

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In the previous chapter, an overview of the literature relevant to this study was provided. Chapter 3 describes the research methodology of the study in terms of aims, sub-aims, and research design. It includes a description of the participants selected for the study and the material developed and used during this study. A discussion of the pilot study is provided with specific reference to the results and recommendations. This is followed by a description and discussion of the data collection procedure and data analysis process.

3.2 AIMS OF THE STUDY

3.2.1 Main aims

The main aim of this study was to investigate which associations tertiary students in the South African context make with selected Minspeak™ icons.

3.2.2 Sub-aims

The sub-aims of this study were to:

- ◆ Elicit associations from South African tertiary education students using the 12 common icons from UniChat™ programme
- ◆ Analyse elicited associations and determine their frequency of occurrence
- ◆ Compare elicited associations with current vocabulary implemented in Unity™

3.3 THE RESEARCH DESIGN

3.3.1 The research design

The study used a descriptive survey design (Denzin and Lincoln, 2000; Neuman, 1997) and included a single group of 480 tertiary education students from diverse backgrounds. Participants were required to complete a self-administered, open-ended questionnaire. This design was selected to obtain qualitative information regarding the associations that young

adults made with Minspeak™ icons, as a foundation for using these icons in the South African context.

3.3.2 The phases of research

The research was conducted in 2 different phases:

3.3.2.1 Phase 1: Preparation

- Icons were selected (based on criteria as set out in 3.5.1);
- An open-ended questionnaire was developed to elicit associations with Minspeak™ icons;
- A pilot study was carried out using the devised questionnaire and participants who complied with the selection criteria. A critical review of the material and procedure was conducted, and subsequent changes were made.

3.3.2.2 Phase 2: Fieldwork

- Specific groups of students were selected (including students from diverse areas of study) and data was collected;
- Data was analysed; and
- Elicited associations were compared with the current Unity™ vocabulary.

3.4 DESCRIPTION OF PARTICIPANTS

3.4.1 Selection criteria

A set of criteria was formulated in order to select participants for this study. Table 3-1 summarises the selection criteria and the rationale for including them in the selection process.

Table 3-1: Summary of selection criteria and motivation for inclusion

CRITERIA	MOTIVATION FOR INCLUSION
Participants had to be tertiary students at the University of Pretoria between the ages of 17 and 25 years	This age group is known to have rich, creative language, with features of a mature language (Louw, 1990)
Subjects had to have a high level of mastery of the English language and were therefore required to have English prescribed books on tertiary level	The original associations in the US and UK versions of Unity are in English; the questionnaires are also in English
Subjects' vision should be normal or aided to such an extent that it does not inhibit functioning	Subjects need to read cueing questions and make visual associations with a full-colour icon presented to them

3.4.2 Description of participants

All participants in this study were students at the University of Pretoria. This group was not homogenous but, being University students, could be regarded as having average or above average cognitive abilities.

The heterogeneity of the participants was evident. Participants' ages ranged between 17 and 25 years, with the majority between 19 and 21 years of age (see Table 3-4 for details). The majority of participants were male (58,7%), which is in accordance with local and international statistics of the gender ratio for people with disabilities (World Health Report, 2000). Table 3-4 summarises participants' ages and gender.

The multi-lingual nature of the South African context was palpable as 14 different first languages were recorded amongst the participants, including IsiZulu, SiSwati, SeTswana, TshiVenda, Cantonese, IsiNdebele, IsiXhosa, Malayalam, German and XiTsonga. The majority of participants spoke Afrikaans, English and Sepedi (the African language that is most prevalent in the area). In addition to this, nine different second languages (including Bengali, SePedi, German, Greek, Shona and Dutch) were recorded, although the majority of participants indicated their 2nd language to be either English or Afrikaans. This is significant as an important selection criterion was that participants should have a high level of mastery of the English language. Only 9,6 % of participants were English first language speakers, but 89,4 % were English second language speakers. However, as all the participants stated that they had English prescribed books and that it was the language of instruction on a tertiary education level, the assumption of an adequate level of mastery of the English language was made. Tables 3-2 and 3-3 summarise participants' first and second languages respectively.

