RESEARCH METHODOLOGY
CHAPTER II

RESEARCH METHODOLOGY

3.1 Introduction

The study is designed to explore the vocabulary knowledge of English as a second language learner (ESL) of children who are native speakers of Kannada. Two groups of children - normal students and children with dyslexia will be examined for vocabulary knowledge through a manual based test employing questionnaire and a computer based test using DMDX software. Lexical items chosen from school text books that contain list of synonyms and antonyms will be administered on children to measure accuracy and reaction time using DMDX; through questionnaire for vocabulary knowledge, and familiarity. The stimuli are designed in graded levels of easy, average, and difficult with reference to four factors – groups (ESL normal students and ESL children with dyslexia), socioeconomic status (low, middle and high), grade (6th-7th, 7th-8th, 8th-9th), and gender (M & F). Therefore, the study on lexical categories investigates and interprets about the score on each test with reference to four factors.

3.2 Secondary data collection

The present study was systematically carried out on the basis of relevant secondary data such as annual reports of selected public and private undertakings, related professional journals, encyclopaedia, books, research papers, articles in journals and personal communication with authors.

3.3 Primary data collection

Primary data has been collected from many sources. The bases for the sources are theoretical, empirical, and observation of behaviour of the participants.

3.3.1 Theoretical: On the basis of theoretical information derived from the review of literature, questionnaire has been prepared by classifying the corpus of lexical categories of synonyms and antonyms for ESL learners. Data was obtained by administering the questionnaire on the participants.

3.3.2 Empirical: The corpus of lexical categories of synonyms and antonyms for ESL learners was designed as per the prescribed norms. Task materials, design, trials, etc. will be mentioned in detail in the later section.
3.3.3 **Observation:** Observation is a useful method in linguistic research methodology. It is used in the present study in order to observe the performance of the individuals on the tasks.

3.3.4 **Participants:** 214 participants among whom 180 students were normal students (NS) and 34 students with Dyslexia (DS) participated in this present study. The study was conducted in Government schools with Kannada as the medium of instruction but English was taught as a subject as per TLF (Three Language Formula) enforced in the State of Karnataka. Care was also taken to control age, gender, background knowledge and socioeconomic status across the entire sample since these variables could affect vocabulary learning strategy. All the subjects were from three different schools and three different age groups and had exposure to English as a subject from sixth standard; the first language and the mother tongue of all the participants was Kannada, the state official language in Karnataka.

**Figure (1): Structure of the Methods**

![Diagram showing the structure of the methods]

3.4 **Place of the Study**

This study was conducted on normal children and children with dyslexia in Mysuru district, Karnataka State, India, that typically represents ESL environment students.

**Mysuru:** Mysuru district lies in the Southern Maidan (Southern Plateau) and it is in the southernmost part of Karnataka State. Also known as the cultural capital of Karnataka Mysuru is the second largest city in the State of Karnataka, India. It is the headquarters of Mysuru districts and the Mysuru division and lies about 146
kilometres (91 miles) southwest of Bangalore, the capital of Karnataka. Mysuru district is located between latitude of 12°18’ N and longitude of 76°39’ E, (“Mysuru District”, 2017) and it spans over an area of 128.42 sq km.

3.5 Design of the study
The following stages were conceived for the current research study: Kannada – ESL learner’s vocabulary knowledge of socioeconomic status students (low, middle, high (LSES, MSES, HSES)) and dyslexia students will be assessed in the following areas of Synonym and Antonym.

3.6 Stage I: Development and Familiarity rating of the stimuli for questionnaire and DMDX
Stimuli for lexical categories was prepared using questionnaire and DMDX software was prepared and subjected to normal students (NS) and students with Dyslexia (DS).

3.6.1 Group – Normal Students (NS) & Dyslexic Students (DS)
The Synonyms and antonyms words are selected from English text books of 1st to 9th grade Government medium schools. Three sets of words lists comprising Synonyms and Antonyms of lexical categories were prepared for the three grades (6th-7th, 7th-8th, 8th-9th) respectively. The list was further subdivided into three levels – Level 1: Easy; Level 2: Average; Level 3: Difficult with 25 words at each word level (easy, average, and difficult). For each stimulus, three choices were provided for both synonym and antonym categories according to the grades to examine vocabulary knowledge of the students.

