CASE STUDY 5 – TOWARDS THE 21ST CENTURY – NEW TRENDS IN TERTIARY EDUCATION. THE FIRST SEMESTER OF 1998.

[Blignaut & Venter, 1999]

Quantitative and qualitative data were collected from two groups in the first semester of 1998, namely Statistics (second year STA215) and Computer Science (third year CS314).

Results of the Statistics class - 1998 (first semester)

Descriptive statistics

The class consisted of 88 students of whom 46.9% were female. The students came from varied cultural backgrounds. The home languages spoken were as follows: 33.3% spoke Xhosa, 22.2% spoke English, 28.4% spoke Afrikaans and 16% spoke other African languages such as Zulu, Sotho, Venda, etc. Eighty-one percent were B.Sc. students; the remainder were B.Com. students. It is interesting to note that 17.7% changed their course (direction) since initial course registration. Forty-seven percent were younger than 21 years and only 13.6% older than 23 years. Only 10.4% obtained a matriculation average of an A or a B.

Only 11.4% of the class used their own computer at home and only 33.3% used e-mail or the Internet on a regular basis. Ninety-one percent of the students enjoyed the course and 90% enjoyed the way the class was conducted. The attendance of lectures was thus very high (84%). It is disappointing however, that only 12.5% indicated that they prepared prior to attending lectures and 44% said they prepared sometimes. The group method of lecturing was preferred above conventional lectures by 77.5% of the students. The majority of students (61.5%) had their first contact with computers at university.

Inferential statistics

Language comparisons

Significantly more of the African home language speakers said they kept their thoughts and feelings to themselves when doing group work and said group members influenced them. The African language speakers were more positive about working in a group; however, they disagreed with the statement "*It was interesting to see how people rated me*". More African language speakers felt prejudiced towards members of other cultures - before group work. Significantly more of the African home language speakers said they kept their thoughts and feelings to themselves when doing group work.

The non-African language speakers used the Internet on a more regular basis. More English and Afrikaans home language speakers expressed support when ideas were disclosed. More of the Afrikaans speakers disagreed with the statement *"I am influenced by group members"* compared to the English and African home language speakers. In general the English speakers felt group members probably influenced them.

Significantly more of the Afrikaans and English home language speakers achieved a matric average of an A, B or C. Only 23% of the African language speakers used a computer before entering university, whereas 41% of the Afrikaans and 70% of the English home language speakers made contact with computers before university level.

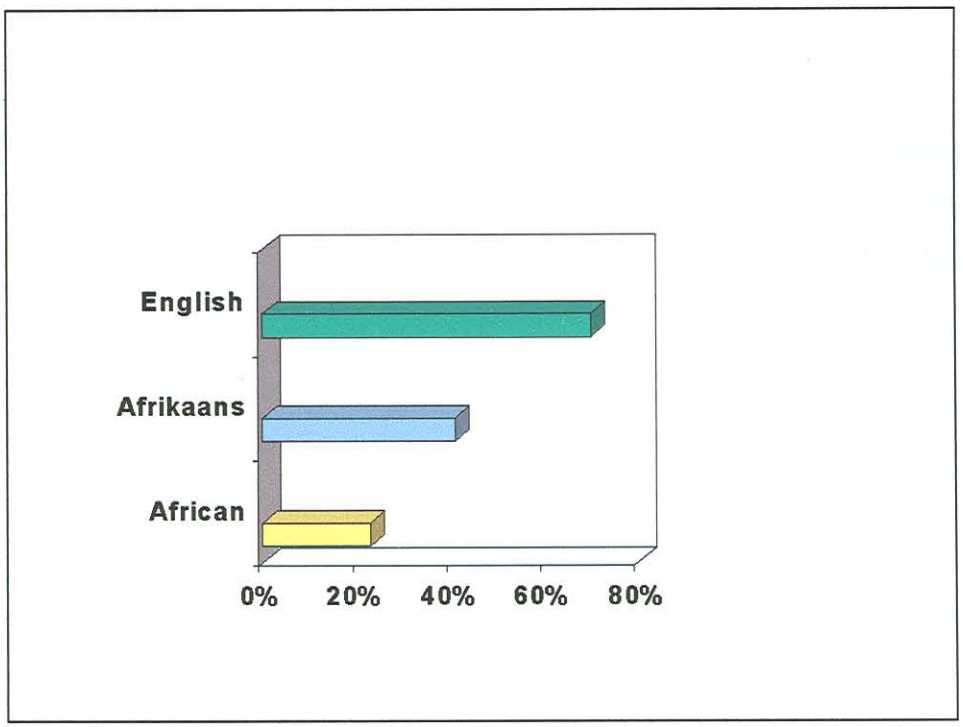

FIGURE 24: Percentage of the language group that used computers before attending university

