3.1 Statement of the Problem
3.2 Variables Under the Study
3.3 Operational Definition of Key Terms
3.4 Objectives of the Study
3.5 Hypotheses Formulated
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3.7 Tools Used
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3.12 The Treatment
3.13 Threats to Experimental Validity
3.14 Delimitation of the Study
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Methodology

Methodology is the systematic theoretical analysis of the method applied to a field. It comprises the theoretical analysis of the body of method and principles associated with a branch of knowledge. It typically encompasses concepts such as paradigm, theoretical model, phases and quantitative techniques (Howell, 2013). It is about principles of how to conduct research and the theory is applied.

The accomplishment of any research work will be done depending upon the type of method used in the study. This chapter of ‘methodology’ includes statement of the problem, which justifies the study, variables under the study, operational definition of key terms, objectives of the study, hypotheses formulated, sample, tools used, method employed in the study, design of the study, development of the package, the treatment, delimitations and limitations of the study, and statistical techniques employed.

3.1 Statement of the Problem

The researcher wished for enhancing the vocabulary of the Standard IX students as she had understood through her field experience that they lack over English vocabulary. The researcher being an English teacher, wanted to experiment with the help of computer in helping the secondary students to acquire vocabulary. In the regular classrooms, the
students were not given much chance to practice vocabulary through innovative computer technology. She felt that the traditional methods would not support them in acquiring vocabulary interestingly and effectively. So, the secondary students lack effective communication skills using apposite vocabulary. To surmount this problem and also to assist the students in enriching their vocabulary, the researcher wanted to introduce computer in the place of the conventional method.

Vocabulary is an element for a successful development of communication. Rich vocabulary is an ongoing challenge for learning language and literature. Students must have a significant vocabulary to be able to learn new words from the context in which they appear. Unfortunately students are not properly encouraged in most of the schools to take it as a challenge in acquisition of vocabulary. Many words are not understood by the students due to less effort taking in reading. Vocabulary exposure in the home environment is not influential due to less advantaged parents. Words that are not heard or read cannot be learned. The limited available vocabulary learning from the texts give less practice to think new words. Without acquiring substantially more meanings students will continue to be at considerable risk of low achievement. Language, a skill, can be attained only by practice. Students are taking priority for scoring marks in the examinations not on extensive reading to enhance vocabulary. Communication in English is deplorable at school level as it is not made mandatory in educational institutions.

When one’s memory is not loaded with hesitation about the correct spelling, pronunciation and contextual use of words, one can concentrate fully on higher level aspects of language such as using precise sentence structures and appropriate expressions for the type of conversation that is going on. Students with smaller vocabularies will continue to lag behind students with larger vocabularies.
As the researcher realized the need of the importance of vocabulary which every secondary student should acquire for strengthening his or her communication skills, and comes to know from the reviewed studies that the computer based instruction would be more apt to enhance students’ vocabulary, she wished to perform this research “effectiveness of computer based instruction for the acquisition of English vocabulary of secondary school students”.

### 3.2 Variables Under the Study

A variable is a characteristic of events, people, animals or objects that take on different values, that is, varies (Evans & Rooney, 2008). A variable is some aspect of a testing condition that can changing or taken on different characteristic with different conditions (Mcburney, 2006). There are two types of variables involved in this study, namely, dependent variable and independent variable.

- **Dependent variable:** It is a measure of the behaviour of the subject that reflects the effects of the independent variable (Mcburney, 2006). In this study, the dependent variable is ‘Acquisition of English vocabulary’.

- **Independent variable:** The condition manipulated or selected by the experimenter to determine its effects on behaviour (Mcburney, 2006). In this study, the independent variable is ‘Computer Based Instruction’.

### 3.3 Operational Definition of Key Terms

An operational definition ascribes meaning to a construct by specifying operations that researchers must perform to measure or manipulate the construct. Operational definitions may not be as rich as constitutive definition but essential in research because
investigators must collect data in terms of observable event (Ary, Jacobs & Sorensen, 2010).

The operational definition of the key terms used in this study are given hereunder, which ensures that everyone concerned understands the particular way the key term are being used.

i) Effectiveness:

It refers to producing indented result.

ii) Computer based instruction:

It refers to a method of teaching with computer as a teaching aid to make the teaching very effective.

iii) Acquisition:

Acquisition means the act of gaining.

iv) English vocabulary:

It refers to the words which have different contextual meanings in second language, taught for Standard IX students at Indian Certificate of Secondary Examination (ICSE) Board.

v) Secondary students:

It refers to the wards studying Standard IX of ICSE in the academic year 2011-2012.

3.4 Objectives of the Study

Objectives are short statements that describe exactly what is needed (Norman, 2008).

