

1-1-1999

Teaching students with severe disabilities to perform a pre-lunch routine using the system of least prompts

Keenan Gerard Rodericks
Edith Cowan University

Follow this and additional works at: <https://ro.ecu.edu.au/theses>



Part of the [Special Education and Teaching Commons](#)

Recommended Citation

Rodericks, K. G. (1999). *Teaching students with severe disabilities to perform a pre-lunch routine using the system of least prompts*. Edith Cowan University. Retrieved from <https://ro.ecu.edu.au/theses/1254>

This Thesis is posted at Research Online.
<https://ro.ecu.edu.au/theses/1254>

Edith Cowan University

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study.

The University does not authorize you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following:

- Copyright owners are entitled to take legal action against persons who infringe their copyright.
- A reproduction of material that is protected by copyright may be a copyright infringement. Where the reproduction of such material is done without attribution of authorship, with false attribution of authorship or the authorship is treated in a derogatory manner, this may be a breach of the author's moral rights contained in Part IX of the Copyright Act 1968 (Cth).
- Courts have the power to impose a wide range of civil and criminal sanctions for infringement of copyright, infringement of moral rights and other offences under the Copyright Act 1968 (Cth). Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

**TEACHING STUDENTS WITH SEVERE DISABILITIES
TO PERFORM A PRE-LUNCH ROUTINE
USING THE SYSTEM OF LEAST PROMPTS.**

By

Keenan Gerard Rodericks

**A thesis submitted on 14th December 1999 in partial fulfilment for the award of Master
of Education (Special Education) at the faculty of Education, Edith Cowan University.**

ABSTRACT

The system of least prompts has been used to teach a variety of daily living skills to students with severe to moderate disabilities. The present study attempted to determine the effects of the system of least prompts when used to teach a pre-lunch routine to two students with severe disabilities. The students were categorised as autistic, or as having autistic characteristics, with severe to moderate intellectual disabilities and communication deficits. The results indicated that the system of least prompts was effective in facilitating a change in students' responses. Three effects were observed in relation to the hypotheses. First, there was an increase in the number of unprompted correct responses. Second, there was a reduction in the time each student required to complete the task. Third, there was a reduction in the use of intrusive prompts to stimulate task-related activity. Additionally, substantial improvements were observed in the communication and behaviour of both students. During maintenance one student continued to perform at an efficient level, while the other student required the assistance of the least intrusive prompt.

DECLARATION

I certify that this thesis does not, to the best of my knowledge and belief:

- (a) incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education;
- (b) contain any material previously published or written by another person except where due reference is made in the text; or
- (c) contain any defamatory material.

KEENAN GERARD RODERICKS

1999

ACKNOWLEDGEMENTS

I would like to convey my thanks to my supervisor, Professor Peter Cole for his invaluable guidance and patient explanations into the nuances of single-subject research. I would also like to thank Jeff Innes for his assistance in selecting the participants for this study.

A special thanks goes to my family for their constant support and understanding throughout the preparation of this thesis. To Lorraine D'sa, who in a thousand silent conversations encouraged me to persevere. I thank you.

TABLE OF CONTENTS

Title	1
Abstract	2
Declaration	3
Acknowledgements	4
Table of Content	5
List of Figures	7
 CHAPTER 1 : INTRODUCTION.	 8
Response prompting strategies	12
System of least prompts: A description	13
Steps for implementation	14
Single-subject research	21
Daily living skills	25
Communication	27
 CHAPTER 2 : LITERATURE REVIEW	 29
Comparative studies	29
Studies on acquisition, maintenance and generalisation	39
Studies on communication intervention	45
Summary	51

CHAPTER 3 : METHOD	54
Case study: Participant 1	55
Case study: Participant 2	57
Research design	60
Reliability	61
Variables	61
Hypotheses	62
Procedural parameters	64
 CHAPTER 4 : RESULTS	 73
Results: Participant 1	74
Results: Participant 2	82
Supplementary analysis	90
Summary	91
 CHAPTER 5 : DISCUSSION	 94
General discussion: Major effects	96
Critical evaluation and implication for future research	103
 REFERENCES	 108

LIST OF FIGURES

Figures	Page
Figure 1.1 Flow chart depicting the system of least prompt procedure.	17
Figure 1.2 Example of a prompt hierarchy used with the system of least prompts.	19
Figure 3.1 Example of the prompt hierarchy used during this study.	67
Figure 4.1 John's data recording sheet.	77
Figure 4.2 Prompted and unprompted responses made by John.	78
Figure 4.3 Time taken by John to complete the task.	78
Figure 4.4 Frequency of verbal prompts used by John.	79
Figure 4.5 Frequency of model prompts used by John.	79
Figure 4.6 Frequency of physical prompts used by John.	80
Figure 4.7 Nicholas' data recording sheet.	84
Figure 4.8 Prompted and unprompted responses made by Nicholas.	85
Figure 4.9 Time taken by Nicholas to complete the task.	85
Figure 4.10 Frequency of verbal prompts used by Nicholas.	86
Figure 4.11 Frequency of model prompts used by Nicholas.	86
Figure 4.12 Frequency of physical prompts used by Nicholas.	87

Chapter One

Advances in the field of special education have affected the manner in which teachers view students with disabilities. Research and innovation have yielded many effective and powerful instructional strategies to assist teachers provide the best education to students who are identified as intellectually disabled. Response prompting strategies have evolved as powerful instructional devices in teaching students with severe intellectual disabilities. The present study employs the use of a strategy known as the system of least prompts.

The terminology in this field differs from country to country. The accepted term in Australia is intellectual disabilities, however the following definition was framed in the United States of America where convention prescribes the use of the term mental retardation. In the present study the term intellectual disabilities and mental retardation will be used synonymously.

Mental retardation refers to substantial limitation in present functioning. It is characterised by significantly subaverage intellectual functioning, existing concurrently with related limitations in two or more of the following adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure and work. Mental Retardation manifests before age 18 (Luckasson, Coulter, Polloway, Reiss, Schalock, Snell, Spitalnik, & Stark, 1992, p. 5).

The continuing controversy over the definition of intelligence permeates the current debate about intellectual disabilities. However, with the current definition researchers have aimed to put into perspective the important role adaptive skills play towards the normal functioning of an individual. The paradigm shift is clear: there is a withdrawal from ability deficits to accentuate the need for adaptive behaviour and efficient support system for these individuals. Adaptive behaviour refers to the student's ability to function in non-academic areas like daily living, self-help, communication and social interactions (Accardo, Whitman, Laszewski, Haake, & Morrow, 1996).

Current trends and policies incline towards providing these individual with the least restrictive environment in which they are able to function within the whole community. This has enabled researchers to develop an eclectic definition which is sensitive to changes in ideas regarding service delivery in our time. The present emphasis leans towards the components that are involved in the interaction between individuals with limited intellectual functioning and the environment (Luckasson et al., 1992).

The present study focuses on students with severe disabilities. Students with severe disabilities are categorised as those with high support needs because they experience extreme disabilities in one or a combination of the following domains: "intellectual (mental retardation), physical (e.g., cerebral palsy), emotional/behavioural (e.g., childhood autism), sensory (e.g., deafness and blindness), and communication" (Reichle, 1997, p. 111). The participants in the present study were primarily categorised as autistic. Autism is characterised by extremely deviant behaviour, with language delays, inability to engage in social relationships, extreme sensitivity to external stimuli,

hyperactivity, and a preservation of sameness. Intellectual disabilities are prevalent in about 85% of cases (Accardo et al., 1996).

There is a growing need for a more extended body of research into the acquisition of adaptive and daily living skills by students with severe disabilities. The trend over the past decade has necessitated a reorganisation and restructuring of educational roles, both within regular education and also within special education. Inclusive education refers to educational environments in which students with and without disabilities collaboratively receive an education within the general school system (Accardo et al., 1996). Inclusive education works on a continuum of available services and has emerged as an appealing new concept, but it also imposes an added responsibility on an already laden system. Furthermore, students with severe disabilities require high support in many areas. Often the primary concern of special educators and practitioners in the field does not hinge on ability criteria, but rather on providing these individuals with the basic functional skills in communication, self-care, home living and health and safety. Competence at these skills foster independence that is vital for integration into the wider community.

The present study addresses the need to facilitate independence skills in children with severe disabilities. Independence refers to the individual's ability to be self-governing and self-sustaining within a supportive environment (Accardo et al., 1996). It is an erroneous presumption that children with severe disabilities are incapacitated by their disabilities to function independently. As a result these children often have everything done for them by trainers, caregivers and parents (Snell, 1993). While some tasks may be unattainable due to the individual's disabilities, other can quite easily be performed by the individual with a little assistance. The principle of partial

participation states that instruction should always focus on independent functioning as its goal, but when independent functioning is not achievable, then instruction should focus on providing support to these individuals to assist them to participate in the various activities. Limited dependence is always more desirable than total dependence (Wolery, Ault, & Doyle, 1992).

The present study targeted children with severe disabilities who were diagnosed with autism or who exhibited several characteristics associated with the condition. Autistic characteristics include behavioural deviance, intellectual disabilities, severe deficits in communication, language delays, stereotypical movement like hand flapping and rocking, poor eye contact and echolalia (Accardo et al., 1996). In recent decades research has focused on teaching these students the functional skills that are required for successful integration into the community. Students with severe disabilities need to be taught skills that would afford them the greatest degree of independence when they are placed in the mainstream of the community. Daily living skills receive high priority during planning of instructional goals for students with severe disabilities because they help students become more independent and also provide the students with the skills that are necessary for vocational and community work. Snell (1993) suggests that consideration should be given to important issues like social validity, generalisation, and partial or full participation. Teachers, parents, caregivers and guardians who are primarily involved with the student should collaboratively decide on the skill to be taught.

Response Prompting Strategies

Response prompting strategies have been used to teach a variety of social and academic skills to students with severe disabilities. Teaching strategies that utilise prompts for instruction and provide extra teacher assistance in the form of prompts are called response prompting strategies (Wolery, Ault, & Doyle, 1992). As the instruction progresses the assistance is gradually faded till the student is able to perform the task independently. Some response prompt strategies provide the student with assistance before the student produces a response, thus guaranteeing a near errorless mode of instruction. These procedures differ in their implementation, but they are all firmly dependent on the principle of programming and prompting.

Wolery, Ault and Doyle (1992) have defined several response prompt strategies along with the key elements that operate during their use. Essentially, response prompting strategies employ the use of two types of prompts. The controlling prompt refers "to teacher behaviours that ensure that the student will respond correctly" (Wolery, Ault, & Doyle, 1992, p. 37). Noncontrolling prompts "increase the probability that the student will respond correctly, but does not ensure the correct response" (Wolery, Ault, & Doyle, 1992, p. 37). The most frequently used prompting procedures include the constant time delay procedure which systematically inserts a time interval between the target stimulus and the controlling prompt. The progressive time delay procedure involves fading the controlling prompt by systematically increasing the amount of time between the target stimulus and the controlling prompt. The most-to-least prompting procedure consist of a prompt hierarchy that provides the student with correct response at the first level and then gradually fades the prompts during all subsequent levels. These procedures provide the students with the correct response

before the student makes an error. Response to the target stimulus, which is an event or occurrence that indicates to the students that they are to respond in a particular manner, is central to all response prompting strategies. The present study employed another frequently used response prompting strategy known as the system of least prompts. The system of least prompts is an instructional strategy that progressively increases the amount of assistance that each prompt provides (Wolery et al., 1992).

The System of Least Prompts: A Description

The procedural framework for the system of least prompts consists of four main criteria. The first criterion refers to the levels in the prompt hierarchy. The student is given the opportunity to respond independently at the first level (without the prompts), and all following levels consist of prompts that are arranged from least intrusive to most intrusive amount of assistance. Intrusiveness is defined as "the extent to which an instructional procedure impinges or intrudes upon a student's body" (Wolery, Ault, and Doyle, 1992, p. 36). The target stimulus is delivered in isolation at the first level of the prompt hierarchy. This communicates to the student that they are to respond. The target stimulus could be any event that occurs naturally in the student's classroom environment, or it could also be a task direction. The main function of the target stimulus is to precipitate a response in the student. The next level consists of the least intrusive prompt in the hierarchy and progressively increases the amount of assistance to culminate with the delivery of the most intrusive prompt at the final level. The last prompt is the controlling prompt, which ensures the student will perform the task correctly.

The second criterion is the presentation of the target stimulus in isolation at Level 1, which is then followed by the prompts at subsequent levels. The third criterion is the insertion of a time interval before delivering the prompt and also after delivery. The time interval must be the same for both instances. The time interval is also inserted between the different levels in the hierarchy and remains uniform till the student is able to respond correctly. The fourth criterion is the selection of reinforcers for all the correct response made by the students. All correct responses are reinforced regardless of when they occur in the hierarchy, but only those correct responses that occur before the prompt is delivered are counted towards satisfying the criterion.

Steps for Implementing the System of Least Prompts

The system of least prompts encompasses eight procedural parameters. The reliability and social validity of the system of least prompts is determined by the degree of adherence to these eight procedural steps. The system of least prompts is not restricted to any particular type of task, although it has been found to be more effective with tasks that involve chained responses rather than discrete tasks that involve only one response. Effectiveness refers to the outcome of an instructional procedure. That is, has the procedure been successful in teaching a student. Efficiency refers to the time and effort the student needs to learn a new skill (Wolery, Ault, & Doyle, 1992). The least prompt procedure has also been used extensively with students with severe to moderate intellectual disabilities, but there has been limited research conducted on students with autism (Wolery, Ault, & Doyle, 1992). The following eight steps are necessary for the implementation of the system of least prompts.

1. The teacher identifies the stimulus that cues the student to respond. After the target behaviour has been selected the teacher must identify the stimulus that signals the student to respond. The target stimulus can be a task direction that involves simple questions or commands, like, "What is this?" or "Tie your shoe lace." Environmental manipulations like placing a toy just out of reach to encourage requesting behaviour or placing dirty dishes near the dishwasher and wait for the child to respond (load the dishwasher) are frequently used to elicit a response from students. Often, events that occur naturally in the student's routine make up effective stimuli, such as the recess bell at school or the microwave timer. The success of the least prompt procedure depends on the target stimulus assuming control over the student's response. With the system of least prompts the target stimulus should be provided at all levels in the hierarchy. The repeated exposure to the target stimulus ensures that the student's response is directly and closely related to the target stimulus (Wolery, Ault, & Doyle, 1992).

2. The teacher determines the number of levels in the hierarchy. The system of least prompts justifies the use of at least two levels of prompts in the hierarchy. Therefore, a minimum of three levels are required because the first level consists of the target stimulus being presented in isolation. There are no limits to the number of levels that can be used, but practitioners should consider the characteristics of the task before deciding on the number of levels to include in the hierarchy. If the target skill commands discrete responses, then two or three levels should be included. The prompt hierarchy would then consist of the target stimulus presented alone at the first level, the target stimulus and Prompt 1 at the second level and the target stimulus and Prompt 2 at the third level. If the task involved chained responses then it would be preferable to introduce a greater number of levels in the hierarchy. However, the practitioner should

consider the characteristics and abilities of the student. If the student has difficulty with attention and concentration, a greater number of levels in the hierarchy would not be the preferable option. A final consideration should be given to the amount of time available for instruction.

3. The teacher selects the types of prompts to be used in the hierarchy. The following prompts are frequently used during the least prompting procedure. Gestural prompts are nonverbal behaviours which inform the student on the appropriate manner of response. They involve hand or body movements, facial expression and gestures.

Gestural prompts are natural, non-intrusive prompts that are easy to use and are not dependent on the proximity of the teacher to the student. Verbal prompts are teachers' vocal pronouncements that provide the student with information on how to respond correctly. They differ from task directions, in that, they are not signals to respond, but cues on how to respond. For example, in the context of the present study, a task direction would be "It's lunch time," but a verbal prompt would be "Get your lunch box." It is important to consider the student's ability to comprehend the meaning of vocal statements before using verbal prompts.

Pictorial prompts refer to pictures or written messages that provide the student with information on how to respond. Often these pictures depict the entire complete response. Frequently picture prompts are used to assist students complete long chained tasks. The pictures are usually put into a book, where the student can turn to the next picture prompt after completing each step in the task. Model prompts are based on demonstrations of the correct behaviour; the teacher demonstrates the behaviour the student is to learn, and the student is expected to imitate the correct behaviour.

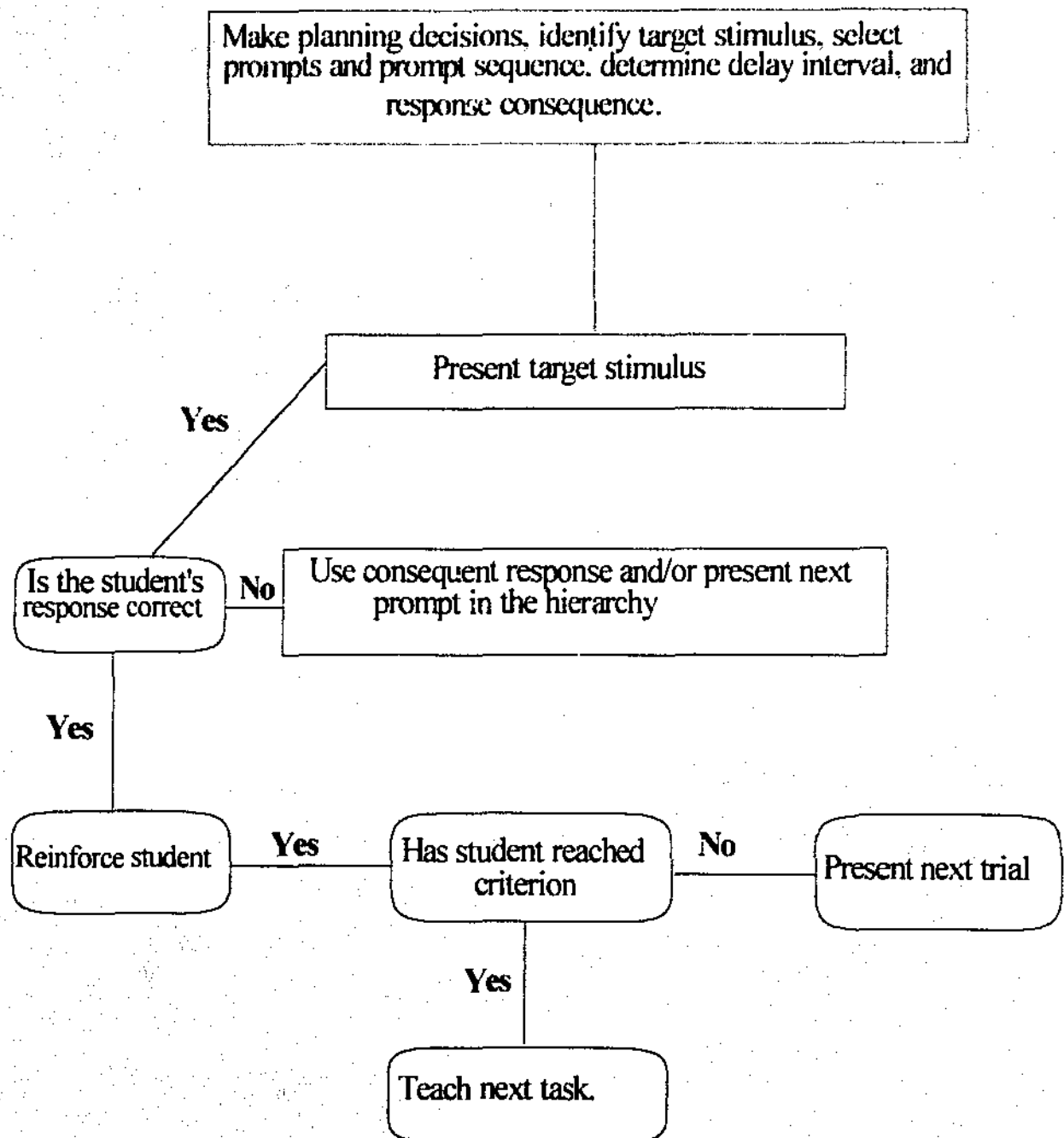


Figure 1.1 Flow chart depicting the system of least prompts procedure. Adapted from (Wolery, Ault, & Doyle, 1992).