More of the Afrikaans home language group said they found it difficult to express their thoughts in English. None of the Afrikaans speakers said that little help was available whilst doing practicals. More Afrikaans and English speakers used their own computers at home. The majority of English home language speakers used e-mail regularly. More Afrikaans home language speakers prepared before attending class.

Degree

More B.Sc. students found it interesting to look at the mind maps of other groups and B.Com. students said they had gained insight into their team roles.

Gender

Females were more likely to discuss their ideas, feelings and reactions to what was taking place within the group. Male students were less inclined to take risks in expressing new ideas and feelings, and were not as positive about working in groups.

Females felt that they got help from group members when they needed this. Fewer males agreed that the Belbin team profile was a good reflection of their personality. Males enjoyed doing assignments more than their female counterparts. More male students disagreed with the statement *"Computer practicals were difficult"*. More male students used a computer at home. The male students used e-mail significantly more and accessed the Internet on a more regular basis.

Age

All the older students felt that the group's contributions were useful and that the mind maps increased their understanding of the subject. More of the younger students felt that the group included them in what they were doing. The male students are significantly older compared to the females.

More of the younger students obtained an A, B or C as their matric average compared to the older students who generally obtained a D or E. Many older students had obtained another qualification prior to enrolling for this course. The older students preferred formal to informal lectures.

For many of the older students this course was their first encounter with computers. Significantly more of the younger students had been exposed to computers at school level.

Mark comparisons

Females outperformed their male counterparts in the group work mark. Although not significant, the male students did better in the computer examination. In the 1997 study, significant differences were found when the male students obtained higher marks in the computer examinations, in both semesters, compared to the females.

No significant differences were found when comparing the B.Sc. and B.Com. groups with respect to the various marks.

The English and Afrikaans home language speakers outperformed the African language students in the computer examination, the semester, exam and final mark.

No significant differences in the marks of the two age groups were found. Students who registered prior to 1996 obtained significantly lower marks in the STA215 exam and final sections of the mark composition.

Qualitative research findings

E-mail survey questions and answers

Each group needed to respond to the following questionnaire via e-mail. In total three groups did not respond at all and two groups did not respond to all the questions asked.

QUESTIONS ASKED TO EACH GROUP	POSITIVE RESPONSE	INDIFFERENT RESPONSE	NEGATIVE RESPONSE
Did you enjoy working in a group?	6	4	2
What do you think of the Belbin roles?	6	1	5
Have you changed your way of learning?	8	1	2
Did working in the group change your perceptions of people in your class?	8	0	2
Did the mind map help you to understand the work?	8	0	2
How do you rate the practicals?	5	2	2
Were the tests reasonable?	9	1	0
Computer assignments (Statistics group)	6	4	0
Did you find the lecturing style acceptable?	11	1	0

TABLE 8: Summary of e-mailed responses to questionnaire posed to the Statistics class

Questionnaire comments

Each student completed a self-administered questionnaire at the end of the semester. In this questionnaire students could add individual comments.

Students were positive about using the mind maps and the method of lecturing. As reflected by the students [Blignaut & Venter, 1999: Appendix G(i), 1 – 3]:

> *I think that mind maps are very useful and you should stick to the way in which you conduct your lectures. I have really enjoyed the way in which lectures were conducted. Although I didn't really like the group work, it gave me insight to how people are and to what I was capable of doing.*
>
> *I enjoyed doing this course and I am going to pass it.*

If funds are available, additional assistants will be employed to assist students during group work sessions. This was a problem identified by the students:

> *During practical periods more assistants should be available.*

This teaching method goes beyond that of teaching subject matter. This comment summarizes the outcome of this teaching strategy [Blignaut & Venter, 1999: Appendix G(ii), 4]:

> *The course goes beyond the teaching theory and subject matter. The group work helped me to assess my communication skills and weaknesses. Eventually, all courses should be this way.*

Results of the Computer Science study group - 1998 (first semester)

Quantitative research findings

Descriptive statistics

The class consisted of 49 students of whom 45.5% were female. The students came from varied cultural backgrounds. The home languages spoken were as follows: 29.5% spoke Xhosa, 36.4% spoke English, 15.9% spoke Afrikaans and 18.2% spoke other African languages such as Zulu, Sotho, Venda, etc. Seventy-four percent were B.Sc. students; the remainder were B.Com. students. It is interesting to note that 18.6% changed their course (direction) since initial course registration. Twenty-three percent were younger than 21 years and only 23% were older than 23 years. Only 4.7% obtained a matriculation average of an A or a B.

Only 23.8% of the class used their own computers at home, only 72.1% used e-mail and 66.7% used the Internet on a regular basis. Fifty-six percent of the students enjoyed the course but only 40% enjoyed the way the class was conducted. In spite of this the attendance of lectures was very high (88%). It is disappointing, however, that only 25.6% indicated that they prepared prior to attending lectures and 46.5% said they prepared sometimes. The group method of lecturing was preferred above conventional lectures by 35% of the students and 25.6% were undecided. The majority of students (58.1%) had their first contact with computers prior to university. Forty-four percent felt that concepts were difficult due to the language and another 30.2% were undecided.

Inferential statistics

Significantly more of the African home language students felt that the group work gave them an opportunity to talk and discuss the study material. More of the African students liked the way the class was conducted (lectures combined with group work) and they indicated that they

paraphrased or summarized what other members had said before they responded or made a comment. None of the African language students used their own computers at home.

Significantly more English-speaking students felt the strongest about the following comment "*Mind maps do not help me when studying the relevant sections*". Significantly more of the non-African language students used their own computers at home. More of the Afrikaans students changed their courses during their study period.

Degree

B.Sc. students felt that group members accepted them just the way they were. Significantly more of the B.Sc. students could identify with this comment *"My fellow group members tell me when I bother them"* and they felt that mind maps increased their understanding of the subject.

The B.Com. students found it easier to remember the important facts once the mind map had been drawn.

Gender

The male students felt that the group work helped them to understand the study material better, whereas the majority of females were unsure. More of the male students felt that group work allowed them to be more dependable and to do their assignments. Significantly more of the male students felt that the textbook was easy to read.

The female students felt that the presentation gave them the opportunity to learn about other aspects of computer science. All the females felt that their group members valued them as persons apart from their skills or status.

Age

More of the older students disagreed with the following statement *I give support to group members who are struggling to express themselves intellectually.* However, when other members disclosed their ideas, feelings and reactions to what was currently taking place in the group, they felt that they could express acceptance and support. Significantly more of the older students felt that group work gave them the opportunity to talk about and discuss the study material.

Mark comparisons

It is interesting to note that the test and year marks correlated significantly with the exam mark. No significant differences were found between the marks of the genders or between the marks of the B.Sc. and B.Com. students.

The non-African language students did significantly better in their examination and subsequently the final mark (combination of the year mark and the exam mark) was also significantly better. The younger students did significantly better in tests.

Qualitative research findings

E-mail survey questions and answers

It was expected of each group to report weekly (via e-mail) on their progress. This was done partly to allow groups to manage their time more efficiently, but also to keep the communication lines open between lecturer and students. It was successful in that it allowed the lecturer both to monitor the groups and their group function carefully, but also to intervene when necessary.

Some groups gave excellent reports on their progress and the development of the team coherence could be seen [Blignaut & Venter, 1999: Appendix GG, 1 – 17]:

> *We are uncertain as to how we involve Th-- as he is seldom present in lectures (he is working and everyone is sympathetic to his situation).*

And then in a subsequent e-mail:

> *We were uncertain of Th--'s role in the group's activities, but he has been present often lately and has presented us with lots of valuable info on our topics.*

Another group were less positive and commented:

> *Our group had problems such as non-attendance and sometimes non-cooperation. The non-attendance made it difficult for some of us to finish in time and that was the same reason that caused the lateness of the presentation. We agreed that by the 24th everything would be finished but to my surprise we were not even halfway. Being in a group taught me something, that if you see that someone is failing, then try to take over because at the end of the day the whole group will suffer.*

