Chapter 4

Instructional Methods

4.1 Introduction

Every person is like *all* persons, like *some* persons, and like *no other* person. According to Dunn and Griggs (1995:37), this shows the way in which human universality, cultural specificity and individual uniqueness interact to influence how each individual learns. As concluded in Chapters 2 and 3 it is clear that students have differences in terms of how they function in an L2 learning environment.

According to Nunan (1991:228), language teaching has been obsessed with a search for the right method for much of its history. It was felt that somewhere there was a method which would work for all learners in all contexts, and that once such a method had been found the language teaching "problem" would be solved once and for all. More recently, it has been realised that there never was and probably never will be a method for all, and the focus in recent years has been on the development of classroom tasks and activities that are in keeping with the dynamics of the classroom itself (Nunan, 1991:228). Yoder (1994:128) states that "there is no single instructional method that is optimal for all learners".

Albright and Graf (1992:7) point out that nothing has really changed at classroom level and that a good many contemporary university students probably find themselves taught by methods largely unchanged from those experienced by their parents and grandparents. In traditional teaching environments the following triangle was always part of the environment: the lecturer/teacher, the student/learner and the subject matter/material to be learned. Duminy and Sönge (1980:59) state that the lecturer should plan every

lesson in terms of the definite and specific needs of the students/learners in the class. Apart from matching student needs, the instructional method should also match the subject matter and the objectives/outcomes of the lecture/lesson.

In recent years the focus has moved very much from the teacher/lecturer to the individual student. The reason for this shift in focus seems to be embedded in the individual differences that exist between teachers/lecturers and students. Different learning outcomes require different skills or abilities. Individuals differ in their abilities to process information, construct meaning from it, or apply it to new situations (Jonassen & Grabowski, 1993:19).

This has lead to teaching styles such as adaptive instruction where the form of instruction changes to suit the needs or desires of individuals. This assumes that all learners will not perform equally well given a single form of instruction. The idea also entails the assumption that the nature of instruction should be adapted, and that we make available to the learners' more than one form (Jonassen & Grabowski, 1993:35).

The focus of this chapter is on the traditional lecture method and Computer-Assisted Instruction (CAI). The reason for this choice is that research by Dreyer (1998; 2000) indicates that the predominant instructional method employed at South African universities and schools is still the traditional lecture method. The importance and affordability makes it a feasible medium of instruction. In recent years the computer has evolved from an educational curiosity (mainly owing to the costs associated with it) to an instructional aid that is available in virtually every school. Cotton (1997:1) reports that during the last 20 years of the twentieth century the number of American schools owning computers increased from approximately 25% to virtually 100%. Although no such statistics are available for South Africa, a comparative growth in the availability of computers in schools can be recognised. The development of educational software is a growing (and ever expanding) industry, with new software titles

appearing every month. The internet has also become a source of information for students and scholars alike.

In addition, this thesis investigates the possibility of combining the traditional lecture and CAI. Oral presentation (i.e. the lecture) is more teacher-centred, whereas CAI is more centred on the individual student. It goes without saying that simple as it may seem, such a division does have its problems in terms of an overlap in the scope of some methods.

The purpose of this chapter is, therefore, to highlight the most important characteristics of each of these instructional methods, and the advantages and disadvantages of each. The benefits of combining the two instructional methods are discussed, and the last section brings research on instructional methods and learning styles together.

4.2 Lecture method

The lecture method has been in use for centuries to train and educate people, and this practice continues to the present. Zemke (1983:50) found in a survey conducted in the United States that 90% of the respondent organisations still cite the lecture as their primary method of instruction. Fink (1989:17) states that the lecture is the most common form of teaching activity at college and university level, and that the lecture method has survived the advent of the printing press as well as video and computer technology.

The lecture method is also known as the telling method, formal instruction, narrative, speech, presenting a paper or talk. This method is well known in the traditional school and has been, for centuries, the chief activity in the classroom. Since the beginning of this century, however, revolutionary changes have taken place in the educational field and the time-honoured telling method and recitation have given way to problem solving methods (Duminy & Sönge, 1980:60).

4.2.1 Characteristics of the lecture method

As a teaching method, the lecture falls under the category of presentation (cf. Sassenberg, 1985:68). In the lecture method the presentation is normally made by the lecturer to a group of students.

The lecture is characterised by the lecturer's control over the teaching process. In the lecture it is assumed that learning happens automatically after the lecture is presented. Contact with students is only made when questions are presented to them. Students normally listen passively and do not interact with the lecturer and other students for most of the lecture (Sassenberg, 1985:68).

Various configurations of the lecture exist and the main features can be described as follows:

According to Lang et al. (1994:270), a good **lecture** is like a good speech: the speaker must catch the students' interest at the beginning, hold it during the session by delivering pertinent information logically arranged, involve listeners overtly or covertly, and stop before they reach saturation point. Classroom lectures should not be boring, full-period monologues. Lecture sessions should be made as stimulating and challenging as the teacher can make them, because maintaining a high interest level pays dividends in student learning. A lecture can be an efficient means of communicating basic facts, concepts, principles, generalisations, points of view, and arguments about a particular area of knowledge. The lecture can also be usefully combined with other techniques, such as discussion, visuals, demonstrations, or question and answer sessions. Depending on a variety of circumstances, the teacher can personalise his/her approach by inviting overt or at least covert student participation. The proportion of instructional time used for a classroom lecture usually increases as the grade level rises (Lang et al., 1994:270).

Fink (1989:18) states that the appropriateness of the lecture method in teaching depends on the material being taught as well as the lecturing abilities of the teacher/lecturer. Fink identifies four aspects of lecturing that can dramatically improve a lecturers' performance: presentational quality, appropriateness of use, intellectual stimulation and interpersonal rapport.

Fink (1989:18) notes that the **quality of the presentation** is in many cases more important than the information that is being presented. Quality of presentation depends on small things i.e. are the transparencies neat, are the main points well organised and well prepared, does the lecturer have an interesting way of opening and closing the lecture, does the lecturer make eye contact, and are examples well selected? Fink (1989:18) maintains that an excellent idea poorly presented has little educational value.

With **appropriateness of use**, Fink (1989:18) questions whether the non-stop 55-minute lecturer talk is the most appropriate way to share the information with the students. Fink (1989:18) suggests that slight modifications to a lecture can have great effects. Examples are to have a mini lecture followed by a discussion, or a mini lecture followed by a case study or demonstration, etc.

According to Fink (1989:19), **intellectual stimulation** is the measure by which the students perceive the information being lectured to them as being dynamic and interesting.

Interpersonal rapport signifies the degree to which the lecturer has succeeded in making contact with the audience. It is easier for a class to become bored if a lecturer has not succeeded in making personal contact (Fink, 1989:19).

4.2.2 The structure of the lecture

The lecture method is mainly used for the transfer of knowledge and information and five phases can be identified in the development of the lecture:

(1) need identification, (2) goal setting, (3) development, (4) implementation, and (5) evaluation.

During the **need identification** phase the learning needs should be identified and the lecturer should judge whether the lecture method is the best method to satisfy the teaching/learning needs before proceeding with lecture development. The lecturer should also take the target audience into account during this phase (Sassenberg, 1985:71).

If a course comprises of more than one lecture, **goals should be set** for the whole course. Individual goals should also be set for each individual lecture and should be told to the students at the beginning of each lecture. These goals form the criteria against which a lecture can be evaluated later (Sassenberg, 1985:72).

The **development phase** is the phase in which the "meat" is put on the skeleton of the goals that have been set for the lecture. The lecture should be set out systematically and develop sequentially and logically, and all relevant aspects should be covered. Examples, case studies, visual aids etc. should be selected and incorporated into the lecture. The whole lecture should be written out and prepared in order to facilitate a natural and spontaneous presentation by the lecturer (Sassenberg, 1985:74).

Implementation entails presenting the lecture to the target audience. One of the first aims of the lecturer is to create a rapport with the target audience, as well as to capture their attention and interest. The most important aspect of delivering a lecture is that it should be presented as spontaneously and naturally as possible. This is only possible if the lecturer has prepared all aspects of the lecture very well. Verbal and non-verbal interaction with the students is also very important to keep interest, and stimulate student response and interaction. The conclusion of the lecture is also very important and the lecture should be ended with a summary of what has been presented in order

to reinforce the retention of the information that has been presented (Sassenberg, 1985:79).

Evaluation can take place in the form of direct feedback from the students, self-evaluation by the lecturer, and external evaluation by, for example, colleagues of the lecturer sitting in on the lecture (Sassenberg, 1985:82).

4.2.3 Advantages of the lecture method

The lecture can be a useful teaching method when:

- The subject matter is factual and provides little opportunity for forming opinion or solving problems.
- You need to arouse your students' interest or provide background information before using another method of instruction.
- You are instructing your students in practising a learning technique.
- Your class is large, teaching time is limited, and critical information must be provided succinctly.

Other advantages of the lecture method include:

- Lecturing as an instructional method generally takes the least amount of effort in terms of preparation and presentation.
- Lecturing also allows the lecturer to cover (or fly over) a vast amount of work in a short period of time since the format is normally that of a monologue.
- The enthusiastic lecturer can motivate students through the lecture. Students can also see the lecturer illustrate methods and ways of thinking that form part of the subject being taught.
- The lecture method allows the lecturer to introduce a new topic to students by way of introduction. The lecture allows the lecturer to give a well structured introduction in a short space of time (cf. Lang et al., 1994:272; Du Plessis, 1993:111).

4.2.4 Disadvantages of the lecture method

Lecturing is not a recommended strategy when:

- The context is complex, abstract, or detailed.
- High rates of learning and long-term retention are instructional goals.
- The content deals with feelings, attitudes, communication, and interpersonal or group skills.
- Learners must integrate content with previous learning or life experience.
- An experimental approach to learning may be more appropriate.
- Thinking skills or process outcomes are more important than product (informational) outcomes.

Other disadvantages of the lecture method are:

- The fact that students tend to be very passive. The more frequently the lecture method is employed the less independent work from the student is necessary to master the work.
- A lot of work can be covered in a lecture without allowing students to internalise the knowledge. This may lead to factual knowledge, but knowledge that the student cannot apply in real life.
- The lecture is mass communication, like a movie or a TV programme. It is difficult to reach every student on a personal level during a lecture (cf. Lang et al., 1994:272; Du Plessis, 1993:112).

4.2.5 Hints on the presentation of lectures

Lang et al. (1994:271-272) and Du Plessis (1993:117) provide the following guidelines for effective lecturing:

- Plan to begin your lecture and assigned question sessions with stimulating advance organisers or pattern guides to grab your students' interest.
- Adapt the content and your style of presentation to your students' developmental levels by using words and speaking at a rate suitable to those levels. Avoid "talking down".

