# Chapter 6

# DATA ANALYSIS: STATISTICAL ANALYSIS OF STAGE 1

## Introduction

This chapter continues the Stage 1 quantitative analysis begun in Chapter 5. It complements the Stage 2 qualitative analysis presented in the following chapter. The two stages in this study with their two distinct methodologies, were designed to provide different but complementary perspectives to the research question: "What are the factors associated with excellence in special education teaching?".

The purpose of the statistical analysis of Stage 1 data was to appraise the teaching competence of a group of special educators, then to examine various possible factors that were associated with professional excellence in order to establish the degree of this association. A secondary purpose was to obtain a group of volunteer teachers and to select from that number five excellent teachers to take part in the Stage 2 qualitative phase of this study.

The Stage 1 research questions were:

(i) What is the individual teacher's perception of his/her competence?

(ii) What is the individual teacher's supervisor's perception of that teacher's competence?

(iii) Are the following professional development factors associated with a high level of perceived competence?

- postgraduate training in special education,
- mainstream teaching experience prior to postgraduate training,
- total teaching experience prior to postgraduate training,

- total experience in special education teaching,
- inservice courses,
- mentoring by special educators,
- membership of professional associations and groups,
- professional reading,
- age.

(iii) What are the teachers' and supervisors' perceptions of the factors which have led, or could lead, to the teachers' professional competence?

(iv) What do the teachers and supervisors think contributes to excellence in special education teaching in general (considering the above and any other factors)?

**Format of this chapter**

The methodology of Stage 1 statistical analysis has been described in detail in Chapter 3, The Research Design. This chapter will discuss the findings as they relate, in turn, to the various analytic procedures used. These are Rasch analysis, correlational analysis, analysis of variance and factor analysis. The results of each of these procedures are presented as they relate firstly to the teachers and then to the supervisors. Where appropriate the results of the two groups are then integrated and/or compared. This will be done in brief for a full discussion is more appropriate in Chapter 8, Convergence and Discussion of the Findings Reference is made throughout this presentation of the statistical findings to question numbers. These are the questions in the Teacher Questionnaire (see Appendix 1) and in the Supervisor Questionnaire, which has the same, or very similar, questions and the same question numbering.

## Rasch analysis of the teachers' and supervisors' responses to the NSW DSE competencies (Part B, Questions 1-22)

Quest software (Australian Council for Educational Research, 1993), as explained in Chapter 3, was used to carry out a Rasch analysis of item difficulty and respondents' special education perceived ability. The total number of participating teachers was 168 and the number of participating supervisors was 178. However, the number of teachers whose responses were used in this analysis was 160. The responses of eight teachers were rejected by the Rasch program either because a number of items were not responded to or because there was a pattern of the same response for all questions, this latter suggesting that the particular questionnaire, in Part B, was completed without adequate thought. The number of supervisors whose responses were used was also 160, that is, 18 were rejected this being for the same reasons that some of the teachers' responses were rejected. There were 126 paired responses (teachers and supervisors appraising the same teacher) but of these 13 were not useable because of the above Rasch rejections. All correlations of the teachers' and supervisors' scores are based on a maximum sample of 113. Where particular questions were not answered by the teachers, either because they were not applicable or because of oversight or other reasons, this number was smaller.

### Item and case fit statistics

### Teachers

The internal consistency for the teachers' responses was .91. This suggests a very high degree of homogeneity, that is, it provides strong evidence that the set of 22 competencies reflects a single underlying construct (Wright and Masters, 1982). The Quest software reported for the item estimates for the teachers' data, a mean of 1.00 and standard deviation of 0.12, and for the case estimates a mean of 1.02 and standard deviation of 0.56. These values indicate that the workplace competencies of the special education teacher formed a scaled set and that there is a close fit between data and model (Wright and Masters, 1982). This is illustrated in the item fit map given below.

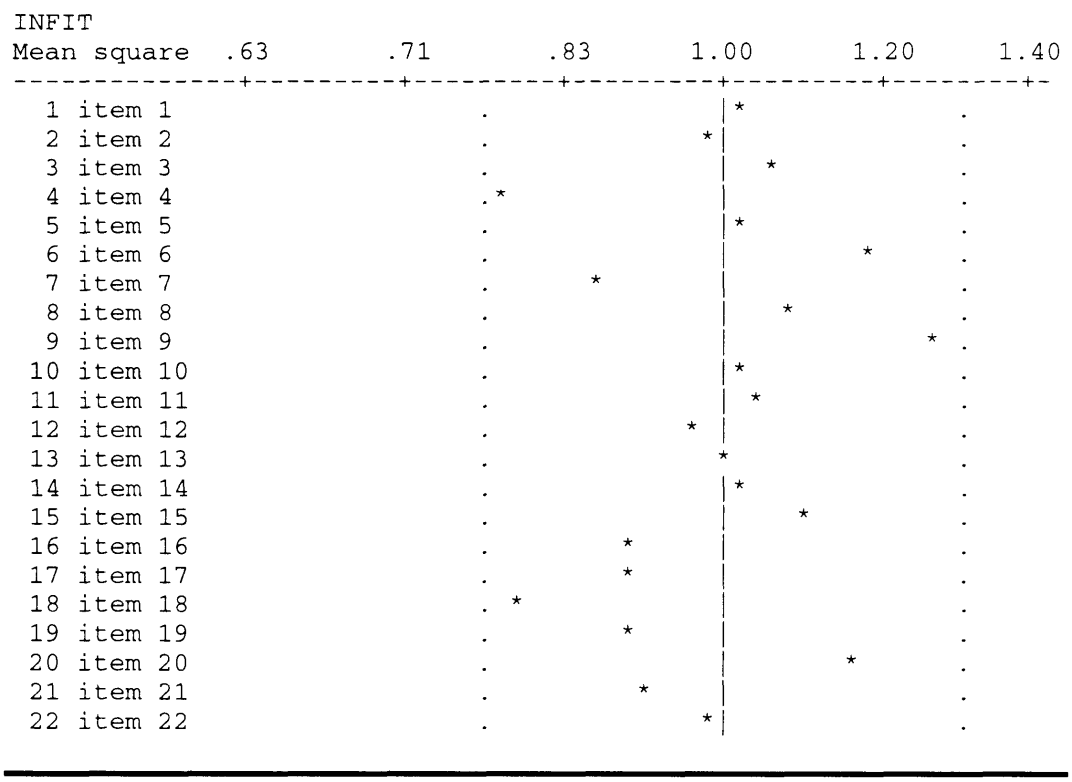


**Figure 6.1**
Teachers' item fit map

The above figure plots the infit mean square for each item and shows the dispersion of item fit around the mean of 1.00. Items falling within the dotted vertical lines exhibit acceptable (Wright and Masters, 1982) fit to the model. It will be noticed that for the teachers' data all items fall within acceptable boundaries.

### Supervisors

The internal consistency for the supervisors' responses was .95. As with the teachers' responses this suggests a very high degree of homogeneity, that is, the evidence is strong that the set of 22 competencies form a scaled set. The Quest software reported for the item estimates for the supervisors' data a mean of 1.00 and standard deviation of 0.10 and for the case estimates a mean of 0.99 and standard deviation of 0.43. These values also indicate that the workplace competencies of the special education teacher formed a scaled set and that there is a close fit between data and model. This is illustrated in the item fit map given in Figure 6.2 below.

