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Impact of Mind Maps on Student's Reading Comprehension at Secondary and Higher Secondary Levels in District Buner

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Abstract: *This study aims to determine how mind-mapping strategies develop the reading comprehension of English language learners in grades ten and twelve. The study focuses on teaching English grammar and text, keeping in view their textbooks. The researcher has used a quasi-experimental design. The study sample comprised sixty students, thirty from the tenth and thirty from the twelfth grade. Thirty students were placed in the experimental group and thirty in the control group. The experimental group received the mind mapping treatment for one month, whereas the control group was given instructions via traditional methods. The researcher analyzed both qualitative and quantitative data from pre-and post-tests and an interview to test the impact of mind-mapping strategies on the participants' reading comprehension. The data were analyzed through a t-test. The statistical analysis showed a significant difference in the mean score of both groups and showed that mind-mapping strategies positively impact the students reading comprehension.*

Key Words: Mind Mapping, Reading Comprehension, ESL Learners

Introduction

Reading is one of the four basic skills of language. It can be defined as:

Reading

Reading" involves translating the text into sounds or spoken words (Freakgenie, 2015).

Reading Comprehension

Reading comprehension is understanding what you are reading. It involves deriving meaning from those words (Mullin, 2019).

Youngsters cannot comprehend a text if they cannot recognize the written words, so reading must come first. Reading comprehension is one of the most important ways to understand a foreign language. It is

vital to studying and teaching English because it is a necessary ability for further reading. Goodman (1971) once said that we learn to read by reading. According to Krashen (1988), meaningful reading is the root of much of our vocabulary knowledge, writing styles, advanced grammar skills, and spelling. It is also the source of all other language abilities. According to Durkin and Dolores (1995), there are three essential parts of reading comprehension:

1. Understanding vocabulary: The reader must decipher the text's language and apply past knowledge to draw out and clarify its meaning.
2. Reading comprehension: The learners must comprehend the statement and what it has to do with the previous one. No doubt, understanding sentences relies heavily on the learner's grammatical proficiency.
3. Understanding the paragraph: To grasp the text, the reader must comprehend the phrases, their order, and their connections.

As for reading comprehension, the traditional grammar-translation method has been used for a long time but only focuses on vocabulary. Therefore, it is not viewed as the best method and never plays a crucial role in enhancing reading comprehension skills because the learners of our country are still very dull in the reading comprehension of foreign languages, especially English. Mind-mapping strategies have been viewed as a catalyst for the enhancement of the reading comprehension abilities of learners.

Mind Mapping

A mind map is a visual representation of knowledge and relationships. It can be thought of as a graphic organizer or diagram that helps students visualize their reading. Using diagrams or graphic arrangements, students can use mind-mapping strategies to visualize their reading tasks and find connections between different bits of information (Brandner, 2015).

Types of Mind Map

Ghosal (2021) claims that a mind map can be created in various ways to fit multiple purposes. Here is a brief overview of the most common types that can be applied to boost output and promote clarity.

Spider Map

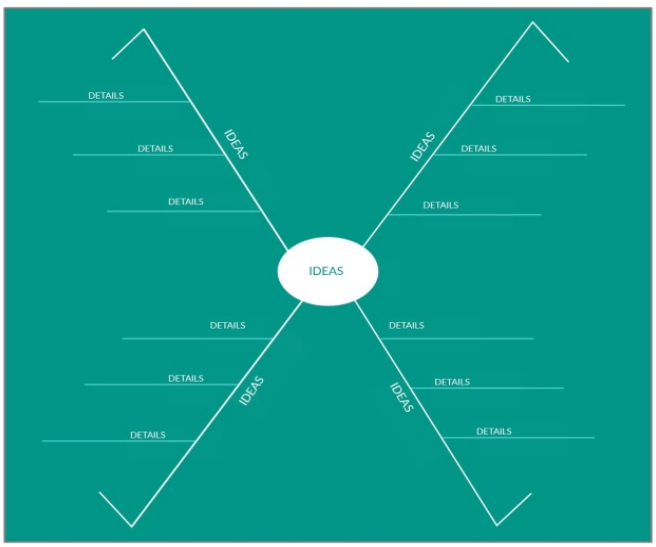

Figure 1

You can arrange your thoughts in a way that mimics a spider using a spider map, a visual brainstorming approach. Your central view is where everything is located, and all your supporting ideas radiate outward from it.