- Show enthusiasm for the topic you are teaching: your students will not be interested in a topic that does not interest you.
- Reinforce the points of your lecture and provide for transfer by relating key points to your students' experiences, successes or interests, and drawing examples from your class. Take care to avoid causing anyone embarrassment.
- Pause to ask for summaries at the beginning of your lesson (past learning), during the presentation (to check for attention and comprehension and allow for questions), and at the end (to check for comprehension and allow for questions).
- Pause, also, to provide emphasis or give your listeners the opportunity to catch up by summarising information for themselves.
- Invite covert participation by asking rhetorical questions or suggesting that students note points they may wish to ask about or discuss later on.
- Supplement your lecture by supporting key ideas with a generous number of visuals: use chalkboard, an overhead projector, charts, or slides.
- Do not read from notes or a text, a procedure that promotes mechanical transfer of information from those sources to your students' notebooks, while leaving the minds and memories of all parties almost undisturbed.
- Do not present too much information all at once: two or three major points per half-hour is enough. Long term memory of the lecture depends on how well the content of the lecture was understood.
- A lecture should cover a defined module or problem. The aim of the lecture is to generate insight and critical evaluation of the content of the lecture. The aim should never be to progress from point A to B in the textbook as this will not lead to insight and critical thinking on the part of the student.
- Any notes on the board or other lecturing aid should be to the point and act as a guide to the lecture. Lecturers should guard against presenting too much information on a transparency as students will stop listening

and understanding in their quest to copy all the content before the lecturer switches to the next transparency.

- A practical example, joke, humorous anecdote, or case study can help maintain interest and assist students in memorising the content being discussed.
- Selective use of the lecture involves remembering that your students' attention span has limits and assessing those limits realistically.
- Students' future need of the information that is delivered in the lecture needs to be taken into account. Classroom time constraints make it impractical to linger over detailed information that students are unlikely to need later on and will soon forget.
- Students' developmental levels and innate learning style preferences should be taken into account, and the lecture should be supplemented with other instructional strategies if the lecturer observes that the students are losing interest.
- The lecture should be followed up by checking that the students understood the information that was presented to them. Time should be allowed for class discussions and opportunities for students to apply newly acquired knowledge (preferably by initiating some activity that involves experimental or hands-on learning) should be provided.

4.2.5.1 Variations on the lecture theme

The lecture method can also be adapted by varying the format of the lecture. This can be done in the following ways:

(i) **Discovery learning**

Discovery learning or indirect instruction promotes learning through the skills of observation, investigation, reasoning, drawing inferences, or forming hypotheses that go beyond the information at hand (Lang et al., 1994:283). **Guided discovery** encourages students to identify for themselves the principles and processes involved in acquiring a skill by "discovering" its

successive steps and their relation. This approach, which can be useful in speeding up learning and promoting transfer, often includes asking questions that will help students to discover the processes and summarise the steps or principles involved in a skill before the content is modelled or demonstrated (Lang et al., 1994:284). Both discovery methods are very appropriate for hands-on learners, especially if props or models are used. Global learners will also appreciate discovering the information that needs to be learned.

(ii) **Classroom conversations / discussions**

Many effective discussions involve the use of authentic materials. Examples are city street maps, public transportation guides, relief maps, lists of hotels, menus from local restaurants, tourist brochures, catalogues, movie listings, and shopping guides. Students can use the authentic materials in designing and discussing imaginary events, for example, a travel itinerary (Scarcella & Oxford, 1992:161). Classroom discussion can provide opportunities to develop qualities such as reciprocity, relevance, depth, and objectivity. Since most classes are too large for productive discussion, it is often necessary to organise the class into groups for such activities (Burton et al., 1975:95).

(iii) **Team learning**

Develop an explicit title for the team learning so that students will know what they will learn from completing the assignment. Select four or five students that will comprise the team, and give clear instructions on what they need to do to master the outcomes successfully. One student should be assigned the responsibility to act as team leader, recording the answers to questions and conclusions the team reach (Dunn & Griggs, 1995:114). While teams are busy, the teacher should walk around and observe who is working and who is not co-operating, and helping where students are getting side tracked (Dunn & Griggs, 1995:115).

(iv) **Working in pairs**

Even first year language students can work profitably in pairs, especially on oral drills. If a teacher carries out an intensive drill for five minutes, calling on individual students, each student in a class of thirty will be speaking for only about five seconds, and the teacher will be speaking for two and a half minutes. If the drills plus correct responses are distributed to the students, or if the textbook already has the correct responses, then pairs of students can take turns playing teacher. One holds the text and reads the question and one answers. The end result is that each student is able to speak for two and a half minutes – almost 30 times as long as when he or she was part of a whole class drill (Allen & Valette, 1977:36).

(v) **Electronic discussion groups**

Electronic discussion groups use e-mail as an instructional strategy. Discussions are an important part of learning because they help students formulate and articulate ideas, learn the language of the subject matter, and become comfortable with the art of discourse. In some ways e-mail conversations among learners are similar to class discussions. In other ways, e-mail functions differently and can sometimes complement face-to-face activities. For example, electronic discussion can be a tool for introducing students who are reluctant to participate in class discussion and who might find e-mail a more comfortable outlet for expressing their thoughts. It also allows time for students to reflect and contribute to the conversation at their own pace (Lowry et al., 1994:22). This strategy is ideal for involving introverts in a manner that does not make them feel uncomfortable or "in the spotlight".

Kroonenberg (1995:24) maintains that electronic mail encourages students to use computers in realistic situations so that they can develop communicative and thinking skills. Even the technologically phobic language teacher can learn to encourage students to use e-mail in skill development, and the most timid

language students can come alive while creating meaningful communication via the keyboard and screen.

(vi) Co-operative learning

A co-operative learning group is **not** a seating arrangement. It is **not** individualistic learning with talking. It is **not** competition at close quarters. It is **not** traditional classroom grouping. To be co-operative, learning groups must be carefully structured to include a high level of positive interdependence with members interacting face-to-face to promote each other's success. Group members should be held individually responsible for their share of the work. They should be directly taught the interpersonal and small-group skills they need to co-ordinate their efforts, and they should process how well they work together and what they do to improve the quality of their group-work (Johnson & Johnson, 1993:61).

(vii) Individual study

Individual study (also known as independent learning, self-directed study, and self-teaching) relates to any educational pursuit that an individual undertakes to improve him/herself. Individual study can also include the computer as an instructional aid. Individual study may range from supervised classroom seatwork to investigating Roman ruins in Italy. The object of individual instruction is self-improvement and the acquisition of lifelong learning skills that include reflection, organising, problem analysis, and decision making. Like other indirect instructional methods, individual study may produce inappropriate pacing and unintended learning outcomes that are sometimes, but not always, desirable. Acquiring independent study and learning skills is so important a part of becoming a mature learner, however, that the risks involved must be taken (Lang et al., 1994:321). Individual study can accommodate the introverted student who prefers to work alone.

4.3 Computer-Assisted Instruction (CAI)

Although computers were developed during the Second World War, CAI has only been in existence for the past three decades. The main reason for this initially slow development was the fact that early computers were extremely expensive, and also had limited capacity. During the latter half of the 20th century computers became cheaper and more powerful and this lead to the adoption of computers as a viable teaching option (Sassenberg, 1985:32).

CAI in all its variants developed under influence of the theory of the day, programmed instruction. Programmed instruction was influenced by the work of Skinner on conditioning. Programmed instruction entails that information is broken up into palatable bits and the students are tested after each bit and get immediate feedback on their performance. This theoretical background explains the popularity of using the computer as a tireless tutor, employing predominantly drill and practice programs (e.g. Plato®) as the basis for a CAI strategy (Sassenberg, 1985:33).

4.3.1 Definitions

The plethora of terms describing the role of the computer in the instructional process can be very confusing. The most common definitions of the application of computers in the instructional arena can be summarized as follows:

CBE, CBT, CBL and CBI Computer-based education, computer–based training, computer–based learning and computer-based instruction are the broadest terms and can refer to virtually any kind of computer use in educational settings, including drill and practice, tutorials, simulations, instructional management, supplementary exercises, programming, database development, writing using word processors, and other applications. These terms may refer either to stand-alone computer learning

activities or to computer activities which reinforce material introduced and taught by teachers. According to Duke (1990:105), the above terms encompass two primary functions: computer-assisted instruction (CAI) and computer-managed instruction (CMI).

CAI, CAL, or **CALL**

Computer-assisted instruction, computer-assisted learning, or computer-assisted language learning are narrower terms and most often refer to drill and practice, tutorial, or simulation activities offered either by themselves or as supplements to traditional, teacher-directed instruction. In CAI, students interact directly with PC's, thereby freeing teachers to provide special assistance to individuals. Microcomputers can be programmed to introduce new material, quiz students, and provide immediate feedback and corrective instruction. In addition, CAI can be used for drill and practice, tutorials, and simulations that test students problem-solving ability by setting up conditions in which only partial information is provided. New software allows teachers to use CAI for developing map skills, writing ability, spatial judgement, and reading comprehension (Duke, 1990:105).

CMI

Computer-managed instruction can refer either to the use of computers by school staff to organize student data and make instructional decisions, or to activities in which the computer evaluates students' test performance, guides them to appropriate instructional resources, and keeps record of their progress. CMI uses the computer to facilitate record keeping and

management of learning activities. It provides cross-referencing with other programs when more extensive practice or assistance is needed. These programs measure students' skills, record scores, and correlate data with those of other students (Kourilsky & Quaranta, 1987:96). In CMI, computers can be used to administer pre-tests and to suggest subsequent tracks for instruction, monitor time within lessons, administer post-tests and generally keep records of student progress. In addition, computers also can assist in other evaluation functions, such as serving test banks, scoring tests, and identifying error patterns, as well as refining tests by computing test means, difficulty levels, and an index of discrimination of individual items. CMI provides teachers with a powerful time saving tool allowing them to make more effective professional decisions (Kauchak & Eggen, 1989:397). CMI has become more important as school systems comply with demands for greater accountability for student learning. Teachers increasingly are expected to specify which students have mastered required outcomes. CMI provides a systematic and easily accessible source of information on student progress that can also be valuable in guiding the diagnosis and remediation of learning problems (Duke, 1990:106).

CEI

Computer-enriched instruction is defined as learning activities in which computers: (1) generate data at the students' request to illustrate relationships in models of social or physical reality, (2) execute programs developed by the students, or (3) provide general

enrichment in relatively unstructured exercises designed to stimulate and motivate students.

CAT or **CBT**

Computer-assisted testing or computer-based testing has got nothing to do with instruction as such, but is primarily concerned with assessment or testing situations. Students are generally tested by the computer with multiple-choice type questions. The advantage of CAT is that teacher resource is saved (i.e. time saved through the computer marking tests), and the students get their scores immediately. CAT or CBT programs can also include tutorials that would explain to a student why the answer chosen is wrong or reinforce why the correct answer chosen is right (cf. Cotton, 1997:2).

4.3.2 Characteristics of Computer-Assisted Instruction

There are three primary uses of computers in the classroom: (1) to teach students to become computer literate, (2) to teach the fundamentals of computer programming and problem-solving, and (3) to serve as an instructional aid (commonly called computer-assisted instruction) (Kourilsky & Quaranta, 1987:94).

Lang et al. (1994:339) find CAI particularly adaptable to individual instruction, and note that CAI brings **novelty** and **variety** to learning, and can provide more fun than the usual classroom activity. Three levels of involvement are possible: drill and practice sessions, in which the computer poses questions, scores answers, and provides immediate feedback; tutorial sessions, in which tutorial functions range from requiring simple recall or basic knowledge to advanced problem solving; and simulations that involve users in gamelike or near-real situations. Computers may or may not reduce learning time, but students generally react positively to using them, and their attitude toward instruction

may improve. Computer instruction, like all other teaching/learning strategies, has its advantages and limitations and as with other methods and technologies, a balance between computer instruction and other forms of instruction should be kept.