Tertiary students studying in 21 different degree courses at the University of Pretoria were represented (Table 3-5 portrays the participants' area of study), as the area of study and/or knowledge in a certain field might have influenced the associations made with symbols. Participants from a variety of courses were therefore selected, including students from Social Sciences, Natural Sciences and Economic and Management Sciences. The largest percentage of participants were engineering students, followed by students in Communication Pathology and Psychology. Participants' length of study varied from one to four years, with the majority of participants being either 1st or 2nd year students.

Table 3-2: A summary of participants' first languages

	Afrikaans	English	SePedi	German	XiTsonga	TshiVenda	Cantonese	IsiZulu	SeTswana	SiSwati	IsiNdebele	IsiXhosa	Luganda	Malayalam
Number of participants	381	46	10	5	2	4	4	9	9	1	4	2	1	2
% of participants	79,4	9,7	2,1	1,0	0,4	0,8	0,8	1,9	1,9	0,2	0,8	0,4	0,2	0,4

Table 3-3: A summary of participants' second languages

	Afrikaans	English	German	Bengali	SePedi	Dutch	Malayalam	Greek	Shona
Number of participants	42	429	2	1	1	1	2	1	1
% of participants	8,8 %	89,4 %	0,4 %	0,2 %	0,2 %	0,2 %	0,4 %	0,2 %	0,2 %

Table 3-4: A summary of participants' ages and gender

	Sex		Age								
	Male	Female	17 years	18 years	19 years	20 years	21 years	22 years	23 years	24 years	25 years
Number of participants	282	198	8	15	300	89	35	18	6	5	4
Total number of participants	480		480								
% of participants	58,7	41,3	1,7	3,1	62,5	18,5	7,3	3,8	1,3	1,0	0,8
Total % of participants	100 %		100 %								

Table 3-5: Summary of participants' area of study

Course	Number of participants	% of participants
B.Com	5	1,0
B.Communication Pathology	56	11,7
Human Movement Sciences	2	0,4
B.Educational Psychology	2	0,4
B Psychology	7	1,5
BSc(Information Technology)	28	5,8
B.Social Sciences	42	8,8
BA	10	2,1
B.Engineering	23	4,8
B.Engineering(Industrial)	23	4,8
B.Engineering(Civil)	25	5,2
B.Engineering(Computer science)	110	22,9
B.Engineering(Electrical)	56	11,7
B.Ed	15	3,1
B.Sc	24	5,0
B.Sc (Financial Maths)	34	7,1
B.Engineering(Mining)	4	0,8
LLB	2	0,4
B.Engineering(Metallurgic)	3	0,6
B.Engineering(Mechanical)	7	1,5
B.Engineering(Chemical)	2	0,4
TOTAL:	480	100 %

3.5 MATERIAL USED

The first sub-aim of this study was to elicit associations from South African tertiary education students. To achieve this goal two steps were followed: i) the selection of Minspeak™ icons with which associations could be made; and ii) the development of a questionnaire to elicit associations.

3.5.1 Icon selection

The selection of icons to be included in this study proved to be an arduous task, as there are more than a hundred different icons in Unity™ alone. To ensure that the selection procedure was more unbiased, compliance with the following selection criteria was required:

Table 3-6: Selection criteria for icons

CRITERIA	MOTIVATION FOR INCLUSION
Icons had to be used for representing common vocabulary of AAC-users	As a first study, it is important to start with icons that were frequently used
Icons had to be used on both beginning communication VOCAs and more sophisticated VOCAs	Icons should cater for development and growth in an AAC-user's communication abilities and needs, e.g. move from single hit messages to multiple hit messages
Icons had to be used on a VOCA that was widely used by AAC-users in SA	The icons need to be relevant for use on an affordable VOCAs within the South African context