A spider map gives a concise yet thorough overview of all the key information using spatial arrangement, colour, and imagery to deconstruct difficult topics. Additional information, further research, linkages, and gap-filling are all always possible.

Making a spider map doesn't have a predefined framework. Then, draw a circle around it after writing your main idea in the center. Then, depict your connected concepts by drawing lines that branch off your main notion.

Flow Map

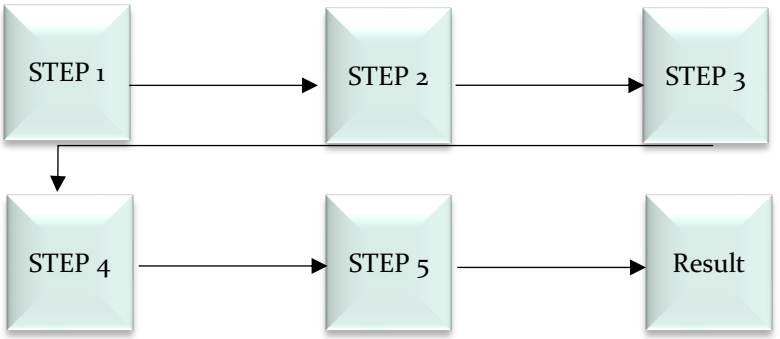

Figure 2

A flow map is a distinct method of information organization that combines maps, flow charts, and diagrams, even though the name "flow map" has its roots in cartography. Use flow maps if you're having trouble representing detailed datasets in a logical order since you're working with them.

Both horizontally and vertically can be used to generate flow maps. You have the option of aligning it ascendingly or descendingly. It illustrates how a process works or how a series of instructions progresses.

Because they accurately reflect the range of concepts contained in a whole project, this is particularly helpful for theoretical works. People with scientific backgrounds and sensibility are the ones who are most fond of them.

Multi-flow Map

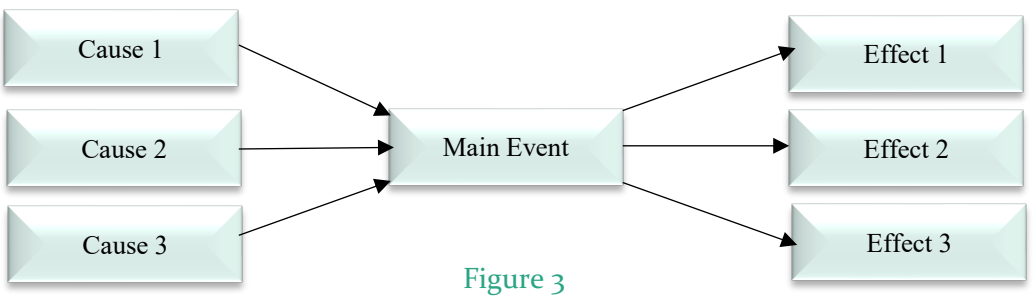

Figure 3

Multi-flow maps are among the best tools for mind mapping and are excellent for illustrating or finding cause-and-effect linkages. The event or circumstance being discussed takes up the central space on the map.

The causes of events are shown in the boxes on the left, while their effects are shown on the right. Left to right is the direction of the arrows. Multi-flow maps can be used to display causes and effects. They may also illustrate how certain events are related to one another.

Bubble Map

Figure 4

A bubble map, also known as a proportional symbol map, is a simple visualization tool that imitates or mimics our natural cognitive process.

Defined, bubble maps are a tool for organizing and developing your thoughts. In reality, they support you in focusing your thoughts and directing your imagination toward elaborating on particular themes and issues.

To create a bubble map, you must first write a noun in the center bubble and the adjectives around it in the surrounding bubbles.

It can occur to you when writing a book or essay to use the same adjective to describe a noun repeatedly. You can solve that issue with a bubble map.