There were three types of target words: one semantically related target, two semantically unrelated targets as primes. Thus, a total of 75 words for each level are prepared individually for synonym word list and antonym word list. After the preparation of the stimuli, the words were subjected to rating for familiarity by two Speech-Language Pathologists. They were asked to rate the test item on a five point rating scale and to suggest any relevant modification to be incorporated. The examiner also ensured that the stimuli in the questionnaire and in DMDX software were appropriate for easy level, average level, difficult level according to the grades (6th-7th, 7th-8th, 8th-9th). According to the rating received and the suggestions put forth by the Speech-Language Pathologists the test stimuli were finalized and modified.
Figure (2): The flowchart shows the procedure.

STAGE I: Development and Familiarity rating of the stimuli for questionnaire and DMDX

STAGE II: Selection of the final stimuli

STAGE III: Administration of the targeted stimuli on students

STAGE IV: Procedure Test Administration
3.7 Stage II: Selection of the final stimuli

270 words, 135 words for synonyms word list and 135 words for antonym word list were finalized considering the familiarity rating on the scale from (3 – 5) by judges. 45 words for each grade with 15 words each for 3 levels of difficulty were selected by the investigator from the total pool of 270 words. Group – Normal students (NS) and Dyslexic student (DS) were administered the list of words as detailed in the procedure. The items were finalized based on the following criteria:

a. Items with rating (3 – 5) score for familiar and most familiar for each word level under each grade was retained.

b. Those items with rating scale of 1-2 score were excluded from the list.

3.7.1 Methodological constraints

The methodological challenge is to construct stimulus sets which are matched for each SES group and also for grade. The difficulty in this design is to find different words but has same meaning which can be applied to the particular age level.

3.8 Stage III: Administration of the targeted stimuli on subjects

The students were selected from three different governments schools with Kannada as the medium of instruction from Mysuru South zone area where English was taught as a subject. To collect the personal data of each student and carry out the treatment phase, data collection permission letters were acquired from Deputy Director of Public Instruction (DDPI) officer of Mysuru South Zone and submitted to each government school.

3.8.1 Participants in the study

214 students were selected for the study. The participants were chosen based on their family status, parents educational status, parents income, grade, language etc. The classification of the participants in the present study is as follows:

3.8.1.1 Group - Normal Students (NS)

Normal students – 180 students participated in both the manual test - questionnaire and technical test - DMDX from three different schools
Table (1): Distribution of Normal Students

<table>
<thead>
<tr>
<th>School</th>
<th>SES</th>
<th>T.T</th>
<th>Gender</th>
<th>Grade</th>
<th>No. of Students</th>
<th>T.T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>M</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 1</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>M</td>
<td>6-7</td>
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<td></td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>F</td>
<td>7-8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8-9</td>
</tr>
<tr>
<td>No. 2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>M</td>
<td>6-7</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>F</td>
<td>7-8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8-9</td>
</tr>
<tr>
<td>No. 3</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>M</td>
<td>6-7</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td>F</td>
<td>7-8</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8-9</td>
</tr>
</tbody>
</table>

3.8.1.2 Group – Dyslexic Students (DS)

Dyslexic students – 34 participated in manual questionnaire from three different schools

Table (2): Distribution of Dyslexic Students

<table>
<thead>
<tr>
<th>School</th>
<th>SES</th>
<th>Grade</th>
<th>No. of Students</th>
<th>T.T</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 1</td>
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<td>2</td>
<td>6-7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>7-8</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>8-9</td>
<td></td>
</tr>
<tr>
<td>No. 2</td>
<td>2</td>
<td>2</td>
<td>6-7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>7-8</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>8-9</td>
<td></td>
</tr>
<tr>
<td>No. 3</td>
<td>1</td>
<td>-</td>
<td>6-7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>2</td>
<td>7-8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>-</td>
<td>8-9</td>
<td></td>
</tr>
</tbody>
</table>

3.8.2 Selection criteria for the normal students in the study

- SES
  The Socio-economic status of participants was controlled as well by collecting information, through questions, about the participants’ social background such as their parent’s level of education, their total family income per month and parents occupation. To check all this Socio-economic status Scale – 2011 was administered (Venkatesan, 2011).

- Grade
Students of 6\textsuperscript{th} - 7\textsuperscript{th} (age range 11-11.11), 7\textsuperscript{th} - 8\textsuperscript{th} (age range 12-12.11), 8\textsuperscript{th} - 9\textsuperscript{th} (age range 13-13.11).

- **Language**
  Native speakers of Kannada language.

- **No other disability**
  Absence of physical ailments or auditory disorders

- **School**
  Kannada medium Government schools Mysuru south zone schools where English is one of the subjects for the students.