Modelling refers to “learning by observation of someone else’s behaviour” (Baron & Bryne, 1987, p. 117). For example, if the student is learning to tie a shoelace the teacher first demonstrates the correct response. If the target behaviour is verbal the

model should be verbal. If the behaviour involves a motor response, then the model should demonstrate a physical movement.

Physical prompts are of two types: partial physical prompts and full physical prompts. Partial physical prompts involve touching students but not controlling their movements. Examples include nudging, tapping, and light pulling and pushing. Partial physical prompts are frequently used to assist students in starting a response. Full physical prompts constitute the most intrusive prompts and involve complete teacher assistance. This happens when the teacher uses complete physical guidance by controlling the student's movements that assist him through the task (Wolery, Ault, & Doyle, 1992).

4. The teacher sequences the prompts from least amount of assistance to most assistance. The least prompts procedure, by definition, dictates that the selected prompts are arranged in a hierarchical order from least to most intrusive. The hierarchy begins with the first level where no assistance is provided to the student. The subsequent levels progressively increase the assistance each prompt provides. The final prompt in the hierarchy is the most intrusive prompt and ensures the student will respond correctly to the target stimulus.

5. The teacher determines the length of the response interval. The student is given an opportunity to respond after each level in the prompt hierarchy. After presenting the target stimulus at the first level, the student is given a brief amount of time to respond independently. The delivery of the target stimulus and the prompts at the next level should be accompanied by the identical amount of time used at the first level. If the student responds correctly, the teacher provides reinforcement. If an incorrect response occurs, or the student fails to respond altogether, the teacher

Levels	Prompts	Examples
1	Target Stimulus	"It's time to brush your teeth."
2	Target Stimulus Gestural Prompt	"It's time to brush your teeth." Point to the toothbrush.
3	Target Stimulus Picture Prompt	"It's time to brush your teeth." Teacher shows the student a picture of a person brushing his teeth.
4	Target Stimulus Model Prompt	"It's time to brush your teeth." The teacher demonstrates the correct response.
5	Target Stimulus Physical Prompt	"It's time to brush your teeth." The teacher physically guides the student through the correct response.

Figure 1.2 An example of a prompt hierarchy and prompt sequence for a tooth-brushing task.

proceeds to the next level until all the prompts are used or until the student responds correctly. There is no established rule concerning the length of the time interval between the target stimulus and the prompt or between the different levels in the hierarchy. Student characteristics and task characteristics would determine the length of the time interval. It is imperative that the time intervals are identical and consistent throughout the procedure (Wolery, Ault, & Doyle, 1992).

6. The teacher determines the consequence for student responses. Prior to instruction the teacher has to determine the consequence for all student responses. With

the least prompt procedure all correct responses produced by the student are reinforced, regardless of when the response occurs. Prompted and unprompted correct responses are immediately reinforced to increase the probability that the student's responses will be influenced by the prompt in future trials. Reinforcement can comprise of verbal praise, token or edibles. If a student is learning to set the table, an extra helping of cake or dessert would be a good reinforcement for correct responses. All correct responses are reinforced, but only those responses that are correct before the prompt are counted as satisfying the criterion. In the event of an incorrect response the teacher should intervene and deliver the next prompt in the hierarchy. Teachers can also use negative feedback and instruct the student to wait for the prompt. If tokens are provided for correct responses they can also be retracted for incorrect responses or no responses (Wolery, Ault, & Doyle, 1992).

7. The teacher selects a data collecting system. It is important to monitor continuously the effectiveness of an instructional program to determine the effects on student performances. Formal observation, anecdotal records and diary entries of notable events collectively provide valuable information on the students. Furthermore, it assists the teacher to make instructional decisions regarding the effectiveness of the procedure.

8. The teacher records student data patterns. Teachers can visually display the student responses on data recording sheets that allow for the presentation of all student responses. Graphic representation helps teachers gauge whether the instructional strategy has achieved the desired results, and also provides a useful medium for data analysis.

If a student consistently makes errors at the final level of the hierarchy, the teacher should select a more intrusive prompt. Errors that occur at any intermediary level in the hierarchy can be minimized by increasing the number of levels and adding an extra prompt. Sometimes the task may be too difficult for a student, in which case the teacher should reconfigure the task and teach the prerequisite skill. Often the student might wait for the prompt instead of attempting an independent response. If this behaviour persists over several sessions the teacher can differentially reinforce prompted and unprompted responses or discontinue reinforcement for prompted responses.

Single-Subject Research

Single-subject research designs are based on behaviourist theory. These designs are powerful experimental devices that have been used predominantly to demonstrate cause and effects in experimental relationships. The main purpose for using single-subject research designs is to establish the manner in which an independent variable has affected the target behaviour (Salkind, 1997). As the name suggests, single-subject designs are concerned primarily with the individual and the effects of a treatment on that individual. If there are several subjects in an experiment, then the data from each subject are analysed separately, instead of collectively as in group designs.

The present study considered three dimensions that are essential to single-subject research. These are research designs, data analysis and replication. Each dimension will be discussed briefly in the following paragraphs. Intrinsic to single-subject research designs is the systematic collection and monitoring of data. Consistency is the essential feature in single-subject research. Data should be collected

the same way over time and measured repeatedly under different conditions. The designs emulate a test-teach-test principle, in that a behaviour is measured before a treatment, and then is measured again after a treatment has been introduced. Finally, it is measured again to determine the effects of the treatment. If there is an improvement in the behaviour the experimenter can conclude that the treatment was responsible for the change and can easily verify this result by testing the behaviour again without the treatment.

The first step in designing a program for single-subject research is to identify a target behaviour. The experimenter must then test and measure the performance of the subject in relation to the target behaviour. For example, if the aim is to reduce the amount of times a student screams in a ten-minute period, the experimenter must first count the incidents of screaming within the period to establish a baseline for the behaviour. This baseline will be used as a yardstick on which to compare the results of the treatment. The focal point of the experiment should be to elicit a change in the baseline measures. The treatment or intervention is then introduced and changes to the baseline condition are measured. As with most behavioural analysis, reinforcement is contingent upon the performance of the correct behaviour. The effects of the treatment can then be measured in a third experimental condition where the treatment and reinforcement are withdrawn and the behaviour is once again measured as it was during the baseline.

Experimental conditions in single-subject designs are generally represented by a letter in the alphabet. The common terminology for single-subject research involves the baseline condition being represented by the letter A and the first intervention or treatment being labelled as B. If the experimental design consists of a third condition in

which the treatment is withdrawn and conditions are reversed back to baseline, then that phase of the experiment is represented again by the letter A. The resultant design is known as the A-B-A design, or reversal design. The present study utilised the A-B-C design. The baseline phase was represented by the letter A, the intervention was represented by the letter B, and the maintenance phase was represented by the letter C. During the maintenance phase the treatment and reinforcement were withdrawn and the participants were expected to perform the task under a different condition. Phase C did not represent another treatment, but the students were expected to perform the task in a different location of the classroom.

Replication is another important consideration in single-subject research. Tawney and Gast (1984) state that replicability is necessary in order to demonstrate reliability and generalisability of data. Replication refers to the systematic or direct reproduction of an experimental program to establish a global credibility for the original results. Direct replication involves the replication of an experiment by the same experimenter (Tawney & Gast, 1984). Direct replications are of two types: intrasubject and intersubject. In intrasubject replication, the original experiment is mirrored exactly, that is, the same subject, the same environments and the same stimuli are all tested a second time. Intersubject replication maintains the sameness in everything except the subject. Systematic replication is more difficult to achieve because it entails observing the results of an experiment in different conditions from those that existed during the original experiment (Tawney & Gast, 1984).

Summarising a student's performance is an important process in single-subject research. Data that have been graphically displayed or summarised in comprehensive recording sheets makes for easy visual analysis. Tindal and Marston (1990) highlight

five characteristics of graphed data that can be used to describe student performance. They are: median of performance, slope of performance, level of performance, variability of performance, and overlap.

Median of performance reflects the middle score of a particular phase. An instructional program that seeks to improve student performance over a period of time should yield a median performance that increases from baseline to intervention. This is a clear indicator that the intervention has been effective. The median performance reflects the typical score of any given phase. The slope of performance, also known as trend line is another effective way to analyse data derived from single-subject research. Essentially, the slope of performance indicates the direction or trend of change in the level of performance over a sequence of observations. The slope line provides the experimenter with information on the student's performance over a period of time. It reveals information on the direction of change and also the rate of change. A steep slope of performance indicates a rapid rate of change that is marked by a positive or negative slope line.

The level of performance provides the experimenter with conclusive evidence pertaining to the effectiveness of the intervention. The level of performance indicates the magnitude of change in the student's performance at a particular period of time. The change in the level informs the experimenter whether the intervention facilitated an increase or decrease in the level of performance. It is evident in the first score following the introduction of the treatment. That is, was there a step up or a step down in the level of performance at the moment the treatment was introduced? Variability of performance refers to the variance or range of student responses over a period of time. If student performances are inconsistent and considerable up-and-down movements are

evident in day-to-day scores, the predictions of future performances become very difficult and consequently the effectiveness of the instructional program cannot be established. If there are small variations in the performance, the experimenter can predict future performances with greater accuracy and make instructional decisions that are more indicative of student performance. Overlap focuses on the highest performance scores prior to the introduction of the treatment and the lowest scores following the treatment. Depending on the aim of the program the overlap yields a range of scores that occur between the best performance during baseline and the worst performance during treatment. Overlap can also be measured within a phase, but the general principle is that overlap is inversely related to treatment effect (Tindal & Marston, 1990). During the present study data were analysed using the slope of performance, level of performance, and variability of performance. Analysis of median performance and overlap were not deemed necessary.

Daily Living Skills

The present study focuses on improving the student's skills in two developmental domains: independence at daily living skills and communication. Snell (1993) cites three primary reasons that justifies the teaching of daily living skill to students with severe disabilities. First, individuals with severe disabilities can increase their independence when provided with systematic instruction. Second, simulated instruction is less effective than instruction that occurs in the natural context. Third, daily living skills should be taught to all learners regardless of their disability. Students should be given the opportunity to function autonomously within the community After all, the ultimate aim of teaching daily living skills is integration into the community.

There are four important considerations in teaching daily living skills to students with severe disabilities. First, consideration should be given to what to teach. If students are able to prioritise their own need for certain skills, then those skills should be taught first. However, if the student is unable to identify high-priority skills, then parents, carers, and teachers should determine what skills should be taught. Chronological age and location of instruction also feature as important factors for consideration. Age appropriate tasks should be selected and the instructional setting should be determined according to the tasks to be learned. School-based instruction, community-based instruction and timing of instruction are further issues to be considered.

Second, social validation of content and procedures are paramount in teaching daily living skills. The method of instruction should be socially relevant and acceptable and the selected skills should not impinge on the student's ability to participate in an activity. Very often instructors use normative comparisons to socially validate the curriculum for daily living skills (Snell, 1993). Furthermore, instructors must be aware of the different variables that may come into play when teaching daily living skills. For example, nutritional restrictions, motor requirement and financial limitation are some elements which need to be given extra consideration.

Third, instructors should determine the manner in which the student is expected to participate in the selected activity. Partial or full participation is an important consideration that should be arrived at collaboratively by everyone involved in the student's care and education. It may be necessary to modify the environment or the task in order to optimise the student's ability to participate actively.

Fourth, instruction should teach with generalisation as the immediate goal. Daily living skills are usually complex tasks that involve many responses. To teach these

skills, Snell (1990) suggests that instructors need to sequence the tasks so that the student learns to perform them across different settings and materials. One strategy entails providing the student with many different examples in which the tasks can be performed. An extension of generalised learning is maintenance, where the learned skill is performed over a period of time without any need for further training.

Communication

The present study is concerned with students with severe communication and language deficits. The literature indicated that these students are more likely to learn new tasks in familiar environments because a predictable environment encourages control over daily activities and provides opportunities for more spontaneous communication (Turnell & Carter, 1994; Drasgow & Halle, 1995). Students who are unable to communicate in a conventional, symbolic manner often communicate nonsymbolically. That is, they use facial expressions, gestures, vocalisation, eye movements and a variety of other idiosyncratic expressions to communicate. Nonsymbolic communication refers to the communication of those individuals with severe and multiple disabilities who do not use symbols to communicate. Rather than imply a transition to another stage the term focuses on the nature of the individual's communication (Stillman & Siegle-Causey, 1989; Snell, 1993).

Intervention guidelines suggests that the tasks selected should be functional, age appropriate, occur in the natural context, and use existing socially acceptable communicative forms. The present study aims to teach a functional daily living task to two students with severe disabilities using the system of least prompt and incorporating

the symbolic and nonsymbolic communication of the students to foster a communicative milieu necessary for the successful completion of the task.

Chapter Two

Literature Review

The following literature review is categorised into three sections. The first section deals with comparative studies for the determination of effectiveness and efficiency of treatment procedures. The literature papers in the first section establish the manner in which the different response prompting strategies compare with each other. The criteria for effectiveness and efficiency are considered in relation to the number of trials, number of errors and total instructional time. The second section covers the acquisition, maintenance and generalisation of learned skills. The second section also reviews articles that seek to explain the best practices to facilitate acquisition, maintenance and generalisation of learning in severely disabled students. The third section deals with communication intervention for students with severe disabilities. In the third section the evolving trends of communication intervention for students who are unable to communicate in a conventional manner are reviewed. This section accentuates the need for the recognition of communicative forms and correct interpretation of communication intent with students who communicate nonsymbolically.

Comparative Studies

The system of least prompts has been used to teach a variety of skill to students with severe disabilities. This procedure has also been called increasing assistance procedure, least restrictive procedure, and least to most prompting procedure (Doyle,

Wolery, Ault, & Gast, 1988). In this section the system of least prompts is compared with other response prompting strategies and the results of the comparisons are outlined. Steege, Wacker and McMahon (1987) evaluated the comparison between a variation of the system of least prompts and a traditional procedure. Four severely disabled students were trained to perform four independent living tasks. The four tasks involved several motor responses. Therefore, only those students who demonstrated sufficient motor coordination were selected for the study. The traditional method consisted of a prompt sequence that was always delivered in the same hierarchical order and involved six levels with the prompts arranged from least to most restrictive. The prescriptive method consisted of a variation in the traditional format of the system of least prompts. During this method the researchers conducted one trial in the traditional way to ascertain which prompts were required to produce a correct response. During the remaining trials the researcher used the data from the first trial to prescribe a prompt that would elicit the correct response from the students if they responded incorrectly to the naturally occurring event that acted as a target stimulus. The continuous process of assessment ensured that the prompts which were used would indeed produce the correct response. A predetermined criterion was established to measure the effectiveness and efficiency of both procedures.

Several prompts were used during this study. It began with a naturally occurring event and then progressed through five levels of prompts which were arranged from least to most intrusive. The criterion was met when each student reached 100% correct responses across two consecutive trials. The results indicated that both the procedures were effective in facilitating independence in the students. Effectiveness was measured in terms of task acquisition and maintenance. Skill acquisition and maintenance were

high for both procedures, but the prescriptive method appeared to be more efficient. Efficiency was measured in terms of trials to criterion, wasted prompts, and cumulative instructional time. When compared to the prescriptive method on these measures, the traditional method required a 53% increase in cumulative instructional time, an 85% increase in the number of wasted (ineffective) prompts, and a 44% increase in the number of training trials. Therefore, the results were more supportive of the prescriptive method regarding the efficiency of both procedures.

There are several important factors to be considered while using this variation to the traditional method. First, to elicit the correct response a practitioner must arrive at the appropriate prompts by first investigating through the traditional method. The prescriptive method by itself cannot use the appropriate prompt without first knowing what it is. To achieve this a practitioner must analyse the data from the traditional method and use the controlling prompt that has already demonstrated its effectiveness to ensure that the student responds correctly during prescriptive trials. The procedure avoids all the prompts that were ineffective in the traditional method and uses only the effective prompts. Second, this method should be used with caution because it would be very difficult to implement the prescriptive method used in this study without the traditional method, and to implement both in tandem would be a time consuming endeavour.

Day (1987) compared two prompting strategies and their effects on skill acquisition of children with disabilities. Six participants with profound mental retardation were selected for this study. The tasks were of equal difficulty and were divided into sets. A strategy was ascribed to each set and the rate of skill acquisition was measured. The strategies consisted of an antecedent procedure where the trainer

prompted the learner before any response was made. This strategy is also called the most-to-least prompting procedure. The second strategy was the consequent procedure where the learner was prompted after an error response and the prompts were then gradually faded. This procedure resembled the system of least prompts. The results indicated that while both procedures elicited the desired results in the participants, the antecedent procedure showed greater gains on the level of performance in the participants. Furthermore, the antecedent procedure was more effective in reaching the criterion level performance in less amount of time.

The antecedent procedure approached a near errorless learning model. The investigators did not wait for the student to make an error before providing assistance. The argument against this procedure is one of vital importance when factors such as independence and integration are considered. The antecedent procedure did not allow for the student to attempt an independent response. Providing a prompt before a response ensures that the response is correct, but also makes the student dependent on the prompt from the beginning. This can result in an adverse effect in which the student becomes over-dependent on the prompts. Besides, rather than presuppose that a student is unable to produce a correct independent response, a student must be first given the opportunity to respond independently.