The objectives of this study are:
i. To develop a package for vocabulary acquisition in English;

ii. To find the effectiveness of computer based instruction on the acquisition of English vocabulary of secondary school students;

iii. To find out the significant difference, if any, in the pretest scores of the vocabulary acquisition among the control group taught by conventional method, experimental group I taught by computer based instruction and experimental group II taught by conventional method cum computer based instruction;

iv. To find out the significant difference, if any, between the pretest and post-test scores of the sample groups;

v. To find out the significant difference, if any, among the gain scores of the sample groups;

vi. To find out the significant difference, if any, among the scores of delayed posttests of the sample groups;

vii. To identify the influence, if any, of difficulty level of words on the acquisition of vocabulary in English; and

viii. To identify the influence, if any, of intelligence on the acquisition of vocabulary in English.

3. 5 Hypotheses Formulated

A hypothesis is a tentative statement about the relationship between two or more variables (Cherry, 2014). It is an educated guess about the relationship between
variables. It reveals that hypothesis comes from previous research (Evans & Rooney, 2008). In the light of the objectives, the following hypotheses were formulated for the present study.

i. There is no significant difference in the acquired vocabulary in English among the control group and the two experimental groups before treatment.

ii. There is significant difference between the pre-acquisition and post-acquisition of vocabulary of the three sample groups.

iii. There is no significant difference among the gain scores of the control group and the experimental groups I and II.

iv. There is no significant difference among the scores of delayed post test obtained by the control group and experimental groups I and II.

v. There is no significant difference in the acquisition of vocabulary of the control group and two experimental groups with regard to the level of difficulty of words.

vi. There is no significant difference in the acquisition of vocabulary of the control group and two experimental groups with regard to the level of intelligence.

3.6 Sample

A sample is part of a population which is actually observed (Cloud, 2008). The performance of a sample is used to make an inference about the performance of the larger group (Gay & Airasian, 2000).
The investigator selected 72 students of standard IX from a school following ICSE board at Renukoot, Sonebhadra District in Uttar Pradesh to serve as control and two experimental groups. There were 24 students each in the Control group, Experimental group I and experimental group II. All the sample students in the three groups were aged between 14 and 15.

3.7 Tools Used

Tools are instruments used to collect data, both quantitative and qualitative, for a research problem. Two tools were used for this study, namely, i) Non-verbal intelligence test and ii) LeWi’s Vocabulary test in English.

The description for these two tools is detailed below.

3.7.1 Non-verbal Intelligence Test

Non-verbal intelligence test (NVIT), a standardized tool developed by Atmananda Sharma (2007), was used to confirm the homogeneity of both the control and the two experimental groups. NVIT contains a series of 25 visually presented problems. These items were in simple language and the students were directed to choose the number against the right answer. Each right answer carries one mark. The wrong and unattempted questions carry no marks. The time allowed for the test is 15 minutes. It is applicable to children of ages 10 years plus to 16 years plus and is culture free. The score of the intelligence test is the total of the scores obtained for all the items. The norms for the test were expressed in terms of standard scores, stanine grades, percentile ranks and percentile bands.

Reliability of NVIT:

The reliability of NVIT was estimated using three methods such as: (i) Split-half; (ii) KR-21; and (iii) SEM. The estimate of reliability by KR-21 lends to lower than
matched-half coefficient because it constitutes, given certain assumption, the mean of coefficients obtained by correlating scores on all possible pairs of the test. Another measure of reliability is Standard Error of measurement (SEM); It has great stability across population since it is relatively independent of range of talent, and it may be used to identify limits that have a defined probability of including the true scores. Reliability Indices for classes VIII and X are given in the following Table 3.1

Table 3.1

<table>
<thead>
<tr>
<th>Reliability</th>
<th>VIII</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Split-half</td>
<td>0.94</td>
<td>0.90</td>
</tr>
<tr>
<td>KR-21</td>
<td>0.78</td>
<td>0.75</td>
</tr>
<tr>
<td>SEM</td>
<td>0.98</td>
<td>1.46</td>
</tr>
</tbody>
</table>

**Validity of NVIT:**

Some assessment of its validity could be obtained with scholastic achievement as a criterion. The test was administered to students of Classes VI, VIII, X of three category of school judged as good, average or poor on the basis of result of public examination held by the Central Board of Secondary Education, Delhi.

**Culture Fairness of NVIT:**

The test has been administered in almost all the states for different purposes like awarding merit scholarships, selection of talented children, selection of candidates for jobs. Therefore, data about the distribution of scores was available. It provides some evidence towards culture fairness of the test. For M =12.00 and sd = 6.00, the KR-21 reliability works out as ‘86’ (approximately) which is also very satisfactory.