### 3.8.3 Selection criteria for the dyslexic students in the study

- **Dyslexic Analysis Test**
  Dyslexic students were collected through the test; Early Reading Skills (ERS) Screening Version– Gwaenneth Rae and Thomas C. Potter (1981). Total of 8 different tests were administered to each student 1) Auditory Discrimination (AUDISC) 2) Phoneme – grapheme – correspondence Level – 1, Identification of beginning consonants (PGCL 1A) 3) Phoneme – grapheme – correspondence Level – 1, Identification of ending consonants (PGCL 1B) 4) Phoneme – grapheme – correspondence Level – 2, Identification of beginning consonants (PGCL 2A) 5) Phoneme – grapheme – correspondence Level – 2, Identification of blends (PGCL 2C) 6) Structural Analysis – Level – 1 (SAL-1) 7) Structural Analysis – Level – 3 (SAL-3) 8) Oral reading.

- **SES**
  Socio-economic status Scale (Venkatesan 2011) was administered to check SES.

- **Grade**
  Students of 6\textsuperscript{th} - 7\textsuperscript{th} (age range 11-11.11), 7\textsuperscript{th} - 8\textsuperscript{th} (age range 12-12.11), 8\textsuperscript{th} - 9\textsuperscript{th} (age range 13-13.11).

- **Language**
  Native speakers of Kannada language.

- **No other disability**
  Absence of physical ailments or auditory disorders

- **School**
Kannada medium Government schools Mysuru south zone schools where English is one of the subjects for the students.

3.9 Stage IV: Procedure- Test Administration

The finalised test consisting of list of words from synonyms categories and antonym categories from stage II will be administrated to the students. These words are administrated manually and through computerized program using DMDX on students. The following section gives details regarding development of questionnaire and programming stimuli using DMDX software.

3.9.1 Questionnaire – Manual part of the research

Questionnaire is a list of questions and / or words given to the participants in a quiet room on one-on-one basis. The main purpose of the questionnaire is to infer the students’ knowledge on vocabulary words and their usage. The questionnaire consist list of words of lexical items in synonyms and lexical items in antonyms. One of the objectives of this questionnaire is to find the out the vocabulary knowledge of Groups (NS & DS), SES (L, M, & H), grade (6th -9th) and gender (M & F).

The questionnaire was designed to elicit two different data sets. First set of questions was to elicit knowledge of words by choosing the appropriate word from the three given choices for the stimulus. The reaction time was compiled for analysis. In the second data set the questionnaire with the word and choices are given to the students. The students are asked to tick the options for word indicating if it is familiar word or non familiar word followed by the choices, indicating if it is familiar choice or non familiar choice. Thus two sets of data (vocabulary knowledge and familiarity) were derived using the questionnaire.

3.9.2 Computerized task with support from DMDX Software

In addition to obtaining data on questionnaire, computerized task paradigm with the help of DMDX software was designed to obtain objective data. DMDX software version 4.0 was used to assess the accuracy and reaction time of the participants for the words from the lexical category (synonyms and antonyms) was presented. As many experiments have been conducted to measure the vocabulary knowledge with the visual stimuli that appear on the screen computerized program using DMDX software was employed in the present study.
3.10 DMDX Software

DMDX is a powerful software technique that has been used previously in various domains such as psychology and speech-language pathology. DMDX is a member of the DMASTR family, and represents an extension of the original DOS programs (DM and DMTG) to a Windows 95/98 environment, will be programmed according to the test stimuli. It is developed by The University of Arizona. It is a runtime environmental experimental stimulus for gathering response. Its strength lies in its precise control. It is appropriate for perceptual experiments (auditory, visual) where very accurate timing is required. As per Foster and Forster (2003), DMDX is a windows display program with millisecond accuracy. Recently, this technique has been used to record the reaction time as well as the accuracy in the field of linguistics, more particularly cognitive linguistics, Psycholinguistics and Neurolinguistics etc., DMDX has many major rules such as to compute the syntax data, present them automatically as visual stimuli on the computer screen, and record both the accuracy and the reaction time of the task.

DMDX has been designed to examine participants and to obtain the accuracy and the reaction time; the speed and the performance. All the lexical words for normal SES groups have been designed and implemented in DMDX software. In DMDX, the accuracy and the reaction time are the prominent measures to examine lexical categories of Kannada - ESL learners. Therefore, the study is expected to provide objective data (Accuracy and reaction time) for vocabulary processing by ESL learners for synonyms and antonyms.