Brace Map

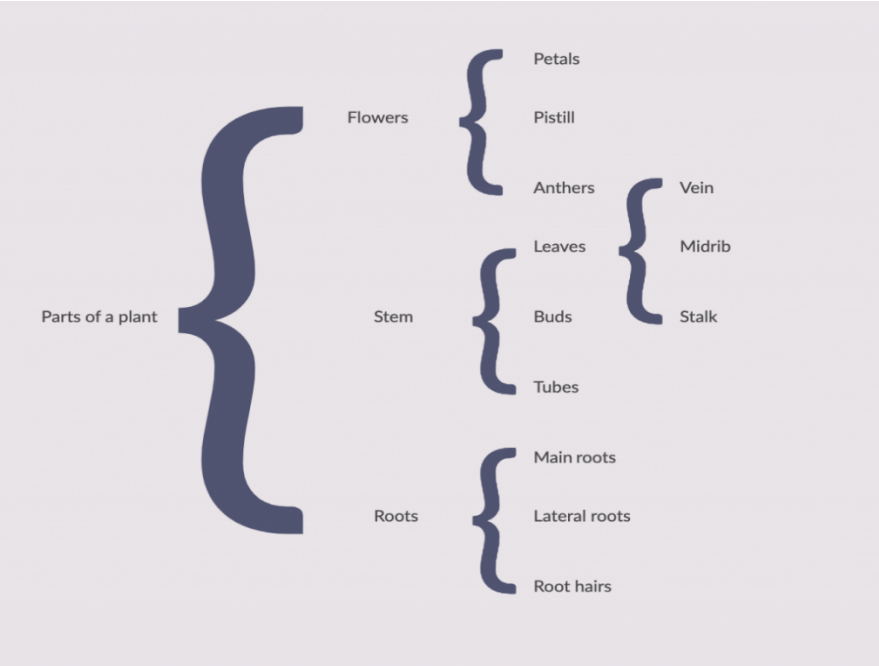

Figure 5

Brace Maps show the links between parts and wholes of concrete objects. Students use these diagrams to locate the components of real-world objects. To the left of the brace, the name of the entire thing is written, followed by one or more sets of braces that divide the principal part(s) into subparts.

The Brace Map can be used in lessons to illustrate the connection between an object's totality and its component pieces. It refers to a tangible thing that can be divided into parts or subparts.

Statement of the Problem

Poor reading comprehension skills of students are evident in secondary and higher secondary schools in district Buner. The problem requires searching for effective teaching methods using active learning strategies such as mind mapping. This study used advanced mind mapping techniques to investigate the effect of its use on 10th and 12th-grade students' reading comprehension, especially in comparison to the traditional grammar-translation method, to solve the poor reading comprehension of students in English.

Research Objectives

The study has the following objectives.

1. To analyze the impact of mind maps on students' reading comprehension at the secondary and higher secondary levels.
2. To explore students' perceptions about using mind maps in teaching English at the secondary and higher secondary levels.

Research Questions

The following questions are part of the study.

1. What impact do mind maps have on secondary and higher secondary-level English-language learners?

2. What are the students' perceptions about using mind maps in English teaching at the secondary and higher secondary levels?

Aims and Significance of the Study

This study compared the uses of mind maps with the conventional teaching strategies based on the Guides provided by the Ministry of Education to teachers to determine the impact of mind maps on developing reading comprehension in English language skills in secondary and higher secondary level school students. It also attempted to quantify mind maps' effect on students' understanding of English grammar and texts.

The following factors contribute to the importance of this study:

1. Investigating the effect of the mind map approach as an independent variable on English language text comprehension and grammar. This tactic might encourage English teachers to use modern techniques to solve the problem of poor reading comprehension achievement in the district Buner pupils'.
2. It is hoped that this study will add a fresh perspective to District Buner's curriculum. Students who use mind maps as a contemporary teaching tool may be better able to comprehend English-language materials, which will improve their academic performance.
3. This will encourage pupils to think innovatively and may enable them to establish new relationships among concepts.

Limitation and Delimitation

This study's findings were restricted to the following:

1. The tenth and twelfth-grade female English-language learners in district Buner private schools were the subjects of this study. The study's sample was chosen during the academic year's eighth semester, which ran from July 16 to September 29, 2022.
2. The results were used to gauge students' understanding of an English text and were restricted to the post-test and a few spoken remarks.
3. English text reading and English Grammar comprehension are assessed.