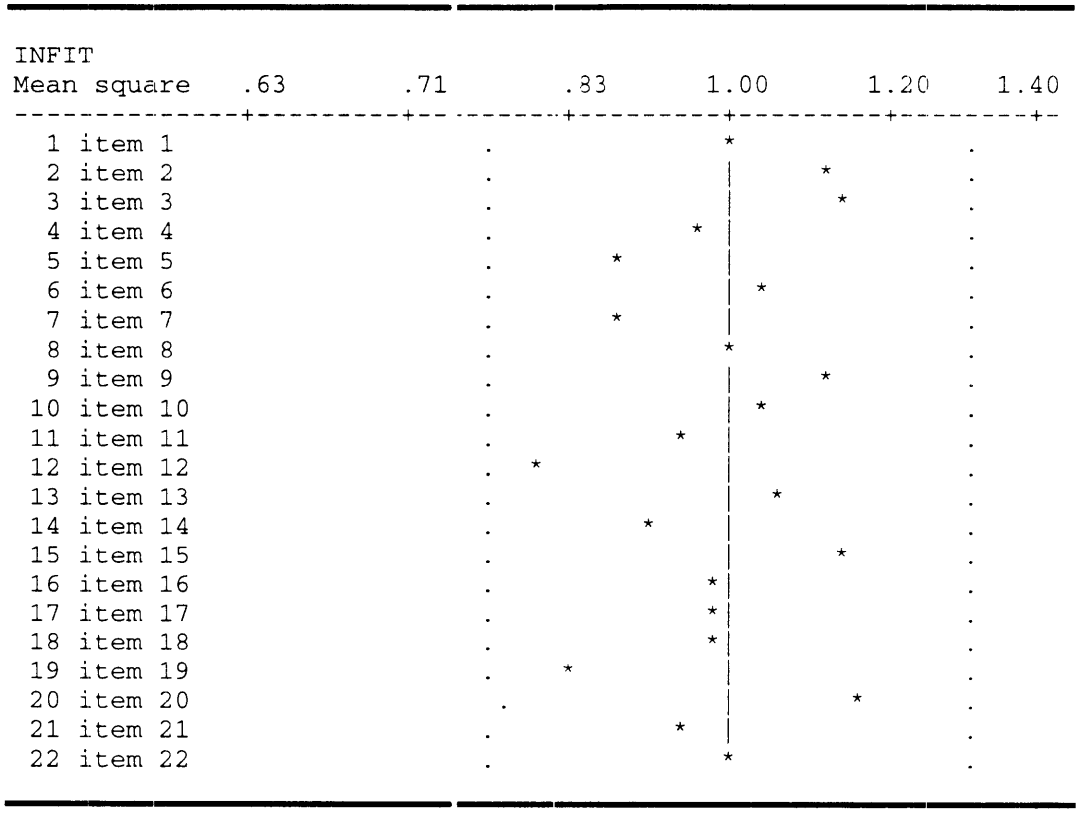


**Figure 6.2**

Supervisors' item fit map

Again it will be noticed from the above figure that, as with the teachers' data, all items fall within acceptable boundaries.

### Step difficulty

Overall item difficulty estimates are provided by the delta and tau statistics reported by Quest which are Andrich location and threshold parameters (Andrich, 1988). It is also helpful to examine across- and within-item step difficulty estimates. The former are reported as Thurstonian threshold levels and the latter as tau estimates. Appendix 2 contains item and step frequency distributions and associated Thurstonian thresholds for teachers and supervisors.

**Teachers**

Figure 6.3 below provides a graphical illustration of across-item step difficulties as perceived by the teachers. The vertical lines on the left-hand side show the logit scale on which the item step difficulties are plotted. The numbers on the right-hand side refer to steps within items. Thus, for example, *20.4* refers to the step difficulty of moving from response category 4 to 5 on item 20; *3.2* refers to the step difficulty of moving from response category 2 to 3 on item 3. The *X* s shown on the left hand side depict a histogram of case abilities. Thus, for example, opposite step difficulty *2.4* there are six Xs, this indicating that six respondents had ability estimates corresponding to the step difficulty of 2.4. The dominant feature of Figure 6.3 below is that across-item step difficulties are graded into four bands, that is, in nearly every instance step 1 difficulty estimates for all 22 items form one group and this is followed by step 2 difficulty estimates for the 22 items and so on. This regularity indicates that the teacher respondents found that step difficulty increased more or less uniformly, but not necessarily with equal intervals, across all items.