Kourilsky and Quaranta (1987:95) consider CAI to be a supplement to the ongoing classroom instruction; it offers another vehicle by which students may acquire information and skills and receive direct assistance. CAI programs are available and can be developed for most curriculum areas including reading comprehension, vocabulary development, punctuation and paragraph writing.

There are four basic types of CAI software that are currently available: (1) drill and practice, (2) tutorials, (3) simulations, and (4) games.
Drill and Practice is the type that is used most extensively in the classroom. Typically, these programs display problems, and the student responds by selecting among provided responses. The computer indicates if a correct or incorrect response has been given. In such programs, the aim is to provide the student with appropriate practice within a specific content area and provide quick and accurate feedback of results. Drill and practice programs must be matched with the students' ability levels and instructional needs. The appropriate level of difficulty is required for the practice exercises to be worthwhile. Also, a program should provide good visual reinforcement to enliven the sequence; auditory reinforcement also helps to maintain interest and sustain attention over time. Incorrect responses, when selected by students, should lead to some sort of appropriate help sequence for the learner (Kourilsky & Quaranta, 1987:96).

Tutorials that present information and then provide practice based on the responses and needs of students are another, more effective, instructional use of computers (Kauchak & Eggen, 1989:397). Generally, such programs provide a pre-test and post-test related to the presented content. They are usually used for enrichment in the classroom; also, they may present content

that the student has missed because of absence. Additionally, some tutorials are used as a review of presented material to check for understanding and increase retention of concepts (Kourilsky & Quaranta, 1987:96). In the tutorial the computer asks questions and the student can answer in a relatively free format. This means that one needs long (and expensive) computer programs and extensive testing to ensure that all possible responses are anticipated (Sassenberg, 1985:58).

Simulations and educational games constitute another type of computer software. Typically, real-life situations are presented to the student, outlining a set of corresponding conditions. Students then make decisions and determine the consequences of these decisions. Examples of formats for situations are: (1) political issues, for example, nuclear power, (2) pioneer life, and (3) family dilemmas. For experience-based instruction in the classroom, such simulation sequences offer a close facsimile of real-life decision-making situations (Kourilsky & Quaranta, 1987:96). Processes can also be modelled, for example, the internal combustion engine or a chemical process. Students can supply input to the computer to modify the parameters involved in the simulation and the computer can then modify the outcome of the simulation (Sassenberg, 1985:58). The most well known type of computer simulator is the flight simulator. Depending on the speed of the aircraft and the approach that gets fed into the computer, the aircraft will, for example, land safely or crash. Some simulators will even explain to the student why the aircraft crashed, for example, "your approach speed was too high", or "you forgot to lower your landing gear".

A subcategory of the simulation is the model or modelling software (also called demonstration software). Modelling software is used to demonstrate a certain principle visually. An example will be a population model for a country. The student can then change, for example, the birthrate and see what effect that will have on the country's water resources (Sassenberg, 1985:58).

Games are used to educate students on a certain topic in an entertaining way. Games vary from "edutainment" to educational games. An example is a mathematics game where students must solve addition and subtraction problems within a certain time limit. In the background of the screen is a burning building and every wrong answer worsens the flames whereas every correct answer results in the flames being extinguished (Sassenberg, 1985:59).

Botha (1989:624) identifies three important characteristics of the computer in terms of CALL (or CAI): Structured Interaction, Process Oriented Data Manipulation, and Automated Individualised Instruction. Structured interaction refers to the fact that the options for the user or student in a CAI program are limited to the options that were programmed into the software. In a book, one can turn to any page you want to. In a CAI software program, one can only exercise the options available on the screen. Process-oriented data manipulation refers to the computers' ability to make millions of calculations per second. The computer can thus react to the learner (if programmed correctly). Just as computers are used in flight simulators, it is possible to use computers in language simulators, using the computer to interact with the student and bring to life the rules that a grammar handbook can only show examples of (Botha, 1989:625). Automated individualised instruction refers to the computers' ability to "learn" from the student and adapt to the student's needs. For example, in a Plato® lesson of 55 minutes, one student can repeat the same lesson four times, while another student in the same class can do three consecutive lessons (Botha, 1989:626).

4.3.3 Advantages of Computer-Assisted Instruction

The advantages of CAI can be summarised as follows:

- Computers provide additional or different ways of presenting information through sophisticated instructional techniques such as animation, time-lapse photos and step-by-step demonstration of complex processes; they can also offer unlimited drill and practice, as well as unlimited opportunities for problem solving through the use of case studies and simulations.

- CAI facilitates breaking the subject matter into small steps that have to be mastered before continuing to the next section. This is not always possible using the lecture method.
- Computers provide a means of individualising instruction by omitting unnecessary instruction or practice, offering needed remediation.
- Using computers can improve students' research and writing skills, and extend their creativity. Graphics and gamelike programs, as well as the impression that computers are "fair" because they are impersonal, may induce some learners to take more responsibility for self-learning.
- Students can interact with computers directly and in varied ways, and receive instant feedback on their responses.
- Computers can provide compact storage and rapid retrieval of large amounts of information.
- Computers can record individual students' responses to help the lecturer monitor their progress and provide remediation as needed.
- Between CAI and conventional classrooms, CAI typically results in about 30% greater learning in up to 40% less time than conventional classroom methods. Effects typically are stronger for adult and young adult populations than for children (Foshay, 1994:4).
- Kulik et al. (1986:249) conducted a meta-analysis of studies on adult populations and found that:
    - Performance of CAI learners on examinations is, on average, about 26% to 37% higher.
    - CAI learners need between 6% to 37% less lecturing time, with an average of 26% less time.
    - Long-term retention is an average of 15% higher for CAI than for traditional classroom lecturing.
    - Attitude toward CAI ranges from no preference to a 33% preference for CAI if compared to traditional classroom teaching.

- According to Bracey (1982:53), students learn more, retain more or learn the same amount faster using computers. Achievement gains aside, students often find computers more "human" - more patient, less critical than the lecturer.
- According to Oberem (1988:140), commenting on the use of Plato® at another South African university, CAI produces significant learning gains and can reduce the amount of time required to learn a given section of work by as much as 35%. This may be attributable to the fact that CAI requires active engagement by the student as opposed to a mostly passive engagement in the traditional lecture situation.
- Oberem (1988:140) notes that CAI is particularly effective in the case of disadvantaged students.
- Students can learn at their own pace.
- CAI is non-destructive, i.e. dangerous situations can be simulated without using real equipment or chemicals.
- CAI is especially effective for routine training courses that deal mainly with factual information.
- CAI presents standardized education. The teacher might feel prejudiced against a certain student and that can influence the way a student or class (e.g. an evening class where the lecturer is tired and wants to go home) performs. The computer does not discriminate or lose its temper with any student.
- Every student gets the opportunity to answer all questions without being inhibited by having to answer in front of the whole class.
- Student responses on questions can be logged in a database and statistical analysis can be performed on the database to identify trends with the aim to improving the course.

(cf. Lang et al., 1994:340; Hudson, 1984:64; Sassenberg, 1985:60-61).

4.3.4 Disadvantages of Computer-Assisted Instruction

As interesting and innovative as CAI can be, it has limitations and raises several concerns:

- Computers may encourage an emphasis on facts and the overuse of drill and practice at the expense of higher-level learning skills and instructional strategies that focus on drawing inferences and forming generalisations.
- CAI does little to promote affective outcomes; some people, in fact, believe that it is a dehumanising form of instruction.
- CAI gives students little opportunity for oral expression.
- CAI and the computer place additional pressure on the lecturer. Apart from having to be a specialist in the subject being taught, the lecturer also needs to become technically computer literate in order to facilitate and operate CAI.
- CAI can take up more time than traditional lecturing if insufficient workstations are available, e.g. if 300 students need to use 30 computers for CAI.
- Creating CAI courseware is time consuming. Generally, it takes between 50 and 100 hours to develop one hour of CAI software.
- In a lot of cases the introduction of CAI will necessitate the appointment of a person with enough computer skills to look after the software and hardware as the lecturers themselves might not possess the necessary technical and IT skills.
- Interaction with a computer only simulates real human interaction and is normally carefully planned to make provision for student responses. Students cannot give the computer any response and expect the computer to be able to process it.
- The computer cannot observe the students to see if a student does not understand or does not pay attention. The computer is also oblivious of a student's emotional state and will persist in asking questions until the student reaches a set score, regardless if the student is not feeling well or is feeling upset.

- CAI requires a certain amount of computer literacy from students as well as lecturers.
- CAI systems malfunction from time to time and can lead to great frustration among students and lecturers, e.g. a power failure during a scheduled CAI period necessitating everyone to schedule extra time to catch up.
- CAI software systems and technology change rapidly. A system acquired today at great cost might be redundant in the next 12 to 24 months. Spending huge amounts of capital on software and hardware can be very risky and any acquisition must be researched carefully.
- Acquired software systems might not be 100% compatible with what is being taught by the lecturer and lead to frustration. An example is Plato's® voice (pronunciation) modules (i.e. American accent) that can be quite confusing and unintelligible to South African ESL learners.

(cf. Lang et al., 1994:340; Sassenberg, 1985:62-63).

4.3.5 The Plato® system

In this study the Plato® system in use at the university where the empirical research was conducted, was used, specifically the drill and practice type exercises. The term CAI is, therefore, used in the discussion that follows. The Plato® system was chosen as the CAI program due to availability and the fact that it is an international best-of-breed software system as far as ESL CAI is concerned.

At the university in the North West province of South Africa, where the research was conducted, the Plato® system is almost exclusively used for ESL training. Oberem (1988:140) reports that the Plato® system, at Rhodes University in the Eastern Cape province of South Africa, is used in twenty-two departments in every faculty of the university with students in over 40 courses. Oberem (1988:140) reports that the Plato® system at Rhodes University was also used by two neighbouring universities and in the region of 10 schools. As is the case at the university in the North West province of South Africa, where the research was conducted, the system is often made available to large corporations for

training purposes. The results of this study may, therefore, indicate whether the use of CAI actually improves student performance and achievement in ESL.

According to Oberem (1988:142), CAI is a way to relieve the teaching pressure of teaching staff. Teachers report that the use of the Plato® system makes them more aware of the needs of the individuals in their classes and provides an efficient way of addressing student problems.

Table 4 provides an overview of current key Plato® components and their purpose:

Table 4: Current key Plato® components

Instructional Goal	Change	Role of Technology (Plato® Component)
Continuous Progress	Modular, self-paced, individualised learning environment.	• Modular architecture, with over 5,000 individually selectable/ assignable learning activities as small as 15-minute lessons. • No longer than 90-minute problem-solving activities. • All self-paced, individual instruction. • Can be selected, grouped and sequenced in any way.
Purposeful Accomplishment	Curricula centered on interesting and realistic problems, using simulation based tools; supported by information resources and instruction for declarative knowledge and component skills, all structured by precise definitions of purposeful accomplishments.	• Entire curriculum structured and managed by precise learning outcome statements. • Problem Solving Activities (PSA's) and projects incorporating authentic tasks at the core of most curricula. • Tools, World-Wide Web and off-line resources integrated in a managed environment. • Declarative and procedural knowledge lessons form comprehensive curricula in core skills.