A copy of NVIT is given in the Appendix 1.
3.7.2 Vocabulary Test in English (VTE)

The researcher constructed and validated the tool entitled “Vocabulary Test in English” (VTE) to measure the acquired vocabulary in English of the sample groups. The preliminary draft of VTE consisted of 227 objective type questions. The topics covered for VTE were eight proses and 11 poems, from Standard IX English book of ICSE Board, given in the following Table 3.2.

Every chosen text has a glossary at the end. But in the VTE, only a few words were chosen from the glossary given at the end of the text. Many words were chosen from text itself and these words were not found in glossary.

Table 3.2

*Portions Covered for Developing VTE*

<table>
<thead>
<tr>
<th>Poems</th>
<th>Proses</th>
</tr>
</thead>
<tbody>
<tr>
<td>If</td>
<td>Astrologer’s day</td>
</tr>
<tr>
<td>River</td>
<td>Dusk</td>
</tr>
<tr>
<td>The road not taken</td>
<td>Case for the defence</td>
</tr>
<tr>
<td>Because I could not stop for death</td>
<td>The tiger in the tunnel</td>
</tr>
<tr>
<td>Night of the scorpion</td>
<td>The umbrella man</td>
</tr>
<tr>
<td>No men are foreign</td>
<td>The sniper</td>
</tr>
<tr>
<td>The Indian who died in Africa</td>
<td>The gift of magi - Part I</td>
</tr>
<tr>
<td>Shakespeare</td>
<td>The gift of magi - Part II</td>
</tr>
<tr>
<td>To Indian my native land</td>
<td>Marriage is a private affair</td>
</tr>
<tr>
<td>Our casuarina tree</td>
<td></td>
</tr>
<tr>
<td>Labella Dame Sans Merci</td>
<td></td>
</tr>
</tbody>
</table>
The questions in the VTE were set on the basis of the difficulty level such as easy, difficult and complex. The researcher decided to have multiple choice items with four options coded a, b, c and d for VTE, because they are the widely used ones among the objective type test items.

**Validity of VTE:**

Validity is an indication of accuracy in terms of the extent to which a reach conclusion corresponds with reality (McBurney, 2006). Validity refers to the purpose for which a study has been undertaken. According to Garrette (1961), validity of a test depends upon the fidelity with which it measures what it purports to measure. The validity of VTE was established by the following two stages, namely, content validity and item validity.

**Content Validity:** Content validity refers to the degree to which the test actually measures, or is specifically related to, the traits it was designed. Content validity is important primarily for measures of achievement. The researcher first determined the widely accepted goals of instruction in the subject and then prepared a blueprint for the test in terms of topics and difficulty level. Test content was drawn from the course content and weighted according to the weightage of the difficulty level.

While preparing the VTE, sufficient care was taken to prepare multiple-choice items with all the grammar of framing objective type questions. The items were shown to three senior teachers handling Standard IX of ICSE and two teacher educators to verify the suitability of the items. On the basis of the recommendations of the experts, ambiguous and overlapping items were either modified or deleted. Thus the content validity was established and thus the tool carried 220 items, covering all the selected topics based on difficulty level, namely, easy, difficult and complex (*Appendix 2a*).

The portion wise distribution of the items is in the Table 3.3.
Table 3.3

Portion-wise Distribution of the Items in VTE

<table>
<thead>
<tr>
<th>S.I.No</th>
<th>Poems/ Proses</th>
<th>No. of items in terms of Difficulty level</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Easy</td>
<td>Difficult</td>
</tr>
<tr>
<td>1.</td>
<td>If</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>River</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>The road not taken</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>Because I could not stop for death</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>Night of the scorpion</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>No men are foreign</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>The Indian who died in Africa</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>Shakespeare</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>To Indian my native land</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>10.</td>
<td>Our casuarina tree</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>Labella Dame Sans Merci</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>Astrology’s day</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>13.</td>
<td>Dusk</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14.</td>
<td>Case for the defence</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>15.</td>
<td>The tiger in the tunnel</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>16.</td>
<td>The umbrella man</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>17.</td>
<td>The sniper</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>18.</td>
<td>The gift of magi - Part I</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>19.</td>
<td>The gift of magi - Part II</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>20.</td>
<td>Marriage is a private affair</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td>80</td>
</tr>
</tbody>
</table>
Item Validity:

Procedure followed for establishing *item validity* of VTE is detailed below:

After getting the prior permission from the head of Higher Secondary School to select 60 students from Standard IX, they were administered VTE comprising 220 items (*Appendix 2a*). The students took about 120 minutes to complete the test. The responses were scored and the item analysis was carried out.

The various steps followed for item analysis are as follows:

Step 1: The answer scripts were arranged in order of scores, from high to low.

Step 2: Upper group was formed by the upper 27 percent scores \(N_1 = 17\) and lower group was formed by the lower 27 percent scores \(N_2 = 17\).