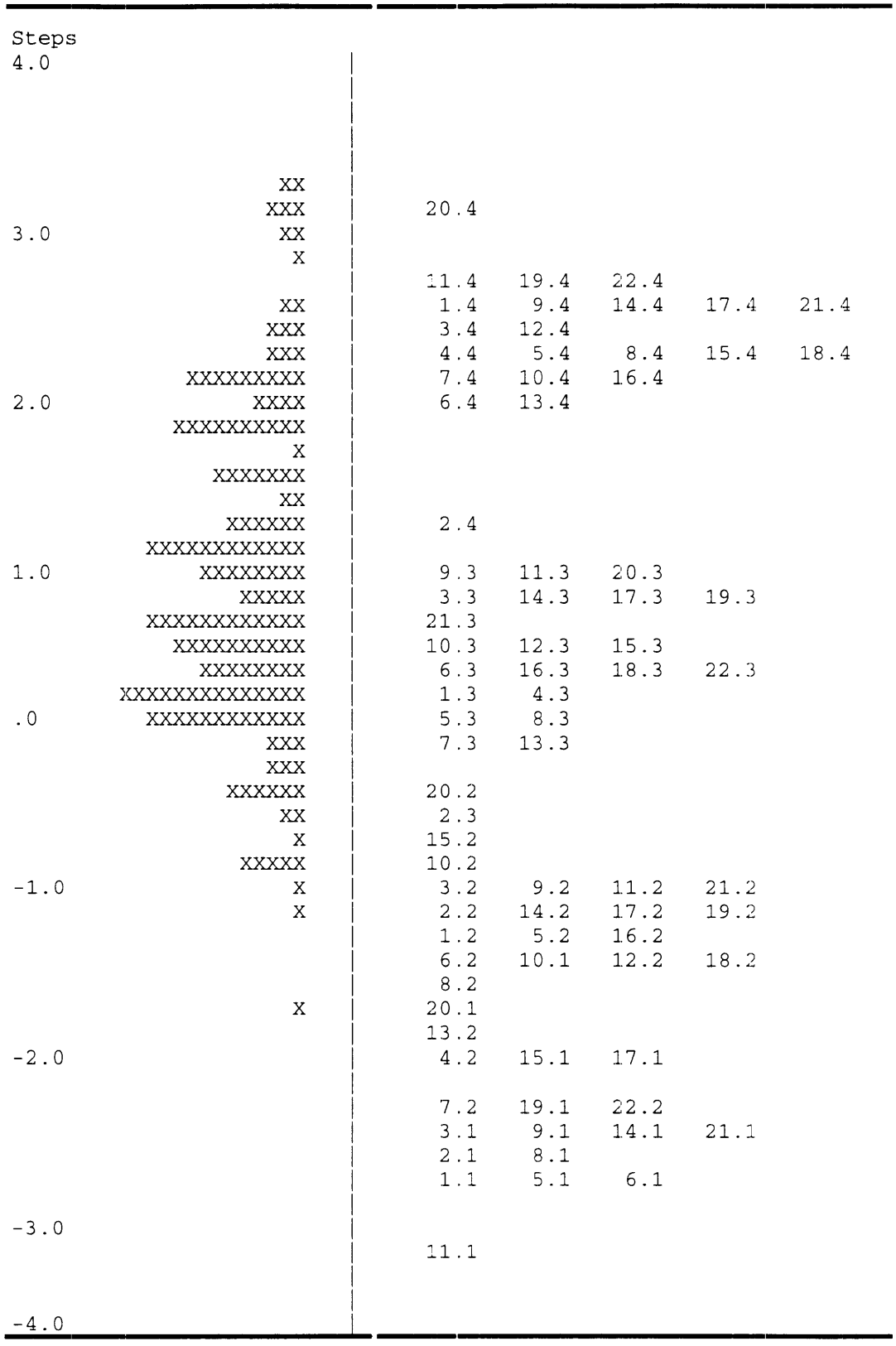


**Figure 6.3**

Across-step difficulty as perceived by the teachers

Turning now to the within-item step difficulty estimates, inspection of the tau estimates in Appendix 2 provides further evidence of uniformity of step difficulty intervals across and within items. It will be noticed that, within items, the last step from response category 4 to 5 was uniformly the most difficult and that intra-item step difficulty was non equal interval.

**Supervisors**

The supervisors' data, shown in Figure 6.4 below, provides an illustration of across-item step difficulty on the same logit scale basis as discussed above in connection with Figure 6.3 for the teachers' data. Again it will be noted that the across-item step difficulties are grouped into four bands corresponding to steps one to four across category responses. Appendix 2 provides a listing of delta estimates of within-step difficulties. Inspection of this table again provides further evidence of uniformity, although not equality, of step difficulty intervals.

```
Steps
5.0                 |
                    |
                    |
                 XX |
                    |
                  X |
4.0                 |
                XXX |
                    |
                  X |
                  X |
                  X |
3.0            XXXXX |     11.4
                XXXX |
                  XX |      9.4   14.4
                 XXX |      6.4   15.4   17.4   19.4
                  XX |      8.4   12.4   18.4   20.4   21.4
             XXXXXXX |      3.4    5.4   10.4
2.0          XXXXXXXX |      1.4    2.4    4.4    7.4
                XXXX |     16.4
           XXXXXXXXXX |     13.4
              XXXXXXX |
          XXXXXXXXXXX |
            XXXXXXXXX |     11.3
1.0          XXXXXXXX |     20.3
              XXXXXXX |      3.3    6.3    9.3   14.3   16.3
               XXXXXX |      8.3   10.3   12.3   15.3   18.3
                XXXXX |      5.3    7.3   13.3
                  XXX |
               XXXXXX |      1.3   22.3
                  XXX |      4.3
.0                XXX |      2.3
                   XX |     11.2
                  XXX |     12.2   14.2   18.2
                 XXXX |      3.2    8.2    9.2   10.2   13.2
                 XXXX |      6.2
                      |      4.2    5.2   17.2   19.2
-1.0                  |      1.2
                  XXX |      7.2   21.2
                    X |
                      |      4.1   22.2
                   XX |      2.2    6.1    9.1
                   XX |      3.1   11.1
-2.0                  |      8.1   14.1
                      |      5.1    7.1   10.1   12.1   18.1
                    X |
                    X |     13.1
                      |      1.1   19.1
                      |
-3.0                  |     16.1   17.1   21.1
                      |      2.1   15.1   20.1
                      |
                    X |
                      |
                      |
-4.0
```

**Figure 6.4**

Across-step difficulty as perceived by the supervisors

In summary, the step difficulty evidence reinforces the earlier conclusions drawn from item fit maps and internal consistency indices that for both the teachers and supervisors the set of the 22 competencies provides an instrument with high internal validity for self appraisal and supervisor appraisal of performance as a special education teacher.

## Perceptions of item performance

### Teachers' perceptions

Rasch analysis provided estimates of the performance of the 22 competency items used by the teachers for self appraisal and by the supervisors for appraisal of the teachers. Responses were indicated on a five-point Likert scale where *one* represented a low appraisal of the performance of a competency and *five* represented a high appraisal.

Table 6.1 concerns the teachers' self appraisal. Where self appraisal was high the item is regarded as easy to achieve and where self appraisal was low the item was regarded as difficult to achieve.

**Table 6.1**

Comparisons of teachers' and supervisors' perceptions of the difficulty of the 22 competencies

| Item (competency) | Teachers' ranking | Supervisors' Ranking | Difference * |
|---|---|---|---|
| 1 | 5 | 2 | +3 |
| 2 | 1 | 1 | 0 |
| 3 | =8* | 16 | -8 |
| 4 | 17 | 11 | +6 |
| 5 | =2 | 10 | -8 |
| 6 | 4 | 18 | -14 |
| 7 | 6 | 17 | -11 |
| 8 | =2 | 15 | -13 |
| 9 | 12 | 20 | -8 |
| 10 | 16 | 12 | +4 |
| 11 | 7 | 22 | -15 |
| 12 | 22 | 14 | +8 |
| 13 | 13 | 5 | +8 |
| 14 | 10 | 19 | -9 |
| 15 | 14 | 9 | +5 |
| 16 | 20 | 4 | +16 |
| 17 | 15 | =6 | +9 |
| 18 | 19 | 13 | +6 |
| 19 | 11 | 8 | +3 |
| 20 | 21 | =6 | +14 |
| 21 | =8 | 3 | +5 |
| 22 | 18 | 21 | -3 |

*Note: The use of the equal sign denotes that the same ranking was achieved by two competencies.

Those competency rankings with the largest discrepancies (difference is greater than 10) between teachers and supervisors are competency items:

16 - advocate earliest need supervisors (S) regard as easy, teachers (T) regard as difficult)

11 - manage behaviour (S-difficult, T-easy)

6 - use CBA to assess (S- difficult, T-easy)

20 - know child protection issues (S- easy, T- difficult)

8 - use instructional strategies (S- difficult, T- easy)

7 - maximise independence (S- difficult, T- easy)

There was also agreement or near-agreement (difference is less than 5) about some items.

1 - understands special needs

2 - application principles

10 - involves parents/students

19 - supports parents, community

22 - efficient reporting

## Correlational analysis

### Correlational analysis of teachers' and supervisors' perceptions of item difficulty

Computation of the item difficulty as perceived by both the teachers and the supervisors allowed two scores (the teachers' score and the supervisors' score), that is, case estimates, to be allocated to each of the 113 teachers for whom there was a paired Rasch score. In this way each teacher was ranked both according to his/her case estimate and according to his/her supervisor's case estimate. The extent of agreement between teachers and supervisors was assessed by computing the Pearson correlation coefficient which was not significant ($r=.0267$, $p>.05$), that is, there was no significant correlation between the teachers' and the supervisors' estimates of ability.