Literature Review

The training and growth of mind maps are highly valued in some developed nations, such as the United States and Europe. The UK and Singapore have made mind mapping a required course for elementary and middle schools. The effect of mind maps—electronic or traditional—on reading comprehension was the subject of several types of research. They all concurred that the use of mind maps improves reading comprehension.

A study was done by Besic *et al.* (2011) to evaluate the usage of mind maps in instruction. They discovered that mind maps were the most effective tools for enhancing reading comprehension because they allowed students to see the connections and relationships between the primary concepts and the supporting ideas and the details and notes linked to them.

Peng (2011), in his study on reading comprehension talent, discovered that the two brain regions were integrated with E-mind maps, which raised the reading comprehension level. It establishes a connection between the use of language, words, logical reasoning, and analysis on the one hand and the use of images, imagination, creativity, and construction on the other hand.

According to Rivera, Benavides, and Rubio (2010), using an electronic mind map boosted students' achievement levels, their level of reading comprehension, their ability to edit their mistakes, and their ability to

quickly switch between different design styles.

Bayat and Malekzadeh (2015) also looked into the impact of the mind mapping technique on Tehran students at the Safir Institute's comprehension of the material in EFL reading texts. The individuals were split into two groups, one experimental and the other control, with a mean age of 25. The results demonstrate that using mind maps improves students' reading comprehension, as seen by the variation in post-test results.

According to Gomez and King's (2014) research, learners could connect the terminology in the texts with the images and symbols by using the symbols, images, and links in the mind maps. These elements worked wonders in aiding the student's comprehension of the texts and improved memory of the material because visual memory is longer-lasting than auditory memory.

Additionally, Bawaheh (2019) contrasted the impact of the mind mapping methodology with the traditional teaching method on the immediate understanding and long-term memory of electric energy concepts in tenth-grade students. One hundred eleven people were chosen at random and split into groups. The outcomes demonstrated that the mind-mapping methodology was superior to the traditional teaching strategy.

There is another study that has been identified on reading comprehension. To help Thai English major students with their reading comprehension and summarization abilities, Chaichompoo (2017) looked at the use of electronic mind mapping. He discovered that this method helped Thai pupils comprehend English reading more effectively. The findings demonstrated that this method enables pupils to summarise and interpret materials easily.

Ellozy and Monstafa (2010) discovered that electronic mind mapping improved the critical reading abilities of first-year Egyptian students enrolled at the American University in Cairo. The improvement was tested using student comments, surveys, and evaluations. The findings showed that electronic mind mapping aids in students' development of visualizing abilities.

In conclusion, several types of research have shown that using electronic mind-mapping techniques benefits pupils. Even though there are numerous types of research on mind mapping, there are few in KP; particularly, there is no research in district Buner on the impact of mind mapping on reading skills. The researcher, therefore, suggested investigating how mind mapping affects reading skills in district Buner.

Research Design

This research design is a Quasi-experimental design based on the experimental and control groups. The researcher will collect both quantitative and qualitative data; therefore mixed-method approach will be used.

Population and Sample

The study's population comprises all the tenth and twelfth grades female English language learners in district Buner private schools. A sample of 60 pupils was chosen from each grade for the current research. Purposefully, two homogeneous classes were made for both grades from the population; one class was selected as the experimental group, while the other was chosen as the control group. There were 30 students in each group.

Sampling Technique

The researcher has applied the Simple Random Sampling Technique via a simple random sampling generator via computer for the subjects' selection for the current study.

Data collection Tool

The experiment was conducted with groups of 10 and 12 grades, comprising 30 students. The students received 48 periods (40 minutes each) of English for Communication and Reading Skills during the investigation. The researcher conducted the sessions with learners. The major focus was on reading comprehension.

The data collection tools are the following.

1. Pre and Post Tests
2. Semi-structured interview

The tools used in this research are to gauge how well readers could understand what they were reading.

Data Collection Procedure

Pre-Test and Post-Test

The material used in this study was derived from their textbooks. For grade tenth, we took a lesson from their English textbook. The lesson's title was "A Strange Voyage of Sindbad." There were also some basic components of English grammar, such as parts of speech and sentence types. The researcher selected a "Truck Decoration" lesson from the 12th-grade English textbook, which required subject and modal verbs for twelfth-grade students. The researcher asked the subjects to read the selected materials and then took a pre-test from both control and experimental groups in the form of MCQs and recorded the statistical and descriptive data of the tests. The tests consisted of 30 items and took one hour to complete. The pre-test was used to gauge the students' reading proficiency before the treatment. After that, the researcher taught the same lessons to both groups through different methods for one month – the experimental group of grade ten received treatment through a spider map, and the control group received treatment through a traditional grammar-translation method.