Godby, Gast and Wolery (1987) compared two different response prompting strategies. The effectiveness and efficiency of the system of least prompts were compared with progressive time delay procedures. The study involved teaching three students with severe handicaps to identify eight functional objects. Four objects were allocated to each procedure. The progressive time delay procedure is an instructional strategy which consists of a time interval being inserted between the task direction and

the controlling prompt. It is similar to the constant time delay procedure, in that the first few trials involve a zero second interval, but all subsequent trials progressively increase the amount of time inserted between the task direction and the controlling prompt. This study sought to enhance a form of receptive communication in the participants who demonstrated communication difficulties.

The functional objects used by Godby, Gast and Wolery (1987) consisted of several items that were frequently used in the kitchen. The researchers also placed several distractor objects along with the target items in the sets assigned to the two procedures. Both procedures followed a sequential format. The criterion for mastery was 100% correct responses to the task direction across three consecutive sessions. During the baseline testing the target objects were selected along with their distractors and they remained the same throughout the study. The progressive time delay trials ranged from 0-7 seconds. The first few trials were conducted at a zero second interval and then progressively increased by 1 second after each session was completed. Seven seconds was the maximum time interval that was required and the participants usually reached criterion at this point. The participants were not required to respond verbally, but they were explicitly instructed to point to the correct object. The system of least prompts on the other hand consisted of a four level prompt hierarchy and a 5 second interval was provided after each task direction. The prompt hierarchy included the presentation of the task direction and a gestural prompt at the first level. A task direction and a model prompt were used at the second level. The third and fourth levels included the task direction and a partial and full physical prompt respectively.

The results of this study are consistent with Steege, Wacker and McMahon (1987) who also concluded that the system of least prompts is an effective instructional

strategy. However, when compared with the progressive time delay procedure on the measure of efficiency, the system of least prompts was found to be less efficient. The measures for efficiency were sessions to criterion, errors to criterion and number of minutes of direct instructional time. The progressive time delay procedure required fewer sessions to criterion. The participants required 96 sessions to reach criterion for the time delay procedure, while the system of least prompts required 117 session to reach criterion. The participants also made fewer errors when the time delay procedure was used. In all 54 errors occurred when the time delay procedure was used, and 210 errors when the system of least prompts were used. This substantial difference in the number of errors could be due to the extra number of trials for the system of least prompts. Therefore, to determine accurately the efficiency of this measure, the percentage of errors and the number of errors a session were calculated. On both these measures the system of least prompts was found to be less efficient than the progressive time delay procedure. The results also indicated that the time delay procedure required less amount of direct instructional time.

The instructional framework of the system of least prompts and progressive time delay differed greatly. The progressive time delay procedure used only one prompt but the system of least prompts used a four level prompt hierarchy. The instructional time for the progressive time delay procedure was only 17 minutes, but the system of least prompts required 25 minutes to complete each session. The controlling prompt for both procedures was the model prompt. However, the model prompt appeared in the second level of the prompt hierarchy. So before it could be delivered to ensure the correct response, the prompt in the first level (gestural) had to be delivered. This prompt elicited many incorrect responses during initial trials. Both procedures were effective in

teaching a discrete task to the participants. This indicates that the system of least prompts is flexible as an instructional procedure that has predominantly demonstrated its effectiveness in teaching tasks that required chained responses.

Gast, Ault, Wolery, Doyle and Belanger (1988) compared the constant time delay procedure and the system of least prompts when used to teach four severely disabled students to read sight words. The constant time delay procedure is considered to be a near errorless instructional procedure. It differs from the progressive time delay procedure in one very important manner: it does not insert a time interval which progressively increases after each trial, but maintains a constant delay interval throughout the procedure. Gast et al (1988) compared the two procedures when used to teach students a list of sight words found commonly in a grocery store. Four female students participated in this study. Two participants were taught 12 words, and two were taught 16 words. The effectiveness and efficiency of the two procedures were compared and measured on the same criteria as the earlier studies (sessions to criterion, errors to criterion and minutes of instructional time). The system of least prompts incorporated four levels in the prompt hierarchy. The prompt hierarchy consisted of the task request presented alone at the first level, a verbal prompt at the second level, and a picture prompt at the third level. The last level consisted of the model prompt, which was the controlling prompt for both procedures. The delay interval for both procedures was four seconds.

The constant time delay procedure was found to be as effective as the system of least prompts, but the constant time delay was more efficient. Both procedures produced criterion level performance among the participants, and generalisation of learning was observed across different settings, persons and stimuli. The constant time

delay procedure produced fewer errors with most students, and required a fewer number of trials. The number of minutes of direct instructional time also appeared to be considerably lower with the constant time delay procedure. Overall, on nine out of twelve measures the constant time delay was more efficient than the system of least prompts.

The system of least prompts has been used effectively to teach disabled students the range of skills that are included in most curricular domains (Doyle, Wolery, Ault, & Gast, 1988). These skills extend to vocational and life care skills (Rae, & Roll, 1985; Smith, & Belcher, 1985; Williams, & Cuvo, 1986), leisure and play skills (Neitupski, & Svoboda, 1982; Haring, 1985; Halasz-Dees, & Cuvo, 1986), academic skills (Bellamy, & Buttars, 1975; Roesenbaum, & Breiling, 1976; Alpers, 1985), and sight words (Browder, Hines, McCarthy, & Fees, 1984). Doyle, Wolery, Ault, and Gast (1988) reviewed 91 research studies that used the system of least prompts procedure and concluded that the system of least prompts was the single most frequently used response prompt strategy. Furthermore, the review indicated that this strategy was used mostly on adults who exhibited severe or profound disabilities. Most of the literature centred on chained tasks rather than discrete tasks.

Schoen and Sivil (1989) conducted a study that compared the system of least prompts, the constant time delay procedure, and observational learning with students who were developmentally disabled. The instruction focussed on self-help skills. The researchers attempted to determine which procedure was more effective in teaching these skills to the students, and also to establish if there was a concrete effect for observational learning on the target skill. The rationale behind this comparative analysis was to provide teachers and practitioners with an accurate yardstick on which to base

the selection of an instructional program. The two tasks selected for the program required the participants to make a snack and get a drink. Both tasks required the formulation of a task analysis. One skill was taught using the system of least prompts and the other skill was taught using the constant time delay procedure. Eight participants were selected for this study. They were then divided into four pairs, with one participant in each pair assigned the role of observational learner, while the other participant was taught both tasks using one of the two methods for each task. The observer was not instructed directly by the researcher and was only required to observe both procedures being administered to the target participants.

The results indicated that the constant time delay procedure was only marginally more effective than the system of least prompts when it was used to teach the task of getting a drink. The four target participants reached 100% criterion for both tasks, but there was a more positive level of change in the target participants and observers when the constant time delay was used. The results also indicated that observational learning was positively effected when the time delay procedure was used to teach the second task, that is, getting the drink. There was no difference in the acquisition rate of the skill because all three instructional procedures produced gain in the learning of the skill.

The average number of trials to criterion, and errors to criterion reflected a slight difference in favour of the constant time delay procedure, but the system of least prompts remained on comparable levels of effectiveness throughout the instructional program. Observational learning was precluded on the assumption that the participants were able to demonstrate adequate imitative skills. The results support this assumption, but imitation skills need to be tested prior to any program that seeks to use observational learning.

In a similar study Doyle, Wolery, Gast, Ault and Wiley (1990) compared the constant time delay procedure and the system of least prompts in teaching preschoolers with developmental disabilities. The task involved teaching three students to read a list of sight words. The two procedures were compared on the bases of their effectiveness and efficiency, but they were also evaluated to determine maintenance and cross-modal generalisation. Cross-modal generalisation was a factor that Schoen and Sivil (1989) considered to be of extreme importance, especially in those cases where the participant does not possess adequate motor dexterity to complete a task that is motorically inclined. Two sessions were conducted each day in the regular classroom, one with each procedure. Two students were taught sixteen words and one student was taught twelve words. All the participants met the prerequisite skills that were required and demonstrated a readiness for sight word identification.

During the constant time delay procedure the researchers inserted a four-second-delay interval between the task direction and the delivery of a controlling prompt. The inter-trial delay was between three and five seconds. All correct responses were reinforced with descriptive verbal praise. The system of least prompts followed the traditional format which included a prompt hierarchy with four levels. The first level consisted of the task direction being presented alone. The second level consisted of the task direction and a verbal prompt. Level three was the task direction and a picture prompt, and finally in level four the task direction was presented with a combination of a verbal and model prompt. The verbal model prompt was the controlling prompt for both procedures. The delay interval for the system of least prompts was the same as constant time delay procedure (4 seconds).

The results indicate that both procedures were effective in reaching criterion level responding among the participants, but the constant time delay procedure appeared to be more efficient. These findings are consistent with Schoen and Sivil, (1989) and Gast, Ault, Wolery, Doyle and Belanger (1988) who also found the two procedures to be comparable on the measure of effectiveness. However, the efficiency measures indicate that the constant time delay procedure required fewer trials to reach criterion and resulted in the students making fewer errors. Furthermore, the constant time delay procedure also required less amount of direct instructional time to reach criterion. Twelve comparisons were made across the three students for the measure of efficiency. Only one comparison resulted in an equal measure, the remaining eleven comparisons were in favour of the constant time delay procedure.

The maintenance sessions were conducted over one, three and five-week intervals. Both the procedures resulted in the maintenance of correct responses across that time. The results for cross-modal generalisation indicated that the participants had generalised the skill across instructors and materials for both strategies. Generalisation across stimuli and people indicated no difference between the two procedures. In conclusion, the constant time delay procedure proved to be more efficient than the system of least prompts, but on all other measures (effectiveness, maintenance, and generalisation) it appears to be as productive and comparable to the constant time delay procedure

Acquisition, Maintenance and Generalisation

In this section several articles are reviewed that employ the use of the system of least prompts within a task analytic framework. The system of least prompt procedure

in combination with a task analysis has proved to be extremely productive with complex tasks, and has also enhanced the acquisition, maintenance and generalisation of the skills that were taught (Neitupski, Welch & Wacker, 1983; Stainback, Stainback, Wehman, & Spangiers, 1983; Pancsofar & Bates, 1985). Task analysis is a common practice with practitioner and teachers in special education. A task analysis is a process that requires the subdivision of sub-tasks and sequentially presenting it to the students. Complex skills which require a number of chained responses usually warrant the use of a task analysis. The following studies focus on the acquisition, maintenance and generalisation of daily living skills. Functional daily living skills are vital if students with severe disabilities are to be integrated successfully into the community. Independence at these skills (laundry, food preparation, telephone usage), and generalisations across different settings are necessary for successful integration. Therefore, to optimize the effectiveness of an instructional program, teachers should select procedures that augment acquisition, maintenance and generalisation of the targeted skill (Browder et al., 1984).

Cuvo, Leaf and Borakove (1978) applied a task analytic framework to teach students a vocational skill. The emphasis was on determining the rate of acquisition, maintenance, and generalisation to different environments and settings. A task analysis of the target skill (janitorial skill) produced six constituent sub-tasks. Each sub-task included between thirteen and fifty-six component responses, with a total of one hundred and eighty-one responses. The participants were expected to perform each response within the sub-tasks in a predetermined sequential order. Two response prompt strategies were used to teach this skill. The most-to-least procedure was used to teach twenty of the most difficult responses. The prompts for this procedure were

arranged to decrease gradually the amount of assistance provided. The remaining one hundred and sixty-one responses were taught using the system of least prompts. The prompt hierarchy used for both procedures incorporated four levels of prompts. The first level in the most-to-least procedure involved verbal instruction plus modelling, level two consisted of a verbal instruction plus graduated physical guidance, level three involved only the verbal instruction, and the fourth level was the stage where no assistance was provided. The one hundred and sixty-one responses taught using the system of least prompts consisted of the same prompts in reverse order, with the last level being the most intrusive prompt (verbal instruction plus graduated physical guidance).

To proceed to the next sub-task, the participants were required to attain 90% correct responses on the target sub-task. If the participants fell below this criterion, the instructor continued training till the criterion for the target sub-task was met. A five-second-delay interval was inserted between the presentation of the task direction and the prompts. All correct responses were reinforced with edibles and verbal praise. The results indicate a high rate of skill acquisition and skill generalisation. Maintenance figures collected over a two-week period depicted a consistent level of performance for all participants. The results favour the generalisation measures the most. Generalisation of the learned skill was observed in different settings and environments, but was not translated across the sub-tasks.

An important feature of this study was that it employed a prompt sequence that adapted to the demands of the task. If the participants experienced a problem with a particular sub-task, the instructor could easily shift to a more intensive prompt sequence to assist the participants. The results further established the credibility of using a task

analytic approach and prompt sequences to teach complex skill to students with severe disabilities. Furthermore, the procedures used in this study enhanced the rate of acquisition of the skill, maintained effectively the level of performance, and translated generalisation across different settings and environments.

A study conducted by Wacker, Berg, Berrie and Swatta (1985) aimed to teach three severely handicapped adolescents to perform three complex vocational and daily living skills using a picture prompt package. The emphasis was on generalisation and maintenance of the skills across similar tasks. Generalisation measures were evaluated on two types of tasks. First, a task that involved similar motor responses and resulted in similar outcomes, but used different materials for training. Second, a task that used different materials, required different motor responses and resulted in different outcomes. The initial training was time consuming and many sessions were required to learn the first training task. A task analysis was conducted for each of the three target tasks. The steps for each task was sequentially arranged as picture prompts in a book. The second training phase required the participant to select the object depicted in the picture prompt book. The book contained pictures of new objects and the participant had to first identify, then select the appropriate objects for the task. The third training phase consisted of the participant selecting the required object to perform the task, or actually performing the motoric responses depicted in the picture prompt book. Maintenance data was collected with and without the picture prompt book being available and was conducted about three months after the generalisation phase.

The results suggest that after the initial training sessions all the participants demonstrated an improvement in the generalised use of picture prompts across settings. The two remaining tasks required less amount of training because the participants were

able to use the picture prompt book without much assistance. During maintenance testing two of the participants performed well with and without the benefit of the picture prompt book. One participant needed the picture prompt to maintain an adequate level of performance. The criterion for generalisation was based on the amount of training that was required to elicit appropriate response behaviour. A positive measure resulted when a participant did not require any training, or required a reduced amount of training to respond correctly. The results indicated that generalisation was significantly enhanced across settings and also across similar and dissimilar tasks.

Snell, Lewis and Houghton (1989) conducted a study that aimed to teach tooth-brushing skills to students diagnosed with cerebral palsy and intellectual disabilities. They based their study on the principle of partial participation, which states that partial participation is more desirable than total dependence (Wolery, Ault, & Doyle, 1992). They targeted partial participation rather than total independence. Three elementary-aged students with extensive motor limitations and severe to profound mental retardation were selected for this study. The tooth-brushing task was broken into three sub-tasks: brushing teeth, rinsing mouth and wiping mouth. These sub-tasks were further divided into component steps which were sequenced. The steps were divided into activities the teacher performed and activities which were taught to the student. The task analysis was carried out to include the students to their optimum ability, given that they all exhibited limited motor movements.

The intervention included the time delay procedure, active reinforcement and error correction. Each of the participants received the same amount of training and followed similar task sequences, with a few adjustments being made according to the individualised needs of the participants. The prompts used for this study included a

verbal prompt in combination with full physical assistance. The trainer used the time delay procedure to fade the physical assistance by delaying the physical prompt for one second. The verbal prompt continued to be delivered without any delay. When the participants were able to perform the steps in the sub-tasks across six consecutive trials over two days, the verbal prompt was faded in the same manner described above. All correct responses were reinforced with praise, but errors were immediately interrupted and students were guided through the correct response.

The criterion was 100% accuracy on the probes over three to five days. Having reached criterion level performance, the conditions were altered from training to maintenance. The maintenance sessions involved regular task performances without the benefit of verbal or physical assistance. Reinforcement was contingent upon the completion of the entire task. The results indicated that two of the three participants reached criterion on all three sub-tasks, and one participant reached criterion on only one task. All three participants maintained performance on one or more sub-tasks when measured between four and nineteen months following intervention. During the maintenance probes two participants required booster training sessions to maintain their skills. Overall, the participants demonstrated a high rate of skill acquisition that was maintained well after the intervention concluded.

This study employed one very distinctive feature. It employed a comprehensive task analytic framework which fragments a complex task into sub-tasks. The value of this procedure is incalculable when one considers the profound disabilities of the students. It not only presents the students with units of a task that are attainable, but also by way of natural progression facilitate the next step in the sequence. The results proved

that students with severe disabilities are capable of performing a complex task with limited assistance from the teacher.

Communication Intervention

Research in the field of communication difficulties has greatly benefited from several innovative programs introduced over the past decade. The rapidly evolving trend in communication intervention with students with severe disabilities has expanded our understanding and necessitated a re-evaluation of traditional procedures. Students with severe disabilities often experience gross deficits in their communication skills and are sometimes unable to recognise or understand conventional communicative forms (vocal and written symbols, signs or pictures). The research literature suggests that many strategies have been used to promote communication (Dragow, & Halle, 1995; Reichle, 1997). The use of augmentative and alternative communication has prompted researchers to explore different avenues to enhance communication in these students (Snell, 1993). This section reviews the effects of expressive and receptive communication on severely disabled children (Hupp, Mervis, Able, & Conroy-Gunter, 1986), investigates the effects of naturalistic delay procedure (Turnell, & Carter, 1994) and examines the current practices in communication intervention with severely disabled students (Reichle, 1997).

Hupp, Mervis, Able, and Conroy-Gunter (1986) conducted a study to determine the effects of receptive and expressive communication training on generalised learning by severely disabled children. These children required extensive instruction and guidance to perform even basic tasks. It was therefore important for these children to learn to respond to verbal and gestural cues rather than being dependent on physical

guidance. Two strategies have been proposed to enhance labelling instruction for severely disabled children. The proponents of the first method suggested that students be taught expressive labelling regardless of their comprehension of the words taught. However, there is little agreement on this point because generalisations of expressive labels are not contingent upon acquisition of the skill. The authors argue that the absence of generalisation nullifies the functional value in different communication settings. The second strategy proposes to teach receptive labelling prior to expressive labelling. However, the effect of teaching receptive labelling before expressive labelling has not been researched extensively.