### Correlational analysis of case estimates and overall appraisal (Part B, Question 23)

**Teachers' case estimates and the teachers' overall self appraisal**
Sample size was 160. The teachers' case estimates and their overall estimates of performance (Question 23) were significantly correlated ($r=.465$, $DF=158$, $p=<.01$).

### Supervisors' case estimates and the supervisors' overall appraisal of the teachers

Sample size was 160. A correlation of .67 was obtained. The results showed an even greater consistency than with the teachers above. Forty-five percent of the variance in one data set were accounted for by 45% in the other data set.

## ANOVA procedures

Analyses using ANOVA techniques were conducted with case estimates as the dependent variable and various factors as independent variables. These factors were:

- teacher training in special education;
- total teaching experience in special education;
- training and prior mainstream teaching experience;
- training and total prior teaching experience;
- age.

The ANOVA procedures required some pairing, that is, whilst the full number of teachers' case estimates could be used (maximum of 160), only those supervisors' case estimates for their paired teachers (maximum 113) could be used.

The following analyses concern training in special education, teaching experience and age.

### Analysis of case estimates and training in special education (Part A, Question 28)

### Teachers' case estimates and their training in special education

Sample size was 159 as of the 160 teachers' case estimates one respondent did not complete the relevant question. Question 28 of the Teacher Questionnaire required the respondents to identify their highest

qualification in special education. They were given three response options.

Group 1 - university or college special education qualification recognised by DSE as a full special education qualification

Group 2 - completion of a major DSE inservice course

Group 3 - neither of the above

The mean case estimates and associated standard errors for the three groups are given in Table 6.2.

**Table 6.2**

Teachers' case estimates and their teacher training

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 101 | 1.024 | .102 |
| 2 | 9 | .546 | .298 |
| 3 | 49 | .72 | .133 |

ANOVA revealed no significant differences between groups (F=2.183, DF=2,156, p=.1162). It would seem, therefore, that the type of special training (postgraduate or major inservice) or the lack of specialist training, is not significantly related to performance according to the teachers' perceptions.

**Supervisors' case estimates and the teachers' training**

Sample size was 113. The supervisors were given the same three response options as those given to the teachers and discussed above. The mean case estimates and the associated standard errors for the three groups are shown in Table 6.3.

**Table 6.3**

Supervisors' case estimates and the teachers' teacher training

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 71 | 1.344 | .160 |
| 2 | 5 | 2.018 | .467 |
| 3 | 37 | .793 | .219 |

There was a significant between-group difference (F=3.069, DF=2,110, p=.0505). The small size of the second group (those teachers who had attended a major inservice course) meant that only Groups 1 and 3 should be considered. The supervisors' perception was that, of those teachers they had appraised, the trained teachers were more competent than the untrained teachers.

**Analysis of case estimates and teaching experience (Part A, Questions 9 and 16)**

Analysis concerned three types of experience:

- total special education teaching experience (Question 9);
- mainstream teaching experience prior to specialist training (Question 16);
- total teaching experience prior to special training (Question 16).

The first of the above analyses concerned all Teacher Questionnaire respondents. The last two of the above concerned only those teachers who had a formal tertiary special education qualification. Question 16 had two aspects, that is, mainstream teaching and special education teaching. These two types of experience were combined to give the total teaching experience prior to teacher training. Analysis of the three areas, listed above, was restricted to those for whom there were case estimates and who answered the relevant questions.

**Case estimates and total special education teaching experience (Part A, Question 9)**

**Teachers' case estimates and their total special education teaching experience**

Sample size was 159 as there was one teacher, for whom there was a case estimate, who did not complete the question. Question 9 contained five response options. The first two of these (less than one year, and one to two years of special education teaching) were collapsed (to become zero to

three years) as they applied to very few respondents. This resulted in four groups. These were:

Group 1- less than three years of special education teaching experience

Group 2 - three to five years

Group 3 - six to ten years

Group 4 - more than ten years

The mean case estimates and associated standard errors for each group are shown in Table 6.4.

**Table 6.4**

Teachers' case estimates and their total special education teaching experience

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 23 | .372 | .211 |
| 2 | 45 | .811 | .135 |
| 3 | 49 | .96 | .139 |
| 4 | 42 | 1.228 | .156 |

ANOVA indicated that there was a significant difference between groups (F=4.059, DF=3,155, P=.0083). Post-hoc comparison of means using the Fisher Protected Least Significant Difference (PLSD) test revealed that there was a significant difference between Groups 1 and 3, Groups 1 and 4 and Groups 2 and 4 but not between Groups 1 and 2 and Groups 2 and 3. This indicates that, according to the teachers' perceptions, performance improved markedly after five years of teaching experience .

**Supervisors' case estimates and the teachers' total special education teaching experience**

The purpose of this analysis was to see if the teachers' length of teaching experience in special education was related to the supervisors' appraisals. The mean case estimates and associated standard errors are given for each of the four groups (as used in Table 6.4) in Table 6.5.

**Table 6.5**

Supervisors' case estimates and the teachers' total special education teaching experience

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 12 | .981 | .224 |
| 2 | 32 | 1.660 | .250 |
| 3 | 38 | .929 | .254 |
| 4 | 30 | 1.128 | .207 |

ANOVA indicated that there was no significant difference between groups (F=1.439, DF=4,108, p=.2261). It is interesting to note that the supervisors' perceptions were that the most competent group of their paired teachers, in terms of their total experience, were the teachers who had taught for three to five years. This competence decreased in the next experience group to increase again in the group which had taught for more than ten years.

**Case estimates and mainstream teaching experience prior to specialist training (Part A, Question 16a)**

**The teachers' case estimates and their mainstream teaching experience prior to specialist training**

Sample size was 99, that is, the number of teachers for whom there were teacher case estimates and who had completed specialist training. Analysis was conducted using the teachers' case estimates and their mainstream teaching experience prior to training. This analysis used two groups. These were:

Group 1 - less than two years of mainstream teaching;

Group 2 - more than 2 years of mainstream teaching.

The two-year criterion was chosen as it related to the stated Commonwealth preference (Schools Council, 1989, p. 49) for a minimum of two years of mainstream teaching prior to postgraduate training in special education. The mean case estimates and associated standard errors for the two groups are shown in Table 6.6.

**Table 6.6**

Teachers' case estimates and their mainstream teaching prior to specialist training

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 49 | 1.03 | .163 |
| 2 | 50 | 1.025 | .131 |

ANOVA revealed no significant difference between the two groups (F=.001, DF=1,97, p=.9818). This indicates that the amount of the teachers' teaching experience (less than or more than two years prior to postgraduate training) was not significantly related to the teachers' perceptions of their performance.

**The supervisors' case estimates and the teachers' mainstream teaching experience prior to specialist training**

Sample size was 69. This figure represents those for whom there were paired case estimates (113) and of this group those teachers who had completed postgraduate training and had answered Question 16a. The mean case estimates and associated standard errors for the two groups (experience was less than or more than two years) are given in Table 6.7. The case estimates are those of the supervisors and the grouping variable refers to the teachers' mainstream teaching experience prior to training.

