regulated learning and academic ahievement in English, while age and self-efficacy for academic achievement had a positive influence in academic achievement in maths, and motivation influenced achievement in English whereas attitude had a positive influence in self-regulated learning.

With reference to environmental variables, an analysis of table 7.12 reveals that socio-economic status had a positive influence in English and maths while living space influenced only achievement in maths.

With relation to the influence of behavioural variables on self-regulated learning and achievement in English and maths, an analysis of table 7.12 reveals that concentration and strategy use had a positive influence in self-regulated learning and the achievement in English. Self-regulated learning influences academic achievement in English and maths, while selecting main ideas and study aids influenced self-regulated learning.