Six severely retarded children were selected for this study. The participants were taught manual signs instead of verbal labels. Verbal labels were presented during instruction but were not emphasised. If a participant responded with a verbal label it would have been considered a correct response, but none of the participants ever used the verbal label. The training for receptive labelling consisted of the teacher presenting a photograph of two categories. The student was asked to find the object (sign and verbal label for the category). If the student picked or touched the correct photograph the response was considered correct. The student was reinforced with verbal praise and was allowed to touch the photograph. If the student made an incorrect response the teacher restated the request and modeled the correct response. Expressive training consisted of the student being shown one photograph and then asked to produce the sign for it. Reinforcement was delivered in the same manner as described earlier. An incorrect response was corrected with the help of an error correction procedure that involved a verbal description of the correct response. Several prompts were also used to assist the

participants in responding correctly. These included model prompts, partial physical prompts and full physical guidance.

The results indicated that the receptive and expressive training regimes were equally successful, but the receptive training resulted in significantly greater generalisation. Further investigation revealed that the receptive training produced generalisation above the chance level, but the expressive training did not. The authors had anticipated that the receptive training would produce better results and help the participants internalise the training to facilitate a strong base for generalisation. The process of generalisation involved detecting relational properties common to the task. During expressive labelling more attention was given to producing the correct responses. As a result less attention was available for the detection of relational properties. The results of this study also provide important information on vocabulary training for severely disabled students. The results also indicated that the mean acquisition score was higher on the expressive training sessions, but acquisition does not necessarily result in generalisation and for a skill to be functionally cogent it must demonstrate generalisability. In conclusion, the receptive training proved to be of superior value than the expressive training because it produced a greater degree of generalisation.

Turnell and Carter (1994) used a naturalistic time delay strategy to teach a requesting skill to students with severe and multiple disabilities. They used tangible symbols to represent a particular item and the student was taught to request the preferred item by reaching for the symbol. Tangible symbols are useful because they act as a bridge to more formal symbolic communication. They are particularly useful with students who experience severe sensory and cognitive disabilities. Tangible symbols

assist students make that transition to a symbolic level of communication because they do not require abstract interpretation and have a high level of iconicity. Another important feature of this study is the use of a naturalistic delay procedure. These strategies are being increasingly used to facilitate communication with students with severe disabilities because they result in generalisation and spontaneous use of the acquired skill. Characteristically, these strategies use the natural environment and events that occur naturally, to create multiple opportunities for communication.

Turnell and Carter's (1994) study aimed to determine the efficacy of the naturalistic delay procedure and the effectiveness of using tangible symbols. It employed the use of referent object symbols and error correction by physical prompting. In view of the participant's disability, object symbols were selected for instruction because of their low cognitive demands. A leisure activity was chosen because the participant demonstrated little interest in anything else. The vocabulary items were chosen for their motivational value and age appropriateness. The symbols were three-dimensional and represented a part of the entire item. During the baseline phase the referent objects were placed where the participant could see it but not reach it. The student had to use his communication board, which contained the target symbol and two distractors, to request the referent object. If the student selected the correct item he was immediately allowed to access it for ten minutes. The intervention sessions consisted of presenting the participant with an item of interest while keeping it out of his reach. A delay interval of ten seconds was inserted and the student had to respond in that time. Physical prompts were used if the participant was unable to respond within the time interval. If the participant touched the correct symbol he was allowed to access it for a short period of time.

The results indicated that the participant had learned to use three of the four symbols to request the desired items. During the training phase the participant reached criterion after twenty-nine sessions for the first symbol, but for the second and third symbols the participant required fewer trials to reach criterion. Generalisation was demonstrated across trainers and settings. Unlike the study conducted by Hupp, Mervis, Able and Conroy-Gunter (1986) Turnell and Carter's study emphasises the acquisition of expressive communication skills rather than receptive communication. Although the study was successful in achieving its aim, issues regarding candidacy and prerequisites for augmentative programs need to be considered.

Reichle (1997) examined past and current trends for communication intervention and emphasised the need to prevent communication disorders in very young children. The study highlights several guidelines that are critical for the enhancement of communication among learners with severe disabilities. Communication intervention should be consistent with four criteria. First, communication is a social behaviour and facilitates productive interaction between individuals. Second, communication should manifest itself in a variety of modes, including symbolic and nonsymbolic. Third, remediation must include parents, caregivers and other professionals in the field. Fourth, intervention should use naturally occurring events to promote communication interaction. Furthermore, a modification of the individual's physical and social environment may be necessary to achieve this effect.

According to Vygotsky, a child's communication acquisition depends on the amount of stimulation the environment provides for the use of new language structures. Based on this theory interventionists would have to identify salient features in the

environment that elicit a learner's communication, and ensure that those features are present during early intervention. As the learner attains more fluency at communicating, those features that initially produced the response can be reduced gradually. Among the other strategies are the mand models, time delay and incidental teaching. All of these procedures must approach communication intervention within the child's environment. However, these methods are effective only if the recipient is able to engage in imitative behaviour. Another drawback stems from the limited literature that is available on the effectiveness of conventional procedures to address the issue of students who do not communicate symbolically.

Another approach that is frequently used is the direct instruction model. Sometimes learners are unable to use the subtle cues that occur in the natural environment. They also find it difficult to generalise their new skills to different environmental settings. Learners with severe disabilities are often restricted by their disabilities to engage in playtime activities. It is during play activities that most children learn to use different language structures that result in social communication. During playtime it is important to modify the environment to provide opportunities for the learner to engage in communicative behaviour. The environment should provide the child with the chance to use existing language structures and also to acquire new ones. Researchers are in agreement on the need to address acquisition and generalisation together, irrespective of the instructional strategy. However, while using prompt strategies to facilitate communication the effects of using naturally occurring events increase the probability of a more spontaneous response (Reichle, 1997).

Learners with severe disabilities sometimes do not possess the repertoire of prerequisite skills needed to learn to produce a communicative message. This often

results in a lack of initiative in communication. It is important for practitioners to recognise the various communication modes and to correctly interpret these modes because in the repertoire of the learner these modes serve a specific function. Intervention should focus on teaching learners to initiate communication and participate actively in the events that occur around them.

Summary

The present literature review focused on the best practices used to teach daily living and skills of independent living to students with severe disabilities. The first section reviewed studies that compared two response prompting strategies when used to teach different skills to students with severe disabilities. The studies included comparisons between the system of least prompts and the progressive time delay procedure, the system of least prompts and the constant time delay procedure, the system of least prompts and the decreasing assistance procedure, and a comparison of a variation of the system of least prompts. The prompt sequences used in the studies were comprised of different prompts used independently, and in combination with each other. The results indicated that when prompts are used in combination for chained responses they elicit better responses from the students. All the studies compared the procedures on two measures: effectiveness and efficiency. The system of least prompts was found to be as effective as other procedures in most contexts. It achieved a great degree of success when used to teach complex tasks that required chained responses. Although the procedure was used successfully in teaching discrete tasks, more research is needed to document its effectiveness in this area.

The system of least prompts proved to be less efficient than the progressive time delay procedure, the constant time delay procedure and most-to-least prompting procedure. The measures under investigation were the number of trials to criterion, percent of errors to criterion and number of minutes of instructional time. The system of least prompts was less efficient on all these measures. These results cannot discount the effectiveness of the system of least prompts, which proved to achieve the same outcome as the other procedures. The system of least prompts requires more time for implementation than the procedures against which it was compared. The hierarchy of prompts dictates that the controlling prompt is delivered at the last level, as a result many errors occur at the preceding levels. This should not be viewed as a drawback because it gives the instructor the opportunity to identify the steps and the levels which are difficult for the student. As the instructor and student progress through the hierarchy it provides an opportunity to initiate and interact in communication.

The next section in this review examined research studies on the best practices to facilitate acquisition, maintenance and generalisation of skills in students. The studies included in this section pertained to daily living skills and tasks that involved complex chained responses. All the studies included intensive task analysis and prompt sequences in their procedure. The results for maintenance and acquisition were very high, but there were some inconsistencies on the generalisation of the skills. Considerations were given to designing programs that view acquisition and generalisation as a unit that together determines the success of the study.

The last section reviewed the past and current trends in communication intervention for the severely disabled. It examined a study of receptive and expressive labelling and presented the arguments of both approaches. Receptive labelling was

found to be more effective and resulted in an increase in acquisition and generalisation of labelling skills. The study also concluded that teaching receptive labelling must precede expressive labelling. The next study in this section examined the results of teaching a student a form of requesting by using tangible symbols and naturalistic delay procedure. This appears to be the trend in current communication intervention with students who experience severe disabilities. The intervention focuses on using naturally occurring events that are functional and facilitate multiple opportunities for communication. Augmentative and alternative communication are also being used with many students who cannot use or understand spoken language.

In conclusion, the literature supported the system of least prompts as an effective instructional procedure and provided valuable information on the acquisition and generalisation of complex skills using prompting strategies. The literature also provided an insight into the current practices used for communication intervention with students who experience severe disabilities.

Chapter Three

Method

This chapter provides details on both participants involved in the present study and also discusses the experimental methodology. Detailed single case experimental studies were conducted for each participant and are reported in the first part of this chapter. The single case experimental studies highlight participants' characteristics from the perspective of their intellectual, behavioural, social and communication development. This is followed by a brief discussion of the research design, the hypotheses, and the independent and dependent variables. Last, the methodology is discussed and the rationale for its use is explicated.

Two students with severe disabilities participated in this study. The parents of both participants consented to have their child participate in this study and the ethics committee had approved of the research proposal. Both the participants attended a special education school in the Perth metropolitan area. The participants exhibited a diverse range of disabilities. These included severe deficits in intellectual, communication, and behavioural domains, consequently inhibiting their ability to function appropriately in the classroom and the community. It was therefore necessary to conduct a single case experimental study for each participant to accommodate their individual deficits, and to plan the instructional program accordingly. The single case experimental study for each participant is illustrated below.

Participant 1

John had been attending a special education school for the past two years. His chronological age at the time of instruction was 6 years 7 months. Psychological testing was conducted on two prior occasions with both sessions proving inconclusive. John failed to participate in the most fundamental test initiated by the school psychologist. His behaviour at this stage included non-compliance and serious disruptive behaviour. Therefore, an accurate estimate of his mental age was not possible through formal testing. John had been diagnosed with autism and manifested a number of behaviours associated with that condition. Although John was considered untestable, he had been categorised as having severe to moderate intellectual disabilities, with severe communication disabilities and behavioural problems. John's classroom environment included three other students with similar intellectual and behaviour difficulties. John is usually indifferent to his class peers. He approached strangers, however, with caution.

John exhibited typical language difficulties found in autistic children. These difficulties included severe difficulty in understanding speech and an absence of any cohesive language development. His communication profile indicated well-developed labelling skills and a vocabulary that consisted mainly of nouns. However, John's language had not developed beyond labelling. The classroom teacher and aide used an intervention program that consisted of computer pictographs for communication, but John experienced difficulty with interpreting these pictures. Although his errant labelling served little functional purpose, it did indicate that John had an average word base from which to expand.

John's receptive communication had developed to a stage where he could comprehend simple task directions resulting in a single behavioural response. Task

directions had to be delivered slowly and purposefully if John was to complete any task with any degree of success. John's expressive communication consisted mainly of monosyllabic words. He did not initiate any interaction and often preferred to be by himself. However, when engaged in an activity on an individual basis, he would respond enthusiastically. John's speech was often incoherent. This resulted from an inability to articulate the various speech sounds. Additionally, it should be noted that the repetitive nature of his speech confounded his communication intent.

John's communication repertoire consisted of a few signs. These signs were incorporated into his classroom routine. John used these signs expressively to indicate if he needed to go to the toilet, or wanted a drink. He also understood that these signs had a meaning. The teacher always encouraged the verbal component, but John's response was usually only a single word. Augmentative communication, such as, computer pictographs resulted in little success.

John had also exhibited severe behavioural problems. His behavioural profile indicated several maladaptive behaviours that were incompatible with learning and severely disruptive to the overall classroom environment. These behaviours included throwing items, running around the room, disrupting any assemblage that was in front of him, screaming and spitting. These recalcitrant behaviours manifested themselves on the introduction of any new task or non-routine activities. Furthermore, when initially presented with a task, John's first response was one of noncompliance and reluctance.

John also experienced difficulties in relating to other people. He often preferred his own company and appeared to be uninterested in the activities that occurred in his environment. There seemed to be a marked difficulty in any form of symbolic or abstract play with a fixation on one favourite toy that he refused to share with his

classmates. He usually engaged in social interaction only to communicate his wants or needs, but shrank from all other social contact. Emotionally, John was most comfortable with people he knew. Strangers usually precipitated bouts of disruptive behaviour.

John had a relatively short attention span and high frustration levels. He also exhibited an aversion to sitting in a chair for a long time. When first engaged in an activity John often demonstrated an urgency to rush through the whole activity. This often resulted in an unsuccessful attempt to complete the activity. This further increased his frustration and accelerated a behavioural episode. John was more adept at tasks which involved motor responses. He tended to participate more actively in these tasks and enjoyed manipulating blocks, or fitting cylinders in the right place. It was uncommon for any disruptive behaviour to occur when John was engaged in these activities

Participant 2

Nicholas was the second student to participate in the study. At the commencement of this project Nicholas' chronological age was 6 years and 10 months. Nicholas had been attending a special education school for two years. Prior to admission to the special education school, Nicholas was part of a self-contained special education unit within a primary school. His behaviour at this school reached alarming levels of disruptiveness. It was therefore necessary to remove him from that environment.

Psychological testing was conducted on two prior occasions. The results of the first assessment confirmed a diagnosis of autism. The second assessment proved to be

inconclusive because during testing Nicholas exhibited a number of deviant and disruptive behaviours that made it difficult for the psychologist to reach an accurate diagnosis. Nicholas had been clinically diagnosed with autism, with moderate intellectual disabilities, severe communication deficits and severe behavioural problems. However, it should be noted that Nicholas was also considered to be untestable. The categorisations of his disabilities were primarily for placement purposes.

Nicholas experienced severe problems with communication. These problems extended to expressive and receptive communication. Speech was absent, with an exception for a few words. These words were not produced consistently with any communication or functional intent. The speech and language pathologist had initiated a program that consisted of computer pictographs and signs, but Nicholas was unable to use either of them expressively. While he interpreted the picture and signs correctly, he often confused them in expression. The program was discontinued and only signs were reinstated into his new program. Nicholas' language development was noncommensurate with his chronological age.

Nicholas' receptive communication had reached a stage where he could understand a few regular signs and common computer pictographs. He could comprehend task directions or verbal statements that were used repeatedly to communicate a standard behavioural response. However, he became confused if the same statement was used differently, or related to different categories of objects. Although Nicholas did not use speech to communicate, he had several strategies that assisted him during expressive communication. He used a few signs to communicate a need for a drink, or if he wanted something to eat. He also employed a combination of

vocal sounds and nonsymbolic strategies to accentuate his communication intent. These strategies consisted mainly of facial expressions, gestures and body movements. Eye contact was very rare but sometimes he indicated a want for a particular object by signalling with his eyes. Gestures were his preferred manner of expressive communication.

Nicholas also exhibited some forms of extreme, deviant behaviour. His behavioural profile indicated a history of deviant, injurious behaviour. These behaviours included spitting, screaming, incontinence, slapping his face, pinching and kicking. Temper tantrums included throwing items and destruction of classroom property. His injurious and violent behaviours had reduced since he was admitted to this school, but they did resurface occasionally. Similarly, his incontinence had abated but there were some situations in which it reoccurred. Nicholas also had an extreme aversion to various sensory stimuli. Exposure to these stimuli usually precipitated a behavioural episode. For example, any uncharacteristically loud noise that occurred in the environment often resulted in a screaming bout. He also seemed to be extremely sensitive to light. Additionally, an intrusion on his isolated play would elicit undesirable behaviour. Nicholas was usually resistant to learning new tasks, but once motivated he responded enthusiastically. Non-routine activities precipitated recalcitrant behaviours in Nicholas.

Social skills were another area in which Nicholas exhibited severe difficulties. He interacted with his teacher or familiar adults but very rarely did he interact or play with other peers in his class. Symbolic play was totally absent and so was any form of social interaction during play. Although the conventions of social play were emphasised by the teacher, Nicholas did not heed them. For example, the teacher had to constantly

remind Nicholas not to hurt his friends, or not to snatch his friend's toy. When Nicholas was not interacting with an adult he would usually be playing by himself with a favourite toy. Eye contact was very rare and any intimation at this seemed to distress him considerably. He was not usually wary of strangers, but seemed to be quite uninterested and heedless of any new presence in his classroom. Overall, Nicholas seemed to be overtly temperamental in his socio-emotional adjustment. There were times when he would seek social contact, and there were times when he shunned it.

Nicholas enjoyed activities that required him to manipulate objects, and would rarely exhibit any undesirable behaviour while engaged in these activities. However, he did have extremely low frustration tolerance levels and a severe problem with attention. The problem with his attention was two fold: distractibility and random attention to stimuli. During most tasks the teacher had to constantly prompts Nicholas to get back to work. His off-task behaviours included screaming, walking around the room, or just sitting in his chair and dreaming. Often he would leave his task incomplete and drift off to where the toys and puzzles were kept and begin playing with them. Some of his behaviour problems were a result of his low frustration tolerance levels. It should also be noted that Nicholas suffered from epilepsy and was under medication for that condition.

Research design

The selection of the experimental design was premised on three important criteria: response characteristic, task characteristic, and time available for instruction. The experimenter selected the single subject A-B-C design because it was the most effective way to test the effects of the intervention. The A-B-C design consisted of

baseline data Phase A, intervention Phase B, and maintenance Phase C. During the baseline data phase information was collected to determine the performance level of the participants, this phase was carried out over a period of eight independent sessions. After the baseline was established, Phase B was implemented into the program. During the intervention phase the system of least prompts was introduced and changes to the baseline condition observed. This phase was carried out across ten sessions. Phase C was the final phase of the design. It involved the testing for maintenance of the learned skill. Essentially, during this phase the experimenter reintroduced baseline conditions and observed the extent to which the skill was maintained.

Reliability

Inter-observer reliability was measured. The observer was a special educator, but she was not apprised of the aims of the experiment. A checklist containing the procedural format for the experiment was devised by the experimenter, and the observer was instructed to tick mark each step in the format. Reliability testing was conducted twice for each participant and the results collated by the experimenter and observer. Inter-observer reliability was 98 per cent.

Variables

The independent variable was the contrast between the baseline condition and the different modes of intervention (prompt hierarchy). The dependent variables were (1) the number of unprompted correct responses to the target stimulus, (2) time taken by the participants to complete the task, and (3) frequency of the use of intrusive prompts to maintain efficiency.

Hypotheses for both participants

The system of least prompts will be highly influential in facilitating changes in the participants' response.

Hypotheses 1: an increase in the frequency of correct responses.

Hypotheses 2: a decrease in the time each participant takes to complete the task.

Hypotheses 3: a reduction in the use of intrusive prompts to stimulate appropriate activity.