**Table 6.7**

Supervisors' case estimates and the teachers' mainstream teaching experience prior to specialist training

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 32 | 1.546 | .264 |
| 2 | 37 | 1.138 | .203 |

ANOVA revealed that there was no significant difference between the two groups (F=1.545, DF=1,67, p=.2183). This indicates that the amount of the teachers' mainstream teaching experience, measured as either more than or less than two years, was not significantly related to the supervisors' perceptions of the teachers' performance.

## Case estimates and total teaching experience prior to specialist training (Part A, Question 16a+b)

### Teachers' case estimates and their total teaching experience prior to postgraduate training

Total teaching experience was calculated by adding the figures provided for the two parts of Question 16 (mainstream and special education teaching experience). Again the criterion of less than or more than two years of experience was used. This resulted in the respondents to Question 16 being placed in one of two groups. The two-year criterion was chosen because it is that used by the NSW DSE in its selection of teachers for the cadetship program. Table 6.8 shows the case estimates and associated standard errors for each group.

**Table 6.8**

Teachers' case estimates and their total teaching experience prior to postgraduate training

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 27 | .839 | .222 |
| 2 | 72 | 1.098 | .116 |

ANOVA showed no significant differences between the two groups of teachers (F=1.229, DF=1,97, p=.2704). This indicates that the amount of total teaching experience prior to postgraduate training, measured as more than or less than two years, was not related to teaching performance. The DSE use of the experience criteria is not supported in terms of the teachers' perceptions.

### Supervisors' case estimates and the teachers' total teaching experience prior to postgraduate training

Sample size was 69. This figure is explained above in relation to mainstream teaching experience. This analysis was parallel to that described above. Responses to both parts of Question 16 were added to provide a figure representing the total number of years of teaching prior to the teachers' postgraduate training. Responses were allocated to one of two groups, that is, less than and more than two year's experience. Table 6.9 shows the supervisors' case estimates and the associated standard errors.

**Table 6.9**

Supervisors' case estimates and the teachers' total teaching experience prior to postgraduate teacher training

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 22 | 1.533 | .298 |
| 2 | 47 | 1.231 | .198 |

ANOVA revealed that there was no significant difference between groups (F=.727, DF=1,67, p=.3968). Again the use by DSE of the two year criterion for cadetship selection is not supported. According to the supervisors' perceptions of the teachers' performance, experience prior to their training did not contribute towards excellence in teaching.

**Case estimates and teachers' age (Question 32)**

**Teachers' case estimates and their age**

Sample size was 144, that is the 160 teachers for whom there were case estimates minus those teachers who chose not to state their age group. The participants were given five possible responses.

- Group 1 - 20-25 years of age
- Group 2 - 26-30
- Group 3 - 31-40
- Group 4 - 41-50
- Group 5 - 51-60

Table 6.10 shows the mean case estimates and associated errors for each of the above five groups.

**6.10**

Teachers' case estimates and their ages

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 14 | .202 | .276 |
| 2 | 14 | 1.11 | .283 |
| 3 | 44 | .737 | .132 |
| 4 | 56 | 1.033 | .128 |
| 5 | 17 | 1.444 | .247 |

ANOVA showed that there is a significant difference between the groups (F=3.966, DF=4,140, p=.0044). Post-hoc comparison of means using the Fisher PLSD test revealed that there was a significant difference between Groups 1 and 2, Groups 1 and 4 and Groups 1 and 5. It should be noted that there was not a significant difference between Groups 1 and 3 and Groups 2 and 3. With the exception of the teachers within the age range 31 to 40 years it would seem that, according to their perceptions, as teachers get older they also perform better.

**Supervisors' case estimates and the teachers' ages**

Sample size was 101, that is, the 113 teachers for whom there were supervisors' case estimates minus those teachers who chose not to disclose their age.

**Table 6.11**

Supervisors' case estimates and the teachers' ages

| Group | N | Mean | Standard error |
|---|---|---|---|
| 1 | 10 | 1.697 | .271 |
| 2 | 11 | 1.475 | .396 |
| 3 | 32 | 1.321 | .245 |
| 4 | 36 | .699 | .229 |
| 5 | 13 | 1.431 | .255 |

ANOVA revealed that there is not a significant difference between the groups (F=2.038, DF=4,97, p=.950). Age, according to the supervisors' perceptions, is not related to competence.

**Summary of procedures**

ANOVA procedures, in summary, yielded the following results in terms of training, teaching experience and age.

- Postgraduate training, major inservice training or the lack of training is not significantly related to teaching performance according to the teachers' perceptions. In terms of the supervisors' perceptions, postgraduate training is significantly related to teacher performance.

- Mainstream teaching experience of more than two years, prior to postgraduate training, is not significantly related to teaching performance according to both the teachers' and supervisors' perceptions.
- Total teaching experience (mainstream and special education) of more than two years prior to postgraduate training is not significantly related to teaching performance according to both the teachers' and supervisors' perceptions.
- Total teaching experience in special education beyond five years, according to the teachers' perceptions, is related to teaching performance. According to the supervisors' perceptions total teaching experience in special education is not related to teaching performance.
- With the exception of the age group 31 to 40 years, age is significantly related to teaching performance according to the teachers' perceptions. In terms of the supervisors' perceptions, age is not significantly related to teaching performance.

## Factor analysis of the NSW DSE competencies

The structural relationships between the 22 DSE variables represented by the competencies were investigated using the principal components form of factor analysis. This form of analysis, rather than common factor analysis, was used because the investigation was essentially explorative in nature and could not be guided by theoretical argument or previous empirical enquiry. All computations were carried out using the SPSS software package (SPSS Inc., 1985).

Turning first to the teachers' responses, the correlation matrix yielded a Kaiser-Meyer-Olkin measure of sampling adequacy of 0.902 and an associated Bartlett chi squared value of 1576.55 ($p<.00001$) indicating that the matrix was factorable. Applying a latent root criterion (eigenvalues greater than one), five factors were extracted for interpretation. Table 6.12 below shows the variance distribution across these five factors and Figure 6.5 shows the application of the latent root and scree test criteria to the extracted factors (Hair et al., 1995). It will be noted that the five factors account for more than 60% of the variance.