The following were some of the comments made during the weekly e-mailed reports [Blignaut & Venter, 1999: Appendix GG, 1 – 17]:

> *Insufficient lectures, but when there was one you had an excellent lecturing style. It was relaxed and it did not seem like a lecture.*

> *The CS314 course was an interesting experience in how the normal way of lecturing can be transformed into something creative, and exciting.*

> *I sometimes sit down and listen to classic music and think about how good you have been to all of us. I really enjoyed doing group work, you know, dividing work among a group of people really makes life easier. Thanks once again for coming up with a master plan.*

> *Enjoyment? - So far, it was interesting, - It was different!*

The mind maps kept us up to date with the chapters. It put all the chapters into perspective.

Very early in the term, the groups were asked to respond to an e-mailed questionnaire (via e-mail).

E-MAIL QUESTIONNAIRE	POSITIVE RESPONSE	INDIFFERENT RESPONSE	NEGATIVE RESPONSE
Did you enjoy working in a group?	6	-	2
What do you think of the Belbin roles?	4	2	2
Have you changed your way of learning?	5	1	2
Did working in the group change your perceptions of people in your class?	7	0	1
Did the mind map help you to understand the work?	5	2	1
Did you enjoy UNIX?	5	4	-
Difficulty of tests – was it easy?	2	3	3
Amount of work – just right?	1	-	7
Mind maps in test - was it helpful?	4	3	1
Was the presentation of literature survey a worthwhile endeavour?	5	-	3
Is the lecturing style satisfactory?	1	4	3
Do you understand the work?	2	6	-
Did you enjoy the course?	3	4	1

TABLE 9: E-mailed comments on the Computer Science course

Only one group did not respond at all. The table (*Table 9*) is a brief summary of the questionnaire. It seems as if this class (contrary to previous classes) did not enjoy the way lectures were presented but they did enjoy the group work. This tendency was confirmed by the quantitative analysis.

Questionnaire comments

Each student completed a self-administered questionnaire at the end of the semester. In this questionnaire students were invited to make individual comments. Twenty-two of the 49 students responded; of these ten were positive, eight gave positive criticism and four were negative.

A student who was positive about group work and drawing mind maps commented as follows [Blignaut & Venter, 1999: Appendix GG, 1 – 17]:

> *The implementation of group work and mind maps is a good idea. Because being a student is not how much you can cram in for a test or the exam but more about your understanding of the course. What I can say is that it was a lot of work and juggling our time between Computer Science and our other subjects was extremely difficult and stressful. But I assume that this was good when put under pressure under working conditions.*

Others experienced group work positively, although one had some reservations:

> *On my part the way the course was presented was very good. It actually gives us strength, confidence to actually explore the computer on our own.*
>
> *I like group working, help communicate with other people.*
>
> *Implementation of lectures in a group approach is good, since the practice is also implemented in groups. However, it's a long way to find team members who will cooperate effectively. I am aware of need for working in teams; however, due to present grouping, I did not enjoy it as much....*

Some gave positive criticism:

> *The CS314 had helped me a lot in improving my self-esteem and to work in a group environment. More time must be scheduled for more topics to be presented in class by the lecturer.*
>
> *I loved this way of presenting the lectures, but there are a few concerns. My suggestion is to have lectures on the particular chapters to be covered that week, the first few periods of the week and then assigning work projects/assignments for the group to do for the rest of the week. I think that the project discussions have dominated group sessions and little or no time was spent on the actual course work.*
>
> *The grouping idea is fine and did work for us to know others and discuss certain topics of our study. I feel the textbook is unnecessarily repeating certain things. The mind maps only helps when you have used it while studying. The presentation is a frightening experience especially because it's done in a big venue. I feel we had too little time to do a lot of things and having had time we would have done better. I have gained a lot from the course.*

To summarise, it seems as if the students enjoyed the group approach but felt uncomfortable with the style of lecturing. They come from a background of formal lectures and feel safe in such an environment. In future the traditional lectures ("chalk-and-talk") should perhaps be phased out more gradually and students should be eased into a teamwork/cooperative learning environment more slowly.