3.10.1 Prerequisites to load DMDX software

3.10.1.1 System requirements

DMDX requires a Pentium PC running Windows 95, 98,988SE, ME, XP, or Windows 2000, with at least Direct X 7 providing some enhanced timing.

3.10.1.2 Operating modes

DMDX runs into several different modes. The standard mode is a simple response time (RT) situation, in which the participant makes a binary classification of the input. In the current study DMDX records the nature of each response. DMDX also provides a digital VOX mode, designed for recording vocal onset latencies. This eliminates the need for an external device. Users can specify the threshold intensity required to trigger the VOX, and have the option of obtaining a wav file output for each trial,
indicating the point at which the VOX was triggered, so that after the testing session, the experimenter can review the appropriateness of the trigger point, and adjust the measured RT accordingly.

3.10.1.3 Types of display
As per Forster (2003), DMDX supports standard windows of graphic and audio stimuli. Graphic which includes Windows font, .bmp and .jpg files. An audio file, on the other hand, does include sound files (.wav files) which can be played simultaneously with graphical displays. Considerable effort has gone into the procedure for synchronizing visual probes with audio files. Support for the display of digital video files (.mpg, .mov or .avi) is also provided. Users can measure RTs to critical frames within these files, although the timing here is more subject to variability.

3.10.1.4 Equipments
These equipments have been used in implementing the tasks in DMDX.
- To administer the stimuli, Toshiba Satellite, 14” Laptop (Black) was used.
- DMDX software version 4.0.4.4 (Forster & Forster, 2003), was used as a useful software in various psychological tests, especially in assessing, memory, reaction time, and other cognitive processes. It is used for calculating the reaction time and accuracy of the lexical decisions.

3.11 Paradigm designing for the study
270 lexical items selected for both synonyms and antonym category were programmed on DMDX software. All the lexical items were computed in DMDX software program to measure accuracy and RT of normal students. Design of 270 words in the lexical categories is shown in Figure (3).

Figure (3): Total number of words appearing on the screen

3.12 Design the paradigm and strategies in presenting the stimuli
(Synonym words and Antonyms words)
Examples
1. Synonym and Antonym words in the six tests (SE, SA, SD, AE, AA, AD) for 6th – 7th Grade:

**Table (3): One sample word for each task**

<table>
<thead>
<tr>
<th>TESTS</th>
<th>WORDS</th>
<th>CHOICES (tick the best option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>Wrong</td>
<td>Not right</td>
</tr>
<tr>
<td>SA</td>
<td>Wrong</td>
<td>Valid</td>
</tr>
<tr>
<td>SD</td>
<td>Wrong</td>
<td>Honest</td>
</tr>
<tr>
<td>AE</td>
<td>Bright</td>
<td>Dim</td>
</tr>
<tr>
<td>AA</td>
<td>Bright</td>
<td>Happy</td>
</tr>
<tr>
<td>AD</td>
<td>Bright</td>
<td>Pale</td>
</tr>
</tbody>
</table>

**Note:** SE = Synonym Easy, SA = Synonym Average, SD = Synonym Difficult, AE = Antonym Easy, AA = Antonym Average, AD = Antonym Difficult.

Each lexical item of each test is selected from the corpus of 270 lexical items. Each test has 15 items for each SES with 45 words for each grade. As shown in Table (3), the stimuli are graded in complexity from easy level to average level to difficult level of the words.

**3.13 Plan of presentation of the stimuli**

The design of the program in the present study is as follows:

1. 15 easy level words should appear on the screen one after another automatically.
2. After easy word level, the 2nd level – Average should appear on the screen one after another automatically.
3. 3rd level – Difficult word level should appear on the screen.

The strategy should be as the following:

**Figure (4) Strategy of the lexical items processing from word to choices in Synonym categories**

First, Synonym word emerged (2000ms)  
Gap (1000ms)  
Second, Synonym choices emerged (2000ms)
According to the paradigm, the time has given to all the participants as 5000msec. for each and every item (2000 mses. + 1000 msec. + 2000 msec.) which means that each item is going to take five seconds for the whole process; on-set and off-set. The following examples show how the process has to be implemented in the DMDX program to measure accuracy and the RT of the lexical processing in Kannada ESL – learners in all the tests of the study, SE, SA, SD, AE, AA, and AD.

Figure (6) Appearance of the PPT lexical item on the screen of the first task (SE) in Synonym word list
Each of these words is designed in a Microsoft office Power Point, the word in the first row and the three choices in the second row.