Step 3: The Difficulty value (DV) of each item, which is indicated by the percentages of students who get the item right, was computed using the formula given below:

\[
DV = \left\{ \frac{R_U + R_L}{N_U + N_L} \right\} \times 100, \\
\]

where

- \(R_U\) = Number of Right responses from upper group
- \(R_L\) = Number of Right responses from lower group
- \(N_U\) = Number of students from upper group
- \(N_L\) = Number of students from lower group

Step 4: The discriminative index (DI) is determined by the extent to which the given item discriminates among examinees that differ sharply in the function measured by the test as a whole (Garrett, 1961).
DI was computed using the formula:

\[ DI = \frac{(R_U - R_L)}{N_U} \]

The items having difficulty value between 40% and 80% and discriminative index above 0.20 were selected and the details are presented in Appendix 2b.

The final draft of VTE consisted of 133 items. The portion-wise distribution of the items in the VTE is in the Table 3.4.
Table 3.4

*Portion-wise Distribution of the Items in VTE*

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Poems/ Proses</th>
<th>No.of items in terms of Difficulty level</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Easy</td>
<td>Difficult</td>
</tr>
<tr>
<td>1.</td>
<td><em>If</em></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>River</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>The road not taken</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td><em>Because I could not stop for death</em></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>Night of the scorpion</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>No men are foreign</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td><em>The Indian who died in Africa</em></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>Shakespeare</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td><em>To Indian my native land</em></td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>10.</td>
<td>Our Casuarina Tree</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td><em>Labella Dame  Sans Merci</em></td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>1.</td>
<td>Astrologer’s day</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>Dusk</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td><em>Case for the defence</em></td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>The tiger in the tunnel</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>The umbrella man</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>The sniper</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td><em>The gift of magipart I</em></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td><em>The gift of magi part II</em></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>Marriage is a private affair</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td>69</td>
</tr>
</tbody>
</table>
The details of difficulty level-wise distribution of the items in the final draft of VTE are given in the following Table 3.6.

Table 3.5

*Level of Difficulty-wise Distribution of Items in VTE*

<table>
<thead>
<tr>
<th>Proses/Poems</th>
<th>Easy</th>
<th>Difficult</th>
<th>Complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qn Nos.</td>
<td>No. of Items</td>
<td>In %</td>
<td>Qn Nos.</td>
</tr>
<tr>
<td>Proses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12, 16, 42, 43, 70, 72</td>
<td>14, 15, 17, 19, 20, 21</td>
<td>18, 25, 87, 88</td>
<td>113, 114, 136, 137</td>
</tr>
<tr>
<td>Poems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, 5, 8-10, 22, 23, 29, 34, 35</td>
<td>6, 7, 13, 14, 31, 33, 55</td>
<td>2, 3</td>
<td>56, 78, 79, 98, 99</td>
</tr>
<tr>
<td>54, 57, 62, 63, 75, 76, 80-82, 100</td>
<td>145</td>
<td>146, 148, 149, 150</td>
<td>120, 168</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>69</td>
<td>24</td>
</tr>
</tbody>
</table>
Reliability of VTE

The reliability of VTE was established by split-half method. In the split-half method, the test is divided into two equivalent halves by considering all the odd numbered items as a set and the even numbered items as a separate set. The correlation (r) for these half-test was found to be 0.64. From the self-correlation of the half-test, reliability coefficient of the whole test (r’) was computed by the Spearman-Brown prophecy formula (Garrett, 1961). The value of r’ was found to be 0.87 which indicates that the tool, VTE is highly reliable (Best & Kahn, 2006).

The final draft of VTE comprising 133 questions is given in Appendix 2c.

3.8 Development of Lewi’s Package on English Vocabulary (LPEV)

The software for teaching vocabulary was developed to teach the text through computer based instruction. It is a combination of various forms such as audio, images and text. The software was developed in such a way that any secondary student can play and learn the text, for which a minimum operating knowledge of computer is enough.

The LeWi’s Package on English Vocabulary (LPEV) was prepared to enable the students to learn visually with the help of multimedia. It was supported with pictures, audio, and examples of how the word can be used. The difficult words were highlighted and when it was clicked the visual view of the word, the audio file for pronunciation of the words and examples for understanding how it could be used are seen.

The purpose of a web browser is to read HTML documents and compose them into visible or audible web pages. The browser does not display the HTML tags, but uses the tags to interpret the content of the page. The prose and the poem can be seen in the front end. On the right, the list of the prose and the poems, which when clicked will be
shown in the main screen. The prose and the poems consist of few tough words highlighted.

When the highlighted word is clicked, it gives the meaning, pronunciation, image, audio effect and an example for its usage. For each word, a link created is highlighted. Java script runs for background colour option.