It was anticipated that as the intervention progressed there would be an increase in the number of unprompted correct response. The prompted responses, however, would require the least intrusive prompt.

Procedure

Response prompting strategies have been used to teach a wide range of daily living skills to students with severe disabilities. This study uses a strategy known as the system of least prompts. The system of least prompts was selected for this study for two main reasons. First, the literature review indicated that the least prompt procedure was as effective as the other response prompting strategies. Furthermore, this procedure was found to be particularly successful with tasks that involved chained responses. As the task selected for this study involved sequenced, chained responses, the least prompt strategy was most appropriate because the participants were disabled and required substantial support. Second, unlike the other response prompting strategies, this procedure provides the student with the opportunity to respond independently, and then progressively increases the amount of assistance. This extra time enables the

experimenter to establish a communicative rapport with the participant and informally assess other skills.

The theoretical framework for the system of least prompts was elucidated in Chapter 1. Essentially this study emulates the principles expounded by Wolery, Ault, and Doyle (1992) with a few variations being made based on the individual needs of the participants. In accordance with the theoretical framework, this study was premised on the four main criteria stated by Wolery, Ault and Doyle (1992). First, the experimenter selected a prompt hierarchy that was composed of four levels. In the first level the student was given the opportunity to respond independently (without the prompts). The second level and all subsequent levels consisted of prompts that were arranged from least intrusive to most intrusive amount of assistance. It was anticipated that if the participant was unable to respond to the target stimulus at the first level, the experimenter would progressively increase the amount of assistance till the final controlling prompt was delivered and the participant responded correctly. The ultimate aim was to get the participants to respond to the target stimulus without the assistance of the prompt.

According to the second criterion the target stimulus was provided in isolation at the first level in the prompt hierarchy. This step was intrinsic to the instructional program because it gave the participant an opportunity to respond independently. If the participant failed to respond to the target stimulus, the experimenter provided assistance at all subsequent levels. The third criterion consisted of a time interval being inserted before and after the delivery of the prompts. The time interval was uniform and the same amount of time elapsed in both instances. The response interval was inserted between the levels in the hierarchy and was persevered with until the participant was

able to respond correctly. The last criterion was the selection of reinforcers for all correct responses made by the participants. The experimenter reinforced all correct responses regardless of their occurrence in the hierarchy, but only those responses that occurred before the prompts were counted toward the criterion.

The system of least prompts is composed of eight procedural parameters (Wolery, Ault and Doyle, 1992). The present study employed only six of these. The integrity of this instructional program depended on the extent to which these steps were adhered to during implementation. Although these steps are not altogether inflexible, variations were considered with some caution. During this project the experimenter endeavoured to be true to the procedural framework, but certain variations were required based on the individual needs of the participants. These variations, and the rationale for implementing them, are discussed in this section.

Procedural Parameters Used for This Study

The first step required the selection of the target stimulus. The target stimulus was a task direction that involved a simple question or command that cued the participant to respond. The experimenter used the statement "It's lunch time" as the target stimulus for this study. This stimulus was used for both participants. It involved the experimenter making the statement "It's lunch time" as the stimulus for the first step in the task. The ultimate aim was for the target stimulus to assume control of the participant's response. The system of least prompts requires that the target stimulus should be provided at all levels in the hierarchy. The repeated exposure to the target stimulus ensures the participant's response is directly and closely related to the target stimulus (Wolery, Ault, & Doyle, 1992). It was necessary to implement the first

variation of the standard procedure at this point. During this study the target stimulus was only delivered at the first level of the prompt hierarchy. On the bases of participants' characteristics it was considered that delivery of the target stimulus at every level would result in monotonous repetitions, and ultimately would lead to boredom and frustration. Initial trials led the experimenter to this conclusion. Furthermore, it was found that the target stimulus, when delivered at the first level, always precipitated the first step in the task sequence.

The second step required the formulation of a task analysis. Ideally, the least prompt procedure uses at least two levels of prompts. Given this, a minimum of three levels are required, because the first level entails the target stimulus being presented in isolation. The task selected for this study involved chained responses in which a whole sequence of responses and behaviours needed to be carried out to complete the task. Considering these characteristics the experimenter decided to include four levels in the prompt hierarchy. Therefore, the hierarchy consisted of the target stimulus provided alone at the first level, Prompt 1 at the second level, Prompt 2 at the third level, and Prompt 3 at the fourth level. Because the task involved chained responses it was more beneficial to introduce only four levels in the hierarchy. Participant characteristics and the amount of time available for instruction were considerations that prompted this decision.

The formulation of a task analysis was an extension to the second step of the program. A comprehensive task analysis yielded a total of ten sequenced steps that were necessary for task completion. The task analysis is as follows.

1. Walks to the refrigerator.
2. Open the refrigerator.

3. Remove the lunch box from the refrigerator.
4. Place the lunch box on the table.
5. Remove drink from the refrigerator.
6. Place drink on the table.
7. Opens cabinet.
8. Remove the plate.
9. Takes plate to the table.
10. Sit at the table.

The task analysis was a comprehensive assessment of what was required from each participant. John was asked to follow the entire task analysis because every step was relevant to his pre-lunchtime routine. However, Nicholas was only required to follow eight steps of the task analysis. Steps 5 and 6 were omitted from his program because they were not intrinsic to his routine. Nicholas did not always have a drink during lunchtime.

The third step required the selection of prompts. By definition, these prompts needed to be arranged from the least to the most intrusive amount of assistance. The experimenter then had to select the prompts in conjunction with the steps in the task analysis. The experimenter settled on three main prompts and used these prompts with both participants. The prompts were as follows: verbal prompt, model prompt and physical prompt. The verbal prompt was the least intrusive prompt and was used during the second level of the intervention after the target stimulus. The verbal prompt consisted of vocal statements made by the experimenter when the participants failed to respond to a particular step in the task analysis. These statements provided the participants with information on how to respond correctly. The experimenter was

Level	Prompts	Example
1	Target Stimulus	"It's lunch time."
2	Verbal Prompt	"Walk to the fridge."
3	Model Prompt	The experimenter models the response.
4	Physical Prompt	The experimenter uses physical guidance to assist the student.

Figure 3.1 The prompt hierarchy used for this study with an example of the first step.

attentive to the severe communication deficits that both participants experienced. Therefore, every verbal prompt was delivered in a lucid, deliberate manner. This guaranteed that the participants would interpret the prompt correctly. For example, if the participant failed to respond to the target stimulus "It's lunch time," the experimenter would then deliver the verbal prompt "Walk to the refrigerator." The participant would then have to walk to the refrigerator and perform the next step in the task analysis.

The next prompt of the hierarchy was the model prompt. Modelling, as defined by Baron and Byrne (1987) refers to "learning by observation of someone else's behaviour" (p. 117). To learn through observation, in essence, means to learn through imitation. For example, the first step of the task analysis involved walking to the

refrigerator. If the participants failed to respond to the target stimulus and responded incorrectly to the verbal prompt by running to the refrigerator, the experimenter then delivered the model prompt. This involved the experimenter modelling the correct behaviour for the participant, and the participant in turn correctly imitating the experimenter's behaviour. It was most appropriate to use the model prompts because preliminary tests indicated that both participants responded well to model prompts.

The full physical prompt was the last and most intrusive prompt to be used during this study. This prompt was delivered at the last level in the prompt hierarchy. At this level the experimenter provided the participants with complete physical assistance to guide them through the correct response. For example, if the participants were unable to respond correctly to the first step in the task sequence and all preceding levels of prompts failed to elicit a correct response, the experimenter then used physical guidance to assist the participants complete that particular step in the task.

The fourth step was to determine the length of the response interval. The participants were given the opportunity to respond before and after the prompts at each level in the hierarchy. After presenting the target stimulus at the first level, the participants were given a brief amount of time to respond independently. While delivering the prompt at the next level the participants were given the identical amount of time to respond. If the participants responded correctly the experimenter provided reinforcement in the form of verbal praise. If there was an incorrect response or no response at all, the experimenter proceeded to the next level in the hierarchy. Participant characteristics and task characteristics determined the length of the time interval. During this study the time interval remained consistent at four seconds.

The next step consisted of selecting appropriate reinforcement for each participant's response. The experimenter reinforced all correct responses irrespective of the time needed for the responses. That is, correct responses that occurred after the prompt was delivered were reinforced with the same intensity as correct responses that occurred before the prompt. Although it was desirable to have the participant respond without the prompt, the prompted responses were also reinforced to increase the probability that the participant's response will be influenced by the prompts. More importantly, it encouraged the participant to attempt an independent response.

The experimenter used only verbal praise as reinforcement because tokens and edibles were found to have little motivational value and weak effect for the participants. Negative feedback was used when the participants exhibited behaviours that were excessive or deviated from the established routine. Although all correct responses were reinforced only those responses that occurred before the prompt were counted towards criterion.

The final step involved the monitoring and recording of participants' data patterns. Essentially, this step was carried out at every stage of the project to determine whether the results reflected an improvement in the performance of the participants, and to monitor the effectiveness of the program. To achieve this it was necessary to develop a system of collecting data which not only recorded participants' responses, but also indicated the situation in which the response occurred. Apart from formal observations there were several other techniques in which the experimenter collected information. Anecdotal records provided a valuable source of information, while interviews with the participant's teacher and other professionals involved with the participants proved to be invaluable in identifying the idiosyncratic behaviours of each

participant. Considering this information, the experimenter decided if the selected program had yielded the desired results. Participants' data patterns were accurately recorded and visually displayed on individual data recording sheets. Data were analysed and collated to depict a lucid representation of each participant's responses.

The instruction was conducted in an isolated corner of the participants regular classroom. Single-subject research design procedure dictates that a baseline be established to determine the student's performance level before instruction. Baseline testing consisted of the participants being presented only with the target stimulus, that is a vocal statement indicating that the child should begin the task. All responses were recorded on the data-collecting sheet. Each participant went through the entire task sequence, as well as the prompt hierarchy with the experimenter delivering the required prompts if either of the participants failed to respond. This was not the usual practice with single subject research, but the experimenter randomly delivered the prompts during baseline testing to establish whether the participants were able to interpret the prompts correctly. Baseline testing was carried out across eight sessions for both participants. If there was no response to the first step of the task analysis, a random prompt sequence was followed and the prompt that elicited the response was recorded on the data collection sheet. No reinforcement was provided to the participants, but ancillary communication skills and behavioural patterns were observed and are included in the supplementary analysis. The time taken to complete the entire task sequence was also recorded during the baseline testing phase. It was anticipated that as the intervention progressed the participant would require less time to complete the task.

The intervention progressed across ten sessions for John, and nine sessions for Nicholas. During the intervention phase the target stimulus was delivered, the

participant was then given a four second time interval in which to respond. If the participant did not respond within the time interval or produced an incorrect response, the experimenter provided the first prompt in the hierarchy and then waited for four seconds for the participant to respond. The sequence progressed until the final controlling prompt was delivered, or the participant responded correctly. When the participant responded correctly to a prompt in the hierarchy, that prompt was recorded in the data collection sheet. The experimenter then waited for four seconds and progressed to the next step in the task sequence. Ten minutes were allocated for the participant to complete the task. Only those responses that occurred within the time interval and without the assistance of a prompt were counted towards criterion. These responses were made independently to the steps in the task analysis. All task-oriented responses were reinforced with verbal praise. Undesirable responses were negatively reinforced and the step in which it occurred was restarted. Time taken by each participant to complete the entire task was also recorded.

The final phase of the program was the maintenance and generalisation phase. This involved the experimenter reverting to the baseline condition. There were three maintenance sessions for each participant, during which the participants were required to respond to the target stimulus. The maintenance sessions for John were conducted twelve days after the intervention phase and there was a six-day interval between the first and second sessions. The maintenance sessions for Nicholas were conducted nine days after the intervention phase, but there was a four-day interval between the second and third sessions. The experimenter deliberately inserted a long period between the intervention and maintenance phases, but the interval within the maintenance phase was

not by design. It was the result of certain extenuating situations within the participants' classroom routine that could not be circumvented.

During the maintenance phase the participants were required to perform the entire sequence of the task with the other students in the classroom. This phase differed from the other phases in that, during the baseline and intervention phases the experimenter isolated each participant and conducted the experiment in a corner of the room, but during the maintenance phase the participants were required to sit at the table with the other students and perform the task. The time taken by each participant to complete the task was also recorded during this phase.

Chapter Four

Results

This chapter covers the results of the intervention program. The results for each participant are reported independently along with a summary data sheet and graphic displays of each participant's responses. The results were analysed and quantified according to the requirement of single-subject research. The analysis is based on the level of performance, slope, and variability. Supplementary analysis appears at the end of this chapter and pertains to ancillary observations about participants' behaviours and communications which were influenced by the intervention.

This study investigates the effects of the system of least prompts on two participants with severe disabilities. The aim was to teach the participants a pre-lunch time routine. It was hypothesised that the system of least prompts would significantly improve the participants' ability to perform this task. The three hypotheses were of the following order: (1) an increase in the number of unprompted correct responses, (2) a decrease in the amount of time taken to complete the task, and (3) a reduction in the use of intrusive prompts. This chapter examines the results of the experiment within the parameters of the above hypotheses. To simplify the results, this chapter is divided into two sections. Each section is then further divided into three parts to address the hypotheses. The results for the two participants are reported independently below.

Participant 1

The instructional program for John was carried out across twenty-one sessions. The first eight sessions were used to determine the baseline, followed by ten intervention sessions in which the system of least prompts was introduced, and finally three maintenance sessions. The outcome of John's program was determined according to three criteria that were part of the hypotheses. Imperative to the whole program was the completion of a task sequence. John's task sequence consisted of ten steps that were necessary for task completion. During each session John's responses were recorded in their corresponding columns, along with the time taken for each session and the number of intrusive and non-intrusive prompts that were used. John's data recording sheet is displayed in Figure 4.1.

The baseline data in Figure 4.1 indicated that John required several intrusive and non-intrusive prompts to complete the task. He needed assistance with every step in the task analysis except Step 2, which he was able to perform independently. Throughout the baseline testing phase John was only able to complete the second step without any assistance. As can be seen from Figure 4.1, there were several occasions when the experimenter delivered the controlling prompt (physical) to stimulate the correct response. The other prompts in the hierarchy were also used extensively during the baseline testing phase. John required three physical prompts, two model prompts, and four verbal prompts during the last session of baseline testing. There was only one unprompted correct response.

During the intervention phase an increase in the number of unprompted correct responses was observed. After the system of least prompts was introduced the number of independent responses increased from one during the baseline phase, to six during

the intervention phase. John required assistance with only four steps in the task sequence. John was able to complete most of the steps in the task sequence without assistance of any prompts. Altogether he managed six independent responses during each of the last three sessions of the intervention phase. This indicated an increase of five unprompted correct responses from the baseline data phase. Throughout the intervention John maintained an efficient level of task completion.

The results for the maintenance phase indicated a consistency of six correct independent responses. These responses did not require any prompting. John maintained the learned skill throughout the maintenance testing phase when conditions were reversed according to baseline. The results also indicated that John needed assistance with four out of the ten steps in the task analysis. The steps in which John required assistance were not the same throughout the phase, although a majority of his independent responses occurred with steps he had succeeded with during the intervention phase.

The data recording sheet in Figure 4.1 provides a clear indication of John's progress throughout the program. It becomes apparent that there was a steady increase in the number of independent responses during each of the three phases in the study. The last two sessions in each phase require particular attention. John made only one correct response during these sessions in the baseline phase, while during the intervention phase this number increased to six and remained at six during the maintenance sessions also. This represents a fifty percent increase in unprompted correct responses from the baseline. The remaining forty percent of John's responses required the various prompts in the hierarchy.

The graphic representation of all prompted and unprompted responses made by John is presented in Figure 4.2. The figure does not indicate which prompts were used. It can be observed that after session nine John's responses began to improve until they reached a consistent six unprompted correct responses. During Intervention Phase B there was an improvement in the level of performance which remained consistent into Maintenance Phase C. The level of performance after the intervention increased to six unprompted correct responses. There was a positive upward slope of performance for unprompted correct responses, while the slope of performance for prompted correct responses is negative. The slope of performance indicates stability was reached after Session 16, which in turn suggests that the rate of change had reached its optimum. That is, a maximum of six independent responses and four prompted responses was observed. Thus, in answer to the first hypothesis, the system of least prompts was successful in this context. The number of independent responses increased during Intervention Phase B and Maintenance Phase C.

It was hypothesised that John would require less amount of time to complete the task as each session progressed. The results indicated that there was a significant difference in the time taken in each of the three experimental conditions. During two sessions of the baseline phase John required the maximum amount of time that was acceptable for task completion (10 minutes). On several occasions he required seven minutes or more to complete each session.

Once the system of least prompts was introduced during the intervention phase, John required less time to complete the whole task. There was a reduction in the time he needed throughout the intervention phase. The last three sessions of the intervention phase saw John taking only two minutes to complete the entire sequence required of the

task. This indicated a significant improvement from the baseline condition. During the maintenance phase John required a little more time to complete the whole task (three minutes). There was still a substantial difference from the baseline phase. Throughout the maintenance testing phase the amount of time John required to complete the task remained consistent at three minutes a session.

Name: John

Instructor: Keenan

Task: Pre-lunch routine

Time: 10 minutes

Age: 6 years 7 months.

Task Analysis	Date	16 /3	17 /3	18 /3	22 /3	22 /3	23 /3	24 /3	25 /3	28 /4	29 /4	3/5	4/5	5/5	10 /5	11 /5	12 /5	13 /5	18 /5	1/6	8/6	9/6
	Trials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Walks to fridge		P	P	P	P	P	P	P	P	P	P	V	M	P	P	P	M	M	M	P	V	V
2. Opens Fridge		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
3. Removes lunch		V	V	P	V	V	V	M	M	V	V	I	V	V	V	I	V	I	I	I	I	I
4. Place lunch on table		V	V	P	V	V	V	M	V	V	I	V	I	I	I	V	I	I	I	I	I	I
5. Removes drink		P	M	M	V	V	V	P	M	V	V	P	V	V	V	V	I	V	V	V	V	V
6. Place drink on table		V	M	V	V	M	M	M	V	V	V	P	I	I	I	V	I	I	I	V	I	I
7. Opens cabinet		P	P	P	M	M	M	P	M	V	I	I	V	I	I	I	V	I	I	I	I	I
8. Removes plate		P	P	V	P	V	P	P	P	V	V	V	V	I	I	I	I	V	V	I	V	V
9 Takes plate to table		V	V	V	V	V	V	V	V	V	V	I	V	V	P	V	V	V	V	V	V	V
10. Sits at table.		P	P	P	P	P	P	P	P	V	V	V	I	P	P	I	I	I	I	I	I	I
Summary Data	Number Of I's	1	1	1	1	1	1	1	1	1	3	4	4	5	5	5	6	6	6	6	6	6
	Number Of V's	4	3	3	5	5	4	1	4	8	6	4	5	3	2	4	3	3	3	3	4	4
	Number Of M's	0	2	1	1	2	2	3	2	0	0	0	1	0	0	0	1	1	1	0	0	0
	Number Of P's	5	4	5	3	2	3	5	3	1	1	2	0	2	3	1	0	0	0	1	0	0
Time (Minutes)		8	8	7	10	10	7	7	5	5	5	6	4	6	4	3	2	2	2	3	3	3

Key: I = Independent, V = Verbal, M = Model & P = Physical.