**Table 6.12**

Teachers' factors and associated eigenvalues

| Factor | Eigenvalue | Percent of variance | Cumulative percent of variance |
|---|---|---|---|
| 1 | 8.26 | 37.6 | 37.6 |
| 2 | 1.79 | 8.2 | 45.7 |
| 3 | 1.25 | 5.7 | 51.4 |
| 4 | 1.11 | 5.0 | 56.5 |
| 5 | 1.03 | 4.7 | 61.1 |
| 6 | 0.90 | 4.1 | 65.3 |
| 7 | 0.83 | 3.8 | 69.0 |
| 8 | 0.73 | 3.3 | 72.4 |
| 9 | 0.70 | 3.2 | 75.5 |
| 10 | 0.63 | 2.9 | 78.4 |

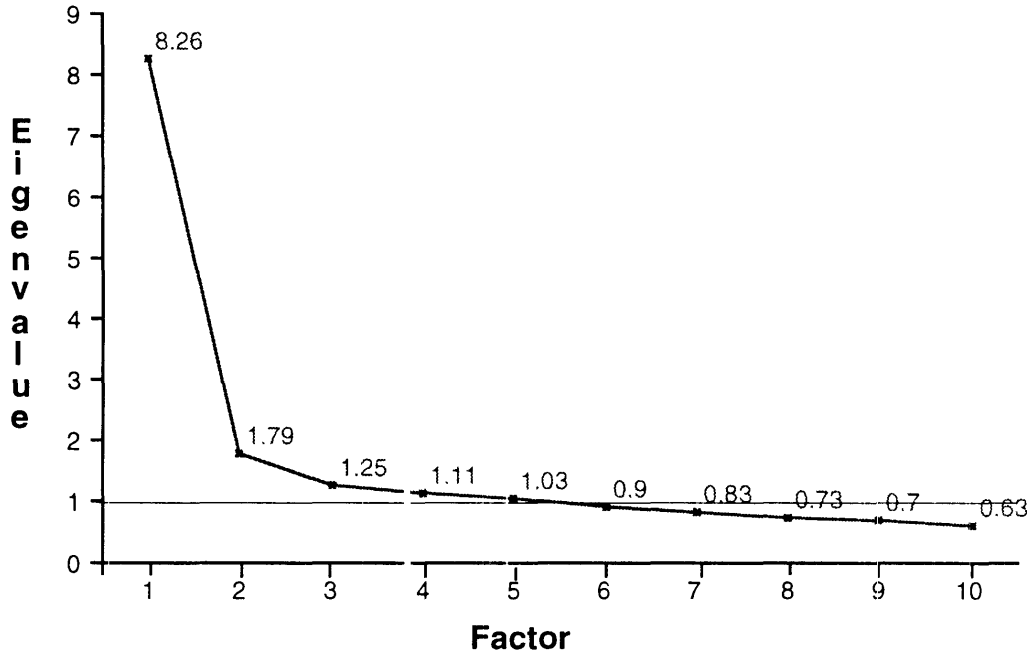


**Figure 6.5**

Teachers' latent root and scree test for component analysis

Because the correlation matrix exhibited large correlations between most variables, and as the main goal of the analysis was not so much reduction of variables as the derivation of theoretically meaningful factors, an oblique rotation method was used. Additionally, because it was expected that some of the factors would show reasonably high intercorrelations following the advice of Tabachnick and Fidell (1989), it was decided that

the *oblimin* rotation method offered by SPSS (1985) would be used. The resulting factor matrix is shown below.

**Table 6.13**

Teachers' factor correlation matrix

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| **Factor 1** | 1.000 | | | | |
| **Factor 2** | -.373 | 1.000 | | | |
| **Factor 3** | .126 | -.022 | 1.000 | | |
| **Factor 4** | .114 | -.041 | .010 | 1.000 | |
| **Factor 5** | -.481 | .486 | -.086 | -.064 | 1.000 |

The resulting factor component pattern matrix is given in Table 6.14 below.

**Table 6.14**

Teachers' factor component pattern matrix

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| **Competency** | 17 (.659) | 1 (-.614) | 3 (.444)* | 15 (.639) | 3 (-.473)* |
| | 18 (.717) | 2 (-.678) | 9 (-.575) | 16 (.508) | 5 (-.560) |
| | 19 (.520) | 4 (-.580) | 10 (.599) | 22 (-.455) | 12 (-.820) |
| | 20 (.803) | 6 (-.859) | 11 (-.556) | | 13 (-.762) |
| | 21 (.503) | 7 (-.546) | | | 14 (-.676) |
| | | 8 (-.847) | | | |

* Competency 3 has been listed under both Factor 3 and Factor 5 because of the similarity of the two loadings.

For purposes of interpretation factor loadings with absolute values greater than .4 were considered significant based on an alpha level of .05, a power level of 80% and a sample size of 166 cases (Hair et al., 1995). It will be seen from Table 6.14 that in using that criterion there is generally a clear statistical relationship between variables and factors. More importantly, the factor structure has theoretical appeal and lends itself to meaningful interpretation. In Table 6.15, there is a list of the above groupings of competencies with a brief summary of those competencies.

**Table 6.15**

Teachers' allocation of competencies to the five factors

| | |
|---|---|
| **Factor 1** | |
| **Competencies** | 17 - provide parents, students information re rights |
| | 18 - work to change attitudes |
| | 19 - support parents, community |
| | 20 - know child protection issues |
| | 21 - demonstrate efficient resource management |
| **Factor 2** | |
| **Competencies** | 1 - demonstrate understanding of special needs |
| | 2 - apply principles normalisation, integration |
| | 4 - adapt curricula, apply DSE policies |
| | 6 - develop, use CBA |
| | 7 - identify learning outcomes, maximise independence |
| | 8 - use research-based instructional strategies |
| **Factor 3** | |
| **Competencies** | 3 - locate, access range of support services |
| | 9 - monitor, evaluate programs, including behaviour |
| | 10 - ensure involvement parents, students in IEPs |
| | 11 - use research-based preventative behaviour strategies |
| | Note: Competencies 9 and 11 have a negative relationship with competencies 3 and 10. |
| **Factor 4** | |
| **Competencies** | 15 - promote responsibility of all teachers |
| | 16 - advocate for individual programs from earliest need |
| | 22 - use efficient reporting procedures |
| | Note: Competency 22 has a negative relationship with competencies 15 and 16. |
| **Factor 5** | |
| **Competencies** | 3 - locate, access range of support services |
| | 5 - use information from other support personnel |
| | 12 - understand practices underpinning collaboration |
| | 13 - work in a team |
| | 14 - negotiate role, responsibilities in school |

The supervisors' responses will now be considered. The correlation matrix yielded a Kaiser-Meyer-Olkin measure of sampling adequacy of .955 and an associated Bartlett chi squared value of 2852.1189 ($p<.00001$).

This indicates that the matrix was factorable. When a latent root (eigenvalues greater than one) and scree test criteria were applied, five factors were extracted for interpretation. Table 6.17 shows the variance distribution across these five factors and Figure 6.6 shows the application of the latent root and scree test criteria to the extracted factors. As with the teachers' analyses, the five factors account for more than 60% of variance. However, in the case of the supervisors this figure was attained by the first two factors alone with the majority of competencies being located in Factor 1.