Instructional Goal	Change	Role of Technology (Plato® Component)
Individualized testing for goals	Modular, individually constructed and delivered, competency-based self-tests, to monitor and prescribe component knowledge and skills.	• Progress (mastery) tests for each lesson. • Custom comprehensive test construction tool. • Placement testing system with automated prescription for core curricula. • All tests individually prescribed, delivered on-line, and most are individually constructed by sampling from item pools. • All tests competency-based and criterion-referenced.
Performance-based assessment	A portfolio of simulation-based and project-based assessment techniques, all structured by the same learning outcome definitions as the instruction, to assess ability to integrate knowledge and skills into performance of realistic tasks.	• Portfolio assessment activities built into problem-solving activities (PSA's). • Support for instructor-defined assessment activities and results entry in Pathways management system. • Integrated Work Keys Locator assessment system.

Instructional Goal	Change	Role of Technology (Plato® Component)
Personal learning plans	Structured and implemented through a computer-managed instruction system.	• Pathways computer-managed instruction system supports creation of learning paths for individual learners or groups defined in any way, with automatic prescription and progress monitoring and real-time reporting to learners and instructors.
Individual and collaborative learning	Collaborative learning environments supported by intra-work group communications and a common set of tools and resources.	• Collaborative learning supports in PSA's and other project-based activities. • Collaborative learning tools such as the Daedalus collaborative writing system. • Ability via Pathways to support "wrap around" instruction centered on instructor-defined problems/projects, for use by collaborative teams. • Collaborative asynchronous discussion group system in Plato® on the Internet.

Instructional Goal	Change	Role of Technology (Plato® Component)
Learning centers	Ability to use computer networking and the Internet to deliver instruction and tools in a managed environment, any time and anywhere, thus allowing learners mobility of space and time.	• Delivery via stand-alone CD-ROM, Local Area Network (LAN), and the Internet. • Rich curriculum and tool set capable of supporting a wide range of individual learning needs. • LAN and Internet store learner records centrally, allowing learners to work at any time and log on from any workstation with system "memory" of their personal records and most recent stopping points. • Collaborative asynchronous discussion system and e-mail in Plato® on the Internet.

Instructional Goal	Change	Role of Technology (Plato® Component)
Teacher as coach or facilitator of learning	Primary instruction and information delivered technologically, using a management system which can communicate the status of individual learners in real time to instructors, who then are freed up to act as "guide on the side" in classroom or distance learning environments, as the learners work or asynchronously.	• Through Pathways management system, instructor selects and sequences all learning and evaluation activities for individual learners and groups. • Assigns self-management rights to learners as appropriate. • System reports learner progress and flags problem areas to learners and instructors, in real time or asynchronously.
Learner as maker	Dialogs with the learner which include prediction, hypothesizing, and argumentation; and project-centered environments which require sense-making, allow exploration, and creation of knowledge and work products.	• Multi-level dialogs built into PSA architecture; some use neural net inference to structure the dialog. • Projects integrated across some curricula. Pathways system and tools support project-rich based work created and assigned by instructors.

Instructional Goal	Change	Role of Technology (Plato® Component)
Whole act of thinking, problem-solving skills and meaning-making	Problem-centered curricula, with emphasis on declarative knowledge teaching of facts, concepts and principles into meaningful mental models.	• Declarative knowledge lessons include extensive application, practice and feedback. • Procedural knowledge lessons include scenario-based exercises. • Problem-Solving Activities (PSA's) require integration of knowledge and skills to solve realistic, complex, multi-step, multi-path problems in multimedia simulations of real contexts, with strategic and tactical coaching.
Integrated, multidisciplinary, whole tasks	Cross-disciplinary problems and projects, supported by collaborative learning tools and environments, such as discussion groups, e-mail, and group writing tools.	• Interdisciplinary projects in the curricula. • Projects may be created using World Wide Web references. • Daedalus group writing environment. Internet system supports discussion groups, e-mail.

Instructional Goal	Change	Role of Technology (Plato® Component)
Advanced technologies as tools	Use of World Wide Web and data bases as sources of information on demand, all integrated via the management system.	• World Wide Web sites and any non-Plato® software can be launched by Pathways management system. • Integrated databases such as those for social studies and vocabulary. • Data capture and representation tools built into science and math project modules.

(Foshay, 1998:11).

The Plato® system in use at the university where the empirical study was conducted did not include all the modules of the complete system.

4.3.6 Core principles of Plato® instructional models

The most important principles of PLATO instructional models include the following:

- All Plato® courseware is built particularly for adults and young adults. This is reflected in the way in which courseware establishes and maintains motivation, the selection of authentic tasks for problem-solving, the frame of reference used for explanations, examples and exercises, and the overall visual style of the system.
- All Plato® instruction is learner-centered. This means that the courseware is designed for direct use by learners. The assessment and management systems allow learners to monitor their own learning progress against personal goals. The user interface is designed to provide the maximum appropriate degree of learner control, and the style of the system constantly reinforces the image that the learner, not the computer, is in charge. This is particularly important for adult and young adult learners.
- All Plato® courseware incorporates rigorous assessment. Education and training professionals are accountable for the learning outcomes achieved by their learners, so they require powerful, rigorous, and valid assessment systems for placement, regulation of progress, and evaluation of results. Every Plato® instructional component is built with rigorous and valid assessment as a prime requirement, to meet the requirement for effectiveness and accountability. The system incorporates a combination of competency-based, criterion-referenced testing and portfolio assessment techniques which instructors can customize.
- All Plato® curriculum structures are coherent, comprehensive and standards-based. Plato® curricula are designed and built in large-scale projects, so that professionals can be assured that the components fit together without gaps, lapses or internal inconsistency. Each curriculum is

guided by an advisory panel of internationally recognized experts in the field, leading Plato® clients, and actual learners.

- All Plato® curriculum structures are open. The system is highly modular, and instructors have complete control over what components to use and how to sequence and use them. Assumptions about sequence and prerequisite knowledge and skill are kept to a minimum, to facilitate maximum flexibility of use. Non-Plato® on- and off-line instructional and assessment activities can be easily integrated at any point. Plato® activities can easily be integrated into non-Plato® on- and off-line curricula wherever appropriate, to serve a complementary or supplementary role.
- Plato® is validated and continuously improved. Most Plato® courseware is designed to assume a primary role in instruction, and its effectiveness is rigorously controlled. In the initial development process, industry-leading instructional design standards and methods are used, emphasizing rapid prototyping and trials with actual learners. Throughout the life of the course, effectiveness is evaluated and the products are continuously improved.
- Plato® supports a range of roles for instructors. There is no such thing as "teacher proof" instruction. The optimum instructor's role depends on the type of instructional activity, the characteristics of the learner, and the learning environment. Plato® courseware and management systems are designed to give the instructor maximum choice in how to integrate Plato® into the curriculum, how to manage the instructional environment, and what role to assume within it. The system includes a full range of support to allow the instructor to assume the role of "guide on the side."
- Plato® supports managed instruction. Professionals in high-accountability education and training environments require powerful instructional management. While individual curriculum components of the Plato® system can be launched and used independently, all are designed to work with the Pathways instructional management system.

- Plato® views hardware and software technology as a means to an end, not an end in itself. The Plato® system is designed to run on current-generation industry-standard hardware and software. It will require no proprietary or exotic investments in hardware and system software technology by its clients.

(cf. Foshay, 1998:18).

4.4 A comparison of the lecture method and CAI

In Table 5 the main features of the lecture method and CAI are presented:

Table 5: The lecture method vs CAI

Lecture method	CAI
Aspects relating to the learner: • Group oriented. • Instructor determines tempo. • Student passive to a great extent. • Little resistance as this is the traditional manner in which someone is educated. • Feedback not always immediate. • Problems cannot be picked up immediately.	• Individual-oriented. • Student determines tempo. • Student actively involved. • Possibly more resistance as this is a new method and technology is involved. • Immediate feedback. • Potential problems are easily recognisable with reporting software. Teacher can pre-empt any major problems by spending more time with the student in the next period.
Transfer of information: • Lecturer to student. • Verbal and visual. • Dependant on the mood of the lecturer. • Abilities and personality of the	• Computer to student. • Mainly visual. • Standardised presentation under all circumstances. • No modification possible during

lecturer influences learning outcome. • Can modify lecture during lecturing to keep track of changing needs of the target audience.	presentation. • Most administration conducted automatically by the computer.
Development: • Relatively simple development. • Relatively fast development (20 hours for every 1 hour of lecturing). • Only lecturer involved in development. • Evaluation relatively easy. • Can cover a lot of information in a relatively short period of time.	• More complex development owing to computer programming involved. • Time consuming development (50-100 hours per 1 hour of presentation). • Lecturer and programmer involved. • Evaluation can be more time consuming • Need more time to cover information.
Logistical aspects: • Require little and relatively cheap apparatus. • Transportable – can move from one location to another by simply moving the lecturer.	• Require expensive and sophisticated software and hardware. • Hardware infrastructure is less mobile and needs to be set up in a more permanent arrangement.

(cf. Sassenberg, 1985:82; Hudson, 1984:8).

4.5 The combined method: lecturing and CAI

It is clear from the discussion above that both the lecture method and CAI have their advantages and disadvantages. Combining the two methods should provide the following benefits for the ESL learner:

- According to Kauchak and Eggen (1989:395), combining CAI and the lecture method is one way of improving classroom learning. Providing variation in terms of instructional method leads to the accommodation of more learning styles which may influence L2 achievement. Oxford et al. (1993a:36) tested the perceptual learning styles of 47 pre-literate refugees learning ESL by using the Kerby Learning Modality Test. A significant difference in achievement was found with subjects who selected their preferred instructional media as they performed better than those who were not allowed a choice of media.
- It is very important for teachers and students that the teaching style(s) and learning style(s) in a classroom situation match. If a teaching/learning style conflict occurs, the affected students may become bored, inattentive, discouraged, and do poorly on tests. And teachers, confronted by students' unresponsiveness, poor attendance, or low test grades, may become frustrated and depressed and even question their own ability to be good teachers. The more able and willing the teachers are to observe their students and to integrate appropriate material presentation and class assignments that match their students' learning styles, the more easily and efficiently their students will learn. That is, students learn more from teachers who are interested in their subjects and their students, and who are more flexible and tolerant in their learning (Ramburuth, 1998:84). Teachers stand to gain more insight into their own subject and teaching by observing students' different approaches to the subject.
- Hasselbring (1986:324) found that when CAI and traditional instruction are compared, students receiving CAI demonstrate equal or better achievement in less time, but that the combination of CAI with an instructor is most effective.
- Hasselbring (1986:325) found that CAI is especially powerful for disadvantaged and low-achieving students, as computers do not

stifle the creative process, are not dehumanizing, and do not foster anti-social behavior or development. In addition, Hasselbring (1986:325) points out that the greatest gains from the use of the computer seem to occur when it is integrated thoughtfully into the on-going curriculum and not used as a replacement for existing courses. While CAI has reduced the dependence of instruction upon the quality of human effort to some extent, human effort and quality instructional materials still remain the major factor in the successful or unsuccessful use of computers in education.