Figure 4.1 John's summary data sheet.

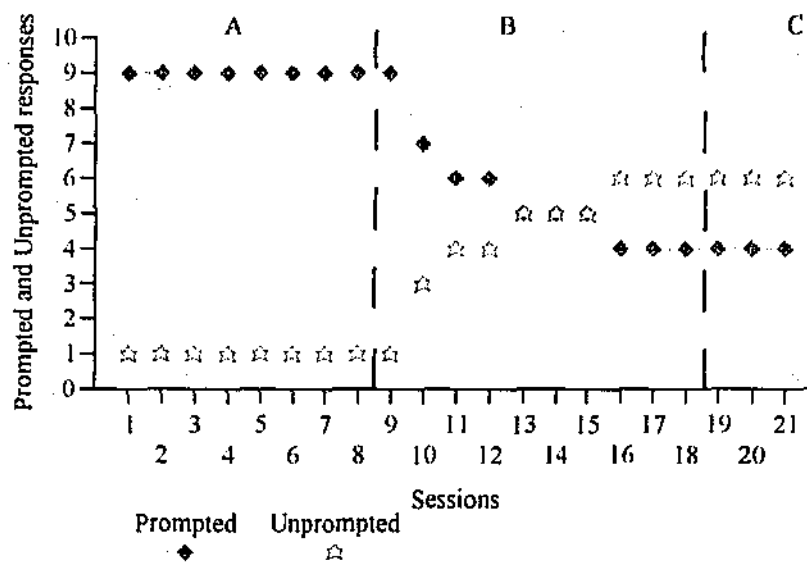


Figure 4.2 Number of prompted and unprompted responses made by John.

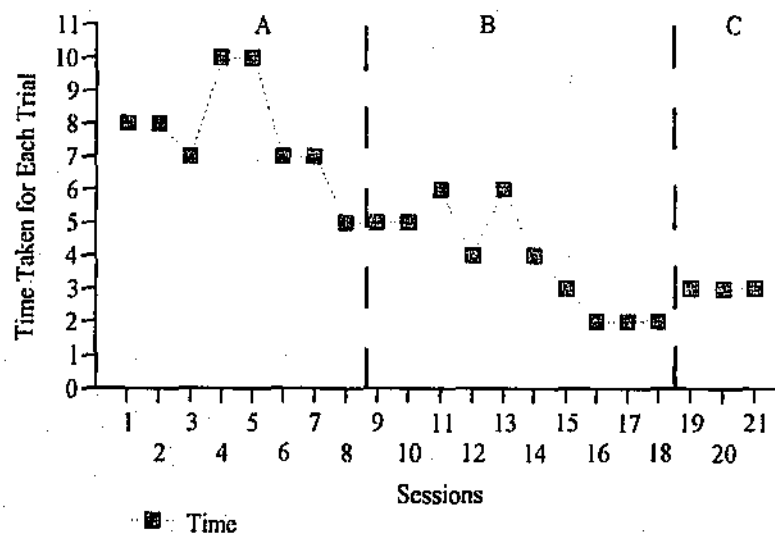


Figure 4.3 Time taken by John to complete the task

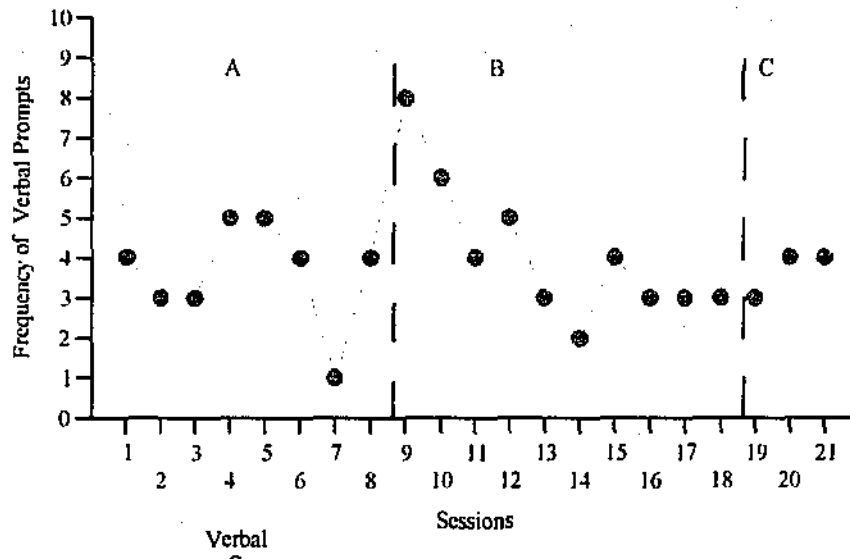


Figure 4.4 Reduction in the frequency of verbal prompts used with John.

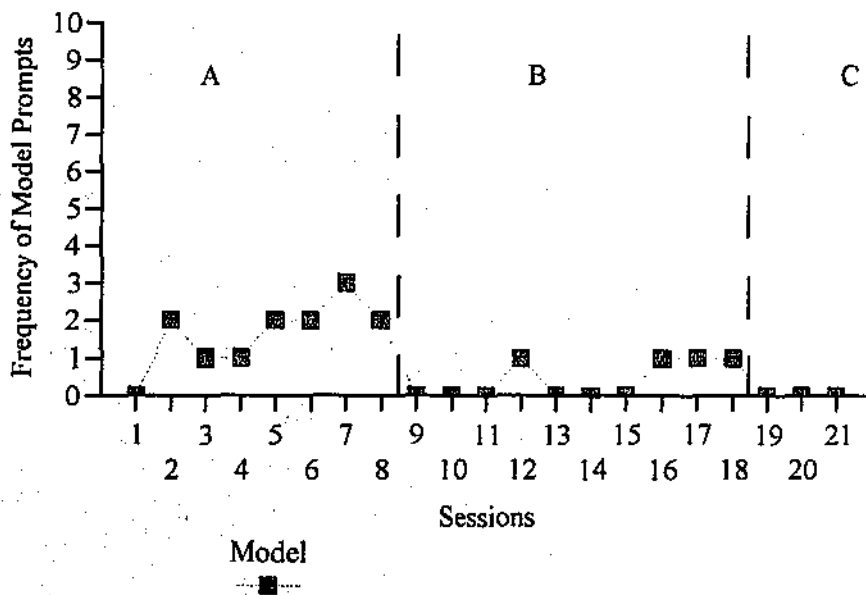


Figure 4.5 Reduction in the frequency of model prompts used with John

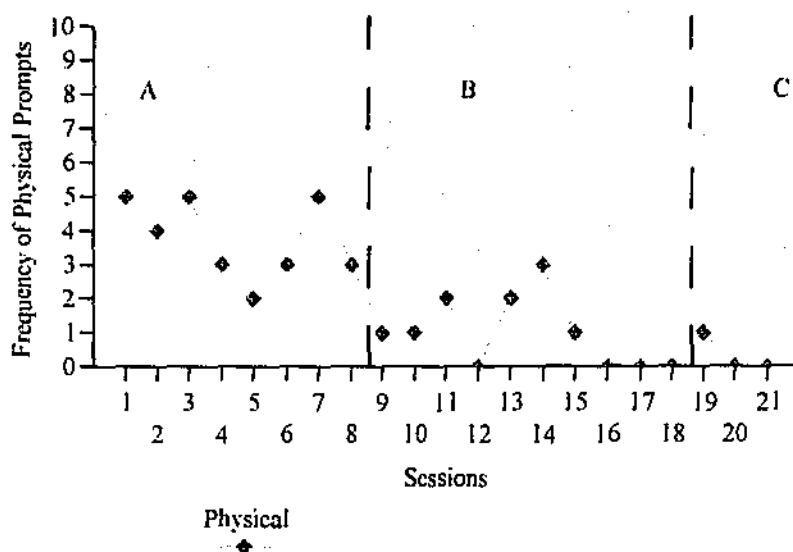


Figure 4.6 Reduction in the frequency of physical prompts used with John.

As can be seen from Figure 4.3, there was a steady reduction in the amount of time that John required to complete each session. The maximum amount of time allotted for this task was ten minutes and John used that amount of time in sessions four and five of the baseline phase. Throughout the baseline phase John used between five and ten minutes to perform the task, but once the system of least prompts was introduced, a marked decrease in the time was observed. The time taken by John during the intervention phase ranged from five to two minutes. The last three sessions were maintenance sessions where there was a slight increase in the time as compared with the last sessions of the intervention. However, a substantial improvement from the baseline condition was observed

Figures 4.4, 4.5 and 4.6 display the frequency of each prompt used to provide John with assistance during each step of the task sequence. It was hypothesised that

there would be a reduction in the number of intrusive prompts. From Figure 4.4 it can be observed that a large number of verbal prompts were needed throughout the baseline phase ($\underline{M} = 3.625$). During Intervention Phase B there was an increase in the use of verbal prompts ($\underline{M} = 4.1$), but this increase was only observed during the initial part of the intervention. During Maintenance Phase C a reduction in the use of verbal prompts was observed ($\underline{M} = 3.66$). The results indicated that the least intrusive verbal prompts increased in frequency during the intervention phase, but reduced during the maintenance phase.

Figures 4.5 and 4.6 display the frequency of the model and physical prompts respectively. These prompts occupied the place of the two most intrusive prompts in the hierarchy, with the physical prompt being the controlling prompt (most intrusive). The frequency of the model prompt also reduced during the three phases of the experiment, baseline ($\underline{M} = 1.625$), intervention ($\underline{M} = .4$) and maintenance ($\underline{M} = 0$). During the intervention phase a clear decline in the number of model prompts was observed. During the intervention phase the model prompt was used on fewer occasions and in a decreasing order, and during the maintenance phase the model prompts were not required at all. The trials during this phase required the least intrusive prompt, if indeed the prompt was required at all.

The frequency of physical prompts as displayed in Figure 4.6 indicates a substantial reduction in each of the three phases of the experiment. After session 16 there was only one instance in which the physical prompt was used, but before session 16 a steady decrease was observed in the use of the physical prompt. The difference can be seen from the mean scores of the three phases, baseline ($\underline{M} = 3.75$), intervention ($\underline{M} = 1$) and maintenance ($\underline{M} = .3$). Through the entire program the frequency of prompts

reduced from a maximum of five physical prompts in baseline to zero during maintenance. Similarly, the model prompts reduced from a maximum of three to a minimum of zero, and verbal prompts reduced from a maximum of eight to a minimum of four in maintenance. The results for John therefore support the third hypothesis which stated that there would be a reduction in the frequency of intrusive prompts. There was an increase in the number of verbal prompts, but this is acceptable because the verbal prompt provided John with the least amount of assistance.

Participant 2

The program for Nicholas consisted of twenty sessions in all. Experimental Condition A was the baseline and was conducted across eight sessions. Phase B was the intervention and was carried out across nine sessions, and the Maintenance Phase C was carried out across three sessions. The hypotheses were tested on the same three criteria as that of Participant 1. The task analysis for Nicholas involved only eight sequenced steps, therefore eight responses altogether. The data collection sheet is displayed in Figure 4.7 and consisted of all the response elements required to test the hypotheses. That is, time taken for each trial, number of correct responses, and number of intrusive and non-intrusive prompts that were used with Nicholas.

The data indicated the need for a relatively high number of intrusive prompts throughout the baseline condition. In Figure 4.7 it can be observed that Nicholas needed assistance with many of the steps in the task analysis. During most of the trials in the baseline phase the experimenter had to use several of the intrusive prompts. The controlling prompt (physical) was used on a total of 21 occasions during the baseline phase, whereas the model prompts were not used as extensively. There was no

consistency in the steps that were performed without assistance, but from trial number five a pattern emerges that reveals Nicholas was only able to perform Step 8 independently. With all the other steps in the task sequence, Nicholas required the entire prompt hierarchy.

The intervention phase precipitated a substantial change in Nicholas' responses. The results indicated a marked increase in the number of unprompted correct responses and a decrease in the number of prompted responses. At the introduction of the system of least prompts the number of independent responses increased from one during baseline trials, to seven during the intervention phase. This increase occurred during Trial 16, but it is evident that throughout the intervention phase Nicholas' response levels did improve significantly. The average number of independent responses across the intervention was six. This indicated an increase of five unprompted correct responses from the baseline condition. Nicholas had difficulty with only two steps in the task sequence. He consistently needed assistance with Steps 4 and 5. Furthermore, it should be noted that the controlling prompt was only used during one trial of the intervention phase.

The results for the maintenance sessions indicated a slight decrease in the number of unprompted correct responses from the intervention phase. During each of the three maintenance sessions Nicholas made three, five and three independent responses respectively. This indicated a decrease of three independent responses. However, when contrasted with the Baseline Phase A, the maintenance session indicated an increase of two unprompted correct responses. Nicholas required assistance with a majority of the steps during the maintenance sessions, but the assistance was provided in the form of the least intrusive prompt (verbal).

Name: Nicholas

Instructor: Keenan

Task: Pre-lunch routine

Time: 10 minutes

Age: 6 years 10 months

Task Analysis	Date	3/5	4/5	5/5	10/5	10/5	11/5	12/5	13/5	18/5	20/5	20/5	24/5	24/5	26/5	27/5	31/5	31/5	9/6	10/6	15/6	
	Trials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1. Walks to fridge		P	P	P	P	P	P	P	P	P	M	M	M	I	I	I	I	I	I	I	V	
2. Opens fridge		M	I	P	P	P	P	P	P	M	V	V	I	I	I	I	I	I	I	I	I	
3. Removes lunch		M	V	V	V	V	M	P	P	V	I	I	I	I	I	I	I	I	V	I	I	
4. Place lunch on table		V	V	P	V	V	M	V	V	I	I	I	I	I	I	I	I	I	V	V	V	
5. Opens cabinet		P	P	V	I	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
6. Removes plate		M	M	V	V	V	V	V	P	P	I	V	V	V	V	V	I	V	V	I	V	
7. Takes plate to table		P	V	I	V	V	V	V	V	P	I	I	I	I	I	I	I	I	V	V	V	
8. Sits at table.		V	I	V	V	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
Summary Data	Number Of I's	0	2	1	1	1	1	1	1	2	5	4	5	6	6	6	7	6	3	5	3	
	Number Of V's	2	3	4	5	5	3	4	3	2	2	3	2	2	2	2	1	2	5	3	5	
	Number Of M's	3	1	0	0	0	2	0	0	1	1	1	1	0	0	0	0	0	0	0	0	
	Number Of P's	3	2	3	2	2	2	3	4	3	0	0	0	0	0	0	0	0	0	0	0	
Time (Minutes)		6	6	5	5	5	5	5	5	5	4	4	4	4	3	2	2	2	3	3	3	

Key: I = Independent, V = Verbal, M = Model & P = Physical.

Figure 4.7 Summary data sheet for Nicholas.

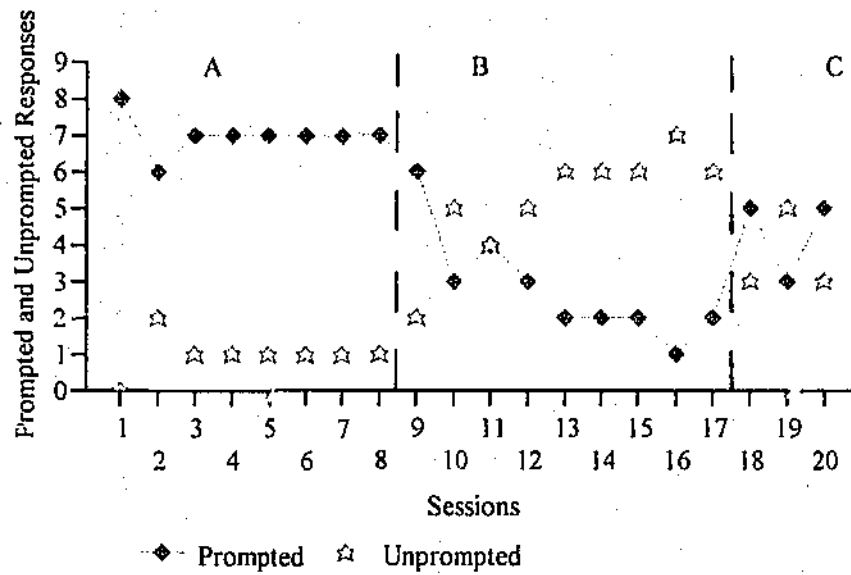


Figure 4.8 Number of prompted and unprompted responses made by Nicholas.

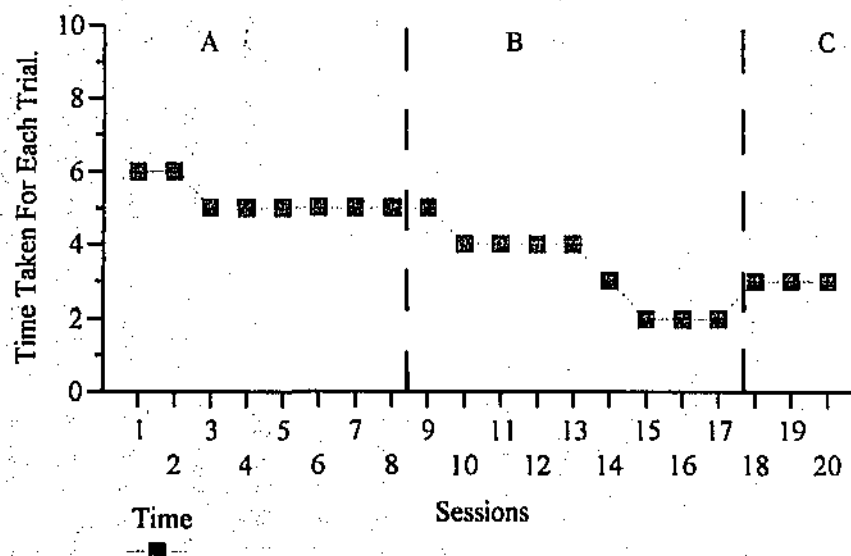


Figure 4.9 Time take by Nicholas to complete each trial.