The hard copy of LPEV is presented in Appendix 3.

### 3.8.1 Features of LPEV

- Simple straightforward and down to earth tools, not only update vocabulary knowledge but also to have an enjoyable reading time.
- LPEV stands out for its simple looks.
- LPEV has a readable font which does not hurt eyes.
- This will not disinterest a person who wants to read for a long time.
- It is very easy to navigate through the LPEV.
- The links to different stories and poems are mentioned on the left side frame and the main body text comes at the top right frame.
- There are no distractions while using LPEV which is a great relief as one can concentrate on the work at hand.
- The preset colour combination provided is a joy to use.
- LPEV gives the meaning and examples for the new highlighted words along with the audio recorded pronunciation.
- Three background colour option based on research which would be favourable for reading.
The entire front end work was done using HTML and CSS. HTML is the main markup language for creating web pages and other information that can be displayed in a web browser. The purpose of a web browser is to read HTML documents and compose them into visible or audible web pages. The browser does not display the HTML tags, but uses the tags to interpret the content of the page. HTML elements form the building blocks of all websites. HTML allows images and objects to be embedded and can be used to create interactive forms. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. It can embed scripts written in languages such as Java Script which affects the behaviour of HTML web pages.

CSS is designed primarily to enable the separation of document content (written in HTML or a similar markup language) from document presentation, including elements such as the layout, colours, and font. This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple pages to share formatting, and reduce complexity and repetition.

In the structural content (such as by allowing for tableless web design), CSS can also allow the same markup page to be presented in different styles for differing rendering methods, such as on-screen, in print, by voice (when read out by a speech-based browser or screen reader) and on Braille-based tactile devices. It can also be used to allow the web page to display differently depending on the screen size or device on which it is being viewed.
3.8.2 System Specification- Hardware

Computer with the following configuration can be used to test this project.

- Processor : intel Dual Core 2 60 GHZ
- Speed : 2.53 GHz
- RAM : Not less than 256 MB
- Hard Disk : 40 GB
- Keyboard : 104
- Mouse : Optical mouse
- Monitor : Min 18inch

3.8.3 System Specification- Software

The following software is used for the development of this system

- Operating system : windows 7
- Server Software : XAMPP
- Front End : Hyper text markup language(HTML), Cascading style sheet (CSS), Java script
- Back End : PHP ,SQL
- Database : MySQL

3.8.4. Technology Used

XAMPP(X Apache, MySQL, PHP and Perl)was used for this set up. Apache server was used for implementing of Software Vocabulary Acquisition (SVA) application. Structured Query Language (MySQL) was used to connect to the server. Personal Home Page (PHP) was used for back end and Hyper Text Mark-up Language (HTML) was used for front end.
Structured Query Language (MySQL) is used to manage data contained within the databases. Users may use the command line tools, or use MySQL "front-ends", desktop software and web applications which create and manage MySQL databases, and data structures, back up data, inspect status, and finally work with data records. The official set of MySQL front-end tools, MySQL Workbench is actively developed by Oracle, and is freely available for use.

The entire front end work was done using Hyper Text Markup Language (HTML) and Cascading Style Sheets CSS about which is described below.

HyperText Markup Language (HTML) is the main markup language for creating web pages and other information that can be displayed in a web browser.

HTML is written in the form of HTML elements consisting of tags enclosed in angle brackets (like <html>), within the web page content. HTML tags most commonly come in pairs like <h1> and </h1>, although some tags, known as empty elements, are unpaired, for example <img>. The first tag in a pair is the start tag, and the second tag is the end tag (they are also called opening tags and closing tags). In between these tags web designers can add text, tags, comments and other types of text-based content.

HTML elements form the building blocks of all websites. HTML allows images and objects to be embedded and can be used to create interactive forms. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. It can embed scripts written in languages such as JavaScript which affects the behaviour of HTML web pages.

Personal Home Page (PHP) is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP is now
installed on more than 244 million websites and 2.1 million web servers. Originally created by Rasmus Lerdorf in 1995, the reference implementation of PHP is now produced by The PHP Group. While PHP originally stood for Personal Home Page, it now stands for PHP: Hypertext Pre-processor, a recursive acronym.

PHP code is interpreted by a web server with a PHP processor module which generates the resulting web page: PHP commands can be embedded directly into an HTML source document rather than calling an external file to process data. It has also evolved to include a command-line interface capability and can be used in standalone graphical applications. PHP can be deployed on most web servers and also as a standalone shell on almost every operating system and platform, free of charge.

The procedure for installation of LPEV is given in the Appendix 4.