- CAI can take over a lot of the less effective and time consuming activities (e.g. taking and marking classroom tests, or drill and practice work), thus freeing the lecturer to spend more time explaining important ideas, or spending individual time with students that need individual attention on a certain problem.

To summarise, the combined method provides both students and lecturers with the best of both worlds in terms of accommodating individual differences and learning styles as well as time management on the lecturer's side.

4.6 The relationship between instructional methods and learning styles

It is reasonable to assume that a learner's learning style reflects both nature and nurture. The learner's personality and cognitive style result in a general preference to learn in particular ways rather than others. But the learner's previous learning experiences can also affect his/her learning style, causing him/her to expect and even require similar experiences in new learning situations. For example, an L2 learner who is used to a traditional, form-focussed method of language teaching or to a transmission mode of education may respond negatively if confronted with a more "communicative" method. A learner internalises an "idea" of what classroom learning involves and then acts out this idea in the tactics he/she adopts. This mental set is not immutable,

however. A learner may revise his/her "idea" as a result of different learning experiences or after receiving "training" in new approaches and techniques (Ellis, 1989:250).

Riding and Sadler-Smith (1992:337) found that instructional method and cognitive style have important effects on learning outcome. Teaching that uses a visual mode of presentation appears to be more effective for certain types of content than a verbal mode of presentation.

Chapelle and Jamieson (1986:36) found that there was a significant negative correlation between field independence and both time spent using CALL and attitude, indicating that highly field independent students preferred not to work on CALL. A significant positive correlation was found between motivational intensity and both time spent using CALL as well as attitude. In other words, those students who reported themselves to be working hard at learning ESL also tended to spend a lot of time using CALL and had a more positive attitude toward it. The relationship between motivational intensity and attitude toward CALL (what students said they liked) was stronger than that between motivational intensity and time spent on Plato® (what students actually did) (Chapelle & Jamieson, 1986:36). The significant ($p<0.01$) positive correlation between the time students spent using CALL and their attitude toward CALL indicates that there is a strong relationship between what students said they liked and what they actually did (Chapelle & Jamieson, 1986:36).

In Chapelle and Jamieson's (1986) study there was no significant correlation between ambiguity tolerance (AT) and English class anxiety. It was expected that students who preferred a more structured environment (those with low AT) would like to work on the Plato® lessons, that is, that AT would correlate significantly, but negatively, with attitude and time. In fact, the direction of the relationship was negative, but not to a significant degree. Similarly, it was thought that students who felt nervous in English classes would like working on English at their own private terminals. The non-significant correlations between

anxiety and the CALL variables did not support the frequently made claims (Chapelle & Jamieson, 1986:37).

Hativa and Shorer (1989:11) investigated the effects of CAI in relation to students' socioeconomic status, aptitude and gender and concluded that the advantaged, high-achieving, male student performed better on CAI than the less able, weaker academic students.

4.7 Conclusion

Two main instructional methods relevant to the ESL teaching/learning process were discussed, namely the lecture method and CAI. A combination of the lecture method with CAI was also discussed. From the research it is clear that the computer excels in certain teaching activities (e.g. drill and practice), and is less effective with other teaching activities (e.g. dealing with students on an emotional level.) The combined method seems practically the most applicable to most tertiary teaching scenarios in terms of financial considerations as well as relieving administrative and time pressure for lecturers. It is becoming more and more difficult for lecturers to give adequate individual attention to every student. CAI can help to free the lecturer in order to spend individual attention when and where most needed at that stage.

Chapter 5

Method of Research

5.1 Introduction

In this chapter the methodology employed in this study is discussed under the following headings:

- Design
- Subjects
- Instrumentation
- Data collection procedure
- Data analysis

5.2 Design

A true experimental design, in which the students were randomly assigned to three treatment groups (lecture, CAI, and combination CAI-lecture), was used.

5.3 Subjects

The accessible population included 186 first-year students taking English as a Second Language (ESL) at a university in the North West Province. The students were divided into the following courses: 62 students taking the academic course focusing on language and literature (ENG 111), 41 part-time students and 83 full time students taking the practical course focussing on reading, writing, speaking, grammar and vocabulary (ENG 112). The accessible population also comprised 119 females and 67 males as well as 134 Afrikaans-speaking students and 52 Tswana/Sotho-speaking students.

The intact classes (i.e. not individual students but the whole class) were randomly assigned to one of the three experimental treatments.

5.4 Instrumentation

The following paper-and-pencil instruments were used:

- The Style Analysis Survey (SAS) for determining learning styles,
- The Gottschaldt Figures Test (GFT) for determining field dependence/ independence,
- Beginning (pre-test) and end-of-semester (post-test) language scores, as a measure of language achievement, and
- A biographical questionnaire to collect information on gender and language background (i.e. mother tongue)

In the following sections each instrument is described briefly:

5.4.1 The Style Analysis Survey (SAS)

5.4.1.1 Description

The SAS is designed to assess a student's general approach to learning and working (i.e. learning styles). It does not predict behaviour in every instance, but it is a clear indication of an individual student's overall style preferences (Oxford, 1993).

The SAS was created to meet the need for an inexpensive, self-scoring, teacher-administrable learning style instrument covering aspects such as sensory preferences, global analytic distinctions, and so-called "Jungian" factors (variables identified by Swiss psychologist Carl Jung, including extraversion/introversion, intuition/sensing, and judging/perceiving). Most learning style instruments include only some of these aspects, and those that include more are often expensive, non-self-scoring, and not capable of

administration by regular classroom teachers. The SAS was designed to obviate these problems.

The current form of the SAS consists of 110 items. Eleven substyles are represented each with 10 items.

These substyles include:

Activity 1: How I use my physical senses to study or work (i.e. visual, auditory, and hands-on)

Activity 2: How I deal with other people (i.e. extraversion/introversion)

Activity 3: How I handle possibilities (i.e. intuitive/concrete-sequential)

Activity 4: How I approach tasks (i.e. closure-oriented/open); and

Activity 5: How I deal with ideas (i.e. global/analytic).

5.4.1.2 Validity and reliability

Internal consistency reliability was assessed using the Cronbach alpha statistic with 677 university students in two language-learning groups; 569 learners of Spanish and 108 learners of French. All the learners came from a university on the East Coast of the United States. The internal consistency reliabilities of the SAS "activities" ranged from 0,69 - 0,90 for both groups of learners. The reliabilities for each of the subscales, ranged from 0,66 - 0,87 (cf. Oxford, 1993). In this study, the reliability coefficients for each of the SAS "activities" ranged from 0,62 - 0,85. The SAS is also reported to have content and concurrent validity (cf. Oxford, 1993).

5.4.1.3 Method of scoring

Students are asked to respond to the items on a scale of 0 to 3, where 0=never, 1=sometimes, 2=often, and 3=always. The score for each substyle, such as extraverted, is generated by adding up the numbers the student gives for each of the 10 items related to that substyle. The largest score represents the student's preferred learning style.

5.4.2 The Gottschaldt Figures Test (GFT)

5.4.2.1 Description

The Gottschaldt Figures Test (GFT) is a test of analytical ability in which the student is required to find embedded figures in more complex diagrams. The student's ability to find the simple figures without becoming distracted by the complex figure indicates the extent to which he/she is field independent.

5.4.2.2 Validity and reliability

The GFT was standardized by the HSRC and is considered suitable for Grade 10 and higher. The test statistics of the GFT were obtained during a project conducted by the HSRC in 1980, 1981 and 1983 (cf. Table 6).

Table 6: GFT results

Number if items in test	45
Mean (X) score	11.71
Mean (X) age	19.58
Number of subjects (N)	369
Standard Deviation (SD)	4,68
Obtained range	2 - 28
Reliability Coefficient	KR_{21}=0,622 KR_{21} (corrected) =0,793[3]

(Reported in Dreyer, 1992:85).

The reliability coefficient (r=0,79) indicates that the GFT is a reliable test.

5.4.2.3 Method of scoring

The GFT is scored by means of counting the number of correct answers (raw score) obtained by each student. The raw score is then converted to a stanine score. Students who obtain a score ranging from 6-9 on the stanine scale are considered to be field independent, while students who obtain a score ranging from 1-4 on the stanine scale are considered to be "field dependent" (lack of

[3] Kuder-Richardson Formula 21 (corrected with Tucker's correction for uniform distribution).

field independence). Students who obtain a stanine of 5 are considered to be a little of both.

5.4.3 Language achievement measure

5.4.3.1 Description

In this study, achievement refers to an individual's level of language development with relation to a particular curriculum. All students wrote a pre-test and a post-test. These tests consisted of two sections, namely a reading comprehension and a grammar section. The title of the reading comprehension was: "South Africa's Economic Situation: A Review". Various types of questions were included, for example, direct, indirect, and inference questions. The grammar section included aspects such as concord, tenses, prepositions, direct and indirect speech, pronouns, adjectives, and adverbs.

5.4.3.2 Validity and reliability

These tests were devised by the researcher. They were checked by a member of the English division, within the School of Languages and Arts, for content and face validity. Test-retest reliability, based on the post-test, revealed a reliability coefficient of r=0,91.

5.4.3.3 Method of scoring

The reading comprehension section consisted of 25 questions which counted two marks each. The grammar section consisted of 50 items each counting one mark. The total test was, therefore, marked out of 100 (i.e. both the pre-test and the post-test).

5.5 Data collection procedure

The students "intact" (e.g., ENG 112 [full time], ENG 112 [part time] and ENG 111 [full time]) were randomly assigned to one of the three experimental treatment groups (e.g. lecture group, CAI group, and a combined lecture-CAI group). The *lecture group* received "traditional" grammar and reading

comprehension lessons by means of traditional lecturing. The *CAI group* received grammar and reading comprehension lessons by means of Plato® exclusively, while the *combination lecture-CAI* group received traditional classroom lectures that were supplemented by lessons using Plato® courseware. The lecture group and the combination CAI-lecture group were taught by the same lecturer. The content (e.g., concord, tenses, etc.) covered in the lecture treatment group and that covered in the CAI treatment group was identical. Students in the lecture treatment group were also given similar drill and practice activities/exercises to those provided by the Plato® courseware. The students in the combination CAI-lecture group received identical content activities and exercises to that given in the lecture group and the CAI group. The treatment spanned a fourteen-week semester. All students wrote the pre-test and post-test. In addition to these language tests, the SAS, GFT and the biographical questionnaire were administered during the first scheduled language period. All students received uniform instructions on how to fill out the various tests. Only the results of those students who had completed all the tests successfully were taken into consideration for analysis.

5.6 Data analysis

The assumption that the randomisation of the three groups (i.e. instructional methods) can be viewed as a random allocation of the students to the different groups, must be made in order to apply significance tests. In order to determine what the learning style "profile" of this specific group of first-year ESL students looks like (i.e. group as a whole, gender and languages), descriptive statistics (i.e. means and standard deviations) as well as t-tests were calculated.

The data were analysed by using the STATISTICA software package. A t-test was used to compare the mean scores of two groups (i.e. males vs females) in order to determine if the two means differed significantly from each other (cf. De Wet et al., 1981:212).