Beginning communication VOCAs making use of Minspeak™-icons were investigated. The Minspeak™-based beginning communication VOCA that was most widely used in South Africa, was the Chatbox™. The UniChat™ programme was typically used with the Chatbox™ where fixed overlays were available, with 12 of the 16 options per overlay consisting of common icons, i.e. these icons appeared on each of the fixed UniChat™ overlays provided. The icons used as core icons on the Chatbox's UniChat™ overlays formed part of icon sequences in Unity™/AT and Unity™ 128 and the icons therefore had articulation possibilities with the AlphaTalker™, DeltaTalker™, Liberator™, and Pathfinder™ amongst others. Each of the 12 *core icons* used in the UniChat™ programme was therefore selected as it complied with all the selection criteria. See Appendix A for a list of icons that were included in this study.

3.5.2 Development and description of questionnaires

A questionnaire was subsequently created for each of the 12 icons, keeping the questionnaire constant, but varying the icon and thus creating 12 different questionnaires. See Appendix B for examples of the questionnaires. Literature searches for association cueing questionnaires presented insightful ideas from the areas of Cognitive Science (Nelson, 1977; Petry, 1977) and AAC (Bruno and Goehl, 1991), including associations made with verbal prompts, and visual representations. However, little information was found on self-administered questionnaires developed to elicit associations with visual representations like pictures or icons.

A questionnaire was developed by formulating cueing question to elicit different types of associations. As discussed in Chapter 2, there are two different levels of association categories, including paradigmatic and syntagmatic associations (refer to Table 2-1 for details). These associations are further sub-categorised into functional, nominal, visual, auditory, episodic and extraneous associations (refer to Table 2-2 for details and examples). The individual's ability to make associations are frequently assessed by asking questions to cue the types of associations mentioned above. The cueing questions used for eliciting associations in this study were based on questions found in assessment protocols (Elder et al., 1989; Glennen, 1997). These questions also complied with the questions posed in the *What is Minspeak™?* book (Van Tatenhove, 1993). Table 3-7 presents a summary of the association categories included and the subsequent cueing questions that were included in the self-administered questionnaire.

Table 3-7: The cueing questions included to elicit associations

Question number	The cueing questions	Possible association categories elicited by the cueing question
1	What do you see?	Nominal
2	What do you do with it?	Functional
3	What group/category does it belong to? (e.g. transport, furniture, etc.)	Nominal (superordinate)
4	Who uses it?	Functional; Episodic
5	How would you describe it? (e.g. size, shape, colour, substance, etc.)	Visual
6	Where do you find it?	Nominal (location)
7	What sounds and obvious utterances would you use with it?	Auditory; Episodic
8	Why would you use it?	Functional
9	What obvious parts does it have?	Nominal (part)
10	Name other things that are similar	Nominal (subordinate)
11	In which forms do you find it?	Nominal (coordinate)
12	What goes with it?	Episodic
13	How do you feel using it?	Episodic

3.5.3 Data recording sheets

Two different data recording sheets were developed for Phase 1 of the data capturing procedure. The first was an Excel spreadsheet developed to record all the responses. A separate table was created for every icon with separate columns created for the following (see Appendix C for an example):

- a different column for each of the responses per question
- a column for the number of questions eliciting no response whatsoever;
- a list of the question numbers eliciting no response whatsoever;
- the number of questions only eliciting comments on the question, but no associations;
- a list of the question numbers only eliciting comments on the question, but no associations;
- a column for each of the two most prevalent prepositions;
- the most prevalent article used in relation to concept identified in question 1 of the questionnaire;
- a column for the most prevalent pronoun used in conjunction with concept identified in question 1;
- a column for generic utterances;
- idioms; and
- moral judgements.

The other recording sheet was developed to record the different common associations per question per icon, with their frequencies and the words included in each common association category. See Appendix D for examples.