3.9 Method Employed in the Study

The method used in this study was experimental method. This experimental research sought to determine if the treatment influenced the acquisition of vocabulary in English. Three groups of Standard IX students studying in the same school were selected for the Control group, Experimental group I and Experimental group II. The impact of the treatments were assessed by providing two different treatments to the two experimental groups and withholding it from another group, say control group and then determining how all the three groups scored on the outcome in the pre-test, post-test and delayed post-test (Nakata, 2008).
3.10 Design of the Study

Design is the basis of experimentation (Gavin, 2008). The purpose of the basic experimental design is to estimate how much change (if any) is attributed to an experimental intervention (Maxim, 1999). Research design is an important component of the research process of establishing cause and effect relationships (Vockell, 1983).

The researcher employed the Pretest-Posttest Equivalent Group Design (Best & Kahn, 2006) for the present study. The three groups of students studying in Standard IX, who are equivalent with regard to intelligence scores and performance in English in the half-yearly examination.

The following five steps were followed in the study.

*Step 1 - Grouping the sample into three equivalent groups:* At this stage, the sample representing the students were divided into three groups namely control group, experimental group I and experimental group II with regard to intelligence scores and the performance in English in the Half-yearly examination to corroborate the homogeneity of the three sample groups.

*Step 2 - Administering pre-test for the three groups:* At this stage, the control and the two experimental groups were measured the acquired vocabulary before the treatment.

*Step 3 - Providing treatment to the three groups:* At this stage, the control and the two experimental groups were given treatment. The control group was given treatment through chalk and talk method of teaching (CMT); the experimental group I was given the treatment of CBI; the experimental group II was given the treatment of CMT cum CBI.
Step 4 - Administering post-test for the three groups: At this stage, the control and the two experimental groups underwent post-test when the treatment period was over.

Step 5 - Administering retention test for the three groups: At this stage, the retention test was administered for the sample groups fifteen days after the post-test.

Then, the effectiveness of CBI and CT cum CBI were found out by the post-test and delayed post-test scores.

The above steps are shown in the following flowchart.

Fig. 3.1

Steps followed in the study – A flow chart
Table 3.6

_Schematic Representation of the Research Design_

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Type</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Nature of the experiment</td>
<td>Pretest-Posttest Equivalent Group Design</td>
</tr>
</tbody>
</table>
| 2.     | Variables                   | *Dependent Variable*: Acquisition of English vocabulary  

*Independent Variable*: Computer Based Instruction  
*Covariate*: Intelligence  
| 3.     | Tools used                  | i) NVIT- Non-Verbal Intelligence Test  

 ii) LPVE - LeWe’s Package on Vocabulary in English  
| 4.     | Sample                      | *Control Group*: 24 students  

*Experimental Group I*: 24 students  
*Experimental Group II*: 24 students  
| 5.     | Treatments provided         | *Control Group*: Chalk and Talk method of Teaching (CMT)  

*Experimental Group I*: Computer Based Instruction (CBI)  
*Experimental Group II*: CMT cum CBI  
| 6.     | Duration of the experiment  | 45 minutes x 20 working days for control and experimental group I  

 45 minutes x 2 times x 20 working days for experimental group II  
| 7.     | Statistical Techniques used | Mean  

Percentage  
Standard deviation  
t-test for dependent means  
One way ANOVA  
Scheffe test  


3.11 Establishing Homogeneity

Homogeneity is the sameness of things. It can also mean that something is the same throughout.

To confirm whether the three groups, namely, Control group, Experimental group I and Experimental group II were homogenous with regard to the level of intelligence, the intelligence test developed by Atmananda Sharma was administered among 72 students studying Standard IX. Then the collected data (Appendix 5) were analysed using One way ANOVA. The p values obtained for the three groups with regard to high, average and low intelligence were 0.965, 0.889 and 0.694, respectively. Since the P values exceeded 0.05, it was confirmed that there was no significant difference among the intelligence of the control group, experimental group I and experimental group II. It confirms the homogeneity of the three groups.

The homogeneity of the three sample groups were reconfirmed by analyzing half yearly examination marks (Appendix 6), where the p values obtained for the three groups with regard to high, average and low marks were 0.905, 0.986, and 0.774 for the Control group, Experimental group I and Experimental group II, respectively. Here also the P values exceeded 0.05.

3.12 The Treatment

This experimental study was constituted with three groups namely control group (N=24), experimental group I (N=24) and experimental group II (N=24). The students were grouped on the basis of their intelligence. The researcher formed these three groups by selecting 72 students from Standard IX of D.C. Lewis Memorial School, Sonebhadra.
District, Renukoot, Uttar Pradesh, after getting permission from the secretary of the school. The secretary realized that learning vocabulary would help the students to write their exams well, since the prose and poetry chosen for learning vocabulary were based on their syllabus.