A stepwise multiple regression analysis was performed to determine which learning styles, if any, could be regarded as the most significant predictors of the language achievement of this specific group of students (i.e. as a whole). In this method a new variable is added at each step. The first variable selected is the one which has the highest correlation with the criterion. Each time a new predictor is "stepped in", the new relationship between the criterion and predictor variables is re-evaluated in order to determine if the predictor variable(s) already selected still significantly contribute(s) to the relationship when later variables are added (cf. Seliger & Shohamy, 1989:222-226). The following formula was used to calculate the practical significance of the cumulative R^2: $f^2=R^2/(1-R^2)$. The practical significance of the change in R^2 was also determined. The following formula was used to calculate the practical significance of the change in cumulative R^2: $f^2=(\text{change in } R^2)/(1 - R^2)$. Whenever $f^2>0,35$ it was agreed that R^2 was highly practically significant (cf. Cohen, 1977).

A two-way analysis of covariance (ANCOVA) was calculated to determine the interaction between instructional methods and learning styles. The pre-test scores served as the covariate and the post-test scores as the dependent variable. Follow-up post-hoc Tukey HSD tests were calculated to determine where the differences in the mean performances (post-test) occurred (cf. Ary et al., 1990:199-209).

Cohen's (1977:20-27) effect size d was used to calculate the difference between two means. Cohen uses the following scales for the d values:

d=0,2 (small effect size)

d=0,5 (medium effect size)

d=0,8 (large effect size)

Cohen's (1977:77-81) effect size r was used to calculate the correlation between two variables. Cohen uses the following scale for the r values:

small effect – 0,1

medium effect – 0,3

large effect – 0,5

The alpha level (e.g. 0,05) refers to the probability of a chance occurrence of for example a difference between means. In the example mentioned above it would mean that a difference or relationship of this size would be expected fewer than 5 times in 100 to be due to chance. The alpha level is used to control for a type I error. The alpha level is usually set at either 0,05 or 0,01.

The alpha level is mostly used to indicate the statistical significance of a relationship between variables, or a difference between group means, whereas Cohen's effect sizes are usually used to indicate if a relationship, or difference can be considered to be practically significant.

5.7 Conclusion

In a study such as this, a multiplicity of variables can influence the outcome of the research. The methodological overview in this chapter was aimed at providing an accurate description of the various steps taken in the research process in order to facilitate future replicability, as well as to serve as a basis for the discussion of the results in chapter 6.

Chapter 6
Presentation and Discussion of Results

6.1 Introduction

This chapter is devoted to the presentation and discussion of the analysed data. The aim with this chapter is to attempt to answer the questions posed in chapter 1:

- What does the learning style "profile" of this specific group of first year ESL students look like, and how does this "profile" compare with other "profiles" compiled in similar South African studies?
- Which learning styles, if any, can be regarded as the most significant predictors of the language achievement of this specific group of students?
- Does instructional method affect language achievement differentially for ESL students with dissimilar learning styles?

In order to ensure a logical order of discussion the data are discussed under the following headings:

- Learning style "profile".
- Learning styles as predictors of language achievement.
- Learning styles and instructional methods.

6.2 Learning style "profile"

The learning style "profile" of this specific group of first-year ESL students is represented in Table 7. The "profile" for the total group is given as well as that for females, males, Afrikaans-speaking and Tswana/Sotho-speaking students.

Table 7: Learning style "profile" of first year ESL students

Style	Tot. gr. M	Tot. gr. SD	Fem M	Fem SD	Male M	Male SD	Afr. M	Afr. SD	Tsw/S M	Tsw/S SD
Vis	18,34* ++	4,11	18,43	4,19	18,17	3,98	18,07	4,05	19,03	4,20
Aud	14,26	3,82	14,20	3,77	14,37	3,94	14,44	3,91	13,80	3,58
H/O	13,77	4,94	13,04	4,67	15,08* +	5,16	13,64	5,04	14,11	4,69
Extr	18,05* ++	5,58	18,35	5,82	17,52	5,12	18,54	5,68	16,78	5,15
Intr	11,04	5,53	10,68	5,37	11,68	5,78	10,96	5,74	11,26	4,98
Int	18,46* +	4,59	17,89	4,49	19,47* +	4,62	18,44	4,90	18,53	3,71
C-S	15,95	4,73	15,47	4,78	16,80	4,55	15,64	4,95	16,73	4,02
C-O	19,41* ++	5,81	19,31	5,51	19,59	6,34	19,05	5,57	20,34	6,34
Opn	14,08	4,95	13,76	5,07	14,64	4,73	14,62* +	4,94	12,67	4,75
Glo	18,21* +	4,50	17,88	4,52	18,80	4,44	18,35	4,48	17,86	4,58
Ana	15,11	3,87	14,79	3,66	15,68	4,19	14,85	3,75	15,78	4,13
FD/FI	1,33	0,47	1,33	0,47	1,34	0,47	1,31	0,46	1,40	0,49

Key:

Style – Learning styles
Vis. – Visual
Aud – Auditory
H/O – Hands-on
Extr – Extraversion
Intr – Introversion
Int – Intuitive
C-S – Concrete-sequential
C-O – Closure-oriented
Opn – Open

Glo – Global
Ana – Analytic
FD/FI – Field dependent/field independent
Tot. gr. – Total group (N=186)
M – Mean
SD – Standard Deviation
Fem – Females (N=119)
Mal – Males (N=67)
Afr. – Afrikaans-speaking students (N=134)
Tsw/S – Tswana/Sotho-speaking students (N=52)

Statistical significance
* p<0,05

Practical Significance
\+ medium effect size
++ large effect size

When comparing groups like males and females or Afrikaans- and Tswana/Sotho-speaking students the assumption has to be made that these groups are random samples from some population to which the generalisations will be made. In this specific study, the groups (gender and language) can be regarded as typical samples of first-year students taking English at a university in the North West province. Generalisations are, therefore, limited only to this accessible population.

The students participating in this study seemed to have a decided visual modality preference. The results of a t-test indicated that the only difference between the females and males was that the males were statistically significantly ($p<0,05$) more hands-on than the females. This difference was, however, not practically significant (small to medium effect size) (cf. Table 7). The difference between those students with a visual orientation and those students with an auditory and hands-on orientation (total group) was statistically as well as practically significant (cf. Table 7). This finding is very important if one considers that approximately 80-90 percent of traditional classroom instruction in many universities in South Africa caters to the competent auditory learner (cf. Dreyer, 2000). This may be a reason why many students do not achieve as highly as we believe they should. If these students appear to be retaining little of what we formally teach largely through verbal instruction, then it seems clear that traditional classroom language instruction (specifically the lecture method) is in need of modification. According to Ehrman (1996), the most difficult adaptation for lecturers to make is accommodating the hands-on learners. In addition, many South African lecture halls are crowded, making activity difficult. It would seem as if creativity in the format of presentation might be a possible answer.

The results of the SAS indicated that with regard to "How I deal with other people" all the students (total group) were statistically as well as practically significantly more extraverted than introverted (cf. Table 7). Educators have warned against prejudging learners on the basis of perceived extraversion. In

language classes, where oral participation (e.g. tutorials) is highly valued, it is easy to view active participants with favour, and to assume that their "visibility" in the classroom is due to an extraversion factor (which may not be so) (cf. Dreyer, 1996; Dreyer, 2000).

With regard to "How I handle possibilities" most students (total group) were statistically significantly more intuitive than concrete-sequential. This difference revealed a small to medium effect size (cf Table 7). The results also indicated that the male students were statistically significantly more intuitive than female students. This difference, however, was not practically significant (small to medium effect size) (cf. Table 7). Intuitive students are often bored by concrete, step-by-step learning and would rather take daring intellectual leaps. The rigid format of the traditional lecture may, therefore, be highly frustrating for the majority of these students.

All the students (total group) were statistically as well as practically significantly more closure-oriented than open (cf. Table 7). The results also indicated that the Afrikaans-speaking students were statistically significantly more open than the Tswana/Sotho-speaking students. This difference, however, was not practically significant (small to medium effect size) (cf. Table 7). Despite being intuitive these students seem to have a strong need for clarity and structure. They want everything spelt out carefully and systematically. This finding corresponds to other South African studies (cf. Dreyer, 1996; Dreyer, 2000). "Structure" and "spoon-feeding" is what these students have become accustomed to in the secondary school. Students in many secondary schools in South Africa have very little opportunity to initiate or actively participate in interactions (cf. Dreyer & Van der Walt, 1991), with the result that most of them have become accustomed to being "guided".

The difference between a detail-oriented (analytic) person and a holistic one (global) is very important in language learning, because the two types of students react differently in the language classroom. The results indicated that

the students (total group) were statistically significantly more global than analytic. This difference revealed a medium effect size (cf. Table 7). This finding corresponds with the finding that the students were also more field dependent than field independent. Global (field dependent) students like socially interactive, communicative events in which they can emphasise the main idea. These students also seem to prefer variation and creativity in the activities they have to perform (cf. Dreyer, 1996). Analytic (field independent) students, on the other hand, tend to concentrate on grammatical details and often avoid more free-flowing communicative activities.

6.3 Learning styles as predictors of language achievement

The results of the stepwise multiple regression analysis indicated that having an auditory and closure-orientated learning style accounted for 12,5% of the variance on the language achievement measure of the students (cf. Table 8). Although the first two variables contributed statistically significantly to the variance on the language achievement measure, their contribution only indicated a small effect size (cf. Table 8).

Table 8: Stepwise multiple regression

Variable	Step	Multiple R	Multiple R-square	R-square change	F-ratio	p	f^2
Auditory	1	0,287	0,082	0,082	11,886	**	0,09
Closure-Oriented	2	0,353	0,125	0,043	6,356	*	0,05
Hands-on	3	0,385	0,148	0,023	3,652	n.s.	0,03

Statistical significance

* p<0,01

** p<0,001

The fact that the auditory and closure-oriented learning styles are statistically significant predictors of language achievement, among this group of students, seems to support the statement that most ESL classes at university still predominantly cater for the auditory learner, and many lecturers continue to provide structure for their students; lecturing styles not preferred by the majority

of the students. Although the results were not practically significant, they seem to highlight the fact that awareness of preferences and appropriate adaptation to them is essential if learning efficiency is to be enhanced. This finding is supported by similar South African studies (cf. Dreyer, 2000). However, it is also clear that there is no **single** variable that significantly contributes to success; language learning requires a multifaceted approach.

6.4 Learning styles and instructional methods

An analysis of the results revealed that instructional method differentially affected the language achievement of students with the following learning styles:

- sensory preferences (cf. 3.4).
- field dependent/field independent (global/analytic) (cf. 3.9).

Only the significant results are, therefore, reported and discussed. Only the results for field dependence and field independence are reported because of the correlation between these styles and the global/analytic styles. The results of a Pearson product-moment correlation indicated that the correlation between field dependence and a global style was statistically and practically significant ($p<0,05$ and $r=0,50$ - large effect size), and the correlation between field independence and an analytic style was also statistically and practically significant ($p<0,05$ and $r=0,45$ – medium to large effect size) (cf. Cohen, 1977:77-81).