Similarly, the experimental group of grade twelve received treatment through a brace map, and the control group received treatment through the traditional grammar-translation method. After one month, the researcher took a post-test of 30 items, which took one hour to complete from both groups, and recorded the statistical and descriptive data. The researcher then compared the pre-test data and the post-test data. The results showed that the mind maps positively impact reading comprehension skills (shown in Tables 01, 02, 03, and 04).

After the post-test, an oral interview was conducted.

Semi-Structured Interview

The researcher asked all 30 students in their classes to get detailed information **(Table 05)**. The six questions in the Appendix were posed to 30 students in each category. The questions were to determine whether they like this technique or want other teachers to use such techniques in different subjects. Can they use such techniques themselves or not?

Data Analysis Procedure

The researcher took the pre-test marks, which the students obtained before giving them the treatment of mind maps and grammar-translation methods, and also took the marks of post-tests. The researcher then separated the pre-and post-test marks of the control and experimental groups to find the significant difference between the marks of the control and experimental groups. For this, the researcher calculated the t-value, the formula of which is $t = \frac{\bar{d}}{s_d/\sqrt{n}}$. The following steps were carried out.

1. For calculating the t-test value of two dependent groups, the null hypothesis and alternative hypothesis are stated as follows:

$H_0 = \mu_D = \mu_1 - \mu_2 = 0$

$H_1 = \mu_D = \mu_1 - \mu_2 \neq 0$

I. The significance level was set as α = 0.05
II. The test- statistic under Ho is:
III. The critical region is /t/ ≥ $t_{\propto/2,(v)}$= /t/ ≥ $t_{0.025\ (14)}$= 2.145

2. As in the formula of t-value, $\bar{d}$ ands_d is required, so to find out these values. First, the researcher took the pre and post-test marks of control groups and found the difference $\boldsymbol{d_i}$ between pre and post-test marks, i.e., the researcher subtracted the post-test marks from the pre-test marks and then took the square of every digit, which comes in the result of post-marks minus pre marks $\boldsymbol{d_i}^2$. After taking the square, we took a summation of $\boldsymbol{d_i}$ ($\Sigma\boldsymbol{d_i}$) and $\boldsymbol{d_i}^2$ ($\Sigma\boldsymbol{d_i}^2$), then through ($\Sigma\boldsymbol{d_i}$) we
3.
4. find the mean of the difference through this formula $\bar{d} = \frac{\Sigma \boldsymbol{d_i}}{n}$. Where n is the total number of students taken under the control group.
5. Now for calculating s_d this formula has been used $\boldsymbol{s_d}^2 = \frac{1}{n-1}[\Sigma\boldsymbol{d_i}^2 - \frac{(\Sigma \boldsymbol{d_i})2}{n}]$ which required ($\Sigma\boldsymbol{d_i}^2$) which has been calculated in the second step. The values are put in the formula to find out the value of $\boldsymbol{s_d}^2$
6. In this step, the researcher put all the values and finds out the t-value of the Control group.

The same steps were followed for calculating the t-values of another control group and experimental groups. Then the researcher evaluated the t-values of all four groups with critical region values and concluded that the t-value of experimental groups were higher, indicating that mind maps positively impact reading skills.

Data Analysis

The analysis of the pre-and post-test was done using a t-test via SPSS to determine whether there were any significant differences between the pre-and post-test scores of both groups.

Oral interview data were organized to

1. The total number of students who agreed
2. And the total number of students who did not agree.

Results

After the analysis of the collected data, the following results were obtained.

Table 1. Pre and Post-test results of the Control group of grade ten

Grade ten	Σd_i	d	Σd_i^2	The standard deviation of the difference s_d	T-test
Control group	66	4.4	500	3.86	4.41

Since the calculated value t= 4.41 falls in the critical region 2.145, the null hypothesis (Ho) is rejected. It is concluded that the data provided sufficient evidence to indicate that the traditional grammar-translation technique affects the average score.