The researcher chose the topics from the poems such as If, River, The road not taken, Because I could not stop for death, Night of the scorpion, No men are foreign, The Indian who died in Africa, Shakespeare, To Indian my native land, Our Casuarina Tree, Labella Dame Sans merci and from the proses namely, Astrologer’s day, Dusk, Case for the defence, The tiger in the tunnel, The umbrella man. The sniper, The gift of magi and Marriage is a private affair, prescribed for Standard IX for ICSE board.

The Control Group and Experimental groups I and II were given treatment for 45 minutes x 20 days and the Experimental group II received an additional 45 minutes for each class as it had to undergo conventional teaching, too. The control group was given chalk and talk method of teaching (CMT), Experimental group I was given Computer-based instruction (CBI) and experimental group II was given CMT cum CBI.

In this study, the pretest-post test Equivalent group design (Best & Kahn, 2006) was followed to analyze the effectiveness of CBI for the acquisition of vocabulary of secondary students. Pretest was administrated to all the three groups and their equivalence was confirmed.

The CMT was performed by the researcher herself and the CBI was supervised by the computer assistant.

Two days after the treatment, VTE (post-test) was conducted for all the three groups. The delayed post test was conducted after 15 days from the post test.
The achievement scores of the three sample groups were obtained for all tests conducted namely, pre-test, post-test and delayed post-test. The gain scores and the retention scores were computed and analysed for all the three sample groups.

3.13 Threats to Experimental Validity

A threat is something that may or may not happen, but has the potential to cause serious damage (Janssen, 2014). The sufficiency of experimental design is judged by the degrees to which the threats to experimental validity is removed or reduced. The experimental validity faces two kinds of threats, namely internal validity and external validity.

3.13.1 Threats to Internal Validity

Internal validity is concerned with the extent to which the experiment is genuinely effective, that is the extent to which the manipulations in the independent variable bring about change in the dependent variables. It is connected with the true variance in the dependent variable that has been brought about by the induced variations treatment in the independent variables. Internal threats bare experimental procedure, treatments or experience of the participants that can threaten the research’s ability to draw the correct inference from the data about the population in an experiment. Experimental researches need to identify potential threats to the internal validity of their experiments and design them so that these are not likely to arise or are minimized. Internal validity may be affected by a number of factors.

The researcher has found the possible threats to internal validity and made attempts to minimize them.
a) History:
A true experiment requires that participants in both the groups be treated the same i.e., they have the same history of experience except for the treatment. Occurrence of unexpected events led to internal validity (Shaughnessy & Zechmeister, 1997).

During the experimental period, unexpected events did not occur. Thus this threat was eliminated.

b) Maturation:
During an intervention, often change may be occur due to the factors associated with passing of time rather than to the intervention itself. This is known as maturation threat (Frankel & Wallen, 2006).

Since the samples selected were in same age group, the researcher used half yearly examination marks in English, and intelligence test scores for establishing homogeneity. Thus this threat was overcome.

c) Testing:
The familiarity with the testing procedure and with the instructor’s expectations that they gain during the first test affects their performance on the second test (McBurney, 2006).

This threat was overcome by conducting same pretest, posttest and delayed post-test for both the control and two experimental groups.

d) Regression:
Statistical regression is always a problem when individuals have been selected to participate in an experiment because of their extreme scores. Regression threat may be present whenever change is studied in a group that is extremely high or low in its pre-intervention performance (Fraenkel & Wallen, 2006).
In the present study, the pretest scores of the two experimental groups and the control group in the achievement test were not statistically different from each other. Thus this threat was minimised.

*e) Instrumentation:*

The changes in instrumentation can threaten internal validity by providing alternate explanations for differences in behaviour between one observation period and another (Shaughnessy & Zechmeister, 1997).

In this experimental study, all the tests conducted were the same for the three groups and hence this threat was overcome.

*f) Location:*

The location in which test and other instruments are administered may affect response. This is known as location threat (Shaughnessy & Zechmeister, 1997).

The treatments to the control and two experimental groups were provided in the familiar classrooms and computer lab in their regular school. So this threat was overcome.

*g) Selection:*

From the outset of a study, differences exist between the kinds of individuals in one group of an experiment and those of another when there is a confounding due to selection (Shaughnessy & Zechmeister, 1997). It is possible that the pupils in the control group may differ from the experimental group in many ways other than the group assignment.
In the present study, there was no significant difference among the control and two experimental groups in the scores of the pretest, half yearly examination in English and the intelligence test. Thus this threat was minimised.

h) Implementation:
The treatment or method in any experimental study must be administered by someone – the researcher, the teachers involved in the study, a counsellor or any other person. This fact raises the possibility that the experimental group may be treated in ways that are unintended and not necessarily part of the method, yet which give them an advantage of some sort or another. This is known as an implementation threat (Fraenkel & Wallen, 2006).