RESEARCH QUESTION	INTERVENTION	RESULTS OF CASE STUDY 5
TEAM CONSTITUTION How should teams be constituted?	Belbin team-role theory used to constitute balanced teams in 1998.	Some commitment problems could be resolved in both Computer Science and Statistics groups. Belbin constituted teams seem to be more successful.
FORMAL/INFORMAL LECTURE RATIO How often should small group learning be alternated with plenary sessions and formal lectures?	Formal lecture given once or twice a week; the rest of the time is spent in small group learning situations.	Statistics group enjoyed informal lectures (77.5%); in contrast 40% of the 1998 Computer Science group indicated that they preferred formal lectures.
SUCCESSFUL LEARNING What could be considered a successful learning experience?	Cooperative learning (where students help/teach each other) and mind mapping was used again.	Data indicate that it was successful – *The course goes beyond teaching theory and subject matter … eventually all courses should be this way.*
MEASURING SUCCESS How is success measured?	▪ Academic achievement ▪ Conceptual learning ▪ Equity ▪ Prosocial behaviour	- *…mind maps put chapters into perspective…* - -
ASSESSMENT How should students be assessed?	Continuous evaluation with less emphasis on examinations – these are still necessary as the university requires examinations.	Have not established which ratio would best reflect the learning that has taken place.

TABLE 10: Summary of the results of CASE STUDY 5 in terms of the research questions

The next study is a meta study of some of the previous case studies. The number of students in each of the separate case studies prevented such an investigation, as the variations of team-role profiles are too many to do any significant statistical analyses. In the meta study the data of the 1997 and 1998 case studies were collated in order to allow valid quantitative analyses on the team role data of the combined group.

META STUDY: TO EXAMINE TEAM ROLES, A STUDY (USING THE DATA OF THREE OF THE CASE STUDIES) WAS UNDERTAKEN.

Introduction

The data of the 1997 and 1998 case studies have been combined to form a data set of 203 students; it increased the sample size and thus allowed valid quantitative analyses on the groupings of team roles. (The 1995 and 1996 study periods' data could not be used as the 1995 data was qualitative data only and the 1996 questionnaire and that of the 1997/1998 cycles differed.) Only the three dominant team roles of each student were used for analyses. These were then grouped into four groupings (control, ideas, leadership and support) as well as three groupings (acting, social and thinking) for further analyses.

Method

The students who participated in the study were a combination of Computer Science (48.3%) and Statistics students (51.7%). One record of a student who repeated a course, or who took courses in both Computer Science and Statistics, was kept and the other deleted so that no student was duplicated on the data set. For each of the students with duplicate records, the record with the highest final mark was kept (See Appendix D).

Results

Forty-seven percent of this combined group was female and the majority was older than 21 (70.6%). Interestingly, Computer Science is still male dominated (58%) and Statistics attracted more females (53%). Two thirds are studying towards a B.Sc. degree (66.7%) and one third towards a B.Com. degree. Their home languages are: Xhosa (25.5%), English (32.3%), Afrikaans (19.3%) and other African languages such as Zulu, Ndebele, South Sotho, etc. (22.9%) (See *Figure 25*).