Table 2. Pre and Post-test results of the Experimental group of grade ten

Grade ten	Σd_i	$\bar{d}$	Σd_i^2	The standard deviation of the difference s_d	T-test
Experimental group	71	4.73	719	5.23	6.23

Since the calculated value t= 6.23 falls in the critical region 2.145 and is more than the t-value of the control group, the Ho is rejected. It can be concluded that the data provided sufficient evidence to indicate that the effect of the Mind Maps technique on the average score is greater than the traditional grammar translational method.

Table 3. Pre and Post-test results of the Control group of grade twelve.

Grade Twelve	Σd_i	$\bar{d}$	Σd_i^2	The standard deviation of the difference s_d	T-test
Control group	104	6.93	1446	7.196	3.73

Since the calculated value t= 3.73 falls in the critical region 2.145, the researcher rejected Ho and concluded that the data provide sufficient evidence to indicate that the traditional grammar-translation technique affects the average score.

Table 4. Pre and Post-test results of the Experimental group of grade twelve.

Grade Twelve	Σd_i	$\bar{d}$	Σd_i^2	The standard deviation of the difference s_d	T-test
Experimental group	42	34.53	202	13.91	9.71

The table shows that the calculated value t= 9.71 falls in the critical region of 2.145. It is also greater than the t-value of the control group; therefore, the researcher rejected Ho and concluded that the data provide sufficient evidence to indicate that the effect of the Mind Maps technique on the average score is greater than the traditional grammar translational method.

Table 5. The table shows the student's Responses to an Interview, after two months of training with mind Mapping Techniques and reading Comprehension.

Questions	Total Number of Students	Number of Students Agreed	No of the Students not Agreed
QNo.1: Is mind mapping a technique better than traditional techniques of reading comprehension?	30	30	0
QNo.2: Do you want to apply this technique to other subjects?	30	19	11
QNo.3: Do you people apply this technique to lessons or any other topic by yourself now?	30	30	0
QNo.4: Is taking a class using the mind mapping technique more interesting than taking a class using traditional methods?	30	30	0
QNo.5: Does this method improve your reading comprehension skills, and are you satisfied with it?	30	30	0

We asked a total of 6 questions from 30 students about mind maps and got the best result, i.e., all 30 students liked mind maps and wanted other teachers to introduce mind maps in different subjects. Only 11 out of 30 said they couldn't apply mind maps themselves; those were the dullest students in the class. Besides, the result of interviews shows that the numbers of students who liked mind-mapping techniques and were satisfied with them are higher, which indicates that mind-mapping strategies positively impact students' reading comprehension skills.

Discussion

The study's findings indicate that students' reading skills improve after learning mind-mapping techniques. Their post-test scores were compared using a t-test to their pre-test scores. At the 0.05 level of significance, the post-test score's t – value was greater than the pre-test score, meaning that mind maps are very effective techniques for increasing students' reading skills. Most students were happy (60%) with their reading comprehension skills and enjoyed using mind maps. However, some students had issues with their vocabularies and could not develop whole sentences to fill out the mind maps (40%). The findings of this study are consistent with earlier studies that showed how the mind-mapping approach might improve pupils' reading skills. (Deesri, 2002; Talal, 2018; Rahat et al.,2020).

Conclusion

It was fascinating to explore why only 60% of the study participants could increase their reading comprehension skills while the other 40% did not. It may be argued that their low reading skills are to blame for how challenging it was for them to handle reading at a higher level, such as summarizing reading passages. The students' deficiencies in various areas, including vocabulary, grammatical skills, and identifying core concepts, can all lead to issues. The results from the questionnaire and interview indicate that teaching vocabulary in the pre-reading stage was vital because it would aid the students during their reading activity. Additionally, the experimental group's notable development may be explained by the fact that students frequently exhibit favorable views toward novel teaching strategies that spare them from the routine and dullness of the regular classroom.

The method works for junior and senior courses; however, junior-level reading instruction requires a hand-made map on the board to increase students' understanding and memorization of the material.

Recommendation

This study only looked at the widespread impact of mind-mapping strategies on students' reading comprehension. Future researchers should focus on the mind map technique's effects on students' innovative problem-solving abilities.

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