A summary of the two-way ANCOVA results for main effects and the interaction between sensory preferences and instructional method appears in Table 9. In this analysis the pre-test scores were entered as the covariate, and the post-test scores as the achievement measure (criterion). The results indicated, among other things, that there was a statistically significant interaction ($p<0,0001$) between learning style and instructional method. The significance of the learning style by instructional method interaction indicated that students

with dissimilar learning styles achieved differentially as a result of instructional methods.

Table 9: 2-Way ANCOVA for sensory preferences and instructional methods

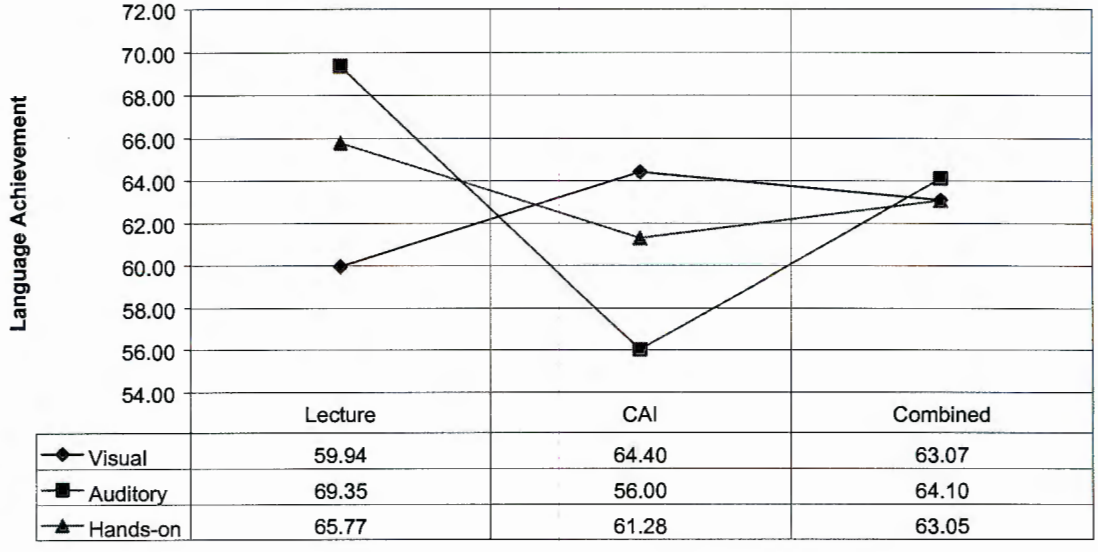
Source	df effect	MS effect	df error	MS error	F	p-level
Main effects						
Style	2	13,17	176	4,79	2,74	0,06
Instructional Method	2	33,71	176	4,79	7,03	*
Interaction						
LSxIM	4	32,17	176	4,79	6,70	**

Key:

		Statistical significance
Style	– learning styles	* p<0,001
Instructional Method	– lecture, CAI and combined	** p<0,0001
LSxIM	– Interaction between learning style and instructional method	

Figure 1 graphically presents the interaction between sensory preferences and instructional methods (using the mean of the post-test scores, cf. Table 10).

Figure 1: Interaction between learning styles (sensory preferences) and instructional methods



In order to analyse the statistically significant interaction that was found between learning styles and instructional methods (cf. Table 9 and Figure 1), post-hoc Tukey tests were calculated to determine where the mean differences occurred. In this analysis each learning style was considered individually within each of the three treatment groups, resulting in a total of 9 groups being considered (e.g. visual lecture, visual CAI, visual hands-on, etc.) The results of the post-hoc Tukey tests for sensory preferences per instructional method are reported in Table 10. The Tukey tests indicated the following main trends: the visual students in the CAI class (group 2) performed statistically significantly ($p<0,05$) better on the language achievement test than did the visual students in the lecture class (group 1) (medium effect size $d=0,68$) (cf. Table 10). The visual students in the combined class (group 3) performed statistically significantly better on the language achievement test than did the visual students in the lecture class (group 1) (small-medium effect size $d=0,47$.) The visual students, however, showed the biggest mean gain score in the combined class. The auditory students in the lecture class (group 4) also performed statistically significantly better on the language achievement test than did the auditory students in the combined class (group 6) (medium effect size $d=0,55$). The auditory students in the combined class (group 6) did statistically significantly better than the auditory students in the CAI class (group 5) (large effect size $d=0,95$). The auditory students in the lecture class (group 4) performed statistically significantly ($p<0,05$) better on the language achievement test than did the auditory students in the CAI class (group 5) (large effect size $d=1,38$) (cf. Table 10). The auditory students in general also showed the biggest mean gain score in the lecture class. The hands-on students in the lecture class (group 7) performed statistically significantly ($p<0,05$) better than did the hands-on students in the CAI class (group 8) (medium effect size $d=0,63$). In general, the hands-on students, however, showed the biggest mean gain score in the CAI and combined instructional method classes.

Table 10: Post-hoc Tukey HSD tests for sensory preferences per instructional method

Groups	N	Pre-test M	Pre-test SD	Post-test M	Post-test SD	M gain score	Tukey
1	39	58,84	4,44	59,94	5,34	1,10	3* +
2	32	62,65	6,66	64,40	6,53	1,75	1* ++
3	55	60,36	6,73	63,07	6,71	2,71	1* +
4	14	65,78	8,18	69,35	9,62	3,57	5* +++ 6* ++
5	2	60,00	5,65	56,00	8,48	-4,00	
6	10	61,40	8,97	64,10	8,45	2,70	5* +++
7	9	63,88	6,39	65,77	7,06	1,89	8* ++
8	7	58,42	4,15	61,28	3,45	2,86	
9	18	60,33	7,14	63,05	6,12	2,72	

Key:
N – number of subjects in group
M – mean
SD – standard deviation

Groups
1 - Visual lecture
2 – Visual CAI
3 – Visual combined
4 – Auditory lecture
5 – Auditory CAI
6 – Auditory combined
7 – Hands-on lecture
8 – Hands-on CAI
9 – Hands-on combined

Statistical significance
* $p<0,05$

Practical significance
+ - Small effect size
++ - Medium effect size
+++ - Large effect size

Sensory preference refers to the physical, perceptual learning channels through which the student learns most comfortably (cf. Oxford et al., 1991). Visually oriented students need a great deal of visual stimulation (e.g. computers), while the auditory students are more comfortable with lectures. The hands-on students like manipulative and three-dimensional materials that are touchable

and moveable (cf. Dreyer, 1998). The results of this study, therefore, seem to indicate that lecturers/teachers need to take cognisance of their students' different learning styles and also need to learn how to accommodate these differences by means of using a variety of instructional methods as well as exercises and activities. A student's perceptual strengths and weaknesses are extremely important for, no matter how motivated a student might be, inability to absorb and retain through an inappropriate sense tends to dampen motivation, and, certainly, inhibits achievement (cf. visual and hands-on students in the lecture class, and auditory students in the CAI class).

A summary of the two-way ANCOVA results for main effects and the interaction between field dependence/independence and instructional method appears in Table 11. In this analysis the pre-test scores were entered as the covariate, and the post-test scores as the achievement measure (criterion). The results indicated a statistically significant interaction ($p<0,0001$) between learning style and instructional method. The significance of the learning style by instructional method interaction indicates that students with dissimilar learning styles achieve differentially as a result of instructional methods.

Table 11: 2-Way ANCOVA for instructional methods and field dependence/independence

Source	df Effect	MS Effect	df Error	MS Error	F	p-level
Main effects						
Style	1	9,33	179	4,91	1,89	0,17
Instructional Method	2	40,04	179	4,91	8,14	**
Interaction						
LSxIM	2	54,26	179	4,91	11,03	**

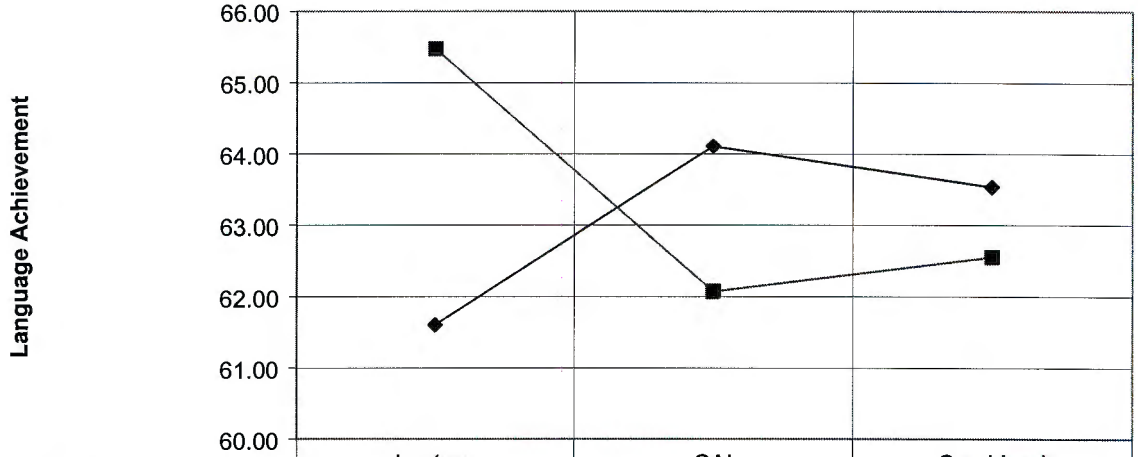
Key:

Style – learning styles
Instructional Method – lecture, CAI and combined
LSxIM – Interaction between learning style and treatment

Statistical significance
**p<0,0001

Figure 2 graphically illustrates the interaction between field dependence/ independence and instructional method (using the mean of the post-test scores, cf. Table 12).

Figure 2: Interaction between learning styles (field dependence/independence) and instructional methods



	Lecture	CAI	Combined
Field dependent	61.60	64.10	63.53
Field independent	65.47	62.07	62.55

In order to analyse the statistically significant interaction that was found between learning styles and instructional methods (cf. Table 11 and Figure 2), post-hoc Tukey tests were calculated to determine where the mean differences occurred. In this analysis each learning style was considered individually within each of the three treatment groups, resulting in a total of 6 groups being considered (e.g. field dependent lecture, field dependent CAI, field dependent combined, etc.) The results of the post-hoc Tukey tests for field dependent and field independent learning styles per instructional method (i.e. treatment) are reported in Table 12. The Tukey tests indicated the following main trends: the field dependent students in the CAI class (group 2) performed statistically significantly ($p<0,05$) better on the language achievement test than did the field dependent students in the lecture class (group 1) (small effect size $d=0,29$); the field dependent students in the combined class (group 3) did statistically significantly better than did the field

dependent students in the lecture class (group 1) (small effect size d=0,22). In general, the field dependent students also showed the biggest mean gain score in the CAI class. The field independent students in the lecture class (group 4) performed statistically significantly (p<0,05) better on the language achievement test than did the field independent students in the CAI class (group 5) (small-medium effect size d=0,48) and the field independent students in the combined class (group 6) (small to medium effect size d=0,47). In general, the field independent students, however, showed the biggest mean gain score in the combined class.