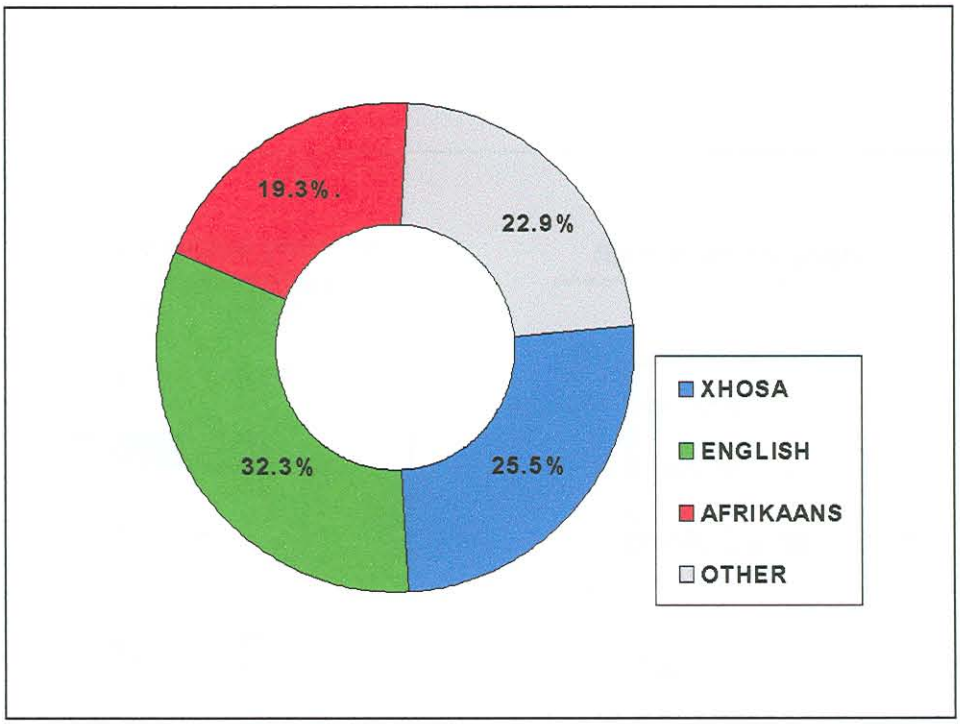

FIGURE 25: Home languages of the combined group

Although the group method of lecturing (opposed to conventional lectures) was preferred by only 56.3%, the majority (65.8%) enjoyed working in a group and liked the way the class was conducted (69.6%). Most of the students (75.5%) felt that the group motivated them to do their share. Significantly more of the female students felt that they learnt to work in a team ($\chi^2 = 7.552$, $p = 0.023$).

Once again it is disappointing to note that only 42.3% access the Internet regularly and of these the majority are men ($\chi^2 = 13.373$, $p = 0.001$). Only a mere 23.9% use a computer at home. Students from this combined group (of 203 students) felt that it was easier to remember the relevant facts after drawing the mind map (78.9%) and that all the relevant information

was included in the mind map (71.1%). Most felt that they had gained insight into their strengths and weaknesses (78.1%) according to Belbin.

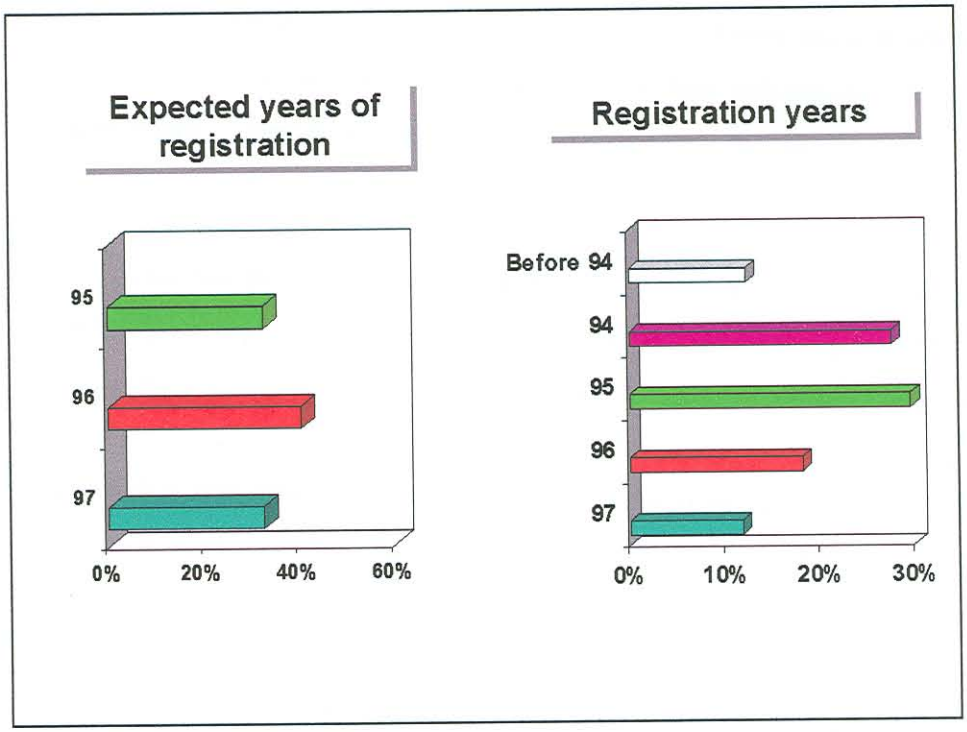

FIGURE 26: Years of registration

The data of this meta study was collected during the 1997 and 1998 academic years. At the time the students were either in their second academic year (the Statistics group) or third academic year (the Computer Science group). It is thus normal to expect that the students of the combined group would have registered in 1995 (27.1%), 1996 (40.4%) and in 1997 (32.5%). However, the picture is quite different – see *Figure 26*.