**Table 6.16**

Supervisors' factors and associated eigenvalues

| Factor | Eigenvalue | Percent of variance | Cumulative percent of variance |
|---|---|---|---|
| 1 | 12.27 | 55.8 | 55.8 |
| 2 | 1.18 | 5.4 | 61.1 |
| 3 | 0.97 | 4.4 | 69.4 |
| 4 | 0.85 | 3.9 | 69.4 |
| 5 | 0.79 | 3.6 | 73.0 |
| 6 | 0.72 | 3.3 | 76.3 |
| 7 | 0.58 | 2.7 | 79.0 |
| 8 | 0.52 | 2.4 | 81.3 |
| 9 | 0.50 | 2.1 | 83.6 |
| 10 | 0.47 | 2.1 | 85.7 |

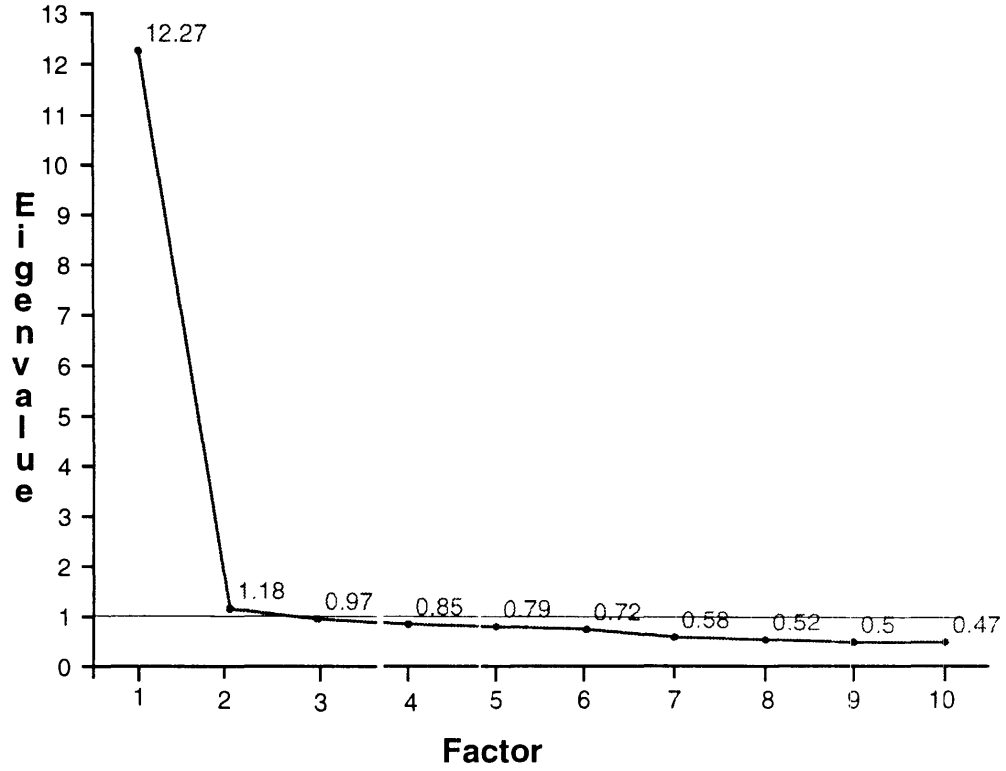


**Figure 6.6**

Supervisors' latent root and scree test for component analysis

Using the oblimin rotation method (previously explained in relation to the teachers) the resulting matrix is as follows.

**Table 6.17**

Supervisors factor correlation matrix

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| **Factor 1** | 1.000 | | | | |
| **Factor 2** | -.643 | 1.000 | | | |
| **Factor 3** | -.322 | .321 | 1.000 | | |
| **Factor 4** | .285 | -.198 | -.077 | 1.000 | |
| **Factor 5** | -.645 | .557 | .300 | -.240 | 1.000 |

The resulting factor component pattern matrix is given in the following table.

**Table 6.18**

Supervisors' factor component pattern matrix

| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 |
|---|---|---|---|---|---|
| **Competency** | 3 (.463) | 1 (-.4285)* | 4 (-.878) | 15 (.997) | 1 (-.4292)* |
| | 5 (.505) | 2 (-.401)* | 22 (-.403) | | 2 (-.398)* |
| | 10 (.587) | 6 (-.798) | | | 12 (-.690) |
| | 16 (.596) | 7 (-.776) | | | 13 (-.816) |
| | 17 (.874) | 8 (-.845) | | | 14 (-.758) |
| | 18 (.576) | 9 (-.789) | | | |
| | 19 (.915) | 11 (-.392) | | | |
| | 20 (.745) | | | | |
| | 21 (.517) | | | | |

* Competencies 1 and 2 were both placed in Factors 2 and 5 because of the very close similarity of their loadings.

Whilst in the case of the teachers' factor loadings with absolute values greater than .4 were considered significant, in the case of the supervisors this criterion was relaxed very slightly to include factor loadings greater than .39. The sample size was 172. The following table lists the supervisors' competency groupings into the five factors.

**Table 6.19**

Supervisors' allocation of competencies to the five factors

| | | |
|---|---|---|
| **Factor 1** | | |
| **Competencies** | 3 | - locate, access range of support services |
| | 5 | - use information from other support personnel |
| | 10 | - ensure involvement parents, students in IEPs |
| | 16 | - advocate for individual programs from earliest need |
| | 17 | - provide parents, students information re rights |
| | 18 | - work to change attitudes |
| | 19 | - support parents, community |
| | 20 | - know child protection issues |
| | 21 | - demonstrate efficient resource management |
| **Factor 2** | | |
| **Competencies** | 1 | - demonstrate understanding of special needs |
| | 2 | - apply principles normalisation, integration |
| | 6 | - develop, use CBA |
| | 7 | - identify learning outcomes, maximise independence |
| | 8 | - use research-based instructional strategies |
| | 9 | - monitor, evaluate programs including behaviour |
| | 11 | - use research-based preventative behaviour strategies |
| **Factor 3** | | |
| **Competency** | 4 | - adapt curricula, apply DSE policies |
| | 22 | - use efficient reporting procedures |
| **Factor 4** | | |
| **Competency** | 15 | - promote responsibility of all teachers |
| **Factor 5** | | |
| **Competency** | 1 | - demonstrate understanding of special needs |
| | 2 | - apply principles normalisation, integration |
| | 12 | - understand practices underpinning collaboration |
| | 13 | - work in a team |
| | 14 | - negotiate role and responsibilities in school |

Again the factor structure has theoretical appeal and allows meaningful interpretation, this being discussed in Chapter 8 together with a discussion concerning the different factor loadings of the teachers and the supervisors.

## Analysis of Questionnaire open-ended questions

### Perceptions of contributors to individual teachers' professional development (Part B, Questions 24 or 25)

Teacher and supervisor respondents answered either Part B, Question 24 or Question 25 depending on the appraisals given to the earlier Part B questions. If the majority of the appraisals, given on the Likert scales, had been less than very positive (majority three or less on the Likert scales) the respondent completed Question 24. If the appraisals had been very positive (majority four or five on the Likert scales) the respondents completed Question 25. The responses to both the questions related to the teacher's professional development either concerning perceptions of the contributors that **could** assist development or perceptions of the contributors that **did** assist development. The supervisors' responses were about the teachers whilst those of the teachers were about themselves. Responses concerned perceptions about the individual teachers' professional development contributors. They were not statements of how teachers in general develop professionally in special education. Such statements were required by Part C, Question 1.

Response categories were generated by the teachers and supervisors themselves. The researcher had no prior perceptions about these. Nine categories were developed as the responses were examined and analysed. One category, that of postgraduate training in special education, was not available to all of the teachers. Presumably the supervisors would have known if the teacher they had appraised had received such training. This meant that this training cannot be regarded as being able to attract as many responses as other categories. It is possible that mainstream training and mainstream teaching were also categories that had some limitations in terms of the number of responses. All questionnaire responses were included in this analysis: unpaired responses were not excluded.