Table 12: Post-hoc Tukey tests for field dependent (global) and field independent (analytic) learning styles per instructional method

Group	N	Pre-test M	Pre-test SD	Post-test M	Post-test SD	M gain score	Tukey
1	41	60,04	7,31	61,60	8,58	1,56	
2	28	61,46	5,98	64,10	6,11	2,64	1* +
3	54	61,16	7,24	63,53	7,03	2,37	1* +
4	21	63,28	3,43	65,47	5,17	2,19	5* ++ 6* ++,
5	13	62,53	7,33	62,07	7,02	-0,46	
6	29	59,20	6,54	62,55	6,20	3,35	

Key:
N – number of subjects
M – mean
SD – standard deviation

Group:
1 - Field dependent lecture
2 – Field dependent CAI
3 – Field dependent combined
4 – Field independent lecture
5 – Field independent CAI
6 – Field independent combined

Statistical significance
* p<0,05

Practical significance
\+ Small effect size
++ Medium effect size
+++ Large effect size

Some students (including certain field independent learners) need to have a very structured basis for their L2 learning, and many of these students might not be comfortable "creating" communicatively with the language unless and

until they can use logical reasoning to analyse the language. Such students often prefer explicit feedback on grammatical accuracy. Computer programs with traditional L2 drills and analytic puzzles allow these students to do the exercises that they need for developing precision, accuracy, and analytical understanding.

On the other hand, some field dependent students might be able to jump directly into communicative activities, assisted by technology or not, without the compelling personal need for analysis and accuracy. Instead of explicit feedback on grammatical precision, such students often prefer contextualised clues or indirect suggestions about how to use forms appropriately (Oxford, 1993).

In general, the results indicated that students with a visual learning style and/or a field dependent learning style benefit from computer-assisted instruction, while students with an auditory learning style and/or a field independent learning style benefit from receiving instruction via a lecturing method, and hands-on students seem to prefer a variety (i.e. a combination) of instructional methods. These results seem to be consistent with the results found in other studies (cf. Hahn, 1984; MacGregor et al., 1988). The results do, however, contrast with Martini's (1986) findings, which indicated consistently higher achievement for all learners when exposed to CAI. The results, therefore, indicate that the matching or mismatching of student learning styles with instructional methods has important implications for student achievement. It is important, however, to remember that subject matter as well as dimensions of learning style interact with instructional methods in unique ways.

The question is not, therefore: "Is use of technology better than non-use of technology for L2 learning?" The question should rather be expanded to include: "Which forms of technology enhance L2 learning (a) with reference to which broad educational goals, (b) with application to which language skills and subskills, (c) for which kinds of learners, (d) with which kinds of teachers, and

(e) in what social and physical environments?" (Oxford et al., 1999:3). Integrating technology throughout language curricula can be considered a "multimodal teaching strategy". Many different techniques are employed to meet the learning needs of a varied student population. The key to promoting improved learning appears to lie in how effectively the medium is exploited in the teaching and learning situation.

6.5 Conclusion

An understanding of the way students learn is an important factor in improving educational opportunities for students. No single instructional modality may be optimal for all students; therefore, an awareness of individual learner characteristics and their association with learning outcomes is essential. Computer-assisted instruction holds significant potential for language instruction. If used properly, technology can interest and motivate learners, expand access to a greater number of learners, provide flexibility of instruction, and develop learners' competence and expertise in certain aspects of language. However, technology is not a panacea that suddenly transforms all learning. The effectiveness of educational technology depends on how it is employed to meet educational goals for particular kinds of students in specific language learning environments.

Chapter 7
Conclusion and Recommendations for Future Research

7.1 Introduction

The purpose of this chapter is to provide a summary of the results obtained in this study as well as to indicate the implications of the results for ESL teaching/learning and teacher training.

7.2 Hypothesis

Regarding the hypothesis posed in section 1.3 the following conclusion can be drawn:

- Students taught by means of an instructional method favouring their learning style achieve better than those students who are taught by an instructional method dissimilar to their preferred style.

7.3 Learning style "profile"

Students participating in this study had a statistically as well as practically significant visual modality preference over students with an auditory and hands-on orientation. The total group of students were also statistically as well as practically significantly more extraverted than introverted.

The total group of students participating in this study were statistically more intuitive than concrete-sequential (small to medium effect size). Male students were also found to be statistically significantly (small to medium effect size) more intuitive than female students. All the students were also

statistically as well as practically significantly more closure-oriented than open, indicating that despite being intuitive, the students still showed a strong need for clarity and structure. The results of this study indicated that the total group was statistically significantly (medium effect size) more global than analytic and also more field dependent than field independent.

The results, therefore, indicate a diverse learning style profile in the average first year ESL tertiary lecture room in the North West Province. Learners are unique and they differ in the way they approach learning.

7.4 Learning styles as predictors of language achievement

The results indicated that having an auditory and closure-oriented learning style accounted for 12.5% of the variance on the language achievement measure of the students. This seems to indicate that most ESL classes at university still predominantly cater for the auditory and closure oriented learner. However, it is also clear that there is no single variable that significantly contributes to success; language learning is a multi-faceted approach.

7.5 Learning styles and instructional methods

In interpreting the results, it is important to underscore the fact that the ESL lessons on the Plato® system cannot be equated with all possible CAI, instead, they represent a particular approach – one taken in many CAI lessons – but certainly not the only possible approach. The findings of this study might have been quite different if the lessons offered on the Plato® system had represented a greater variety of approaches.

The combined method appears to be the method that delivers the best results in terms of student performance regardless of individual learning style. It should be noted that the combined method in this study comprised

of the lecture method combined with computer-based drill and practice exercises conducted via the Plato® system. The use of CAI as a supplement to conventional instruction produces higher achievement than the use of conventional instruction alone.

7.6 Implications for ESL teaching/learning and teacher training

7.6.1 ESL teaching/learning

McBeath (1994:165) states that there is general agreement among educators and employers that all students should develop effective communication, critical thinking, problem solving, and interpersonal skills to meet the demands of the "knowledge society". Very little, however, in the educational system prepares students for the reality in which they will live, work, and become effective. Our schools have yet to accept the fact that in the knowledge society, the majority of people make their living as employees. They work in an organisation and no educational institution tries to equip students with the elementary skills of effectiveness as members of an organisation: ability to present ideas orally and in writing (briefly, simply, clearly), ability to work with people, and the ability to shape and direct one's work.

According to Knott (1992:162), the future of learning in the emerging global village holds that learning will become a lifelong, multi-faceted process which focuses on learners' specific needs at a given time. In order to accomplish such rapid information transfer, learning processes must change drastically. "Just in time" learning, based on clearly identified and ever changing learner needs, will become critical in order for us to survive in the global village.

According to McBeath (1994:165), we have moved into a society where lifelong learning is essential, the basic rules have changed, and we are in a paradigm shift situation. Course structure will have to guide students beyond the basics of acquiring knowledge and providing them with higher levels of effectiveness in

communication, critical thinking, problem solving, interpersonal relationships, and the creative use of knowledge. In the new economy, lifelong learning is cited as one of the major new changes to our current education paradigm. With technology changing so rapidly and information becoming more and more readily available, people in the workforce will have to learn continuously to remain competitive in the labour market.

Marshall (1990:62) states that teaching to learning styles represents a philosophical change from tradition to a mutual embrace of accountability: "If students do not learn the way we teach them, then we will teach them the way they learn." This statement of Marshall implies that teaching should change from an authority driven or lecturer driven activity to client or student driven activity. This notion is not unique to education, it is part of a paradigm shift or *Zeitgeist* that has slowly taken effect in all facets of modern culture. This *Zeitgeist* can be characterised by the shift in power from the single authority to the masses. Examples can be found in any industry, e.g. the motor industry, from Henry Ford's – you can buy any colour as long as its black – to the consumer today being able to select colours, upholstery, features etc. in their new cars.

Research conducted by Reed-Sanders and Liebowitz (1991:228) on the computer in the teaching curriculum has pointed out that the use of CAI in a course showed more positive student' attitudes toward the subject, the course, the professor and the use of the computer. The CAI group also performed better than the group taught with conventional methods. This is of the utmost importance as this must impact on the way a group of students is taught (cf. Oxford et al., 1999:1,13; Chapelle & Jamieson, 1986:37). Capper and Copple (1985) and Bialo and Sivin (1990) also found that motivation in terms of time-on-task was higher with CAI students than traditionally instructed students. Time spent, or time-on-task can thus be regarded to go hand in hand with motivation. Should different instructional methods, or a combination of methods, prove to be more motivating to individual students, lecturers should

consider pre-testing the variables (e.g. cognitive, affective, psychological and behavioural) that make students learn in unique ways.

7.6.2 Teacher training

Pre- and inservice teacher training should address L2 teachers' technology skills and attitudes toward technology. Negativity and indifference must be overcome before teachers can improve their technology skills. To deal with such attitudes, teachers should learn ways in which technology can help them improve their language instruction. Technology is motivational, but it should not become a crutch. If a teacher has a boring and monotonous teaching style technology will not save him/her.

Teacher training should encompass not just computer use but should also deal, when necessary, with using overhead projectors, audiotapes, and videotapes effectively. Teachers will also need "refresher" courses on effective teaching/lecturing, especially if the requirements for Outcome-Based Education (OBE) are to be met. Teachers will need to learn how to integrate technology within their daily lesson structures. Teachers should learn which cognitive styles fare best with which kind of classroom activities and with which technological applications. Teachers should develop competence in teaching students how to use technology, so that technology-assisted instruction becomes a vehicle for meaningful learning, not just an exercise in operating software or hardware or a trivial encounter with noise and images. The goal of teacher training should be to empower teachers to make intelligent choices, so that their students can learn more effectively through a variety of media.

7.7 Recommendations for future research

The following recommendations for future research are suggested:

- Research on the influence of new media (i.e. the television, personal computer) on the modality preference of the younger section of our population would also give an indication if this is a trend that affects primary as well as secondary students. Should the visual modality preference be prevalent, a more accommodating system could lead to improved achievement of primary, secondary, and tertiary students.

- Time on task (i.e. total amount of time spent using the CAI software) needs to be taken into account in order to ascertain the influence of this variable on student performance using CAI or the combined method.

- CAI programs other than the Plato® system (and also programs representing a different approach to CAI) need to be used in research to ascertain the validity and generalisability of this research.

- The combined method needs to be researched and described in order to come up with valid and repeatable research findings. Currently, the combined method used in this study comprised lecturing and drill and practice exercises on the CAI system. These permutations can change, for example, a variation of the combined method can include student preparation via the internet, feedback session with lecturer and class, CAI reinforcement and testing.

- In addition, the literature on learning styles and individual differences provides a rich but largely untapped source of data for instructional designers. Consideration of this literature can lead to a greater understanding of learners' approaches to study, greater awareness of individual differences in learning and improved design to cater for diversity.

7.8 Conclusion

Second language learning achievement depends on so many variables. In the final aspect, what the student has learned and what the student can achieve with that knowledge is the most important measure of success. Understanding and accommodating individual differences in our second language learning and teaching can facilitate better achievement as well as better student performance.

Further exploration and clarification of the relationship between computer-assisted instruction and students with different cognitive and affective characteristics should contribute to the knowledge required to develop optimal learning environments as well as a better understanding of the human-machine teaching relationship relative to student achievement.

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