A co-researcher and industrial psychologist, Deon Stoltz, interpreted the data as follows.

Belbin's research indicates that the overrepresentation or underrepresentation of team roles (imbalances) in teams cause predictable problems, unless the teams are made aware of these imbalances and taught appropriate coping strategies. Experience in the management development arena has confirmed these findings.

The team-role profiles of the Computer Science group of students reveal a high representation of the control roles (30.6%) and ideas roles (33.7%). This indicates that they will be able to develop and implement ideas in a fairly well-organised fashion in a learning situation. However, the danger exists that new ideas will be implemented by "trial-and-error", because the Monitor Evaluator role makes for only 20% of the control roles. The presence of the Completer Finisher role (20% of control roles and 6.1% of all team roles) is also low and, as a result, a lack of attention to detail may lead to omissions and unnecessary mistakes in the learning situation.

The Plant role (88% of the ideas roles) is well represented and should lead to an abundance of self-generated ideas and alternatives to explore. However, the learning teams may find it difficult to identify the better ideas, because of the low representation of the Monitor Evaluator role (6.1% of all the team roles and only 20% of the control roles). The teams may also be subjected to disruptive conflict. Experience indicates that a high incidence in teams of individuals who display a combination of Plant and Shaper team-role strengths and weaknesses leads to overly egocentric behaviour. The Resource Investigator accounts for only 12% of the ideas roles (4.1% of all team roles), and this may cause an inward focus (lack of "investigative" interaction with other teams or their learning environment, thus "re-inventing the wheel").

The learning teams (of the Computer Science group) may experience a strong sense of urgency (the Shaper role accounts for 81% of the leadership roles and 13.3% of all team roles), but this can lead to the suppression of valuable contribution from other less assertive team members. When considering the frequency of role 1 (the most dominant role) of this group it reaffirms the above contention. Investigative skill and the ability to listen with insight need to be developed, as the natural representation of these skills in this group is low.

The students studying Statistics seem to be a more diverse group with a more balanced representation in all the role groupings. When considering each student's two most dominant team roles, it seems as if assertive leadership and implementation skills are well represented within the group, but that there is a shortage of coordinating and analytical skills.

When comparing the relationship of the first, second and third most dominant team-role groupings of the composite group (Computer Science and Statistics), some interesting findings come to the fore (see *Table 11*). It is noted that when the control roles are most dominant, it is followed by Support roles in both the second and third positions. A possible explanation for this pattern is the very low incidence of the Completer Finisher and Monitor Evaluator roles, especially in the Computer Science group (both 6.1%).

A very interesting observation, however, is the lack of any consistency following the ideas roles in the most dominant position. This has been observed constantly over many years of team-role profiling.

FIRST DOMINANT ROLE GROUPING	MOST LIKELY SECOND DOMINANT ROLE GROUPING	MOST LIKELY THIRD DOMINANT ROLE GROUPING
Control	Support	Support
Support	Control	Ideas
Leadership	Ideas	Control
Ideas	Any	Any

TABLE 11: Cross-tabulation of team roles (See Appendix D)

Even though the perception may be that students whose dominant roles are in the thinking and leadership categories should be the high achievers this was not found to be so (See *Mark comparisons within role groupings*, Appendix D). For each of the role groups the average final mark achieved was *very* similar, therefore dominancy of role grouping has no bearing on achievement.

Discussion and conclusion

In this chapter the study period was broken up into and discussed in five distinct periods. As pointed out before, although the research methodology used was not that of the case study, each period was discussed as a unique but interlinked case study. The research methodology used in this study is typical of the grounded approach, where advantage was taken of emergent themes [Pandit, 1996]. According to Pandit the grounded theory is not generated *a priori* and then tested, rather, it is "*inductively derived*" at. ("*Theoretical saturation*" is reached when similar instances are seen again and again. It then becomes necessary to move on to the investigation of a new category.)