**Figure (7) Appearance of the JPG lexical item on the screen of the first task (SE) in Synonym word list**

![Image of Figure (7)](image)

After designing in PPT each slide is changed into JPG format in a separate folder for each level (Easy, Average, and Difficult) and rtf. item file containing codes are created in Microsoft word to support the design of the program in DMDX software.

**3.14 DMDX Item File**

Each and every item file has to start with a header line. Therefore, the header line sets various parameters for the experiments. An example is shown below:

```
<azk> <cr> <fd 17> <d 169> <t 5000> <vm 1366, 768, 768, 32 , 0> <id keyboard>
<id recordvocal, 5000> <nfb> <dbc 255255255> <dwc 0>
```

Every item from each test is changed into JPG format as shown in the Figure (7) and then into software. The example of each word process has been presented below and loaded into the software as well as on the screen as follows:
How to run DMDX

DMDX program has been strongly employed as a very helpful and useful tool in the field of linguistics (Athaifani, 2014b). To run the item file click the Run button, press ESC when the item file is finished to save the data. DMDX's primary dialog presents the name of the item file to be run and a browse button to change it. To exit DMDX click Exit, to use another dialog just select it from the menu (the current DMDX and TimeDX dialogs don't need to be exited manually). To perform syntax checks (analogous to ICHECK) click the Syntax Check button (the screen shot is of a syntax check). The syntax check will not display items as they are processed, nor will it perform any branching -- it will parse the entire file and check for the existence and integrity of any bitmaps or wave files (inc. cursor names) that are used, it even checks that the destinations of branches exist too.

Procedure

- Obtaining the consent letter from the schools and students who participated in the study. The participants were also informed about the right to withdraw participation from the test whenever needed.
- The procedures were tested individually in a quiet environment with minimal background noise in their schools. To increase the sensitivity of the test DMDX software has the facility which helps in varying background noises.
- The participants were seated in a comfortable position facing 15 inches screen of Toshiba laptop.
- Participants were given few trials to make them feel comfortable during the session because of the varying difficulty levels of the tasks and poor self-esteem issues among many dyslexic students (Caroll and Iles, 2006). Next the participants are instructed to be ready for the task,
focussed on the screen, when the stimuli appeared on the screen, the participants have to read the stimuli and they have to say the correct option through the microphone for the particular word shown in the screen. The words or questions were answered in terms of familiarity and each word appears within the time from of 5000 msec, either the participant’s answers or not answers after pressing the any keys, everything will be recorded automatically in a folder. In other words, the student’s response was recorded with a button press and was saved as separated files. These audio files were used for RT measures. RT was measured from the start of the utterance of the response till the end time on the screen for each word within the given duration of 5000 msec. When the response is not received within 5000 msec and time elapses, another stimulus emerges on the screen till the last word of the lexical item. Consequently, the tasks were presented in increasing order of difficulty. The procedure is done for the other five tests for each SES level for each grade.

- Following the completion of each test sections the examiner rewarded the participant using verbal praises and they were given a tangible reinforce at the end of the complete test.

3.17 Responding Mode

The way of responding would be either by keyboard or by verbal mode for each item. If by keyboard, the participant has to press either (1) or (0), if by reading, the participant has to read the lexical item aloud. In this case, participants required a microphone for doing so. In this current study, the microphone has been used. The participants were instructed to utter the correct answer to the target stimulus presented on the screen and choices given in the task as quickly and as accurately as possible into an external microphone that was connected to the computer. Each participant of each grade received 90 words, the process has been designed systematically and the visual stimuli containing words on the screen were also systematically presented. The accuracy is the correct word the students responds and reaction time is the time duration between stimulus presentations to appearance of the first verbal output. So, reaction time in millisecond was recorded and saved in audio software.

Practice stimuli were given before the experimental trial began. Three short breaks were included in the test between the two lexical categories to prevent subject
fatigue. A single experimental session for each student of 45 words lasted about 60 minutes.

3.18 Summary of the Research Methodology Chapter

The present study has two students groups NS and DS. Theoretically, it was formed on well-designed questionnaire. The 6 sets of stimuli in the questionnaire was based on Synonyms of three sets and Antonyms of three sets of each levels (easy, average and difficult), with regard to SES groups, grades. These 6 sets of questionnaire is analyzed by two speech language pathologist and administered to the 214 student participants. Computerized DMDX software has been employed for administering the 6 sets of experiments of the study only to Normal students group. Trials have been given to the participants to be accustomed with the experiments. The following chapter will present the results of data analysis.