During the experiment, the researcher administered the same tools to the respondents of all the three groups. Thus this threat was minimised.

i) Subject mortality:
When participants are lost from an experiment, there is a threat to internal validity. The threat to internal validity rests on the assumption that subject loss changes the nature of the group from that established prior to the introduction of the treatment. Participants who are left in the experimental group will differ from those dropped out if for no other reason than that they were able to do the task (Shaughnessy & Zechmeister, 1997).

During the experimental period, such subject loss did not occur. Thus this threat was eliminated.

3.13.2 Threats to External Validity
True experiments may be weakened by threats to external validity. Education researchers are primarily concerned with the practical uses of their findings; they frequently conduct
their studies in real classroom situations. Although these real-life settings present opportunities for greater generalization, they do not automatically result in externally valid research (Best & Kahn, 2006).

The researcher briefly stated the possible threats to external validity and how they were minimized.

a) Interference of prior treatment:
In some types of experiments the effect of one treatment may carry over to subsequent treatment. In an educational experiment learning produced by the first treatment is not completely erased, and its influence may accrue to the advantage, or disadvantage, of the second treatment.

Here different subjects serve for control group and experimental groups. The control group was treated with only conventional method and the two experimental groups were treated with computer based instruction. No other treatments were considered as treatment to the sample groups.

b) The artificiality of the experimental settings:
In an effort to control extraneous variables, the researcher imposes careful control that may introduce a sterile or artificial atmosphere not at all like the real-life situation to which generalization is desired.

In the present study, it is minimized by giving the treatment in the real classroom, after the class hours (1.30 pm - 2.15 pm).
c) *Interaction effect of testing*:

The use of a pretest at the beginning of a study may sensitize individuals by making them more aware of concealed proposes of the researcher and may serve as a stimulus to change.

In this study, same pre-test in vocabulary acquisition was conducted for the control and two experimental groups. So the interaction effect was common for all the three groups.

d) *Interaction of selection and treatment*:

It is because of narrow characteristics of the settings of participants in an experiment that a researcher cannot generalize to individuals who do not have the characteristics of the participants.

The selection of control group and two experimental groups were done by conducting the same intelligence test. Furthermore the treatment for them lasted for the same days and the gap between the post test and the delayed post test were the same for all the three groups. Hence, this threat was minimized.

e) *The extent of treatment verification*:

Because of the potential threat of experimenter bias, most researchers have research assistant or others who are not directly involved in the formulation of the research hypothesis deliver the treatment. This leads to a potential threat to external validity. The researchers must have a verification procedure to make sure that the treatment was properly administered.

In this study, the researcher taught the control group and the experimental groups studied of their own. The students of two experimental groups were monitored by the lab-in-charge. Thus this treat was minimized.
3.14 Delimitations of the Study

Delimitation is a limitation imposed by the researcher in the scope of the study and it is a choice that the researcher makes to define a workable research problem (Thomas et al., 2011).

The delimitations of this study were:

i. Seventy two secondary students (Standard IX) following ICSE (Indian Certificate of Secondary Education) syllabus were selected for the study.

ii. The researcher focused only on English vocabulary.

iii. The conventional method was taught by the researcher herself and the experimental group students were supervised by the computer assistant.

3.15 Limitations of the Study

Every research study would have certain limitations during the treatment. It is true in the present study too.

i. While the experimental treatment was going on, there were power cuts often. Extra time was taken on some days due to power cut.

ii. Since the students were tightened with project work in all the exams for all the subjects they vacillated to attend the language classes by the researcher.

3.16 Statistical Techniques Employed

The statistical techniques employed for analyzing the collected data were: Descriptive analyses (Mean, Percentage, Standard deviation and Pearson’s correlation coefficient)
and the inferential analyses (t test for dependent groups, One-way ANOVA and post-hoc test).

i. **Mean:** The arithmetic mean or simply mean is the center of gravity of the group. It is the fulcrum about the entire group revolves.

ii. **Percentage Analysis:** The scores equal to or above the sum of mean and 1 SD are high level scores, the scores equal to or below the difference between mean and 1 SD are low level scores and in between scores of high and low levels are average scores.

iii. **Standard Deviation:** Standard deviation is a prominent member of the family of measures of dispersion. Standard deviation has been termed so because it provides a standard unit for measuring distance of various scores from their mean.

iv. **Pearson’s correlation coefficient:** It is the degree of quantitative relationship between two sets of measures.

v. **t test for dependent groups:** It is used to find out the significance of difference in mean scores between the pre-test and post-test of the same group.

vi. **ANOVA:** Analysis of Variance is used when there is an involvement of more than two groups. It has been employed to find the difference among the variables.

vii. **Post-hoc test (Scheffe Test):** When the ‘F’ ratio is significant, the Scheffe test is used to find which group is more significant.

*The next chapter deals with data analyses.*