At this stage it is probably necessary to "stand back" and re-evaluate what has been achieved with this longitudinal research effort.

Groups were constituted with the aid of Belbin's [1993] team-role methodology. Belbin defines a team role as –

> *...a pattern of behaviour characteristic of the way in which one team member interacts with another where his performance serves to facilitate the progress of the team as a whole.*

He maintains that each of the nine identified team roles has a distinctive contribution to make to successful team functioning. These team roles are: Plant, Resource Investigator, Coordinator, Shaper, Monitor Evaluator, Teamworker, Implementer, Completer Finisher, and Specialist. Each team role has a set of "allowable" weaknesses associated with it, and Belbin describes these allowable weaknesses as the cost of the positive contribution to the team of the team role.

Some common threads run through all the years of the research. The language of instruction is a foreign language for most of the students and is therefore one of the main reasons students resort to verbatim studying. The use of cooperative learning addresses this problem as it allows students to express themselves in the language of the subject and also creates an opportunity for them to verbalise their understanding of the work in a small, familiar and empathetic group.

Most of the students, in their second or third academic year, are older than 21 years of age. (And a relatively large proportion of the students in their third academic year are older than 23.) It was initially assumed that many students start their university career at a later stage, which would underwrite the assumption that students are from academically disadvantaged backgrounds. However, when looking at the years since registration of these students, it was found that fewer than 20% of academic second-year

students are indeed in their second year at university (*Figure 26*). Most spend three or more years to reach their second academic year. It would thus seem that students generally need more than the required three years to complete their bachelor degrees and are using a year (or more) at university to bridge the gap between school and university. It is thus clear that many of the students' schooling did not adequately prepare them for tertiary education. On the other hand, the backlog that many experience in their first year is eradicated by the time that they reach their third year (*Figure 20*).

In one of the case studies it was possible to compare the traditional lecturing method ("chalk-and-talk") with the small group learning method. It was found that students did significantly better when the latter method was used. The majority of the students enjoyed this new approach to learning. They enjoyed working in a group and the group motivated them to do their share. The students felt that they reflected more on their learning and that the mind map gave them a broader perspective of the work.

In general, although it is always still possible to improve, the approach seems to have achieved its objectives:

TEAM CONSTITUTION	In all the case studies students indicated that they enjoyed working in the Belbin constituted teams.
FORMAL/INFORMAL LECTURE RATIO	In all the case studies (except Case Study 5) students enjoyed the informal lectures and were satisfied with the formal/informal lecture ratio.

SUCCESSFUL LEARNING	Students felt that they learnt more, and did not have to resort to verbatim studying
MEASURING SUCCESS	When using Cohen's criteria to measure success the approach was indeed successful
ASSESSMENT	Within the constraints of university teaching small adaptations were made to assessment. It is felt that assessment still needs to be adapted to reflect the learning that has taken place.

When the data of the 1997 and 1998 case studies were combined, analyses indicated that there was a high representation of the control role (30.6%) and ideas role (33.7%) in the Computer Science group. This may indicate that they will be able to develop and implement ideas; however, with the low representation of leadership (16.3%) and social roles (19.4%) in this group, it is questionable if solutions to problems posed would be client-orientated.

The students studying Statistics seem to be a more diverse group with a more balanced representation in all the role groupings. Assertive leadership and implementation skills are well represented within this group, but there is a shortage of coordinating and analytical skills. It was found that dominancy of role grouping has no bearing on achievement.

The results of this meta study are important in that it emphasises the need for the constitution of "balanced" teams. However, there is a natural deficiency of certain team roles in certain groupings, for example, the Computer Science group showed a deficiency in the leadership and social role groupings. Students will have to be made aware of these role shortages

in their grouping, so that they can develop the necessary skills to be able to assume these roles.

In Chapter 5, the research findings will be viewed from several different perspectives; these include the use of Habermas' knowledge interests from his critical social theory; hermeneutics; and Giddens' "*consequences of contemporary modernity*" as viewpoints. The emergent themes will allow the development of a framework for group constitution for small group learning in the field of information technology. This framework will be developed in Chapter 6.