3.5.4 The compilation of the Unity vocabulary list for comparison

A list of UnityTM vocabulary items was compiled for comparison with the elicited associations. This list was a culmination of the current Unity vocabulary as suggested by two sources: the Vocabulary sort on the “Look who’s really talking” CD-ROM (Prentke Romich Company, 1998); and the Unity 128 version of the BUILLDTM customised vocabulary sort (Valot Klotz et al., for Prentke Romich Company, 1997). The compiled list was compared with both these sources to ensure that the final list included all vocabulary cited. The developers of these sources emphasise that these vocabulary items are *not* the only ones that can be used, and the

use of customised vocabulary is encouraged. However, these vocabulary items are included in Unity software packages that are distributed worldwide and are included in this investigation.

3.6 PILOT STUDY

A pilot study was done to review the effectiveness of the material and procedures to elicit the associations. The pilot study was carried out using randomly selected participants that complied with all the selection criteria. The results are summarised in Table 3-8:

Table 3-8: A summary of the findings of the pilot study

AIMS	PROCEDURES	RESULTS	RECOMMENDATIONS
1. To determine whether the instructions are easily understandable	Participants had to complete the questionnaire, followed by a discussion	Most participants conveyed that they understood the instructions well. This was confirmed by the responses derived. Two participants revealed that they did not read the instructions.	No alterations to instructions are necessary, except to block and bold them, to ensure that participants read the instructions.
2. To evaluate the ease with which the participants understand the language and specific terminology used in the questionnaire	Participants completed the questionnaires and a group discussion was held about the difficulties experienced in completing the questionnaires	Participants reported that they found the questionnaire “easy”, except for four questions - numbers 3, 5, 7 and 9. Students affirmed that they understood the instructions well. This statement was confirmed by their responses	The questions that were difficult to understand were rephrased and, where necessary, highlighted with an example.
3. To determine the amount of time required for completing a questionnaire	As for the main study each participant had to complete one questionnaire and the amount of time required to complete a questionnaire was determined	Participants completed the questionnaires in between 7 and 10 minutes	At least 12 minutes need to be allocated in the data collection procedure for every participant to complete his/her questionnaire
4. To determine feasibility of the data collection procedure proposed	A short introduction to the aims of the research was given to the students, they had to complete the questionnaire independently, the questionnaires were collected and an incentive was handed to each student	It seems that data collection will be easier with the aid of at least 2 research assistants to aid in collecting questionnaires from students around the lecture hall. Students reacted favourably to the small incentive	At least two research assistants need to be recruited to help with the data collection procedure
5. To test the efficiency of the computerised system that is to be used in data capturing	Data was captured in Excel, creating a column for every response	The data capturing procedure proved to be efficient in terms of time and reliability	MS Excel will be used for capturing data
6. To determine the effectiveness of the questionnaire in eliciting associations from South African young adults	The aims of the study were briefly explained to students and students had to complete the questionnaire.	Creative associations were elicited from the participants. They were excited to be part of the research.	This questionnaire seems to be effective in eliciting associations from South African tertiary students and, when adjusted according to the recommendations mentioned above, could be used for determining their associations with icons and pictures.
7. To determine whether the analytic framework will be effective in interpreting results	The data analysis procedure was followed as described for the main study, looking at the effect of the different icons on association performance.	Data analysis and interpretation seem to be effective, but more information is needed on the impact of the different questions on association performance.	Clear guidelines need to be established, with the interrater, for pruning to ensure reliability

3.7 DATA COLLECTION PROCEDURE (MAIN STUDY)

3.7.1 Preparation for fieldwork

The following procedure was used while preparing for the fieldwork:

- a) Groups of potential participants were selected (see Table 3-1 for selection criteria), including students from the Social Sciences, Natural Sciences as well as the Economic and Management Sciences
- b) The respective lecturers were approached to request assistance. Upon compliance, time slots were discussed. These time slots were scheduled for the first 20 minutes of a 50 minute lecture period in every instance
- c) Questionnaires were reproduced in colour, to preserve the icons' colour and print quality
- d) 40 copies of each of the 12 questionnaires were made. The 480 questionnaires were sorted, alternating the icons to ensure adjacent participants who complete the questionnaires supplied original answers

3.7.2 Fieldwork (Data collection)

The following procedure was used for data collection:

- a) The researcher introduced herself and the research assistants and briefly explained the aims of the research
- b) The researcher explained what would be expected of participants and requested students who were not willing to participate to leave the room. Care was taken during the introduction not to influence the participants in any way and to put them at ease. No names were attached to the questionnaires to ensure confidentiality. All participants had the right **not** to participate in the study or to exit at any particular point in time during the fieldwork (See Appendix E for verbatim instructions)
- c) Questionnaires were distributed to participants and a time frame for completion (approximately 10 minutes) was suggested, but no time limit was given
- d) On completion, participants handed their questionnaires to one of the research assistants who checked the questionnaires for completeness
- e) Questionnaires were sorted according to the depicted icon and were numbered to ensure that the intra-rater and inter-rater could refer back to the different questionnaires if needed
- f) Pruning of responses were done according to the guidelines provided in 3.8.1
- g) Responses were captured on MS Excel spreadsheets and common associations were established

3.7.3 Research assistants

Two research assistants were recruited to assist the researcher in handing out and collecting questionnaires from students during the data collection procedure. These research assistants were students in the Honours in AAC programme at the University of Pretoria.

3.8 DATA CAPTURING PROCEDURES

3.8.1 Phase 1

As the questionnaires only included open-ended questions, responses had to be recorded accordingly. Responses were pruned and captured on Excel spreadsheets (see Appendix C for example), according to guidelines based on the work of McBurney (1998), the type of associations/concepts used in the current Unity™ software, discussions with the other students and the supervisor in the Masters programme in AAC and the researcher's experience with analysing the data during the pilot study. See Appendix F for an example of a pruned questionnaire.

Table 3-9: Guidelines for pruning and data capturing

Data capturing procedure	Example
The "golden rule" is to focus on the <u>concept</u> portrayed and not simply the words. Implied concepts are also included	<i>man behind bars</i> can be recorded as: man/ behind/ bars/ man-behind-bars (i.e. convict)/ behind bars (i.e. convicted)/ in jail
Record only root words - modifications pruned	"round" in stead of roundish, etc.
Basic concepts were recorded, whilst pruning articles	recording "eat", "watch" and "communicate" in stead of "eat it", "watch it" and "communicate with it"
A generic utterance was only recorded when it was a full sentence, while it was pruned if it was only an introduction to or an insignificant part of the response	"I don't know" as opposed to "The fact that ..."
Multiple words in response to the same question, from the same semantic field were coded separately, as this might provide information to facilitate learning or enhance richness of vocabulary	"jumping" and "leaping"; "pretty" and "beautiful"
Prepositions denoting a specific element were coded <i>with</i> the specific element	"behind bars" can be any one or more of the following elements: behind/bars/behind bars (i.e. convicted)
Record the number of questions that did not elicit an association, but only a comment on the question or were omitted intentionally (i.e. line drawn in/across the response area of questionnaire)	2 questions were consciously omitted (by means of drawing a line in the response area) - questions number 7 and 11
Those prepositions that were most prevalent in every questionnaire and used in connection with the concept provided in question 1 (i.e. "What do you see?"), were recorded separately. The two most prevalent prepositions were recorded	"behind" and "under"

The second rater was involved in the development of the pruning guidelines to ensure applicability. See section 3.9.4 for more details.

3.9 DATA ANALYSIS AND STATISTIC PROCEDURES

The data analysis procedure consisted of two phases, namely the primary phase where the percentage of occurrence of an association was calculated, and the secondary phase that included determining the impact of the icons and cueing questions on the association performance, and comparing elicited associations with the current vocabulary found in Unity.

3.9.1 Phase 1

After responses were computerised, the percentage at which the associations occurred was calculated. These associations were further categorised, in order to determine what the common associations elicited for each icon were. For this purpose, words/phrases/concepts from the same semantic field were grouped together under a general term describing the relationship between the lexical units (see Chapter 2 for a detailed description of semantic fields), e.g. the APPLE-icon elicited associations like banana, peach, strawberries, grapes, pears, et cetera, and a common association was recorded as “Other fruit”.