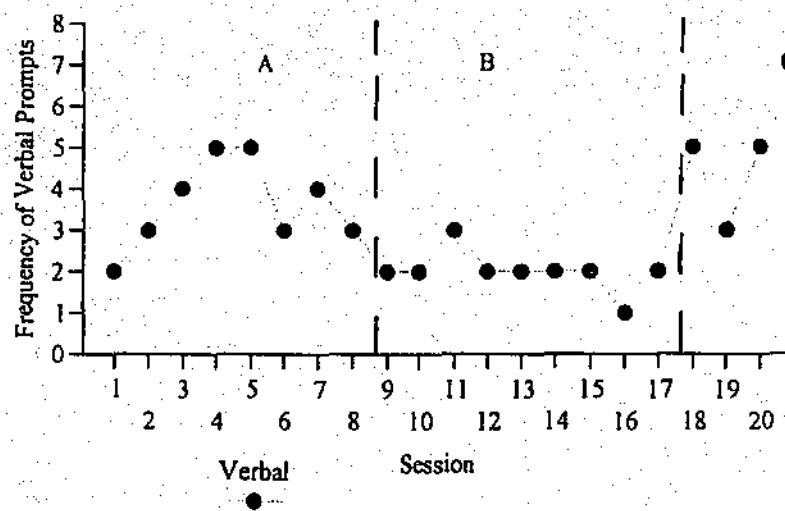


Figure 4.10 Frequency of verbal prompts used by Nicholas.

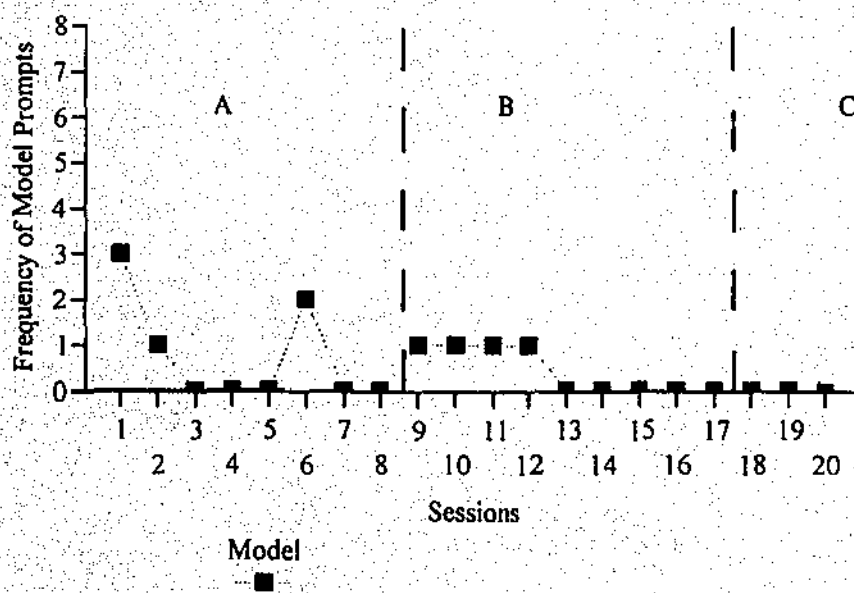


Figure 4.11 Frequency of model prompts used by Nicholas

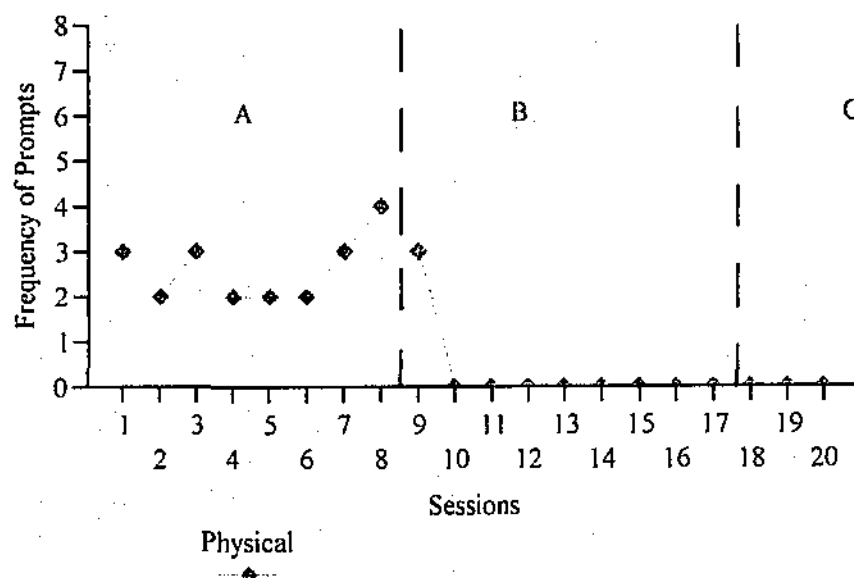


Figure 4.12 Frequency of physical prompts used by Nicholas.

It can be observed that during the intervention phase the number of P's are virtually nonexistent despite being so prominent during the baseline phase, while the number of M's also declined. The independent responses began to increase markedly when the system of least prompts was introduced, that is, the number of independent responses reached the optimum of seven with only one response having to be prompted. Similar gains were not observed during the maintenance testing.

Figure 4.8 is the graphic presentation of all prompted and unprompted responses made by the participant over the period of instruction. The prompted responses begin to decline during the intervention phase. The participant produced more unprompted correct responses to the target stimulus during this phase. The level of performance for unprompted responses improved significantly between Phases A ($\underline{M} = 1$) and B ($\underline{M} =$

5.2). The Maintenance Phase C revealed a decrease from the intervention phase but an increase from the baseline phase ($M = 3.6$). It can be observed that during Trial 16 there was only one prompted response. The average number of independent response in experimental Condition B was six. This represent 75 percent unprompted correct response and a 65 percent increase from Baseline Condition A. The slope of performance also changed in the anticipated direction. That is, the prompted responses indicate a downward slope, and the unprompted responses moves upwards in a positive direction. There was some variability in the responses during the maintenance phase. The number of prompted responses alternated between three and five indicating an inconsistent performance during maintenance testing. However, the results indicated that the system of least prompts did facilitate a change in Nicholas' response patterns. In particular, there was an increase in the number of unprompted correct responses.

In accordance with the second hypothesis, the time taken for each trial was also measured. There was a steady reduction in the amount of time that Nicholas required to complete the entire sequence of activities demanded of the task. During the baseline trials Nicholas required between five and six minutes to perform the eight steps in the task analysis. On the introduction of the system of least prompts the time began to decrease steadily. The initial trials of the intervention saw little change from baseline, but during the last three sessions of the intervention phase Nicholas needed only two minutes to complete the task. This indicated a substantial improvement from baseline, where five minutes was the average time required by Nicholas. During maintenance testing the amount of time increased by one minute from the last intervention trial. When contrasted with the baseline, there appeared to be a two-minute improvement. Throughout the maintenance trials Nicholas registered a time of three minutes.

As can be seen in Figure 4.9, there was a reduction in the amount of time Nicholas required to complete the task. Time during the baseline sessions did not reach the optimum of ten minutes but remained steady between five and six minutes. After the last baseline trial the time began to reduce slowly, until it reached the two-minute mark towards the end of the intervention. This effect did not translate to the maintenance phase since it can be observed that for all three trials during Phase C the time increased only slightly. However, there was a substantial improvement in experimental Conditions B and C when compared with the Baseline A.

Figure 4.10 displays the frequency of verbal prompts for all three phases. It can be observed that there was a high frequency of verbal prompts during Baseline Phase A ($\bar{M} = 3.65$) and Maintenance Phase C ($\bar{M} = 4.33$). However, the Intervention Phase B witnessed a decrease in the use of the verbal prompt ($\bar{M} = 2$). Variability seemed to be high during the maintenance phase because there was no consistency in the use of the verbal prompts. The experimenter used between five and three verbal prompts in Phase C and this indicated an increase from the baseline phase as well as from the intervention phase. Thus, it can be concluded that the verbal prompts were used with the highest frequency and are consistent with the expectation set for the third hypothesis.

Figure 4.11 displays the frequency of model prompts for the three phases. It is evident that the model prompts were not used extensively during any of the three experimental conditions ($\bar{M} = .75$, $\bar{M} = .44$ and $\bar{M} = 0$). During the Intervention Phase B the model prompt was only required on a total of four occasions, with the maximum number being one for each session. After trial twelve the model prompt was no longer required. Figure 4.12 displays the frequency of physical prompts. The physical prompt

was used extensively during Baseline Phase A ($M = 2.65$). This was the controlling prompt and was used when all preceding levels of prompts failed to elicit a correct response. Nicholas required the physical prompt on a total of 21 occasions during the baseline phase. This number reduced to three during the intervention ($M = .33$) and zero during the maintenance phase.

During the maintenance phase no intrusive prompts were required because every prompted response was made with the assistance of a verbal prompt. Throughout the program the use of intrusive prompts declined. The number of physical prompts decreased from four during in the baseline to zero during maintenance. There was a reduction in the use of model prompts from a maximum of three during baseline to a minimum of zero during maintenance. However, the use of verbal prompts remained constant.

Supplementary Analysis

Several other findings manifested themselves during the intervention. Behaviour and communication were two areas in which both participants demonstrated severe difficulty, and it is in these two areas that positive changes were observed. During the earlier part of this program both participants had demonstrated a strong reluctance to engage in this activity that was previously being done for them by the teacher. Behaviours during the baseline phase included screaming, running and throwing items around the room. These behaviours were totally unpredictable and would occur at any stage in the task sequence. During the intervention phase a reduction in this disruptive behaviour was observed. Furthermore, the behaviours did not occur with the same

intensity and were easily controlled. This result was also translated into the maintenance phase.

Communication skills were enhanced during the intervention and maintenance phases. John used some of his signs more spontaneously, especially for those familiar objects like his lunch box and his drink. Nicholas used gestures with an intent to communicate. Frequently he would point to the refrigerator in anticipation of the first step in the task analysis. This behaviour was absent during the baseline sessions. There were several instances when Nicholas used words like "fridge," "chair" and "lunch." However, this kind of behaviour did not occur consistently. Furthermore, it should be noted that once the initial rapport was established, both participants demonstrated an eagerness to engage in social contact with the experimenter.

Summary

This study investigated the effectiveness of the system of least prompts when used to teach two students with severe disabilities to perform a pre-lunch routine. The three hypotheses stated that there would be an increase in the number of unprompted correct responses, a reduction in the amount of time each participant required to complete the task, and a reduction in the use of intrusive prompts. The results indicate that the system of least prompts was effective in facilitating a change in all three dependent variables.

First, the introduction of the system of least prompts brought about an increase in the number of unprompted correct responses for both participants, while reducing the number of prompted responses. John was able to perform six steps in the task sequence without the assistance of the prompts. This result was translated into the maintenance

phase also. The results for Nicholas indicated a sharp rise in the level and slope of performance during the intervention phase. There was considerable variability in his performance during the intervention and maintenance phases. The range of responses indicated a maximum of seven correct responses during the later stage of intervention, and a minimum of three correct responses during maintenance. However, both participants made considerable gains in the number of independent correct responses, but only John maintained these results into Phase C.

Second, the results indicate that both participants required less time to complete the task as the intervention progressed. This was also observed in the maintenance phase for both participants. The steady reduction in time was more pronounced for John, whose time performance reduced substantially from a maximum of ten minutes during Trials 4 and 5 in the baseline phase, to two minutes during Trials 16, 17 and 18 in the intervention phase. During the maintenance phase John required only three minutes to complete the task. Nicholas also demonstrated a reduction in time taken to complete the task during each of the three experimental conditions. During the maintenance phase Nicholas was able to complete the task sequence in three minutes. This indicates an improvement of about two minutes from Baseline Phase A.

Third, there was a reduction in the use of intrusive prompts that each participant required to complete the designated task sequence. During the baseline sessions both participants required a large number of intrusive prompts to maintain appropriate task-related activity. The introduction of the system of least prompts reduced the need for the more intrusive prompts in the hierarchy because both participants were able to perform the correct responses independently or with the help of this least intrusive prompt (verbal). The data indicate that both participants no longer required the model

and physical prompts after the intervention had progressed through a couple of sessions. During the maintenance sessions John required the physical prompt only once. All other responses were produced independently or with the assistance of the verbal prompt. Nicholas did not require the physical prompt after the first trial of the intervention session. The need for the model prompt also began to fade midway through the intervention. This was maintained into Phase C, during which Nicholas only needed the verbal prompts to stimulate appropriate activity.

Last, a supplementary analysis indicated that both participants demonstrated substantial improvements in their task-related behaviour and communication after the system of least prompts was introduced. Communication and appropriate behaviour were the two areas in which both participants demonstrated severe deficits. During the intervention and maintenance phases the incidents of disruptive and deviant behaviours reduced substantially, while an improvement in spontaneous communication was observed in both participants. In conclusion, the system of least prompts was instrumental in teaching both participants to perform the pre-lunch routine to a degree of independence that was absent before the inception of the program.

Chapter Five

Discussion

This chapter contains a synopsis of the entire research study. It also highlights the major effects of the intervention and examines them with reference to the research literature. Additionally, the lesser effects of the intervention are also discussed. The last section of this chapter investigates the implications of this study for special educational settings. The benefits of teaching daily living skills to people with severe disabilities are also discussed, with suggestion for future research.

The aim of this study was to investigate the effectiveness of the system of least prompts in teaching a pre-lunch routine to two students with severe developmental disabilities. The two participants were categorised with severe to moderate intellectual disabilities and with severe deficits in communication and behaviour. The task selected for the study was a pre-lunch time routine. Previously this task had been performed for them by the teacher or the aide. This led to a state of learned helplessness that produced several complications before the program was first initiated. Both participants exhibited severe disruptive behaviours when they were first presented with the task. These behaviours included tantrums, running around the room, and throwing items. According to Drasgow and Halle, (1995) these behaviours should be viewed as the student's attempt at communication, in this case rejecting and protesting. This was consistent with the classroom teacher's view that both participants disliked a variation to routine or participating in new tasks and would thus act out disruptively. During the baseline phase both participants exhibited this type of behaviour. John would indiscriminately

label objects that were not task related and would frequently run around the room and refuse to perform the task. Nicholas would react in a more disruptive manner by throwing things and screaming.

The participants were taught to perform the pre-lunch routine with a degree of independence which would not require constant teacher attention in the classroom. The ultimate aim was to facilitate independence in the participants and provide them with some of the self-help skills that are vital for integration into the wider community. For this reason the system of least prompts was selected for the study. The system of least prompts provides the individual with the opportunity to respond independently and then progressively increases the amount of assistance that is needed. The attempt at an independent response is imperative because very often a correct response nurtures confidence and encourages the student to be more independent (Wolery, Ault, & Doyle, 1992).

The effectiveness of the system of least prompts was investigated in relation to three dependent measures: the number of correct responses, time, and frequency of intrusive prompts. It was hypothesised that the system of least prompts would be influential in augmenting the number of unprompted correct responses and reduce the time in which the task was completed. Furthermore, it was stated that there would be a decrease in the use of intrusive prompts. The data indicated that the system of least prompts was effective in facilitating an improvement on all three dependent variables for both participants. The baseline data established that the participants were not competent at this task. The experimenter used a wide range of intrusive prompts to stimulate task-related activity and ensure that the task would be completed in its

entirety. During the baseline testing phase the participants were only able to complete one step in the task analysis independently.

The introduction of the system of least prompts expedited a change in all three dependent measures during the intervention and maintenance phases. Data were analysed on the bases of level of performance, slope of performance, and variability. Three major effects were observed during the intervention and maintenance phases and pertained to the changes in the dependent variables from baseline to intervention and maintenance. The system of least prompts was found to be effective in producing a change in the participants' responses. During the intervention phase the number of unprompted correct responses increased for both participants. These findings are consistent with the research studies that found the system of least prompts to be effective in producing an increase in the number of unprompted responses (Godby, Gast, & Wolery, 1987; Steege, Wacker, & McMahon, 1987; Gast, Ault, Wolery, & Doyle, 1988; Doyle, Wolery, Gast, & Ault, 1990).

Major Effects

The first major effect was observed in the increase in the number of independent correct responses made by both participants after the introduction of the system of least prompts. The data clearly indicate that there was a marked increase in the number of correct responses made by both participants. This effect was observed for both participants and their levels of performance improved substantially during the intervention phase. John's level of performance increased to six unprompted correct responses, and was fairly consistent till the end of the program. The same consistency was not reflected for Nicholas. The data for Nicholas indicated a sharp increase in the

level and slope of performance during the intervention phase, but this was not maintained into Phase C. Nicholas demonstrated only a marginal improvement from baseline in the number of correct response during Phase C. This indicated that Nicholas did not maintain the skill with the same efficiency he had demonstrated during intervention. However, the main indicator for the effectiveness of the program was contingent upon the total number of independent responses. In relation to this criterion, the system of least prompts was found to be influential in increasing the number of independent correct responses for both participants.

The second major effect was observed in relation to the time taken by the participants to complete the task. The research literature indicated that the system of least prompts did not produce the same efficiency as the constant time delay or progressive time delay method in relation to number of trials to criterion, and minutes of instructional time (Gast, Ault, Wolery, & Doyle, 1988; Doyle, Wolery, Gast, & Ault, 1990; Steege, Wacker, & McMahon, 1987). However, the system of least prompts typically requires more time to implement and execute and therefore would take longer than the other response prompting strategies. The results of the present study indicated that both participants became more proficient as the intervention progressed and consequently took less time to complete the task. Furthermore, both participants maintained an efficient time into phase C. The slope of performance indicated a steady downward slope with little variability in John's performance during the intervention phase. Nicholas, however, performed the task very efficiently throughout the intervention and maintenance phases.

A substantial reduction in the amount of time taken to complete the task was observed for both participants in each of the three phases. Initially, John required the

maximum time allocated to complete the task, but midway through the intervention phase this time had reduced substantially and stabilised into the maintenance phase. John maintained a high level of performance in relation to number of correct responses and also maintained an efficient time in which he completed the task.

Nicholas made considerable gains in relation to the time required to complete the task. Nicholas' timed performance was stable in all three experimental phases and decreased gradually as the intervention progressed. These gains were observed throughout the study. This conclusion is consistent with the research literature that found the system of least prompts to require more instructional time to reach criterion (Gast, Ault, Wolery, & Doyle, 1988; Doyle, Wolery, Gast, & Ault, 1990; Steege, Wacker, & McMahon, 1987). However, one has to consider that the system of least prompts requires a greater amount of time to implement. This is inherent in its design, which utilises a wide range of prompts within the overarching hierarchy. Furthermore, this study did not employ a criterion level performance, or a time frame in which to achieve the goal. The only stipulation in regard to time was that the participants would perform the task in less time as the intervention progressed. The data indicated that this criterion had been achieved successfully.