Results of the analysis of the responses, both teachers' and supervisors', to Question 24 will be presented first and these will be followed by the analysis concerning Question 25.

**Table 6.20**

Perceptions of the factors necessary for the teachers' professional development (Part B, Question 24)

| Respondents | Mainstream Training | Mainstream Experience | Special Education Experience | Teamwork and Collaboration | School Hierarchy Support | Postgraduate Training | DSE Inservice Courses | Informal Professional Development | Personal Characteristics |
|---|---|---|---|---|---|---|---|---|---|
| Teachers (47) | 0 | 1 | 5 | 6 | 17 | 16 | 6 | 10 | 3 |
| Supervisors (42) | 0 | 2 | 8 | 8 | 11 | 10 | 8 | 6 | 4 |
| Total (89) | 0 | 3 | 13 | 14 | 28 | 26 | 14 | 16 | 7 |

The less-than-excellent teachers believed that their teaching would improve if they received more professional support and/or more training. The former was described variously as support from the school principal and senior staff, more resources and more time. The latter included particularly postgraduate training in special education and informal professional development such as visiting other schools, professional discussions. The other factors received fewer responses.

The supervisors believed that the teachers would improve through more special education teaching experience, greater collaboration with peers, increased support from the school hierarchy and opportunities for informal training such as observing others.

**Table 6.21**

Perceptions of the factors which contributed to the teachers' development of excellence (Part B, Question 25)

| Respondents | Mainstream Training | Mainstream Experience | Special Education Experience | Teamwork and Collaboration | School Hierarchy Support | Postgraduate Training | DSE Inservice Course | Informal Professional Development | Personal Characteristics |
|---|---|---|---|---|---|---|---|---|---|
| Teachers (75) | 2 | 9 | 31 | 25 | 26 | 13 | 10 | 22 | 37 |
| Supervisors (115) | 1 | 5 | 24 | 26 | 16 | 21 | 10 | 15 | 98 |
| Total (190) | 3 | 14 | 55 | 51 | 42 | 34 | 20 | 37 | 135 |

These perceptions were about those teachers who were considered, by either the teachers or supervisors or both, to be excellent. The teachers believed that the most important contributor to their excellence in special education was their personal characteristics. These included flexibility, respect for their students and maturity. Four other contributors were regarded as important. Of these, experience in special education teaching was regarded very highly. Working with peers, support from the school hierarchy and informal professional development were also important contributors. Of much less importance were postgraduate training and DSE inservice courses.

The supervisors, who were in senior positions which required knowledge, experience and close contact with their teachers, believed that the special education teachers were excellent primarily because of their personal characteristics. This category received four times the number of responses that the other high categories received. However, care must be taken in interpreting the large number of responses in this category. Every personal characteristic item was counted. Whilst some respondents listed more than one item, for example, "flexibility", "likes children", "sense of

humour", they were less likely to include more than one item in any other category.

Less important in terms of number of responses, but nonetheless important, were the teachers' experience in special education teaching, their collaboration with their peers and their postgraduate training.

Whilst there should be no close comparisons of the figures in the two tables above because of the different bases of their formulation, they do indicate trends in the teachers' and supervisors' perceptions concerning what would assist the less competent teachers' professional development in special education and what has assisted the more competent teachers' development in this area. In terms of the former group teaching experience, working with peers, inservice courses and informal opportunities for development do not appear to be regarded as highly as postgraduate training in special education and support from the school hierarchy. It also appears that either personal characteristics are considered to be unchangeable or that there is no need for change/development in this area.

In contrast, in terms of those teachers who were perceived to be excellent special educators, both the teachers and supervisors considered that the teachers' personal characteristics had been important contributors to their teaching excellence. Teaching experience in special education and working with their peers were also perceived to be important. Whilst some other factors (postgraduate training, support from the school hierarchy, and informal opportunities for professional development) were considered to have made some contribution to excellence, mainstream training and experience were not considered to be significant.

## Perceptions of contributors to special education teachers' professional development (Part C, Question 1)

Both teachers and supervisors were asked "What teacher factors do you think best contribute to excellence in special education?" They were asked not to feel that they were restricted to aspects of training and experience (the major foci of Part A questions). The purpose of this question was to provide an open opportunity for them to express their thoughts about professional development as special educators in general. More

questionnaire space was deliberately allocated for the answer of this question than was allocated for the responses to Part B, Question 24 and 25. Most of the responses were lengthy and several participants used additional paper to express all their thoughts and even concerns. The writer sensed that some of the respondents welcomed the opportunity to express their thoughts.

Analysis in the form of response counts produced seven broad categories. Initially many more categories were developed as the questionnaires were perused, there being no prior perceptions of what these would be. However, it gradually became apparent that it was impossible to identify accurately and classify the subtleties of fine meaning expressed in many different ways by the respondents. It became clear that it would be more accurate and do greater justice to the participants if there were broad response categories. As the task of analysis was greater than anticipated, the researcher enlisted the help of a research team of graduate special education students. Three postgraduate students, an academic peer and the writer took part in this count. Interrater reliability was an acceptable 81%. The following table shows the resulting seven categories, determined on the basis of the types of responses and the counts within each.

**Table 6.22**

Analysis of responses to open-ended Part C, Question 1

| Respondents | Relationships | Formal Knowledge | Experiential Knowledge | Application of Knowledge | Personal Attributes | DSE Conditions | Miscellaneous |
|---|---|---|---|---|---|---|---|
| Teachers (160) | 88 | 88 | 89 | 116 | 248 | 28 | 1 |
| Supervisors (162) | 116 | 140 | 96 | 134 | 288 | 21 | 9 |
| Total (322) | 204 | 228 | 185 | 250 | 536 | 49 | 10 |

Personal attributes, such as "likes children", "patience", "flexibility", were referred to much more frequently than the aspects within the other categories. The number of responses in the "Personal Attributes" category was more than twice that in each of the other categories. However, it cannot be claimed on the basis of this analysis that the participants did, in fact, regard personal characteristics as more important than the other contributors. Each reference to a personal characteristic produced a count (as did each reference to other factors). Some respondents wrote of one personal characteristic only, for example, a sense of humour, and then expanded on this (and so it was given one count); other respondents listed several personal attributes each of which then generated a count. This latter type of response was less frequent in the other six categories. It would be necessary to frame a question differently in order to be more sure of the respondents' weighting of the "Personal Attributes" category. However, it can be stated with confidence that the participants regarded this category as of considerable, if not prime, importance as a factor associated with excellence in special education teaching.

## Concluding statement

A number of statistical procedures were used in the analysis of the Stage 1 data. These, together with the frequency data presented in Chapter 5, Data Analysis: Description of Stage 1 Participants, provided various ways of examining the research questions. They also provided two different perspectives, that of the teachers and of the supervisors. An additional perspective is provided in the following chapter which presents the reflections, over a two-day period, of each of the five excellent teachers who participated in Stage 2.