An arbitrary **minimum frequency of 15%** had to be achieved in order for an association to be regarded as a meaningful **common association**. This was done in compliance with the current Unity™ format, where there are different categories of associations connected with the first icon in these icon sequences; and more specific items defined by the second and third icon in the different icon sequences. These association categories were created in conjunction with the second rater (see section 3.9.4 for more details).

3.9.2 Phase 2

The second phase of the data analysis procedure had three parts: (i) analysing data to determine what the effect of the icons were on association performance; (ii) analysing data to determine the impact of the cueing questions on association performance; and (iii) using the common associations and the words/phrases/concepts included under each of them to compare them with the associations used in the current Unity™ 128 software. A recording sheet was developed for every question, in order to record the three common associations with the highest frequencies and the words/concepts/phrases that were included under each common association (see Appendix D for examples).

Only those **common associations** occurring at a percentage of **more than 15 %** were included. Common associations that did not occur at a frequency of 15 % or more, were

categorised under the “Other associations” category and the percentage of occurrence per question per icon was calculated. The common association per icon with the highest percentage was coined the first level association, with the subsequent associations called the second and third level associations. An average percentage of occurrence of the three common associations per question per icon was established, as well as the percentage of the first level association per question per icon.

3.9.2.1 The cueing questions’ impact on association performance

Calculations were done to determine whether there were significant differences in association performance as elicited by every question across icons. The average of commonality was determined for every question across all 12 icons by calculating the average of the top three common associations’ percentage of occurrence per question per icon. These figures were analysed in terms of meaningful differences in association performance.

3.9.2.2 The icons’ impact on association performance

Other calculations were done to determine whether there were significant differences in association performance across the different questions for every icon. The average of the three common associations’ percentage of occurrence was calculated across questions for every icon, as well as an average of every question’s first level association across questions for every icon. Once again, these figures were analysed in terms of meaningful differences and patterns of association performance that might have been evident.

3.9.2.3 Comparison of elicited responses and current Unity™ vocabulary

The list of words used to describe associations was compared with the compiled list of current Unity™ vocabulary (see 3.5.4 for a description of the compilation process). The comparison was made on two levels. Firstly, the actual Unity™ vocabulary was compared with the words used to describe concepts elicited in this study. For this purpose the percentage of agreement was calculated *for every icon*, using the following formula:

$$\frac{\text{The total number of communal words}}{\text{Total number of words included in Unity}} \times \frac{100}{I}$$

The second comparison made was to describe the commonalities between the lists in terms of the concepts used and similarities in the semantic fields used and elicited. This was done as a comparison of only the words might misrepresent conceptual commonality.

3.9.3 Intra-rater reliability

The researcher recorded the responses according to the aforementioned guidelines and after a period of 10 days the responses were re-recorded. Intra-rater reliability was calculated at 94,3 %, according to the formula proposed by McReynolds and Kearns (1983):

$$\frac{\text{total amount of similarities}}{\text{total amount of similarities and differences}} \times \frac{100}{1}$$

It was decided that, based on the high level of intra-rater reliability, the questionnaires and recording sheets could be handed to the second rater.

3.9.4 Interrater reliability

The second rater was a PhD-student in the field of AAC, at the University of Pretoria. The interrater involvement in the data capturing and analysis procedures of this study was fourfold. See Table 3-10 for a summary of interrater involvement, the nature of involvement and the results of procedures. For procedure 2 and 3 the interrater reliability was calculated according to the previously mentioned formula (McReynolds and Kearns, 1983). High levels of interrater reliability was calculated (see Table 3-10) and the researcher could proceed.