The third major effect was observed in changes in the number of intrusive prompts required in each of the three phases. The third hypothesis stated that there would be a reduction in the use of intrusive prompts as the intervention progressed and the participants became more adept at the task. This result was reflected in the performances of both participants. It was observed that the use of intrusive prompts diminished even during the maintenance phase. This does not only indicate a positive level of maintenance, but also reveals that when the participants did need assistance it

was only in the least intrusive form. These findings are consistent with research studies done on maintenance and generalisation, which postulate the practice of partial participation rather than total dependence and a reduced or limited amount of assistance to stimulate appropriate activity (Cuvo, Leaf, & Barakove, 1978; Wacker, Berg, Berrie, & Swatta, 1985; Snell, Lewis, & Houghton, 1989).

It was observed that once the participants familiarised themselves with the requirement of the task they responded with more circumspection, which automatically reduced the need for intrusive prompts. Nicholas demonstrated substantial improvement in this regard because after the first intervention trial the controlling prompt was no longer required. John's performance also revealed a reduction in the use of intrusive prompts, but this occurred only after the intervention had advanced through several sessions. Additionally, the occurrences of the model prompt also diminished midway through the intervention for both participants.

John's performance data indicated that the controlling prompts were used mostly for Steps 1, 9 and 10. These particular steps required John to commute from one end of the classroom to the other. Invariably he would forget about going to the table, or sitting at the table and instead gravitate to where the toys were kept. The controlling prompt (physical prompt) was used on these occasions. During the maintenance sessions the controlling prompt was used only once, and that was at the beginning of the task. Step 1 constantly elicited the use of the more intrusive prompts (physical prompt or the model prompt). John's first action during this step was to run towards the refrigerator. However, the results are consistent with research studies which indicated a reduced amount of assistance is needed during maintenance (Cuvo, Leaf, & Barakove, 1978; Wacker, Berg, Berrie, & Swatta, 1985; Snell, Lewis, & Houghton, 1989).

Nicholas demonstrated a marked reduction in the need for intrusive prompts during the intervention and maintenance phases. The data indicated that after the first trial in the intervention phase the controlling prompts were no longer required to stimulate task-related activity. The use of the model prompt also diminished during the intervention phase. This indicated a substantial improvement from the baseline condition. The reduction in the use of intrusive prompts was mirrored during the maintenance phase also and reflects congruence with the research literature (Cuvo, Leaf, & Barakove, 1978; Wacker, Berg, Berrie, & Swatta, 1985; Snell, Lewis, & Houghton, 1989).

The system of least prompts was instrumental in facilitating a change in the participants' responses. The total number of unprompted correct responses increased for both participants during the intervention and maintenance phases. This resulted in a decrease in the number of prompted responses. Additionally, the participants were able to complete the task in less amount of time during Phases B and C. It was also evident that the number of intrusive prompts had reduced significantly during the intervention and maintenance phases. Therefore, at the end of the program both participants were able to perform the task with the least amount of assistance and a high degree of independence.

Other effects were observed in the areas of communication and behaviour. In this section the experimenter will highlight the ancillary effects of the intervention on the communication and behaviour of both participants. Chapter 3 provided a lucid description of each participant's disabilities. Both participants demonstrated severe deficits in language and communication and while John's labelling skills appeared to be good, they often served little or no functional purpose. The research literature indicated

that receptive and expressive labelling were essential for students with severe disabilities, because these students are often unable to interact with other people due of a lack of communication skills (Hupps, Mervis, Able, & Conroy-Gunter, 1986; Snell, 1993). Furthermore, Turnell and Carter, (1994) stated that events which occur naturally in the student's environment are more likely to produce communicative exchanges.

Both participants experienced severe difficulties in communication. Their receptive and expressive communication skills were very poor, yet an inspection of the data analysis sheets indicated that both participants required only verbal prompts toward the end of the intervention phase and into the maintenance phase. Apart from the spontaneous attempts to communicate with the experimenter, both participants were also interpreting the verbal prompts correctly. This is because there was conformity in the manner in which the instruction and prompts were delivered. The instruction and prompts were delivered in the same manner for all trial during the intervention. This repeated exposure to the same prompts aided the participants to familiarise themselves with what was expected from the task and to be able to perform the desired response.

A major change was observed in the behaviour and communication of both participants during the intervention and maintenance phases. There were fewer incidents of disruptive behaviour and an eagerness to engage in the task. During the intervention phase both participants became more familiar with the requirements of the task and had more success with it. The task no longer produced anxiety or frustration because the participants were able to perform it with some independence. It was no longer a new activity and the participants were aware that they had to perform the task themselves. It should be noted that neither participant was motivated by the natural

consequence of lunch on completion of the task. Food had no motivational value for either of the participants.

There was a substantial improvement in Nicholas' communication skills. His communication predominantly manifested itself nonsymbolically. Gestures and pointing were his preferred forms of communication. Nicholas produced these forms with more spontaneity as the intervention progressed. In anticipation of the next step in the task analysis he would often point to the refrigerator or the cabinet to indicate that it was the next thing he had to do. This behaviour was not observed during the baseline phase. Although this sometime resulted in an incorrect response, it was highly desirable to have Nicholas attempt the response and communicate irrespective of the outcome, because the prompt was always provided in the event of an incorrect response.

John also demonstrated an improvement in his communication behaviour during the intervention and maintenance phases. This was observed mainly with his labelling skills. As the intervention progressed John began to label objects more within the context of the topic. According to Drasgow and Halle (1995) this is essential because communication should be functionally and contextually appropriate. That is, the participant should respond to the target stimulus, in relation to the task. John labeled the object as they appeared in the sequence of the task. There were fewer incidents of errant labelling, with most of his labelling being task-related and occurring in anticipation of the next step in the task.

The disruptive behaviour of both participants also improved during the intervention and maintenance phases. There were fewer incidents of behaviours like screaming, tantrumming, running around the room, throwing objects, and kicking. Whether this is the direct result of the intervention is difficult to ascertain, but the

introduction of the system of least prompts did facilitate an improvement in the number of independent correct responses. It is the view of the experimenter that as the participants experienced success with the task they were less frustrated and less likely to exhibit any undesirable behaviour. These observations are unique because there has been no empirical support for this outcome in any of the literature that was researched for this study. When either of the participants demonstrated any disruptive behaviour during the intervention phase it was easily controlled and the experimenter cued the participants to continue the task by saying "back to work." Furthermore, it should be noted that these changes in communication and behaviour were also reflected during the maintenance phase.

Critical Evaluation and Implication for Future Research

The results of the present study are consistent with the vast research literature which deals with the efficacy of the system of least prompts procedure when used with children with severe disabilities. During this study the experimenter encountered several factors within the system of least prompts that were integral, and contributory to the achieved outcome. Even so, there exist several limitations to the system of least prompts which manifested itself during the study. This section critically evaluates the study, and expounds those factors that contributed to the successful outcome, and those that might have impeded a better result.

First, the system of least prompts had been used extensively to teach a wide range of tasks to students with severe disabilities. Most of the research has centred on students with severe disabilities, but does not include reports on students with autism. The present study included two participants with autism as the primary disability. It was

therefore promising to have both participants achieve these results. It might seem paradoxical, but the principle of partial participation should always apply in those cases where a student's disability inhibits his ability to participate entirely. The alternative of total dependence is not a desirable one. The system of least prompts was an effective instructional device which brought about positive results with both participants. Furthermore, it was indirectly influential in eliciting more spontaneous communication and an improvement in the participants' behaviours.

Second, there were several factors that could account for the participants' inability to perform all the steps in the task sequence. The first question one must consider is, Did the task analysis contain too many steps? The experimenter conducted a comprehensive analysis of the task and tested the participants for all the prerequisite skills that were required for task completion. The resultant analysis was then individualised and consisted of steps that were intrinsic to the task, and necessary for task completion. None of the steps could be omitted from the analysis because to do so would result in an incomplete sequence. It was more desirable to prompt the participants when they could not respond independently than to perform any particular step for them. In this way there was always the probability that the participants would learn the step themselves and not require the prompt.

Another factor that had some effect on the outcome for both participants was the lack of continuity during the intervention phase. Ideally, it would have greatly benefited the participants if the intervention was carried out across ten straight days. However, certain extenuating circumstances prevailed which could not be circumvented. The schedules of the experimenter and the participants did not permit a continuous implementation of the intervention phase. Additionally, holidays, excursions, and

absenteeism all interrupted the continuity of the program. This may have affected the overall results, but to what extent, is difficult to ascertain. It is, however, a valid consideration for future research.

Last, the research indicated that the system of least prompts does not match up to procedures like the constant time delay and progressive time delay in relation to number of trial to criterion, or minutes to criterion. Why then was this procedure selected? Efficiency was not the consideration for this study, but effectiveness was, and the literature indicated that the system of least prompts was as effective as the constant time delay and the progressive time delay procedures. The literature also indicated that the system of least prompts was especially successful with task that involved chained responses (Steege, Wacker, & McMahon, 1987; Godby, Gast, Wolery, 1987; Gast, Ault, Wolery, Doyle, & Belonger, 1988; Doyle, Wolery, Gast, Ault, & Wiley, 1990; Wolery, Ault, & Doyle, 1992). The system of least prompts is known to take up much time for implementation, this assisted the experimenter to observe other aspects of the participants' behaviour and communication which would otherwise have eluded him. Furthermore, there was no criterion for time during this study, therefore it was appropriate to utilise the extra procedural time to build up a communicative rapport with the participants.

Several implications can be derived from the outcomes of this study. It is important to consider a wider use of the system of least prompt procedure. Ideally, the aim of any intervention program for students with severe disabilities should focus on teaching the individual a variety of skills which would assist him in the classroom and the community. The system of least prompts was most successful when tasks involved chained responses (Wolery, Ault, & Doyle, 1992). Neither of the participants in this

study were physically disabled, so they were both able to perform the motoric responses with the least amount of constraint. The results of this study lend further credence to the existing literature that had already established the system of least prompts to be an effective instructional device. However, the system of least prompts does require an extra amount of time to implement, and if time is an essential factor for a study then the system of least prompts may not be the appropriate strategy to use. The same can be said about its use in the classroom. Teachers have to decide if the system of least prompts would be appropriate with their students within the context of the task at hand. Tasks within the domain of self-care or daily community living, which generally consists of chained sequenced steps would best be taught using the system of least prompts. Further research is needed to establish the effectiveness of the system of least prompts in relation to group instruction and task that involve discrete responses.

Few studies in the literature have attempted to investigate the effectiveness of the system of least prompts in relation to communication and behavioural difficulties. Future research should consider a more eclectic approach to evaluate students on all the component skills required to complete a task successfully. During this study a substantial change was observed in two component skills (communication and behaviour) that were partly responsible for the student achieving little success during the baseline. Changes to these variables were not the primary objective of this study, but these changes cannot be dismissed as by products of the intervention.

The changes in the participants' behaviour indicated that the intervention had markedly reduced disruptive behaviours and had a positive influence on task-related behaviour in both participants. This presents the experimenter with two questions. (a) Was it the initial failure at the task that stimulated frustration, which in turn precipitated

a behavioural episode? (b) Did success at the task produce less frustration, and consequently fewer behavioural problems? It would be worthwhile to investigate these questions in future research because the three factors of success and failure, frustration, and behaviour appear to be circuitously related. However, alternative answers address the situation in which the behaviour occurred. It is likely that the behaviour problems were the participants' way of protesting to a new task, or to an unfamiliar person in the environment. Therefore, the reduction in disruptive behaviour can be attributed to progressive familiarity with the new task and the unfamiliar person.

Further research is needed to investigate whether the system of least prompts is effective in reducing behavioural problems and augmenting communication in children with severe disabilities. The participants in this study demonstrated substantial reduction in maladaptive behaviours and an improvement in communication after the system of least prompts was introduced, but no empirical data were collected to substantiate these findings. Future research should examine the direct effects of the system of least prompts on communication and behaviour within a more diverse range of tasks.

References

- Accardo, P. J., Whitman, B. Y., Laszewski, C., Haake, C. A., & Morrow, J. D. (1996). *Dictionary of Developmental Disabilities Terminology*. Maryland: Paul H. Brookes.
- Alpers, S. (1985). The use of teacher questioning to increase independent problem solving in mentally retarded adolescents. *Education and Training of the Mentally Retarded*, 20, 83-88.
- Baron, R. A., & Bryne, D. (1987). *Social Psychology: Understanding Human Interaction*. New Delhi: Prentice-Hall.
- Bellamy, T., & Buttars, K. L. (1975). Teaching trainable level retarded students to count money: Towards personal independence through academic instruction. *Education and Training of the Mentally Retarded*, 10, 18-26.
- Browder, D., Hines, C., McCarthy, L. J., & Fees, J. (1984). A treatment package for increasing sight word recognition for use in daily living skills. *Education and Training of the Mentally Retarded*, 19(3), 191-200.
- Cuvo, A. J., Leaf, R. B., & Barakove, L. S. (1978). Teaching janitorial skills to the mentally retarded: Acquisition, generalisation and maintenance. *Journal of Applied Behaviour Analysis*, 11(3), 345-355.
- Doyle, P. M., Wolery, M., Gast, D. L., Ault, M. J., & Wiley, K. (1990). Comparison of constant time delay and the system of least prompts in teaching preschoolers

- with developmental delays. *Research in Developmental Disabilities*, 11(1), 1-22.
- Drasgow, E., & Halle, J. W. (1995). Teaching social communication to young children with severe disabilities. *Topics in Early Childhood Special Education*, 15(2), 164-186.
- Gast, D. L., Ault, M. J., Wolery, M., Doyle, P. M., & Belanger, S. (1988). Comparison of constant time delay and the system of least prompts in teaching sight words reading to students with moderate disabilities. *Education and Training of the Mentally Retarded*, 23(2), 117-128.
- Godby, S., Gast, D. L., Wolery, M. (1987). Comparison of time delay and system of least prompts in teaching object identification. *Research in Developmental Disabilities*, 8, 283-306.
- Halasz-Dees, M., & Cuvo, A. J. (1986). Teaching a functional leisure skill cluster to rehabilitation clients: The art of Macrame. *Applied Research in Mental Retardation*, 7, 71-93.
- Haring, T. G. (1985). Teaching between-class toy play behaviour to handicapped children. *Journal of Applied Behavioural Analysis*, 18, 127-139.
- Hupps, S. C., Mervis, C. B., Able, H., & Conroy-Gunter, M. (1986). Effects of receptive and expressive labels on generalised learning by severely mentally retarded children. *American Journal of Mental Deficiency*, 90(5), 558-565.
- Luckasson, R. L., Coulter, D.L., Polloway, E. A., Reiss, S., Schalock, R. L., Snell, M. E., Spitalnik, D. M., & Stark, J. A.(1992). *Mental Retardation: Definition, Classification, and Systems of Supports* (9th ed.). Washington, DC: American Association on Mental Retardation.

- Nietupski, J., & Svoboda, R. (1982). Teaching a cooperative leisure skill to severely handicapped adults. *Education and Training of the Mentally Retarded, 17*, 38-43.
- Nietupski, J., Welsh, J., & Wacker, D. (1983). Acquisition, maintenance, and transfer of grocery item purchasing skills by moderately and severely handicapped students. *Education and Training of the Mentally Retarded, 18*, 279-286.
- Panscofar, E. L., & Bates, P. (1985). The impact of the acquisition of successive training exemplars on generalisation. *The Journal of the Association for Persons with Severe Handicaps, 10*, 95-104.
- Rae, R., & Roll, D. (1985). Fire safety training with adults who are profoundly mentally retarded. *Mental Retardation, 23*, 26-30.
- Reichle, J. (1997). Communication intervention with persons who have severe disabilities. *The Journal of Special Education, 31*(1), 110-134.
- Rosenbaum, M. S., & Breiling, J. (1976). The development and control of functional reading-comprehension behaviour. *Journal of Applied Behaviour Analysis, 9*, 323-333.
- Salkind, N. J. (1997). *Exploring Research*. New Jersey: Prentice-Hall.
- Siegle-Causey, E., & Guess, D. (1989). *Enhancing Nonsymbolic Communication Interaction among Learners with Severe Disabilities*. Baltimore: Paul H. Brookes.
- Smith, M. D., & Belcher, R. (1985). Teaching life skills to adults disabled by autism. *Journal of Autism and Developmental Disorders, 15*, 163-175.

- Snell, M. E., Lewis, A. P., & Houghton, A. (1989). Acquisition and maintenance of toothbrushing skills by students with cerebral palsy and mental retardation. *Journal of the Association for Persons with Severe Handicaps*, 14(3), 216-226.
- Snell, M. E., (1993). *Instruction of Students with Severe Disabilities*. New York: Macmillan.
- Stainback, S., Stainback, W., Wehman, P., & Spangiers, L. (1983). Acquisition and generalisation of physical fitness exercises in three profoundly retarded adults. *Journal of The Association of the Severely Handicapped*, 8(2), 47-55.
- Steege, M. W., Wacker, D. P., & McMahon, C. M. (1987). Evaluation of the efficacy and efficiency of two prompt strategies with severely handicapped students. *Journal of Applied Behaviour Analysis*, 20(3), 293-299.
- Tawney, J. W., & Gast, D. L. (1984). *Single Subject Research in Special Education*. Ohio: Merrill.
- Tindal, G. A., & Marston, D. B. (1990). *Classroom-Based Assessment: Evaluating Instructional Outcomes*. Ohio: Merrill.
- Turnell, R., & Carter, M. (1995). Establishing a repertoire of requesting for students with severe and multiple disabilities using tangible symbols and naturalistic time delay. *Australia and New Zealand Journal of Developmental Disabilities*, 19(3), 193-207.
- Wacker, D. P., Berg, W. K., Berri, P., & Swatta, P. (1985). Generalisation and maintenance of complex skills by severely handicapped adolescents following picture prompt training. *Journal of Applied Behaviour Analysis*, 18(4), 329-336.

- Williams, G. E., & Cuvo, A. J. (1986). Training apartment upkeep skills to rehabilitation clients: A comparison of analytic strategies. *Journal of Applied Behaviour Analysis, 19*, 39-51.
- Wolery, M., Bailey, D. B., Jr., & Sugai, G. M. (1988). *Effective Teaching: Principles and Procedures of Applied Behaviour Analysis with Exceptional Student*. Boston: Allyn & Bacon.
- Wolery, M., Ault, M. J., & Doyle, P. M., (1992). *Teaching Students with Severe to Moderate Disabilities: Use of Response Prompting Strategies*. White Plains, N.Y: Longman.