Table 3-10: Summary of second rater involvement

#	Procedures where second rater was involved	Nature of interrater involvement	Results of interrater involvement
1	Establish guidelines for pruning and capturing of responses on Excel spread sheets	A set of guidelines were developed following a discussion between the students in the Masters programme in AAC at the University of Pretoria and their supervisor. These guidelines were used during the pilot study to obtain further details. This set of guidelines was submitted to the second rater together with a random sample of questionnaires to obtain feedback on the applicability of the guidelines. A discussion of what the aims of the guidelines were, followed.	After the discussion about the aims of the guidelines and the interrater investigation, some clarification was needed on the guidelines submitted to the interrater. Changes were subsequently made to the guidelines and the set of guidelines was seen as applicable to the response pruning of this study.
2	Recording responses on the Excel spread sheets	The researcher recorded the responses according to the guidelines (also see intra-rater reliability in section 3.9.3). Recording of responses had to be checked for reliability and 14 % of response sets (questionnaires and recording sheets) were submitted to the second rater to obtain data for interrater reliability. The second rater had to check the responses the researcher recorded and mark differences.	Making use of the formula suggested by McReynolds (1983), it was established that interrater reliability for this procedure was 97,9 %, which was considered high enough to proceed. See Appendix G for more detail.
3	Deciding on the minimum percentage of commonality that would be expected of an association in order to be considered a common association	Discussions were held with both the supervisor and second rater respectively, as to what percentage of commonality (i.e. what percentage of responses were a specific association) would be high enough to regard as significant.	A preliminary minimum of 10 % commonality was suggested, but further data analysis indicated that 15% commonality would be more desirable.
4	Further categorisation of responses into semantic fields to establish common associations	The responses per question per icon were grouped for synonyms, co-ordinates, parts, sub-ordinates; and different semantic fields were identified by the researcher. The results of this subcategorisation was submitted to the second rater to check and record changes where necessary.	The amount of similarity between the researcher and second rater was initially 91,2 %. This was followed by a discussion of differences. Another 14 % of categorisation sets were analysed and interrater reliability was now established on 97 %, which was considered high enough to proceed.

3.10 SUMMARY

This chapter described the research methodology of the study. It included the aims, sub-aims and research design for the study. The pilot study was discussed with specific focus on the results and recommendations for the main study. The different criteria for selection, and a description of participants were provided. Finally, the data collection and analysis procedures were discussed with specific attention to interrater reliability.

Chapter 3 described the research methodology of the study. This chapter describes the results obtained, which are discussed against the background of the sub-aims as stated in the previous chapters. The responses elicited for each icon will be discussed in terms of the different semantic associations and the percentage of correctness with which these associations occurred. The influence of the different testing situations on the types and preferences of occurrence of the elicited associations is reviewed. Finally, the results of a comparison between the elicited associations and the current primary 7 vocabulary are described and discussed.

4.2 RESPONSE RATE

As described in Chapter 3, a self-administered questionnaire was used to elicit associations from tertiary education students. A high average response rate of 97 % was achieved, which indicates that on average 97 % of respondents provided associations across the different overlays, ranging between 96 and 99 % for different icons. Table 4-1 is a summary of the response rate per question per icon.

Table 4-1: Summary of response rate per question per icon

Question	Icon 1	Icon 2	Icon 3	Icon 4	Icon 5	Icon 6	Icon 7	Icon 8	Icon 9	Icon 10	Icon 11	Icon 12	Icon 13	Icon 14
Q1	100	100	100	100	100	100	99	100	99	100	99	99	99	99
Q2	100	99	98	98	98	99	99	99	100	98	99	99	99	99
Q3	100	100	99	100	99	100	99	99	100	99	99	99	99	99
Q4	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q5	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q6	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q7	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q8	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q9	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q10	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q11	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q12	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q13	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q14	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q15	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q16	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q17	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q18	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q19	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q20	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q21	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q22	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q23	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q24	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q25	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q26	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q27	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q28	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q29	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q30	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q31	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q32	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q33	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q34	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q35	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q36	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q37	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q38	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q39	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q40	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q41	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q42	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q43	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q44	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q45	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q46	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q47	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q48	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q49	100	99	99	100	99	100	99	99	99	99	99	99	99	99
Q50	100	99	99	100	99	100	99	99	99	99	99	99	99	99